आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

Course Structure

&

Syllabus

Of

B. Tech
Mechanical Engineering

[Applicable w.e.f. Academic Session - 2022-23]
[As per CBCS guidelines given by UGC]

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD.
www.iftmuniversity.ac.in

Study & Evaluation Scheme of
Bachelor of Technology (B.Tech) Mechanical Engineering

Programme:	**Bachelor of Technology in Mechanical Engineering**
Course Level:	**Graduate Degree**
Duration:	**04 Years (Eight semesters) Full Time**
Medium of instruction:	**English**
Minimum Required Attendance:	**75%**
Maximum credits:	**226**

Programme Outcomes (POs):

Students completing this programme will be able to:

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
3. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
4. Environment and Sustainability: Understand the impact of the professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
5. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
6. Design / Development of Solutions: Design solutions for complex engineering problems and design system components or process that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
7. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, healthy, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

School of Engineering & Technology * IFTM University
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

8. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
9. Life-long Learning: Recognize and need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
10. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
11. Individual and Team Work: Function effectively as an individual, and as a member of leader in diverse teams and in multidisciplinary settings
12. Project management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team to manage projects and in multidisciplinary environments.

Programme Specific Outcomes (PSOs):

The learning and abilities or skills that a student would have developed by the end of four-year B.Tech Program:

1. Understanding knowledge of mathematics, engineering and science to identify, formulate, analyze the engineering problems and find cost-effective and optimal solution of real-life problems.
2. Applying mechanical engineering concepts and tools to solve complex engineering and industrial problems in the field of Manufacturing Engineering, Thermal Engineering and Design Engineering.
3. Analyzing managerial and entrepreneurial skills to work effectively in multidisciplinary teams for building nation and helping society by following ethical and environmentally friendly practices.
4. Evaluating the need of lifelong learning and will engage in learning modern techniques and engineering tools like CAD, Solid Works, CNC machining, 3D printing etc.
5. Creating positive attitude for conducting experiments and developing new concepts on emerging fields.

Choice Based Credit System (CBCS):

Choice based credit system (CBCS), provides a learning platform wherein the student or knowledge seeker has the flexibility to choose their course from a list of elective, core and soft skill courses. This is a student-centric approach to achieve his target number of credits as specified by the UGC and adopted by our University.

Groups of CBCS:

07 Groups of courses have been identified to provide student comprehensive exposure to a large number of areas, leading to the holistic development of an individual. These groups / clusters are as follows:

1. Humanities, Management courses, Language and Literature (HML)
2. Elementary / Fundamental Science courses (FSC)
3. Engineering Core Courses (ECC)
4. Engineering laboratory Courses (ELC)
5. Engineering departmental Elective (EDE)
6. MOOCs/NPTEL/Mandatory Course/Value added courses (VAC)
7. Project/Seminar/Industrial training/General Proficiency (PST)

- **Humanities, Management courses, Language and Literature (HML):** These courses are actually Ability Enhancement Course (AEC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later

School of Engineering & Technology IFTM University, Moradabad Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad

stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. These courses are of 4 credits each.

- **Elementary / Fundamental Science courses (FSC):**
  These courses include science courses from the disciplines of Physics Chemistry and Mathematics department, crafted for engineering students. These courses are of 4 credits each.

- **Engineering Core courses (ECC):**
  Core courses of B.Tech. Program will provide a holistic approach to engineering education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.
  The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the society at large.
  A wide range of core courses provides groundwork in the field of thermo-fluids, engineering designs, industrial and production engineering etc.
  We offer core courses in semester III, IV, V, VI, VII &VIII during the B.Tech. - Mechanical program. These courses are of 4 credits each.

- **Engineering Laboratory Courses (ELC):**
  These courses includes various laboratories of Engineering designed to provide the student solid foundation to the domain of engineering. In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done. These courses are of 1 credit each.

- **Engineering Departmental Elective (EDE):**
  The departmental elective course is chosen to make students specialist or having specialized knowledge of a specific domain like thermo-fluids, designing, industrial, production management etc. The student will have to choose any one out of the given list of specialization offered. These courses are of 4 credits each.

- **MOOCs/NPTEL/Mandatory Course/Value added courses (VAC):**
  A Value-Added Course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day- to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world.
  This is recommended for every student to take at least one MOOC Course throughout the programme. Every student completing a MOOC course through only NPTEL.

- **Project/Seminar/Industrial training/General proficiency (PST):**
  1. Project with a department faculty.
  2. The students, who take up experiential projects in companies, where senior executives

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other than their regular classes.

3. Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

B.Tech. Mechanical Engineering: Four-Year (8-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S. No.	**Type of Course**	**Credit**	**Total Credits**
1	**Humanities, Management courses, Language and Literature (HML)**	4 Courses of 4 Credits each (Total Credit 4X4)	16
2	**Elementary / Fundamental Science courses (FSC)**	11 Courses of 4 Credits each (Total Credit 11X4)	44
3	**Engineering Core courses (ECC)**	26 Courses of 4 Credits each (Total Credit 31X4)	104
4	**Engineering Laboratory Courses (ELC)**	26 Courses of 1 Credits each (Total Credit 26X1)	26
5	**Engineering Departmental Elective (EDE)**	2 Courses of 4 Credits each (Total Credit 2X4)	08
6	**MOOCs/NPTEL/Mandatory course/Value added courses (VAC)**	2 Course of 4 Credits each (Total Credit2X4) 2 Course of 0 Credits each (Total Credit 2X0)	08
7	**Project/Seminar/Industrial training/General Proficiency (PST)**	10 Courses of 1 Credits each (Total Credit 10X1) 1 Course of 10 Credits (Total credit 1x10)	20
Total Credits			**226**

Evaluation of Performance

1. Programmes: Evaluation of performance of the students in a programme shall be a continuous process based on their performance in the class test, quizzes, assignments and the end semester examinations.

a. Theory papers in semester system (Maximum Marks: 100)

The evaluation will be done through two class test and one end semester examination. This will be in addition to quizzes, assignments, attendance, etc. Each class test will carry a weightage of 10 marks, and the end semester examination will carry a weightage of 70 marks. The remaining 10 marks will be awarded on the basis of attendance and performance in quizzes and assignments.

School of Engineering & Technology ★ IFTM Univers... Director

Registrar
IFTM University
Moradabad.

b. Practical in semester system (Maximum Marks: 100)

In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done, which will carry a weightage of 30 marks. There shall be an end semester practical examination with or without an external examiner which will carry a weightage of 70 marks.

2. Summer Training, Project, Seminar etc.: Summer Training, Project, Seminar, and other learning-oriented activities shall have associated maximum marks and credits, as stated in the syllabus.

3. Examination:

a. The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.

b. A candidate, in order to pass, minimum CGPA of 4.50 is required in a particular academic year inclusive of both semesters of that academic. And maximum numbers of Carryover paper permissible for promotion to next academic year are 06 theory / practical / project papers.

c. There shall be no minimum Grade required to pass in General Proficiency (GP). However, Grade obtained in General Proficiency (GP) shall be included in SGPA.

d. In case of audit paper, the minimum Grade required to pass is Grade D. However, the Grade obtained in audit paper shall not be included in SGPA.

e. For further information, examination ordinance of IFTM University can be followed.

Evaluation Scheme:			
	Internal	**External**	**Total**
Theory	**30**	**70**	**100**
Practical	**30**	**70**	**100**
Seminar / Industrial Training	**100**	**--**	**100**
Project	**300**	**400**	**700**

Unique practices adopted:

Our teachers' use of communicative strategies encourages pedagogic practices that are interactive in nature and is more likely to impact on student learning outcomes. Some specific strategies, that promoted this interactive pedagogy includes:

Audio-Visual Based Learning:
It is clear that audio visual aids are important tools for teaching learning process. It helps the teacher to present the lesson effectively and students learn and retain the concepts better and for longer duration. Use of audio-visual aids improves student's critical and analytical thinking. It helps to remove abstract concepts through visual presentation. However, improper and unplanned use of these aids can have negative effect on the learning outcome. Therefore, teachers should be well trained through in-service training to maximize the benefits of using these aids. The curriculum should be designed such that there are options to activity-based learning through audio-visual aids. In addition, government should fund resources to purchase audio-visual aids in colleges

Director

Registrar
IFTM University
Moradabad

Field / Live Projects:
The objective of their training program is to enhance knowledge of the students on any one of the Trending technologies according to the industry standards without which the student degree is a mere degree. This is done by making students work on live projects which equip them with the required skill needed for the corporate world.

Personality Development Program (PDP):
It is conducted by professional trainers/experts from corporates as also by dedicated in-house faculty to actually bring a change in the traits of students in terms of values, behavior and personal growth. It enhances their body language, self-discipline, includes boosting one's confidence, improving language speaking abilities and widening one's scope of knowledge. Following PDP programs are undertaken in the Institute.

- **Aptitude:** Prepare students for placements by enhancing students' understanding in reasoning, numeric aptitudes, language proficiencies and general awareness.
- **Resume Writing:** Trains students about the current trend to present their Personal, Educational & Professional achievements and Strengths in an impressive manner. They learn how to write covering letter through which they can efficiently present their extra information. They also get an exposure to the Social Professional Sites like LinkedIn.
- **Group Discussion:** Help students to improve their ability to understand a topic/idea from different perspectives. They are able to realize its importance as a standard recruitment and selection tool. Students are trained to demonstrate their leadership, team work, oral and body language skills.
- **Personal Interview:** A platform to train students in improving their listening abilities and handling interviewer's questions and answer accordingly so that they are able to remove hesitation and anxiety during placement process.

Student Development Programs (SDP):
SDP has various modules dealing with professional development, Awareness and opinion building, communication and self-presentation etc. The purpose of these modules is to help students grow as individuals, develop the power of critical thinking and, at a material level, secure better placements

Special Guest Lectures (SGL):
Guest lectures are a highly useful medium to provide exceptional knowledge to students, it also adds an extra variety to the classroom routine and universities put a lot of emphasis on the importance of Guest lectures. The Guest lecturers are the "real-world" arriving in the classroom in order to make classes more interesting.

Industrial Visits:
Industrial visits are an integral part of Engineering and acknowledgment of technological up gradation. Industrial visit is considered as one of the tactical methods of teaching. The main reason behind this, it lets student to know things practically through interaction, working methods and employment practices. Moreover, it gives exposure from academic point of view. Main aim of industrial visit is to provide an exposure to students about practical working environment. They also provide students a good opportunity to gain full awareness about industrial practices. Through industrial visit students get awareness about new technologies. Technology development is a main factor, about which a students should have a good knowledge. Visiting different companies actually help students to build a good relationship with those companies.

Industry Focused programs:
Industry oriented education is an approach to learning from an industry perspective where core subjects are taught in the context of application of that knowledge to product design, development and operation.

Mentoring scheme:
The new process has been established as Mentoring System". Each faculty will be the mentor of a group of 20 to 25 students. First, second, third and fourth-year students will have mentors from the parent

School of Engineering & Technology * IFTM University
Director

Registrar
IFTM University
Moradabad.

department. Departmental faculties will continue to be mentors for the same group of students till their post-graduation.

Extracurricular Activities:
In IFTM University, various Co-Curricular and Extra-Curricular activities are regularly conducted along with regular Academic activities and students are continuously inspired and motivated to participate in these various activities to ensure the overall development of the students.

- **Cultural Activities:** The various activities undertaken are – Singing, Dancing, Playing Musical Instruments, Compeering, Skit, Band, Stand-up Comedy, Poetry, Fashion Show etc. These activities help to develop self-confidence, cultural interest, creativity and sense of cooperation among students.

- **Games & Sports:** IFTM strongly believes that a healthy physique leads to a healthy mind. The Institute encourages sports culture and students also reciprocate by actively participating and distinguishing themselves at Sports Meets. IFTM possesses proper playgrounds and hard courts for outdoor sports. In Boys hostels students enjoy the facilities of Gym, badminton, and Table Tennis. The various sports activities undertaken are – cricket, football, basketball, volley ball, carom, chess, badminton, athletics etc. They increase self-esteem & mental alertness among students and promote team spirit. They also lead to balanced mental and physical growth of the students and teach them life skills like discipline, teamwork, leadership, patience, perseverance etc.

- **Induction program:** Every year induction program is organized for 1st year students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad

SCHOOL OF ENGINEERING & TECHNOLGY

IFTM UNIVERSITY

(Established under UPGovt.ActNo.24 of 2010 and approved under section 22 of UGC Act 1956)
Lodhipur Rajput, Delhi Road, Moradabad- 244102, U.P.
0591-2360817, 2360818 **Email:** admissions@iftmuniversity.ac.in **Website:** www.iftmuniversity.ac.in

DEPARTMENT OF MECHANICAL ENGINEERING

CBCS Programme

Effective from Session 2022-23

Course Code	CBCS BASKET	Credits			
Humanities, Management courses, language and literature(HML)		**L**	**T**	**P**	**C**
TPSD101	Professional Skill Development-I	3	1	0	4
PSD401	Professional Skill Development-II	3	1	0	4
EHU601	Human Values & Professional Ethics	3	1	0	4
EHU801	Industrial Management	3	1	0	4
Elementary/Fundamental Science courses(FSC)		**L**	**T**	**P**	**C**
TEMA101	Engineering Mathematics-I	3	1	0	4
TEPH101	Engineering Physics-I	3	1	0	4
TEEE101	Electrical Engineering	3	1	0	4
TEME102	Materials & Manufacturing	3	1	0	4
TEEC201	Electronics Engineering	3	1	0	4
TECS201	Computer Fundamentals & Programming	3	1	0	4
TEME201	Engineering Mechanics	3	1	0	4
TECH201	Engineering Chemistry	3	1	0	4
TEMA201	Engineering Mathematics-II	3	1	0	4
TEPH201	Engineering Physics-II	3	1	0	4
TEMA301	Engineering Mathematics –III	3	1	0	4
Engineering Core Courses(ECC)		**L**	**T**	**P**	**C**
TEME301	Thermodynamics	3	1	0	4
TEME302	Mechanics of Solids	3	1	0	4
TEME303	Fluid Mechanics	3	1	0	4
TEME304	Measurement & Metrology	3	1	0	4
TEME307	Industrial Engineering	3	1	0	4
TEME 401	Applied Thermodynamics	3	1	0	4
TEME 402	Advance Mechanics of Solids	3	1	0	4
TEME 403	Materials Science	3	1	0	4
TEME 404	Kinematics of Machines	3	1	0	4
TEEE 405	Electrical Machines & Automatic Control	3	1	0	4
EME 501	Heat Transfer	3	1	0	4
EME 502	Machine Design –I	3	1	0	4
EME 503	Manufacturing Engineering - I	3	1	0	4
EME 504	Fluid Machinery	3	1	0	4
EME 507	I.C. Engines	3	1	0	4
EME 601	Refrigeration & Air Conditioning	3	1	0	4
EME 602	Machine Design –II	3	1	0	4
EME 603	Dynamics of Machines	3	1	0	4
EME 604	Manufacturing Engineering - II	3	1	0	4
EME 605	Production Planning & Control	3	1	0	4
EME 701	Power Plant Engineering	3	1	0	4
EME 702	Computer Aided Design	3	1	0	4
EME 703	Computer Aided Manufacturing	3	1	0	4
EME 704	Automobile Engineering	3	1	0	4
EME 705	Unconventional Manufacturing Processes	3	1	0	4
EME 801	Maintenance Engineering & Management	3	1	0	4

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

Engineering Laboratory Courses (ELC)		L	T	P	C
TEPH151	Physics Lab	0	0	2	1
TECH251	Chemistry Lab	0	0	2	1
TEEE151	Electrical Engineering Lab	0	0	2	1
TEEC251	Electronics Engineering Lab	0	0	2	1
TEME152	Materials & Manufacturing Lab	0	0	2	1
TECS251	Computer Lab	0	0	2	1
TEME153	Engineering Graphics Lab	0	0	2	1
TEME251	Mechanical Engineering Lab	0	0	2	1
TEME351	Thermodynamics Lab	0	0	2	1
TEME352	Machine Drawing –I Lab	0	0	2	1
TEME353	Fluid Mechanics Lab	0	0	2	1
TEME354	Measurement & Metrology Lab	0	0	2	1
TEME451	Applied Thermodynamics Lab	0	0	2	1
TEME452	Machine Drawing -II Lab	0	0	2	1
TEME453	Materials Testing Lab	0	0	2	1
TEEE455	Electrical Machines Lab	0	0	2	1
EME551	Heat Transfer Lab	0	0	2	1
EME552	Machine Design –I Lab	0	0	2	1
EME553	Manufacturing Engineering Lab	0	0	2	1
EME554	Fluid Machinery Lab	0	0	2	1
EME651	Refrigeration & A.C. Lab	0	0	2	1
EME652	Machine Design – II Lab	0	0	2	1
EME653	Dynamics of Machine Lab	0	0	2	1
EME752	Computer Aided Design Lab	0	0	2	1
EME753	Computer Aided Manufacturing Lab	0	0	2	1
EME754	Automobile Engineering Lab	0	0	2	1
Engineering Departmental Elective (EDE)		**L**	**T**	**P**	**C**
	Elective – I				
EME 011	Gas Dynamics	3	1	0	4
EME 012	Computational Aerodynamics	3	1	0	4
EME 013	Tribology	3	1	0	4
EME 014	Advanced Welding Technology	3	1	0	4
EME 015	Finite Element Methods	3	1	0	4
EME 016	Operations Research	3	1	0	4
EME 017	Mechanical System Design	3	1	0	4
EME 018	Reliability Engineering	3	1	0	4
EME 019	Thermal Turbo Machines	3	1	0	4
EME 020	Composite Materials	3	1	0	4
NCC-01	NCC General	3	1	0	4
	Elective – II				
EME 021	Total Quality Management	3	1	0	4
EME 022	Ergonomics	3	1	0	4
EME 023	Numerical Control Of Machine Tool	3	1	0	4
EME 024	Applied Computational Fluid Dynamics	3	1	0	4
EME 025	Micro Manufacturing	3	1	0	4
EME 026	Mechanical Vibrations	3	1	0	4
EME 027	Optimization Techniques in Engineering	3	1	0	4
EME 028	Management Information System	3	1	0	4
EME 029	Supply Chain Management	3	1	0	4

	EME 030	Entrepreneurship Development Program	3	1	0	4
	TEME 031	Renewal Energy Resources and Its utilization	3	1	0	4
	TEME 032	Industrial Automation & Control Systems	3	1	0	4
	TEME 033	Basics of Nano Technology	3	1	0	4
	TEME 034	Modern Manufacturing Processes	3	1	0	4
	TEME 035	Project Management	3	1	0	4
	TEME 036	Robotics & FMS	3	1	0	4
MOOCs/NPTEL/ Mandatory Course/ Value added courses (VAC)			**L**	**T**	**P**	**C**
TECE-101		Environmental Science	3	1	0	4
EME-802		Non-Conventional Energy Resources	3	1	0	4
TEHU-401		Disaster Management (Audit Paper)	2	1	0	0
VAC-01		Welding (optional)	2	0	0	0
VAC-02		Auto CAD (optional)	2	0	0	0
VAC-09		Analytical Reasoning (optional)				
Project/Seminar/Industrial Training/ General Proficiency (PST)			**L**	**T**	**P**	**C**
TGP-101		General Proficiency	-	-	-	1
TGP-201		General Proficiency	-	-	-	1
TGP-301		General Proficiency	-	-	-	1
TGP-401		General Proficiency	-	-	-	1
GP-501		General Proficiency	-	-	-	1
GP-601		General Proficiency	-	-	-	1
GP-701		General Proficiency	-	-	-	1
GP-801		General Proficiency	-	-	-	1
EME -654		Seminar	0	0	2	1
EME -751		Industrial Training (Evaluation & Viva)	0	0	2	1
EME – 851		Project	0	0	20	10

School of Engineering & Technology ★ IFTM University ★
Director

Sanjeev Gaur
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

STUDY AND EVALUATION SCHEME
YEAR I, SEMESTER- I

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA101	ENGINEERING MATHEMATICS-I	3	1	0	20	10	30	70	100	4
2.	FSC	TEPH101	ENGINEERING PHYSICS-I	3	1	0	20	10	30	70	100	4
3.	VAC	TECE101	ENVIRONMENTAL SCIENCE	3	1	0	20	10	30	70	100	4
4.	HML	TPSD101	PROFESSIONAL SKILL DEVELOPMENT-I	3	1	0	20	10	30	70	100	4
5.	FSC	TEEE101	ELECTRICAL ENGINEERING	3	1	0	20	10	30	70	100	4
6.	FSC	TEME102	MATERIALS & MANUFACTURING	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TEPH151	PHYSICS LAB	0	0	2	-	-	30	70	100	1
8.	ELC	TEME152	MATERIALS & MANUFACTURING LAB	0	0	2	-	-	30	70	100	1
9.	ELC	TEEE 151	ELECTRICAL ENGINEERING LAB	0	0	2	-	-	30	70	100	1
10.	ELC	TEME153	ENGINEERING GRAPHICS LAB	0	0	2	-	-	30	70	100	1
11.	PST	TGP101	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

STUDY AND EVALUATION SCHEME
YEAR I, SEMESTER- II

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA201	ENGINEERING MATHEMATICS-II	3	1	0	20	10	30	70	100	4
2.	FSC	TEPH201	ENGINEERING PHYSICS-II	3	1	0	20	10	30	70	100	4
3.	FSC	TECH201	ENGINEERING CHEMISTRY	3	1	0	20	10	30	70	100	4
4.	FSC	TEME201	ENGINEERING MECHANICS	3	1	0	20	10	30	70	100	4
5.	FSC	TEEC201	ELECTRONICS ENGINEERING	3	1	0	20	10	30	70	100	4
6.	FSC	TECS201	COMPUTER FUNDAMENTALS & PROGRAMMING	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECS251	COMPUTER LAB	0	0	2	-	-	30	70	100	1
8.	ELC	TECH251	CHEMISTRY LAB	0	0	2	-	-	30	70	100	1
9.	ELC	TEEC251	ELECTRONICS ENGG. LAB	0	0	2	-	-	30	70	100	1
10.	ELC	TEME251	MECHANICAL ENGG. LAB	0	0	2	-	-	30	70	100	1
11.	PST	TGP201	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

STUDY AND EVALUATION SCHEME
YEAR II, SEMESTER-III

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	FSC	TEMA301	ENGINEERING MATHEMATICS – III	3	1	0	20	10	30	70	100	4
2.	ECC	TEME301	THERMODYNAMICS	3	1	0	20	10	30	70	100	4
3.	ECC	TEME302	MECHANICS OF SOLIDS	3	1	0	20	10	30	70	100	4
4.	ECC	TEME303	FLUID MECHANICS	3	1	0	20	10	30	70	100	4
5.	ECC	TEME304	MEASUREMENT & METROLOGY	3	1	0	20	10	30	70	100	4
6.	ECC	TEME307	INDUSTRIAL ENGINEERING	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TEME351	THERMODYNAMICS LAB	0	0	2	-	-	30	70	100	1
8.	ELC	TEME352	MACHINE DRAWING –I LAB	0	0	2	-	-	30	70	100	1
9.	ELC	TEME353	FLUID MECHANICS LAB	0	0	2	-	-	30	70	100	1
10.	ELC	TEME354	MEASUREMENT & METROLOGY LAB	0	0	2	-	-	30	70	100	1
11.	PST	TGP301	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

STUDY AND EVALUATION SCHEME
YEAR II, SEMESTER-IV

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TEME401	APPLIED THERMODYNAMICS	3	1	0	20	10	30	70	100	4
2.	ECC	TEME402	ADVANCE MECHANICS OF SOLIDS	3	1	0	20	10	30	70	100	4
3.	ECC	TEME403	MATERIALS SCIENCE	3	1	0	20	10	30	70	100	4
4.	ECC	TEME404	KINEMATICS OF MACHINES	3	1	0	20	10	30	70	100	4
5.	ECC	TEEE405	ELECTRICAL MACHINES & AUTOMATIC CONTROL	3	1	0	20	10	30	70	100	4
6.	HML	TPSD401	PROFESSIONAL SKILL DEVELOPMENT - II	3	1	0	20	10	30	70	100	4
7.	VAC	TEHU401	DISASTER MANAGEMENT (AUDIT PAPER)#	3	0	0	20	10	30	70	100	0
PRACTICALS / PROJECT												
8.	ELC	TEME451	APPLIED THERMODYNAMICS LAB	0	0	2	-	-	30	70	100	1
9.	ELC	TEME452	MACHINE DRAWING -II LAB	0	0	2	-	-	30	70	100	1
10.	ELC	TEME453	MATERIALS TESTING LAB	0	0	2	-	-	30	70	100	1
11.	ELC	TEEE455	ELECTRICAL MACHINES LAB	0	0	2	-	-	30	70	100	1
12.	PST	TGP401	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Audit paper:

 # The Subject (EHU-401), Disaster Management will be offered as a compulsory audit course and each student has to pass the subject at the minimum by getting 35 Marks out of 100.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

STUDY AND EVALUATION SCHEME
YEAR III, SEMESTER-V

S.N.	Category	Course Code	Course Name	Periods		EVALUATION SCHEME					Course Total	Credits
						Mid Term Exam			External Exam			
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	EME501	HEAT TRANSFER	3	1	0	20	10	30	70	100	4
2.	ECC	EME502	MACHINE DESIGN -I	3	1	0	20	10	30	70	100	4
3.	ECC	EME503	MANUFACTURING ENGINEERING - I	3	1	0	20	10	30	70	100	4
4.	ECC	EME504	FLUID MACHINERY	3	1	0	20	10	30	70	100	4
5.	ECC	EME507	I.C.ENGINES	3	1	0	20	10	30	70	100	4
6.	EDE	DEME1	DEPARTMENTAL ELECTIVE - 1	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	EME551	HEAT TRANSFER LAB	0	0	2	-	-	30	70	100	1
8.	ELC	EME552	MACHINE DESIGN –I LAB	0	0	2	-	-	30	70	100	1
9.	ELC	EME553	MANUFACTURING ENGINEERING LAB	0	0	2	-	-	30	70	100	1
10.	ELC	EME554	FLUID MACHINERY LAB	0	0	2	-	-	30	70	100	1
11.	PST	GP501	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Elective – I

EME011	GAS DYNAMICS
EME012	COMPUTATIONAL AERODYNAMICS
EME013	TRIBOLOGY
EME014	**ADVANCED WELDING TECHNOLOGY**
EME015	FINITE ELEMENT METHODS
EME016	OPERATIONS RESEARCH
EME017	MECHANICAL SYSTEM DESIGN

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

EME018	RELIABILITY ENGINEERING
EME019	THERMAL TURBO MACHINES
EME020	COMPOSITE MATERIALS

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

STUDY AND EVALUATION SCHEME
YEAR III, SEMESTER-VI

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	EME601	REFRIGERATION & AIR CONDITIONING	3	1	0	20	10	30	70	100	4
2.	ECC	EME602	MACHINE DESIGN -II	3	1	0	20	10	30	70	100	4
3.	ECC	EME603	DYNAMICS OF MACHINES	3	1	0	20	10	30	70	100	4
4.	ECC	EME604	MANUFACTURING ENGINEERING - II	3	1	0	20	10	30	70	100	4
5.	ECC	EME605	PRODUCTION PLANNING & CONTROL	3	1	0	20	10	30	70	100	4
6.	HML	EHU601	HUMAN VALUES & PROFESSIONAL ETHICS	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	EME651	REFRIGERATION & A.C. LAB	0	0	2	-	-	30	70	100	1
8.	ELC	EME652	MACHINE DESIGN – II LAB	0	0	2	-	-	30	70	100	1
9.	ELC	EME653	DYNAMICS OF MACHINE LAB	0	0	2	-	-	30	70	100	1
10.	PST	EME654	SEMINAR	0	0	2	-	-	100	-	100	1
11.	PST	GP601	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Note: ***Industrial Training of 4 – 6 Weeks after VI Semester which will be evaluated in VII Semester.***

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

STUDY AND EVALUATION SCHEME
YEAR IV, SEMESTER-VII

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	EME701	Power Plant Engineering	3	1	0	20	10	30	70	100	4
2.	ECC	EME702	Computer Aided Design	3	1	0	20	10	30	70	100	4
3.	ECC	EME703	Computer Aided Manufacturing	3	1	0	20	10	30	70	100	4
4.	ECC	EME704	Automobile Engineering	3	1	0	20	10	30	70	100	4
5.	ECC	EME705	Unconventional Manufacturing Processes	3	1	0	20	10	30	70	100	4
6.	EDE	DEME2	Departmental Elective - II	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	PST	EME751	Industrial Training (Evaluation & Viva)	0	0	2	-	-	100	-	100	1
8.	ELC	EME752	Computer Aided Design Lab	0	0	2	-	-	30	70	100	1
9.	ELC	EME753	Computer Aided Manufacturing Lab	0	0	2	-	-	30	70	100	1
10.	ELC	EME754	Automobile Engineering Lab	0	0	2	-	-	30	70	100	1
11.	PST	GP701	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Elective – II

EME021	**TOTAL QUALITY MANAGEMENT**
EME022	ERGONOMICS
EME023	NUMERICAL CONTROL OF MACHINE TOOL
EME024	APPLIED COMPUTATIONAL FLUID DYNAMICS
EME025	MICRO MANUFACTURING
EME026	MECHANICAL VIBRATIONS
EME027	OPTIMIZATION TECHNIQUES IN ENGINEERING
EME028	MANAGEMENT INFORMATION SYSTEM
EME029	SUPPLY CHAIN MANAGEMENT
EME030	ENTREPRENEURSHIP DEVELOPMENT PROGRAM
TEME031	RENEWAL ENERGY RESOURCES AND ITS UTILIZATION
TEME032	INDUSTRIAL AUTOMATION & CONTROL SYSTEMS

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

TEME033	BASICS OF NANO TECHNOLOGY
TEME034	MODERN MANUFACTURING PROCESSES
TEME035	PROJECT MANAGEMENT
TEME036	ROBOTICS & FMS

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

STUDY AND EVALUATION SCHEME
YEAR IV, SEMESTER-VIII

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	EME801	MAINTENANCE & ENGINEERING MANAGEMENT	3	1	0	20	10	30	70	100	4
2.	VAC	EME802	NON-CONVENTIONAL ENERGY RESOURCES	3	1	0	20	10	30	70	100	4
3.	HML	EHU801	INDUSTRIAL MANAGEMENT	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
4.	PST	EME851	PROJECT	0	0	20	-	-	300	400	700	10
5.	PST	GP801	GENERAL PROFICIENCY	-	-	-	-	-	100	-	100	1
			TOTAL	**09**	**03**	**20**	-	-	-	-	**1100**	**23**

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Dwivedi
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEMA101: ENGINEERING MATHEMATICS –I

Objective: -The main aims of this course are to recall and remember basics of matrices, differential, integral and vector calculus. The focus of the subject to understand the concepts of basic mathematical methods to solve engineering problems, analyze engineering problems and evaluate the results for skill development, employability and entrepreneurship development.

UNIT I **(12 Sessions)**

Matrices : Introduction of matrices, Special type of matrices, Elementary row and column transformation, Adjoint & inverse of matrices , Rank of matrix, , Consistency of linear system of equations, Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors, Linear dependency and Independency of vector, Diagonalisation of matrices for skill development.

UNIT II **(10 Sessions)**

Differential Calculus–I: Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem, Change of variables, Total differentiation, Jacobian, Expansion of function of several variables for skill development and employability

UNIT III **(10 Sessions)**

Differential Calculus–II: Asymptotes, Curve tracing, Approximation of errors, Maxima & Minima of functions of several variables, Lagrange's method of multipliers for skill development.

UNIT IV **(08 Sessions)**

Multiple Integrals : Definite integral, Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Dirichlet integral, Liouville's extension formula, Applications to area and volume for skill development and employability.

UNIT V **(12 Sessions)**

Vector Calculus: Point functions, Gradient, Divergence and Curl of a vector and their properties, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems, Statements and problems (without proof) for skill development.

Course Outcomes: After completion of this course student will be able to:

CO1: Remember the basics of matrices and apply the concept of rank for solving linear simultaneous equations for skill development achieving national and international interest.
CO2: Apply the concept of limit, continuity and differentiability in the study of Rolle's, Lagrange's, Cauchy mean value theorem and Leibnitz theorem for skill development and employability.
CO3: Apply partial differentiation for evaluating extreme values, expansion of function and Jacobian for skill development .
CO4: Apply the methods of multiple integral for finding area, volume, centre of mass and centre of gravity for skill development and employability and develops local and global interest.
CO5: Apply the concept of vector for evaluating directional derivatives, tangent and normal planes, line, surface and volume integrals for skill development and employability.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	2	1	3	2	1	3	1	3	2	1	2	1
CO3	2	3	3	1	3	3	1	3	1	2	1	1
CO4	3	1	1	1	1	3	1	3	3	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	2	1
CO4	3	3	1
CO5	3	2	1

Suggested Readings:

1. Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
2. B. S .Grewal, Engineering Mathematics, Khanna Publishers.
3. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4. C.Ray Wylie & Louis C .Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
5. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEPH101: Engineering Physics-I

Objective: The aim of this course is to impart knowledge of statistical mechanics, quantum mechanics, Laser system and their applications, special theory of relativity for skill and employability development.

UNIT **(8 sessions)**

Relativistic Mechanics: Frame of reference, Michelson-Morley Experiment, transformation equation, Length contraction & Time dilation, Addition of velocities, Variation of mass with velocity and Mass energy relation for skill development and employability.

UNIT II **(10 sessions)**

Statistical Mechanics: Concept of phase space, Density of states as a function of energy, Maxwell- Boltzmann statistics, Distribution law and its application in case of ideal gas, Energy and velocity distribution. Bose -Einstein statistics Distribution Law and its application to Black body radiation to obtain Plank's law of radiation, Distribution law and its application to electrons in metals, Calculation of Fermi energy and average energy of electrons in metals for skill development.

UNIT III **(10 sessions)**

Quantum Mechanics: De-Broglie Hypothesis, Davisson -Germer Experiment, wave function and its properties, the Uncertainty principle and its importance. Time Dependent & Time Independent Schrodinger Equation, Particle in one dimensional box, Eigen values and eigen function for skill development and employability.

UNIT IV **(8 sessions)**

Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser and application of Lasers for skill development and employability.

UNIT V **(8 sessions)**

Fibre Optics: Fundamental ideas of optical Fiber and its employability in communication applications, Propagation Mechanism, Numerical aperture, Acceptance angle and Acceptance cone, Single and multi-mode fibers, Applications of optical fibres for skill development and employability.

Course Outcomes: After completion of this course student will be able to:

CO1: Understand and learn Frame of reference, Lorentz transformation equation for skill development and emp national and international

CO2: Understand Statistical Mechanics, Maxwell- Boltzmann statistics and its application for skill development.

CO3: Understand De-Broglie Hypothesis, Davisson - Germer Experiment for skill development and employability.

CO4: Attain basic knowledge on different types of LASERs and their applications for skill development and employability.

CO5: Gain knowledge of optical fibre and its applications for skill development and employability and develops local and global interest.

School of Engineering & Technology * IFTM University * Moradabad
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	2	2	3	2	1	3	2	3	2	1	2	1
CO3	3	3	3	1	3	1	1	3	1	2	1	1
CO4	3	3	1	3	1	3	3	3	3	1	1	2
CO5	2	1	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Beiser, "Concepts of Modern Physics
2. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.
3. W.T. Silf vast, "Laser Fundamental" Cambridge University Press (1996).
4. G. Keiser "Optical Fiber Communication" New York.
5. K.M. khanna" Statistical Mechanics"
6. C.Kittel" Elementary Statistical Mechanics"

Website Sources:

- https://web.stanford.edu
- https://sites.google.com
- https://en.wikipedia.org
- https://www.khanacademy.org
- https://www.rp-photonics.com
- https://nptel.ac.in
- https://www.eatm.in

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TECE101: Environmental Science

Objective: The goals of environmental science are to provide every student with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment. To develop and reinforce new patterns of environmentally sensitive behavior among individuals, groups and society as a whole for a sustainable environment. Understand the trans-national character of environmental problems such as global warming, climate change, ozone layer depletion etc. and ways of addressing the for skill development, employability and entrepreneurship development, including interactions across local to global scales.

UNIT I **(10 Sessions)**

Environment: Definition of environment. Environmental education. Need for the public awareness. : Concept of Ecology: Ecosystem, energy and nutrients flow in ecosystem food chain for skill development for skill development.

Environmental segment: Atmospheric structure. Classification of air pollutants, sources of air pollution and their effect on human health and property

UNIT II **(10 Sessions)**

Air quality and standard: Meteorological phenomenon and their influence on air quality, lapse rates, dispersion of pollutants. Air pollution control: Introduction to particulates and gaseous pollutants such as SOx, NOx& CO, and their effects for skill development.

UNIT III **(10 Sessions)**

Water quality: Physical. Chemical & biological parameters. Water quality standard, BOD.COD and BOD COD calculations for skill development and employability.

Environmental Analysis for skill development and entrepreneurship: pH, alkalinity, conductivity, ammonia, fluoride, sulphate, chloride. Analysis and measurement of gaseous pollutants.

UNIT IV **(10 Sessions)**

Pollution: Pollution from industry and agriculture. Polymers and plastic, food additives, fertilizers, insecticides, fungicides and herbicides. Heavy metal and energy their environmental implications. Solid waste and its managements for employability. Pollution and public health aspect Environmental Protection- Role of government, initiatives by non-governmental organizations (NGO) for entrepreneurship.

Course outcomes: After completion of this course student will be able to:

CO1: Understand the issues and challenges related to environmental and ecosystem due to some human activities, it will develop the skills of students.

CO2: Achieving national and international interest by understanding about the different sources of air pollution and their impact on human health. it will develop the skills of students

CO3: Understand about the quality parameter for water and standards related to water, and make the students employable.

CO4: Know about different types of pollution and their sources it will develop the skills of students and develops local and global interest.

CO5: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	2	1
CO3	1	3	1
CO4	3	1	2
CO5	1	1	3

Suggested Readings:

1. "Environmental studies" Benny Joseph, Tata McgrawHill-2005
2. "Environmental studies"-Dr D.L. Manjunath, Pearson Education-2006
3. "Environmental studies" R. Rajagopalan, Oxford Publication-2005
4. "Text book of environment science & Technology", M.Anji Reddy, BS Publication.

Website Sources:

- https://www.india.gov.in/official-website-ministry-environment-and-forests-0
- https://www.earthshare.org/environews/

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology ★ IFTM University Moradabad ★
Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TPSD101: PROFESSIONAL SKILL DEVELOPMENT-I

Objectives: The objectives of Professional Skill Development-I are to develop knowledge and understanding of grammar, to develop abilities to make use of the grammar in own writing English, to increase understanding and recall of what is read and listen including facts and main idea, to enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resumes, bio-data, letters and applications of different kinds, to develop all the four skills of English language for skill development, employability and entrepreneurship development.

UNIT I **(10 Sessions)**

Basic Applied Grammar and Usage: The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. Noun: Kinds; Gender; Case; Number; Usage. Pronouns: Definition; Kinds; Usage. Adjectives: Kinds, Degrees of Comparison, Transformation of Degrees. Determiners: Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. Articles: Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. Verbs: Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage for skill development and employability.

UNIT II **(8 Sessions)**

Basic Applied Grammar Continued... Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. Adverbs: Kinds and Usage. Prepositions: Kinds and Usage. Conjunctions: Kinds; Usage. Interjections: Definition; Usage for skill development and entrepreneurship

UNIT III **(6 Sessions)**

Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech for skill development.

UNITIV **(8 Sessions)**

Précis Writing: Techniques of Précis Writing; examples. Paragraph Writing: Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension for skill development and employability.

UNITV **(8 Sessions)**

Writing of Resume, Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment for skill development and employability.

Course outcomes: After completion of this course student will be able to:

CO1: Understand the sentences, its types, its transformations, parts of speech and its types etc. for skill development and employability achieving national and international interest.
CO2: Understand about the different types of non finite verbs, gerund, adverbs and its types, prepositions and its types etc. for skill development and employability.
CO3: Understand about the Clauses and phrases, tenses, voice and speech and its conversion for skill development.
CO4: Know about Techniques of Précis Writing, Paragraph Writing, Techniques of Paragraph Writing for skill development and employability
CO5: Develops local and global interest by writing of Resume, Bio-Data, Writing of Letters and Applications for skill development and employability

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	3	3	3	3	3	1	3	3
CO2	3	3	3	1	3	2	3	3	1	1	3	2
CO3	3	1	3	1	3	3	3	3	3	3	3	2
CO4	3	1	1	1	2	3	2	1	3	3	2	3
CO5	3	1	3	3	2	3	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping (Please **write 3, 2, 1** wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	2	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.

Website Sources:

- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEEE101: ELECTRICAL ENGINEERING

Objective: To provide comprehensive idea about AC and DC circuits for skill development and employability and its analysis along with the working principles and applications of basic machines in electrical engineering.

UNIT I **(08 Sessions)**

D.C. Circuit Analysis: Network, Active And Passive Elements, Concept of Linearity And Linear Network, Unilateral And Bilateral Elements, Sources, Source Transformation, Kirchhoff's Laws, Star-Delta Transformation, **Network Theorems:** Thevenin's Theorem, Superposition Theorem, Norton's Theorem, Maximum Power Transfer Theorem for skill development and employability.

UNIT II **(08 Sessions)**

Single Phase AC Circuits: AC Waveforms, Average and Effective Values, Form and Peak Factors, Analysis of Series, Parallel and Series-Parallel RLC Circuits, Active, Reactive and Apparent Powers, Power Factor, Causes of Low Power Factor, Resonance in Series and Parallel Circuits for skill development and employability.

UNIT III **(08 Sessions)**

Three Phase AC Circuits: Three Phase System, Advantages, Phase Sequence, Star and Delta Connections, Balanced Supply and Balanced Load, Three-phase Power and its Measurement, **Measuring Instruments:** Types of Instruments, PMMC and Moving Iron Instrument, Single-Phase Dynamometer Wattmeter, Induction Type Energy Meter for entrepreneurship development.

UNIT IV **(08 Sessions)**

Magnetic Circuits: Magnetic Circuit Concepts, Analogy between Electric & Magnetic Circuits, Magnetic Circuits with DC and AC Excitations, B-H Curve for skill development and employability, Hysteresis and Eddy Current Losses, **Single Phase Transformer:** Principle, Working, Construction, E.M.F. Equation, Power Losses, Efficiency, Introduction to Auto-Transformer (Excluding Numerical)

UNIT V **(08 Sessions)**

Principles of Electro-Mechanical Energy Conversion.

DC Generator: Construction & Working, E.M.F. Equation of Generator, Types of D.C. Generator, Applications for entrepreneurship development, **D.C. Motor:** Principle of operation, Torque Equation of a Motor, Types of D.C. Motor, Applications (Excluding Numericals).

Three Phase Induction Motor: Construction-(Squirrel cage and slip-ring motor),Principle of Operation, Applications (Excluding Numerical)

Course Outcomes: On completion of the course students will be able to

CO1: Use basic electrical DC concepts and theorems to analyze circuits for skill development.

CO2: Use of resonance and implications for practical circuits for skill development and employability achieving national and international interest.

CO3: Understand the preference of poly phase system over single phase system, star and delta connections along with develops the knowledge of theoretical and mathematical principles of electrical measuring instruments for skill development, employability and entrepreneurship development.

CO4: Analyze magnetic circuit and differentiate magnetic and electric circuits and understand single phase transformer, auto transformer and three phase transformer for skill development and employability.

CO5: Understand the construction of D.C machine, different windings, their merits and demerits and the basic concept of Three-phase induction motor and its working principle instruments for skill development, employability and entrepreneurship development and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	1	1	1	2	1	2	3
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	3	2	1	1	1	2	1	1	2
CO4	3	3	3	2	2	1	1	1	2	1	1	2
CO5	3	3	3	2	2	1	1	1	2	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc- Graw Hill
4. T.K. Nagsarkar& M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
5. W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEME102: MATERIALS & MANUFACTURING

Objective: The objective of this course is to familiarize the students with different types of engineering materials and manufacturing processes and to understand the design, selection and processing of materials for a wide range of applications in engineering and elsewhere for entrepreneurship and skill development and employability.

UNITI **(09 Sessions)**

Basic Manufacturing: Importance of Materials & Manufacturing towards Technological & Socio-Economic developments, Classification of manufacturing processes, Plant location, Plant layout and its types, Production and its classification, Production versus Productivity, Misc. Processes: Powder-metallurgy process and its applications, Plastic-products manufacturing, Galvanizing and Electroplating, Properties of Engineering Materials: Mechanical properties, Chemical properties, Electrical properties, Dielectric and Magnetic properties, Optical and Physical properties, Introduction to elementary corrosion and oxidation, Elementary ideas of fracture, fatigue & creep for skill development.

UNIT II **(09 Sessions)**

Engineering Materials: Ferrous Materials, Iron ore and its extraction, Furnaces, Cast iron, Steels & its classification based on percentage of carbon, its properties & applications. Alloy steels: stainless steel and tool steel, Non-Ferrous metals & alloys: Various non-ferrous metals, Common uses of various non-ferrous metals. Alloying elements and their effect, Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin, Non-Metallic Materials: Common types & uses of different non-metals such as Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite materials for skill development.

UNIT III **(09 Sessions)**

Introduction to Metal Forming and its Applications: Basic metal forming process: hot working and cold working process, Rolling, Forging, Extrusion, Drawing, Wire & Tube-drawing, Product applications and their defect. Press - work, Die & Punch assembly, Sheet metal operations, Cutting and forming and its applications. Casting: Casting terms. Casting processes, Pattern & allowances, Pattern and mold making materials and its desirable properties, Molding method, mould making with the use of a core, Gating system, Die-casting and its uses, Casting defects & remedies, Heat Treatment: Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening for skill development and employment.

UNIT IV **(07 Sessions)**

Introduction to Metal Cutting: Cutting tool, Chips and its formation process; Working principle, classification and operations performed on Lathe machine, Shaper machine and Planer machine. Operations performed on Drilling, Milling & Grinding machine for entrepreneurship and skill development and employability.

UNIT V **(06 Sessions)**

Introduction to Welding and its Applications: Importance and basic concepts of welding, Classification of welding processes. Gas-welding, Types of flames, Electric-Arc welding, Resistance welding, Soldering & Brazing and its uses for skill development.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the importance of materials and manufacturing, various properties of materials, plant layout and production for skill development achieving national and international interest.

CO2: Understand the ferrous and non-ferrous metals their alloys and application, non-metals and their applications for skill development.

CO3: Able to get a brief knowledge of metal forming operations, working of machines and heat treatment process and their importance for skill development and employment.

CO4: Able to understand the methods and techniques associated with the process of metal cutting operations on various metal cutting machines for entrepreneurship and skill development and employability and develops local and global interest.

CO5: Able to understand various type of welding process and their application n specific field for skill development.

School of Engineering & Technology * IFTM University * Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	1	1
CO3	3	3	3
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. Manufacturing Process, B.S Raghuvanshi, DhanpatRai Publication.
2. Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. Materials Science, Narula&Narula, McGraw Hill Education Private Limited.
4. Manufacturing Technology, R. K. Rajput, Laxmi Publications Private Limited.
5. An Introduction to Engineering Materials and Manufacturing Processes, NIIT, Prentice Hall of India Private Limited.

Website Sources:

- www.wikipedia.org
- www.sciencedaily.com
- www.youtube.com
- www.slideshare.net
- onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEPH151: PHYSICS LAB

Objective: To achieve perfectness in experimental skills. The study of practical applications will bring more confidence and to learn the usage of electrical and optical systems for various measurements for skill development, employability and entrepreneurship.

List of Experiments (Any Ten) **(20 Sessions)**

1. To determine the wavelength of monochromatic light by Newton's ring for skill development and employability.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism for skill development and employability.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points for skill development and employability.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter for skill development and employability.
5. To determine the wavelength of spectral lines using plane transmission grating for skill development and employability.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge for skill development and employability.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil for skill development and employability.
8. To verify Stefan's Law by electrical method for skill development and employability.
9. To calibrate the given ammeter and voltmeter for skill development and employability .
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up and its employability scope for skill development and employability.
11. To determine energy band gap of a given semiconductor material for skill development.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen and for skill development.
14. To determine the ballistic constant of a ballistic galvanometer for skill development.
15. To determine the viscosity of a liquid for skill development.

Course Outcomes: The students completing this course will be able to:

CO1: Achieving national and international interest by understanding the principle, concept, working and application of technology and comparison of results with theoretical calculations for skill development and employability.
CO2: Apply the various procedures and techniques for the experiments to create for skill development and employability.
CO3: Understand usage of instruments and real time applications in engineering studies for skill development and employability.
CO4: Understand the basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results for skill development and employability.
CO5: Understand the some basic law like stefan's law, Hall effect etc. for skill development and develops local and global interest.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	2	3	2	2	2	2	2	2
CO2	3	2	2	2	2	2	3	3	2	2	3	2
CO3	2	2	3	1	3	1	1	1	3	2	2	2
CO4	3	2	1	3	3	3	2	2	3	1	2	2
CO5	2	1	1	3	1	2	1	2	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	2	3	2
CO4	3	3	1
CO5	3	2	1

Suggested Readings:

1. Engineering Practical Physics by S. L. Gupta
2. Engineering Practical Physics by Navneet Gupta
3. Engineering Practical Physics by S. K. Gupta

Website Sources:

- http://www.iiserpune.ac.in
- https://www.toppr.com
- https://wp.optics.arizona.edu
- https://www.gopracticals.com
- http://vlab.amrita.edu
- https://circuitglobe.com

Note: Latest editions of all the suggested readings must be used.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEME152: MATERIALS & MANUFACTURING LAB

Objective: The objective of this course is to meet curriculum requirements and provide knowledge of different types of tools, instruments and machines and their applications in manufacturing to produce different metal components and articles and develop skills in the students for skill development, employability and entrepreneurship.

List of Experiments: (Minimum 10 experiments are required to be performed)

1. Carpentry Shop: **(03 Sessions)**
a. Study of tools & operations and carpentry joints.
b. Simple exercise using jack plane for skill development, employability and entrepreneurship.
c. To prepare half-lap corner joint, mortise & tenon joints for skill development, employability and entrepreneurship.
d. Simple exercise on woodworking lathefor skill development, employability and entrepreneurship.

2. Fitting Bench Working Shop: **(03 Sessions)**
a. Study of tools & operations
b. Simple exercises involving fitting work for skill development, employability and entrepreneurship.
c. Making perfect male-female joint for skill development, employability and entrepreneurship.
d. Simple exercises involving drilling/tapping/dieing for skill development, employability and entrepreneurship.

3. Black Smithy Shop: **(03 Sessions)**
a. Study of tools & operations
b. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & Swaging for skill development, employability and entrepreneurship.

4. Welding Shop: **(03 Sessions)**
a. Study of tools & operations of Gas welding & Arc welding for skill development, employability and entrepreneurship
b. Making simple Butt and Lap arc welded joints for skill development, employability and entrepreneurship.
c. Simple exercises involving Oxy-acetylene Gas welding for skill development, employability and entrepreneurship.

5. Sheet-metal Shop: **(02 Sessions)**
a. Study of tools & operations for skill development, employability and entrepreneurship.
b. Making Funnel complete with 'soldering' for skill development, employability and entrepreneurship.
c. Fabrication of tool-box, tray, electric panel box etc. for skill development, employability and entrepreneurship

6. Machine Shop: **(03 Sessions)**
a. Study of machine tools and operations.
b. Simple exercises involving Plane turning for skill development, employability and entrepreneurship.
c. Simple exercises involving Step turning for skill development, employability and entrepreneurship
d. Simple exercises involving Taper turning for skill development, employability and entrepreneurship

7. **Foundry Shop:** **(03 Sessions)**
a. Study of tools and operations.
b. Preparation of sand for molding for skill development, employability and entrepreneurship.
c. Mould making using core for skill development, employability and entrepreneurship.

Course Outcome: Students completing this course will be able:

CO1: To define and use different manufacturing process e.g. casting, forging, turning, drilling etc. for skill development, employability and entrepreneurship achieving national and international interest.
CO2: To define and use different welding processes e.g. gas welding and electric arc welding for skill development, employability and entrepreneurship.

School of Engineering & Technology, IFTM University
Director

Registrar
IFTM University
Moradabad.

CO3: To acquire thorough knowledge of carrying out various operations on lathe machine for skill development, employability and entrepreneurship.
CO4: To acquire skills for creating different objects from raw materials for skill development, employability and entrepreneurship and develops local and global interest.
CO5: To acquire thorough knowledge of carrying out various operations on Sheet metals for skill development, employability and entrepreneurship.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	2	1	3	2	1	3	1	3	2	1	2	1
CO3	2	3	3	1	3	3	1	3	1	2	1	1
CO4	3	1	1	1	1	3	1	3	3	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Manufacturing Process, B.S Raghuvanshi, DhanpatRai Publication.
2. Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. Materials Science, Narula&Narula, McGraw Hill Education Private Limited.
4. Manufacturing Technology, R. K. Rajput, Laxmi Publications PVT. LTD.

Website Sources:

- www.wikipedia.org
- www.brcmcet.edu.
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEEE151: ELECTRICAL ENGINEERING LAB

Objective:

1. To design electrical circuits on bread board.
2. To analyze a given network by applying various network theorems.
3. To expose the students to the operation of dc/ac motor and transformer.

LIST OF EXPERIMENTS: **(20 Sessions)**

1. Verification of Kirchhoff's current law for employability.
2. Verification of Kirchhoff's voltage law for employability.
3. Verification of Superposition theorem for skill development and employability.
4. Verification of Thevenin's Theorem for skill development and employability.
5. Verification of Maximum Power Transfer Theorem for skill development and employability.
6. To study a Single phase induction motor and its various methods of starting for employability and entrepreneurship development.
7. To study running and speed reversal of a Three Phase Induction Motor and determine the slip for employability and entrepreneurship development.
8. To determine the transformation ratio and turns ratio and current ratio of a single-phase transformerfor employability and entrepreneurship development.
9. To study the construction of a dc machine for skill development, employability and entrepreneurship development.
10. To study a single phase Induction type Energy meter for skill development, employability and entrepreneurship development.

Course Outcomes: After successfully studying this course, students will be able to:

CO1: Achieving national and international interest by explaining the concept of circuit laws and network theorems and apply them to laboratory measurements for skill development, employability and entrepreneurship development.
CO2: Systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines for employability and entrepreneurship development.
CO3: Acknowledge the principles of operation and the main features of electric machines and their applications for skill development and employability.
CO4: Discuss the starting methods of a single phase induction motor for employability and entrepreneurship development.
CO5: Acquire skills in using electrical measuring devices for skill development and employability and develops local and global interest.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	1	1	1	2	1	2	3
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	3	2	1	1	1	2	1	1	2
CO4	3	3	3	2	2	1	1	1	2	1	1	2
CO5	3	3	3	2	2	1	1	1	2	1	1	2

School of Engineering & Technology * IFTM University
Director

Sanjeev Singh
Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	1	3	2
CO3	2	3	1
CO4	1	3	2
CO5	3	2	1

Suggested Readings:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc- Graw Hill
4. T.K. Nagsarkar& M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
5. W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.iare.ac.in
- www.ocw.mit.edu
- www.nptel.ac.in
- www.vlab.co.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEME153: ENGINEERING GRAPHICS LAB

Objective: The course is aimed at developing Basic Graphic skills, Develop Skills In Preparation Of Basic Drawings and Skills in Reading and Interpretation of Engineering Drawings skill development, employability and entrepreneurship

1. Introduction **(03 Sessions)**
Introduction, Drawing Instruments and their uses, BIS conventions, Lines & Lettering, Dimensioning and free hand practicing.Coordinate system and reference planes.Definitions of HP, VP, RPP &LPP.Creation of 2D/3D environment.Selection of drawing size and scale.

2. Orthographic Projections **(05 Sessions)**
Introduction, Definitions- Planes of projection, reference line and conventions employed. Principle of Orthographic projections, First and Third Angle projections.
Projection of Points, Pictorial view for skill development and employability.
Terms used in Projection of lines. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems.(First Angle Projection Only) for skill development and employability

3. Projections of Solids (First Angle Projection Only) **(06 Sessions)**
Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. Sections and Development of Lateral Surfaces of Solids, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. Development of lateral surface of above solids, their frustums and truncations for skill development, employability and entrepreneurship.

4. Isometric Projection (Using Isometric Scale Only) **(06 Sessions)**
Introduction, Principle of isometric projection, Terminology, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids for skill development, employability and entrepreneurship.

Course outcome: Students completing this course will be able to:

CO1: Use the drawing instruments effectively and able to dimension the given figures for skill development and employability.
CO2: Appreciate the usage of engineering curves in tracing the paths of simple machine components for skill development and employability achieving national and international interest.
CO3: Understand the concept of projection and acquire visualization skills, projection of points for skill development and employability.
CO4: Able to draw the basic views related to orthographic projections of Lines, Planes for skill development, employability and entrepreneurship.
CO5: Able to draw the basic views related to isometric projections of Lines, Planes for skill development, employability and entrepreneurship and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	1	1	1	1	1	3	1	3	2	1	2	1
CO3	2	2	3	1	3	2	3	2	1	2	1	1
CO4	3	1	1	1	1	3	1	3	3	1	1	2
CO5	2	2	1	3	2	1	2	1	3	1	2	1

Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.
2. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.
3. Engineering Graphics – K.R. Gopalakrishna, 32nd edition, 2005 – Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production – Luzadder Warren J., duff John M., Eastern Economy Edition, 2005 – Prentice- Hall of India Pvt. Ltd., New Delhi.
5. Engineering Drawing with an introduction to Auto CAD by Dhananjay A Jolhe, Tata McGraw Hill Book Company, New Delhi.

Website Sources:

- https://lecturenotes.in/
- http://home.iitk.ac.in/
- http://www.fkm.utm.my/
- https://lecturenotes.in/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEMA201: ENGINEERING MATHEMATICS-II

Objective: - The main aims of this course are to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics Differential equation, series solutions, Fourier series and PDE introduced to serve as basic tools for specialized studies in many fields of engineering and technology for skill, employability and entrepreneurship.

UNIT I **(12 Sessions)**

Differential Equations: Ordinary differential equations of first order and first degree, Linear differential equations of n^{th} order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solutions of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation) skill development .

UNIT II **(10 Sessions)**

Series Solutions and Special Functions: Series solutions of ODE of 2nd order with variable coefficients with special emphasis to differential equations of Legendre and Bessel, Legendre polynomials, Bessel's functions skill development and employability.

UNIT III **(10 Sessions)**

Fourier Series: Periodic functions, Trigonometric series, Fourier series of period 2π , Euler's formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series skill development.

UNIT IV **(10 Sessions)**

Partial Differential Equations: Introduction of partial differential equations, Solution of first order differential equations, Linear partial differential equations with constant coefficients of second order and their classification – Parabolic, Elliptic and Hyperbolic with illustrative examples skill development and employability

UNIT V **(10 Sessions)**

Applications of Partial Differential Equations : Method of separation of variables for solving partial differential equations, Wave equation upto two dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two-dimensions, Equations of transmission Lines skill development and employability

Course Outcomes:

CO1: Apply differential calculus and higher order problems and necessary and sufficient condition for total differential equations skill development achieving national and international interest.

CO2: Students learn about the how to solve Legendre and Bessel, Legendre polynomials, Bessel's functions skill development and employability.

CO3: Know about Fourier series initial conditions and its applications to different engineering models skill development.

CO4: Solve second and higher order linear Partial differential equations with constant coefficients and construct all solutions from the linearly independent solutions skill development and employability and develops local and global interest.

CO5: Solve partial differential equations with methods & its Applications skill development and employability.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	1	1	1	1	1	3	1	3	2	1	2	1
CO3	2	2	3	1	3	2	3	2	1	2	1	1
CO4	3	1	1	1	1	3	1	3	3	1	1	2
CO5	2	2	1	3	2	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	2	2
CO5	3	3	2

Suggested Readings:

1. Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
2. A Textbook of Differential Equations, Pitamber Publications.
3. B. S .Grewal , Engineering Mathematics , Khanna Publishers, New Delhi.
4. E.Kreyszig, Advanced Engineering Mathematics , John Wiley & Sons.
5. C.Ray Wylie & Louis C . Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
6. Chandrika Prasad ,Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University * Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEPH201: ENGINEERING PHYSICS-II

Objective: The goal of this course is to familiarize students about electromagnetic theory, magnetic materials, solid state Physics, superconductors and their applications for skill, employability and entrepreneurship.

UNIT I **(10 Sessions)**

Electromagnetic Theory, Gauss law, continuity equation, Ampere's Law, Maxwell's equations (differential and integral forms), Pointing vector and Pointing Theorem, propagation of plane electromagnetic waves in free space Non conducting and in conducting media Skill development and employability.

UNIT II **(08 sessions)**

Dielectric and Magnetic Properties of Materials

Dielectric Properties: Dielectric constants, Polarization of dielectric materials, Polarizability, Claussius- Mossotti Equation, Application of dielectric for skill development.

Magnetic Properties: Magnetization, Magnetic moment, Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve for skill development .

UNIT III **(08 Sessions)**

Solid State Physics

Energy bands in metals, Semiconductors and insulators, Intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors, P-N junction, Tunnel diode, Zener diode and their scopes in employability.

UNIT IV **(08 Sessions)**

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), London's Equation, Properties of superconductors, applications of superconductors. Nano Materials: Basic principle of nano science and technology, Structure, properties and uses of Fullerene and carbon nano tubes, Application of nano technology and their scopes in employability.

Unit V **(08 Sessions)**

X-Rays: Diffraction of X-rays, Production and properties, Bragg's Law, Bragg's spectrometer, Applications of X-rays. Ultrasonics: Introduction, Production of Ultrasonics (Magneto striction and piezoelectric methods), properties & applications of Ultrasonic waves and their scopes in employability.

Course Outcome: The students completing this course will be able to:

CO1: Understand Gauss law, Ampere's Law, Maxwell's equations and their applications Skill development and employability.

CO2: Study of Propagation of plane electromagnetic waves in free space for skill development achieving national and international interest.

CO3: Understand Dielectric and magnetic properties of the materials for employability.

CO4: Develops local and global interest by explaining intrinsic and extrinsic semiconductors and the construction, operation and characteristics of diodes for employability.

CO5: Understand concepts of superconductors, Properties of superconductors & applications of superconductors and the basic principle of nano science and technology and applications of nanotechnology for employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	1	2	2	1	1	3	1	3	2	1	2	1
CO3	3	2	3	1	3	2	3	2	1	2	1	1
CO4	3	1	1	1	1	3	1	3	3	1	1	2
CO5	2	2	1	3	2	1	2	1	3	1	2	1

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	2	3	1
CO4	2	3	1
CO5	2	3	1

Suggested Readings:

1. Concept of Modern Physics: A. BEISER
2. Atomic Physics: Rajam
3. Greiner : Quantum Physics
4. Griffth : Introduction to Electrodynamics
5. S. K. Gupta: Engineering Physics
6. Beiser : Perspective of Modern Physics

Website Sources:

- https://www2.ph.ed.ac.uk
- http://web.mit.edu
- http://pcwww.liv.ac.uk
- http://sites.science.oregonstate.edu
- https://eng.libretexts.org
- https://shodhganga.inflibnet.ac.in
- https://www.electrical4u.com
- https://vardhaman.org

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TECH201: ENGINEERING CHEMISTRY

Objective: The goal of this course is to emphasize the relevance of fundamentals and applications of chemistry in the field of engineering, to take into account appropriate combinations of old and new emerging concepts for the potential uses in engineering, to address the principles of general chemistry and specific topics relevant to various engineering disciplines to bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer, to bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs for skill, employability and entrepreneurship.

UNIT I: **(08 Sessions)**

Matter - Chemical Bonding and its States : Types of bonds (Ionic, covalent and chemical bonds), valence bond theory, molecular orbital theory and its applications to homo and hetero (CO & NO) diatomic molecules. Solid state- Types of unit cells, space lattice (only cubes) calculation of density of the unit cell, two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications for skill and employability.

UNIT I **(08 Sessions)**

Chemical Kinetics and Electrochemistry : Molecularity and order of reactions, zero, first and second order reactions, theories of reaction rates, electrode potential, electrochemical cells (galvanic and concentration), Nernst equation, electrochemical and galvanic series, definition, significance and classification of corrosion, electrochemical corrosion for skill and employability.

UNIT III **(08 Sessions)**

Reaction Mechanism and Spectroscopy: Electrophile, Nucleophile (SN^1 and SN^2reactions)
Mechanism of the following reactions: (i) Aldol condensation (ii) Beckmann rearrangement (iii) Cannizaro reaction (iv) Hoffmann rearrangement (v) Diels-Alder reaction and ((vi) Friedel craft reaction
Basic principle, instrumentation and general application of UV, Visible, IR/FTIR & ^{1H}NMR spectroscopy (excluding specific applications) for skill, employability and entrepreneurship.

UNIT IV **(08 Sessions)**

Polymers: Polymers, classification and applications, polymerization (addition and condensation), Thermoplastic and Thermosetting polymers, preparation, properties and uses of PVC, Dacron, nylon66 and Bakelite. Elastomers (Natural rubber, bunaN, bunaS) vulcanization, conducting polymers (Intrinsic & Extrinsic), doping, ion exchange resins, biodegradable polymers for skill, employability and entrepreneurship.

UNIT V **(08 Sessions)**

Water Treatment And Fuels: Hardness of water, calculation on hardness and its determination by EDTA method, sludge and scale formation, causes and prevention of scale formation (colloidal, phosphate, and calgon conditioning), removal of hardness (Soda lime process, zeolite process & ion-exchange process), calculations based on lime soda process for skill, employability and entrepreneurship.
Definition of fuels, classification of fuels, calorific value, determination by Dulong's formula, analysis of coal (Proximate and ultimate analysis), petroleum, important fractions of petroleum and their uses, gaseous fuels (CNG & LPG) for skill, employability and entrepreneurship

Course Outcome: Upon completion of course, students will be able to:

CO1: Gain knowledge about the basic concepts of chemistry and states of matter for skill.
CO2: Understand kinetic and electrochemical methods for various reactions for skill achieving national and international interest.
CO3: Demonstrate the mechanism of different reactions and their characterization using spectroscopy for skill.
CO4: Learn about the various kinds of polymers and their applications for skill and develops local and global interest.
CO5: Demonstrate knowledge of science behind common impurities in water, methods to treat them and gain the basic knowledge of various types of Fuels, their properties for skill improvement.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping(Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
2. Liquid Crystals and Plastic Crystals, vol.-l, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, N York.
3. Corrosion Engineeringby M.G. Fontana MeGraw Hill Publications Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co. New Delhi (2004)
4. Chemistry of Engineering Materials by C.P. Murthy. C.V. Agarwal and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org
- https://w w w.engineeringvillage.com
- https://www.technicalsy mp0sium.com

Note: Latest edition of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEME201: ENGINEERING MECHANICS

Objective: The primary purpose of the study of engineering mechanics is to develop the capacity 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 for entrepreneurship and skill development and employability.

UNIT I **(10 Sessions)**

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and non-concurrent force systems, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications for skill development.

UNIT II **(08 Sessions)**

Trusses: Introduction, Simple Truss and solution of simple truss, Method of Joints and Method of Sections for skill development and employability.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application for skill development and employability.

UNIT III **(08 Sessions)**

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorem, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry for skill development and employability.

UNIT IV **(06 Sessions)**

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams for skill development and employability.

UNIT V **(08 Sessions)**

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion. Relative Velocity for skill development and employability.

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium for skill development and employability.

Course outcome: Students completing this course will be able to:

CO1: Recognize different force systems, moments and couple for skill development achieving national and international interest.
CO2: To draw Free Body Diagram and label the reactions on it for skill development and employability
CO3: Find centroid and Moment of Inertia of different bodies for skill development and employability
CO4: To draw shear force diagram and bending moment diagram for skill development and employability
CO5: Understand Newton's law in motion, and recognize different kinds of particle motions for skill development and employability and develops local and global interest.

School of Engineering & Technology IFTM University
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	1	2		3	1	2	1	3	1	2	1
CO2	2	1	1	2	1	3	1	3	2	1	2	1
CO3	2	1	3	1	3	2	1	1	1	2	1	1
CO4	2	1	1	1	1	3	1	3	1	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Engineering Mechanics by R.K.Bansal, Laxmi Publications, New Delhi.
4. Engineering Mechanics by SS BhaviKatti, New age International Publisher, New Delhi.

Website Sources:

- https://nptel.ac.in/courses/122/104/122104014/
- https://www.coursera.org/learn/engineering-mechanics-statics
- https://www.edx.org/course/engineering-mechanics-2
- https://www.youtube.com/watch?v=ADR04oYgpAM

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEEC201: ELECTRONICS ENGINEERING

Course Objective: The objective of the course is to familiarize the students with the concepts of semiconductor technology and devices along with their applications in real life for employability.

UNIT I **(08 Sessions)**

Theory of Semiconductor material: Energy band Theory of crystals, Insulators, Semiconductors and Metals, classification of semiconductors, Mobility and Conductivity, Donor and Acceptor Impurities, Mass- Action law, Variation in semiconductor parameters with Temperature, Hall – Effect for skill development and Employability.

UNIT II **(10 Sessions)**

Semiconductor Diodes and Applications: p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance, p-n junction as rectifiers, filter (Shunt capacitor filter), clipping circuits, clamping circuits, breakdown mechanism, breakdown characteristics, zener resistance, zener diode application as shunt regulator. Introduction of LED, and Photo diode and their application in Employability

UNIT III **08 Sessions)**

Bipolar Junction Transistor (BJT): construction, transistor action, CB, CE and CC configurations, concept of voltage gain, current gain. Field Effect Transistor (FET): JFET: construction, principle of working, concept of pinch-off, drain saturation current, characteristics, characteristic equation, CG, CS and CD configurations, MOSFET: depletion and enhancement type, construction and their application in Employability.

UNIT IV **(09 Sessions)**

Number system: conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, understanding of Boolean algebra, logic gates, concept of universal gates for skill development, Canonical forms.

UNITV **(07 Sessions)**

Operational Amplifier (Op-Amp): concept of ideal operational amplifier, parameters. Inverting, non-inverting and unity gain configurations, Op-amp as adder, subtractor, Block diagram of Communication Systems, Introduction to Modulation, Need for modulation, Definition of AM and FM for understanding and skill development in field of communication system for skill development and Employability.

Course outcome: Students completing this course will be able to:

CO1: Measure voltage, current through multimeter for skill development achieving national and international interest.
CO2: Understand the practical working of a diode for employability.
CO3: Understand the graph transitions of a transistor for skill development.
CO4: Develops local and global interest by understanding the concept of logic gates for employability.
CO5: To build clamper circuit using diode for skill development and employability.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2		3	1	2	1	3	1	2	1
CO2	2	1	1	2	1	3	1	3	2	1	2	1
CO3	2	1	3	1	3	2	1	1	1	2	1	1
CO4	2	1	1	1	1	3	1	3	1	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested readings:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
2. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education
3. Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
4. Morris Mano "Digital Computer Design", PHI 2003
5. Kennedy, Davis, "Electronics Communication System" 4th Edition, TMH

Website Sources:

- en.wikipedia.org
- onlinecourses.nptel.ac.in
- www.scribd.com
- www.tutorialspoint.com

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University
Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TECS201: COMPUTER FUNDAMENTALS & PROGRAMMING

OBJECTIVE: The objective of this course is to introduces the concepts of computer basics & programming with particular attention to Engineering examples and to learn the fundamentals of the C programming language for skill development, employability and entrepreneurship.

UNIT I **(Sessions 8)**

Introduction: Introduction to Computer Systems, Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems. Number systems: Binary, hexadecimal, octal and their inter conversions. Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler. File Allocation Table, Hardware for skill development and employability.

UNIT II **(Sessions 8)**

Input, Output and storage units: Introduction to various Input and output Devices. Printers: Various type of Impact and Non- Impact Printers.

Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code. Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs for skill development and employability.

UNIT III **(Sessions 8)**

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity for skill development, employability and entrepreneurship.

UNIT IV **(Sessions 6)**

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue for skill development, employability and entrepreneurship.

UNIT V **(Sessions 10)**

Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types. Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler for skill development, employability and entrepreneurship.

COURSE OUTCOMES: On completion of the course students will be able to

CO1: Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming for skill development and employability.
CO2: Write, compile and debug programs in C language and use different data types for writing the programs for skill development and employability.
CO3: Design programs using the concepts decision statements, loops, functions, arrays pointers etc. for skill development, employability and entrepreneurship achieving national and international interest.
CO4: Design programs using Conditional Program Execution, switch statements, Iteration etc. for skill development, employability and entrepreneurship.
CO5: Design programs using Modular Programming, scope rules and global variables, recursive functions, conditional compilation etc. for skill development, employability and entrepreneurship and develops local and global interest.

School of Engineering & Technology * IFTM U
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2		3	1	2	1	3	1	2	1
CO2	2	1	1	2	1	3	1	3	2	1	2	1
CO3	2	1	3	1	3	2	1	1	1	2	1	1
CO4	2	1	1	1	1	3	1	3	1	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. "Let us C", Yashvant Kanitkar
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Resources:

- www.swayam.gov.in
- onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TECS251: COMPUTER LAB

OBJECTIVE: The objective of the course is to introduce students to the basic knowledge of programming fundamentals of C language, to impart writing skill of C programming to the students and solving problems, to impart the concepts like looping, array, functions for employability for skill development, employability and entrepreneurship.

List of Experiments **(Session 20)**

1. Write a program in C to add, subtract, multiplication and division of two numbers for skill development and employability.
2. Write a program in C to compute the compute the average for skill development and employability.
3. Write a program in C to calculate Factorial of a Number for skill development and employability.
4. Write a program in C to print a Table for skill development and employability..
5. Write a program in C to check whether a number is even or odd for skill development and employability..
6. Write a program in C to check whether a number is prime number or not for skill development, employability and entrepreneurship.
7. Write a program in C to find largest of three numbers for skill development, employability and entrepreneurship.
8. Write a program in C to read n integers, store them in an array and find their sum and average for skill development, employability and entrepreneurship.
9. Write a program in C to find the addition of two matrix for skill development, employability and entrepreneurship.
10. Write a program in C to find the factorial of a given Natural Number n using recursive for skill development, employability and entrepreneurship.

Course Outcomes: On completion of the course students will be able to

CO1: Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming for skill development and employability achieving national and international interest.

CO2: Write, compile and debug programs in C language and use different data types for writing the programs for skill development and employability.

CO3: Design programs using the concepts decision statements, loops, functions, arrays pointers etc. for skill development, employability and entrepreneurship.

CO4: Design programs using Conditional Program Execution, switch statements, Iteration etc. for skill development, employability and entrepreneurship.

CO5: Design programs using Modular Programming, scope rules and global variables, recursive functions, conditional compilation etc. for skill development, employability and entrepreneurship and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2		3	1	2	1	3	1	2	1
CO2	2	1	1	2	1	3	1	3	2	1	2	1
CO3	2	1	3	1	3	2	1	1	1	2	1	1
CO4	2	1	1	1	1	3	1	3	1	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. "Let us C", Yashvant Kanitkar
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Resources:

- www.swayam.gov.in
- onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TECH251: CHEMISTRY LAB

Objective: The objective of the lab is practical implementation of fundamental concepts of qualitative and quantitative analysis, to gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practical, to rely on elementary treatment and qualitative analysis and makes use of concepts involved, to provide an overview of preparation and identification of organic compounds for skill development, employability and entrepreneurship.

List of Experiments **(Sessions 20)**

1. Determination of alkalinity of the given sample of water for skill development and employability.
2. Determination of temporary and permanent hardness of water sample by versinate method for skill development and employability
3. Determination of available chlorine in bleaching powder for skill development and employability.
4. Determination of quantity of dissolve oxygen in given sample of water for skill development and employability.
5. Determination of iron content in the given water sample by Mohr's methods for skill development and employability.
6. Determination of ion exchange capacity of given sample of ion-exchange material for skill development and employability.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5 for skill development and employability.
8. Determination of viscosity of polystyrene by Ostwald Viscometer for skill development and employability.
9. Preparation of Bakelite resin for skill development and employability.
10. Element detection and functional group identification in organic compounds for skill development and employability.

Course Outcome: Upon completion of lab, students will be able to:

CO1: Students are able to estimate the impurities present in water for skill development and employability.
CO2: Ability to prepare advanced polymer materials for skill development and employability achieving national and international interest.
CO3: Ability to know the strength of an acid present in secondary batteries for skill development and employability.
CO4: Ability to find the Fe^{+2}, Ca^{+2} & CI using titrimetric for skill development and employability and develops local and global interest.
CO5: Ability to find the functional group identification of organic compounds for skill development and employability

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Applied Chemistry by R. S. Katiyar & J.P. Chaudhary Publication B.B.P. & Co. Meerut
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin & Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical

Note: Latest edition of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEEC251: ELECTRONICS ENGINEERING LAB

Objective: The objective of this lab is to familiarize the students with the basic working of diodes and also help them calculate voltage and currents through simple devices such as multimeter to improve skill and provide knowledge for employability and entrepreneurship.

Experiments: **(20 Sessions)**

1. To study of Digital Multimeters (measurement of AC and DC voltage, measurement of current, measurement of resistance, capacitance), passive components (resistor, capacitor) and verify using color code to inculcate knowledge for employability
2. To Study Cathode Ray Oscilloscope (To study of controls of CRO, to measure amplitude, time period and frequency of time varying signals), function generator, power supply & Bread Board for skill development.
3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection for skill development.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier knowledge for employability.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers knowledge for employability.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance knowledge for employability.
7. To Plot input / output characteristics for common base transistor for employability
8. To verify the truth table of basic logic gates (AND, OR, NOT) for skill development
9. To build and test the clipper circuit using diode for skill development.
10. To build and test the clamper circuit using diode for skill development.

Course Outcome: Students taking this lab will be able to:

CO 1: Measure voltage, current through multimeter for skill development achieving national and international interest.
CO 2: Understand the practical working of a diode for employability.
CO 3: Understand the graph transitions of a transistor for skill development.
CO 4: Understand the concept of logic gates for employability.
CO 5: To build clamper circuit using diode for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	2	1	1	3	1	1	1	2	1
CO2	1	1	2	3	2	2	3	3	1	1	1	1
CO3	1	1	3	3	1	2	3	3	1	1	1	1
CO4	1	1	1	2	1	1	3	3	1	3	1	1
CO5	1	1	1	3	1	1	3	1	1	3	2	1

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	2	2
CO2	1	2	1
CO3	3	3	2
CO4	2	2	1
CO5	2	3	2

Suggested Readings:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
2. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education 2007
3. Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
4. Morris Mano "Digital Computer Design", PHI

Website Sources:

- www.nptel.ac.in
- www.gradeup.in
- en.wikipedia.org
- www.electr_basic.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2022-23)

TEME251: MECHANICAL ENGINEERING LAB

Objective: The objective of the course is to introduce students to different engineering material and create an understanding of different mechanical properties by using Destructive testing methods. Also the students will be familiar with the basic working of IC engines & boilers for skill development, employability and entrepreneurship.

List of Experiments: (Minimum 08 experiments are required to be performed) **(16 Sessions)**

1. To conduct tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen using UTM Machine for skill development and employability.
2. To conduct compression test and determine the ultimate compressive strength for a specimen using UTM Machine for skill development and employability.
3. To conduct Impact-tests (Izod/Charpy) on Impact-testing machine to find the toughness for skill development and employability.
4. To determine the hardness of the given specimen using Brinell/Rockwell hardness testing machine for skill development and employability.
5. To study 2-stroke & 4-stroke I.C. Engine models for skill development and employability.
6. To study Lancashire, Babcock Wilcox and Locomotive boiler models for skill development and employability.
7. To study Steam Engine & Steam Turbine models for skill development and employability.
8. To study vapor compression Refrigerator unit tutor / refrigerator for skill development and employability.
9. To study window type Air conditioner skill development and employability.
10. To conduct torsion test on mild steel or cast iron specimens to find out modulus of rigidity for skill development and employability.

Course outcome: Students completing this course will be able to:

CO1: Describe the behavior of materials upon normal external loads for skill development and employability.
CO2: Predict the behavior of the material under impact conditions for skill development and employability achieving national and international interest.
CO3: Recognize the mechanical behavior of materials for skill development and employability.
CO4: Recognize parts of IC engines for skill development and employability and develops local and global interest.
CO5: Recognize components of boilers for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	3	1	2	1	3	1	2	1
CO2	2	1	3	2	1	3	1	3	2	1	2	1
CO3	3	3	3	1	3	3	3	2	1	2	1	1
CO4	3	1	1	1	2	3	1	3	3	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Engineering Mechanics by R.K.Bansal, Laxmi Publications, New Delhi.
4. Engineering Mechanics by SS BhaviKatti, New age International Publisher, New Delhi.

Website Sources:

- https://www.sciencedirect.com/topics/engineering/izod-impact
- https://www.twi-global.com/technical-knowledge/faqs/faq-what-is-charpy-testing
- https://www.hardnesstesters.com/test-types/brinell-hardness-testing
- https://www.youtube.com/watch?v=liiopCScMck

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEMA301: ENGINEERING MATHEMATICS- III

Objective: - The main aims of this course are to exposing the students to learn the Laplace transform and Z-transform and introduce the fundamental ideas of the functions of complex variables and developing a clear understanding of the fundamental concepts of Complex Analysis such as analytic functions, complex integrals and a range of skills which will allow students to work effectively with the concepts in the field of engineering for skill development, employability and entrepreneurship.

UNIT I **(12 Sessions)**

Laplace Transform : Existence theorem, Laplace transform of derivatives & Integrals inverse Laplace transforms, Unit step functions delta functions , Laplace transform of periodic functions, Convolution theorem, Applications to solve simple linear and simultaneous differential equations for skill development and employability.

UNIT II **(08 Sessions)**

Integral Transform: Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z- transforms and its applications to solve difference equations for skill development and employability.

UNIT III **(10 Sessions)**

Functions of a complex variable – I : Analytic functions, C- R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental theorem of algebra for skill development and employability.

UNIT IV **(10 Sessions)**

Functions of a Complex Variable – II : Representation of a function by power series ,Taylor's series and Laurent's series, Singularities, Zeroes and poles, Residue theorem, Evaluation of real integrals of type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ and $\int_{-\infty}^{+\infty} f(x)dx$, Conformal mapping and Bilinear transformations for skill development and employability.

UNIT V **(12 Sessions)**

Method of least squares and curve fitting of straight lines, Polynomials, Exponential curves etc., Solution of cubic and Bi-quadratic equations for skill development and employability.

Course Outcomes:

CO1: Develop the concepts of Laplace transformation & Inverse Laplace Transformation with its property to solve PDE for local, national and international interest which is helpful in all engineering & research work for skill development and employability achieving national and international interest.

CO2. Gain knowledge of Fourier series representation for even/odd functions and Z- transforms and its applications for skill development and employability.

CO3: Apply the concept of analyticity and the Cauchy-Riemann equations to analyze results on harmonic and including the fundamental theorem of algebra for skill development and employability.

CO4: Learn about Cauchy's theorem and its uses in complex integration. Taylor's and Laurent's series in complex form for skill development and employability.

CO5: To be able to apply the knowledge of least square and curve fitting of straight lines for skill development and employability and develops local and global interest.

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	1	2	1	3	1	2	1
CO2	1	1	3	2	1	3	1	3	2	1	2	1
CO3	2	3	2	1	3	3	3	2	1	2	1	1
CO4	3	1	1	1	2	3	1	3	3	1	1	2
CO5	2	2	1	3	3	1	2	1	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. B. S .Grewal , Engineering Mathematics , Khanna Publishers, New Delhi.
2. B . S . Grewal , Higher Engineering Mathematics , Khanna Publishers,New Delhi.
3. E.Kreyszig, Advanced Engineering Mathematics , John Wiley & Sons
4. C.Ray Wylie & Louis C . Barrett , Advanced Engineering Mathematics ,Tata Mc Graw –Hill Publishing Company Ltd.
5. Chandrika Prasad ,Advanced Mathematics for Engineers, Prasad Mudranalaya.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME301: THERMODYNAMICS

Objective: The objective of this course is the study of energy and its transformation. Most studies of thermodynamics are primarily concerned with two forms of energy – heat and work. Thermodynamics study includes quantitative analysis of machine and processes for transformation of energy and between work and heat. In classical thermodynamics a macroscopic viewpoint is taken regarding such matters for entrepreneurship and skill development and employability.

UNIT I **(06 Sessions)**

Fundamental Concepts and Definitions: Introduction and definition of thermodynamics, Dimensions and units, Microscopic and Macroscopic approaches, Systems, surroundings and universe, Concept of continuum, Control system boundary, control volume and control surface, Properties and state, Thermodynamic properties, Thermodynamic path, process and cycle, Thermodynamic equilibrium, Reversibility and irreversibility, Quasi static process, Energy and its forms, Work and heat, Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases for skill development and employability.

Zeroth law of thermodynamics: Zeroth law of thermodynamics, Temperature and its measurement, Temperature scales for skill development and employability.

UNIT II **(10 Sessions)**

First law of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. First law analysis for closed system (non flow processes), Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer, Limitations of first law of thermodynamics, PMM-I for skill development and employability.

UNIT III **(10 Sessions)**

Second law of Thermodynamics: Devices converting heat to work, Thermal reservoir, Heat engines, Efficiency, Devices converting work to heat, Heat pump, refrigerator, Coefficient of Performance, Reversed heat engine, Kelvin Planck statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II for skill development and employability.

UNIT IV **(07 Sessions)**

Entropy : Clausius inequality, Concept of Entropy, Entropy change in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics for skill development and employability.

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function for skill development and employability.

UNIT V **(07 Sessions)**

Properties of steam and thermodynamics cycles: Pure substance, Property of steam, Triple point, Critical point, Sub-cooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Mollier charts, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: To understand the Fundamental Concepts and Definitions of Thermodynamics for skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Director

Registrar
IFTM University
Moradabad.

CO2: To understand and study the First law of Thermodynamics for skill development and employability at local and international level achieving national and international interest.
CO3: To understand the Second law of Thermodynamics for skill development and employability.
CO4: To gain interest at local and international level to understand the concept of Entropy for skill development and employability.
CO5: To understand the concept of Steam generation at constant pressure and. Simple Rankine cycle for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12
CO1	3	3	1	1	1	1	1	1	3	1	1	2
CO2	2	1	2		3	2	1	1	3	3	1	1
CO3	2	1	1	3	1	1	1	3	2	1	2	1
CO4	3	1	2	1	1	1	2	1	3	3	1	1
CO5	2	1	1	1	3	3	1	3	1	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
2. Fundamentals of Classical Thermodynamics by Van Wylen, John wiley& sons.
3. Thermodynamics by J.P. Holman, McGraw Hill.
4. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub.
5. Thermal Engineering by R.K. Rajput, Laxmi Publication.
6. Engineering Thermodynamics by C.P. Arora.

Website Sources:

- https://nptel.ac.in/courses/112/104/112104113/
- https://www.ohio.edu/mechanical/thermo/
- https://freevideolectures.com/course/2681/basic-thermodynamics
- https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/video-lectures/

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology, IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME302: MECHANICS OF SOLIDS

Objective: To give the fundamental knowledge of deformation of solids under various type of external applied load. To understand the behavior of solid materials by their properties, under externally applied load, torque and pressure in case of cylinder and sphere for entrepreneurship and skill development and employability.

UNIT I **(08 Sessions)**

Simple Stress and Strain: Introduction, normal shear stresses, Hooke's law, stress-strain diagrams for ductile and brittle materials, one dimensional loading of members of varying cross sections for skill development.

Elastic Constants: Introduction, longitudinal strain, lateral strain, Poisson's ratio, volumetric strain, bulk modulus, expression for Young's modulus in terms of bulk modulus, relationship between modulus of elasticity and modulus of rigidity for skill development.

UNIT II **(10 Sessions)**

Compound Stress and Strains: Introduction, state of plane stress, principal stress and strain, Mohr's stress circle for employability.

Strain Energy and Impact Loading: Introduction, definitions of resilience, proof resilience, modulus of resilience, expression for strain energy stored in a body when the load is applied gradually, suddenly and with impact for employability.

UNIT III **(06 Sessions)**

Pure Bending of Beams: Introduction, type of beams, pure bending, simple bending theory, normal stresses, shear stresses in beams of different cross sections for entrepreneurship development.

UNIT IV **(06 Sessions)**

Torsion: Introduction, torsion of shafts of circular section, torsion equation, shear stress due to torque, torque and twist. Combined torsion and bending of solid shafts, torsion of thin-walled tubes for skill development.

UNIT V **(10 Sessions)**

Thin cylinders & spheres: Introduction; difference between thick and thin-walled pressure vessels, thin-walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain for employability.

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders. Stresses in rotating shaft and cylinders, stresses due to interference fits for employability.

Course Outcomes: Students completing this course will be able to:

CO1: The students will be able to understand the mechanical properties of solids under various type of applied load and will be skilled to plot property diagram diagrams for skill development.

CO2: The students will be able to get employment in design sector for finding out the maximum and minimum stresses on a cross sectional plane of a material and role of strain energy under applied load for national and international interest achieving national and international interest.

CO3: The students will be able to start their entrepreneurship in designing of beams in pure bending at various projects in construction for entrepreneurship development.

CO4: The students will be able to understand the behavior of shafts under torsion and design the shafts with skill development.

School of Engineering & Technology ★ IFTM University Moradabad ★ Director

Registrar
IFTM University
Moradabad.

CO5: The students will be able to develop local and global interest in designing thick and thin-walled pressure vessels and their deformation due to internal and external force and will be employable in this area and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	3	1	2	1	2	1	2	1	2
CO2	2	2	1	2	3	3	2	1	2	1	2	1
CO3	1	2	3	1	3	1	2	1	1	1	2	1
CO4	2	1	1	3	1	3	1	2	3	1	1	1
CO5	1	1	2	3	1	3	2	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	1
CO3	2	1	3
CO4	3	1	1
CO5	2	3	1

Suggested Readings:

1. Introduction to Solid Mechanics by Shames, PHI
2. Strength of Materials by Timoshenko and &Yσungs
3. Fundamental of Solid Mechanics by Gambhir, PHI
4. Strength of Materials by Ryder.
5. Strength of Materials by Dr. R. K. Bansal
6. Strength of Materials by S. Ramamrutham.

Website Sources:

- www.nptel.ac.in
- www.utube.com
- gradeup.co/gate-me-notes
- alphalearning.in/ese-gate/strength-of-material

Note: Latest editions of all the suggested readings must be used.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME303: FLUID MECHANICS

Objective: The objective of this course is to familiarize the students with the properties of fluids and the applications of fluid mechanics. To formulate and analyze the problems related to fluid flow. To understand the concept of flow measurement, types of flows and dimensional analysis for entrepreneurship and skill development and employability.

UNIT I: Introduction and Kinematics of Fluid flow **(08 Sessions)**

Fluid and continuum, Physical properties of fluids, Rheology of fluids. Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational, flows, compressible and incompressible flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink for skill development employability.

UNIT II: Fluid Statics **(08 Sessions)**

Pressure-density-height relationship, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis for employability and skill development.

UNIT III: Dynamics of Fluid Flow **(08 Sessions)**

Euler's Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends for the employability and entrepreneurship skills.

UNIT IV: Dimensional Analysis and Hydraulic Similitude **(08 Sessions)**

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies. Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sublayer, separation and its control, drag and lift, drag on a sphere for skill development.

UNIT V: Laminar, Turbulent Flow and Boundary Layer Analysis **(08 Sessions)**

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipes in series and parallel, power transmission through a pipe, siphon, water hammer for employability and developing entrepreneurship skills.

Course Outcomes: Students completing this course will be able to:

CO1: Understanding the concepts of fluid behavior and developing working models for skill development employability achieving national and international interest.
CO2: Applying the concept of fluid mechanics on static as well as dynamic conditions which helps in employability and skill development.
CO3: Developing the employability and entrepreneurship **skills** by analyzing the mechanics related to fluid motion and develops local and global interest.
CO4: Evaluating different problems related to the fundamental principles of fluid statics, fluid kinematics and fluid dynamics for skill development and develops local and global interest.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO5: Creating designs of different machining equipment's using fluid as a working medium for creating employability and developing entrepreneurship skills.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	2	1	3	1	2	1	1	3	2	3	1
CO2	1	1	1	2	1	1	3	2	2	3	1	2
CO3	1	2	1	1	3	2	2	1	3	1	2	1
CO4	3	1	2	1	1	3	3	1	2	1	1	1
CO5	1	3	1	1	1	3	1	2	1	2	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	2	3	3
CO4	3	2	1
CO5	2	3	3

Suggested Readings:

1. Som, S K &Biswas, G: Introduction of fluid mechanics and fluid machines, TMH, 2000, 2nd edition.
2. Das, M M: Fluid mechanics turbomachines , Oxford University Press.
3. Agarwal, S K: Fluid mechanics and machinery, TMH.
4. Garde, R J: Fluid mechanics through problems, New Age International Pvt. Ltd, New Delhi, 2nd Edition.
5. Rouse, H: Elementary mechanics of fluids, John Wiley & Sons, 1946.
6. Gupta, V and Gupta, S K: Fluid Mechanics and its Applications, Wiley Eastern Ltd, 1984.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Sanjeev Dorawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME304: MEASUREMENT & METROLOGY

Objective: The students will learn about inspection of engineering parts with various precision instruments. Design of part, tolerances and fits. Principles of measuring instruments and gauges and their uses. Evaluation and inspection of surface roughness for entrepreneurship and skill development and employability.

UNIT I **(06 Sessions)**

Mechanical Measurements

Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors for skill development and employability.

UNIT II **(06 Sessions)**

Sensors and Transducers: Types of sensors, types of transducers and their characteristics for skill development and employability.

Signal transmission and processing: Devices and systems. Signal Display & Recording Devices for skill development and employability.

UNIT III **(12 Sessions)**

Time related measurements: Counters, stroboscope, frequency measurement by direct comparison. Measurement of displacement for skill development and employability

Measurement of pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures for skill development and employability.

Strain measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration for skill development and employability.

Measurements of force and torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems for skill development and employability.

Temperature measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers for skill development and employability.

Vibration: Seismic instruments, vibration pickups and decibel meters, vibrometers accelerometers for skill development and employability.

UNIT IV **(08 Sessions)**

Metrology

Metrology and Inspection: Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardization. Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator. Limit gauges classification, Taylor's Principle of Gauge Design for skill development and employability.

UNIT V **(08 Sessions)**

Measurement of geometric forms like straightness, flatness, roundness. Tool maker's microscope, profile project autocollimator. Interferometry: principle and use of interferometry, optical flat. Measurement of screw threads and gears. Surface texture: quantitative evaluation of surface roughness and its measurement for skill development and employability.

Course Outcomes: Students completing this course will be able to:

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

CO1: Define the measurement and measuring instruments for national and international projects. Describes the static and dynamic performance characteristics of measurement instruments for skill development and employability.

CO2: Understand the types of sensors and transducers and also working of transducer and sensor for skill development and employability.

CO3: Apply the various measuring instruments and appropriate method for inspection for measuring different physical quantities for skill development and employability.

CO4: Understand the standards of length, angles; they can understand the evaluation of surface finish and measure the parts with various comparators for skill development and employability.

CO5: Understand and apply various geometrical forms like straightness, flatness etc. Also know the working of different metrological tool for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	2	3	3	1	2	1	1	1	2	3
CO2	2	1	1	3	2	1	1	1	2	1	1	3
CO3	3	3	2	1	1	1	3	1	1	2	3	1
CO4	2	1	1	3	2	3	2	3	1	1	3	3
CO5	2	1	2	3	1	1	3	1	2	3	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., "Measurement Systems, Application Design", McGraw Hill, 1990.
3. Kumar D.S., "Mechanical Measurements and Control", Metropolitan, N. Delhi.
4. Hume K.J., "Engineering Metrology", MacDonald and Co. 1963
5. Gupta, I.C., "Engineering Metrology", DhanpatRai& Sons, New Delhi, 1994
6. Jain, R.K., "Engineering Metrology" Khanna Publishers
7. Jain, R.K., "Mechanical Measurement" Khanna Publishers

Website Sources:

- https://www.mechanical.in/engineering-metrology-and-measurements-subject-notes/
- http://www.darshan.ac.in/Upload/DIET/Documents/ME/2141901_MMM_E-Note_22032016_031012AM.pdf
- https://easyengineering.net/me6504-metrology-and-measurements/
- https://lecturenotes.in/subject/239/engineering-metrology-and-measurements-emm

Note: Latest editions of the suggested readings must be use

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME307: INDUSTRIAL ENGINEERING

Objective: The objective of this course is to learn how to organize the production facilities like machines, men, material etc. to achieve stated production objectives with respect to quantity, quality, time and cost for entrepreneurship and skill development and employability.

UNIT I **(08 Sessions)**

Productivity: Introduction, definition, measurement, productivity index, ways to improve productivity, Types of Production System for skill development and employability.

Work study: Meaning and benefits of work study, time & motion study. Micro motion study P.M.T.S. man machine Diagram flow chart. Motion economy, Method study, work measurement, work sampling, standard time for skill development and employability.

UNIT II **(08 Sessions)**

Plant layout and materials handling: Plant location, type of layout, principles of facility layout principles of material handling, Material Handling equipment's for skill development and employability.

Production planning and control: Objectives, Forecasting, product design and development functions, steps in PPC. Planning routine, scheduling, Dispatching & follow-up, Effectiveness of PPC, Introduction of JIT for skill development and employability.

UNIT III **(10 Sessions)**

Managerial Economics : Introduction, Assumptions, Time Value of money, apprised, criteria step-in BEA, purpose, costs & overheads fixed & variable costs, margin of safety, Angle of incidence profit volume graph for skill development and employability.

Replacement Analysis: Depreciation causes, obsolescence, service life of assets, Replacement of items for skill development and employability.

Maintenance Management: Maintenance Planning & Control, Maintenance Strategy for skill development and employability

UNIT IV **(06 Sessions)**

Inventory Control: Inventory, function, cost, deterministic models, Introduction to MRP, supply chain Management for skill development, employability and entrepreneurship development.

Quality Control: Introduction, process control, SQC control Charts, Single double & sequential sampling, Introduction to TQM & bench marking for skill development, employability and entrepreneurship development.

UNIT V **(08 Sessions)**

Industrial Ownership: Proprietorship, partnership, Joint stock & co-operative stores for skill development and employability.

Manpower Planning: Resources, Human relationship for skill development and employability.

Organization: Principles of organization, Development of Organizational charts like line, staff, line and staff & Functional types for skill development and employability.

Course Outcomes: Students completing this course will be able:

CO1: Understanding various concepts and techniques of Industrial Engineering like productivity, work study, facility location decisions, principles of facility layout and material handling and use this knowledge for skill development and employability.

CO2: Applying functions of PPC like routing, scheduling, dispatching, loading and follow-up in industry for skill development and employability in achieving national and international interest.

CO3: Analyzing break even chart, acceptance sampling plans and various maintenance strategies for skill development and employability.

School of Engineering & Technology IFTM University
Director

Registrar
IFTM University
Moradabad.

CO4: Evaluating depreciation of fixed assets through various methods, economic order quantity for inventory management, job evaluation, merit rating and wage incentive plans for skill development, employability and entrepreneurship development and develops local and global interest.

CO5: Creating organizational charts as per organization's needs for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	1	3	3	1	2	1	2	1	1	1	3
CO2	3	1	1	2	1	1	3	2	1	3	1	2
CO3	2	1	3	1	3	1	3	1	1	1	1	1
CO4	1	1	3	2	1	3	2	1	2	3	1	3
CO5	2	3	1	2	1	2	1	2	3	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	3
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. Principles of management. An analysis of management functions-H.Koontz& C.O. Donnel. Tata McGrow-Hall Co.
2. Manufacturing Management-J Moore Prentice Hall Englewooncliffs :New jersey.
3. Modern production operations Management-Buffam E.S. Wiley eastern.
4. Industrial Engg. & Management O.P. Khanna.
5. Industrial Engineering by Ravi Shanker.
6. Industrial Engineering by Mahajan.

Website Sources:

- www.iise.org
- onlinecourses.nptel.ac.in
- www.edx.org/learn/industrial-engineering
- www.accessengineeringlibrary.com/front
- https://guides.libraries.psu.edu/industmanu
- https://wne.libguides.com/industrial_engineering/websites

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME351: THERMODYNAMICS LAB

Objective: The objective of this lab is to familiarize the students able to understand the water tube boiler and fire tube boiler working and its parts, working and study of different parts of two stroke and four stroke petrol and diesel engine, working of steam engine and gas turbine and study of ignition engine for entrepreneurship, skill development and employability.

List of Experiments: (Minimum 8 experiments are required to be performed) **(16 Sessions)**

1. Study of Fire Tube boiler for skill development and employability.
2. Study of Water Tube boiler for skill development and employability.
3. Study and working of two stroke petrol Engine for skill development and employability.
4. Study and working of four stroke petrol Engine for skill development and employability.
5. Study and working of two stroke Diesel Engine for skill development and employability.
6. Study and working of four stroke Diesel Engine for skill development and employability.
7. Study of Steam Engine model for skill development and employability.
8. Study of Gas Turbine Model for skill development and employability
9. Study of Ignition system of I.C .Engine for skill development and employability.

Course Outcome: The students will be able to understand the knowledge of:

CO1: Water tube boiler and fire tube boiler working and its parts for skill development and employability in gaining national and international interest.
CO2: Working and study of different parts of two stroke and four stroke petrol engine for skill development and employability.
CO3: Working and study of different parts of two stroke and four stroke diesel engine for skill development and employability.
CO4: Working of steam engine and gas turbine for skill development and employability
CO5: Study of ignition engine for skill development.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	3	1	2	1	2	1	1	1	3
CO2	3	1	1	2	1	1	3	2	1	3	1	2
CO3	2	1	3	1	3	1	3	1	1	1	1	1
CO4	1	1	3	2	1	3	2	1	2	3	1	3
CO5	2	3	1	2	1	2	1	2	3	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

	Skill development	Employability	Entrepreneurship development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	2
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
2. Fundamentals of Classical Thermodynamics by Van Wylen, John wiley& sons.
3. Thermodynamics by J.P. Holman, McGraw Hill.
4. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub.
5. Thermal Engineering by R.K. Rajput, Laxmi Publication.
6. Engineering Thermodynamics by C.P. Arora.

Website Sources:

- https://nptel.ac.in
- https://www.wikipedia.org
- https://www.youtube.com

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME352: MACHINE DRAWING -I LAB

Objective: The objective of this lab is to explain about the basics (IS codes for machine drawing, lines, scales, dimensioning and standard abbreviations) of engineering drawing. To explain about the basic of orthographic drawing (First angle projection, Third angle projection).Student will understand about various types of threaded fasteners and their nomenclature. To understand the concept of various machine parts (Key, cotter, coupling and rivet joint),To understand the concept of assembly drawing of various parts (Engine parts, stuffing box and screw jack),To explain the basic concept and importance of free hand sketching, To understand and apply national and international standards while drawing machine component, To familiarize in drawing assembly, orthographic and sectional views of various machine components for entrepreneurship, skill development and employability.

List of Experiments: **(16 Sessions)**

1. **Introduction:** Graphic language, classification principles of drawing, IS codes for machine drawing, lines, scales, dimensioning, standard abbreviations for skill development and employability.
2. **Orthographic projection:** First & third angle projection, drawing and sketching of machine elements for skill development and employability.
3. **Threaded fasteners:** Introduction, nomenclature, forms of thread, thread designation, Representation of thread, Foundation bolt for skill development and employability.
4. **Keys and cotter:** Keys and cotter joint for entrepreneurship, skill development and employability
5. **Shaft couplings:** Introduction, rigid and flexible coupling for entrepreneurship, skill development and employability.
6. **Riveted joint:** Introduction, Rivets and riveting, Rivet head, Classification for entrepreneurship, skill development and employability.
7. **Assembly drawing:** Introduction, Engine parts, Stuffing box, screw jack for skill development and employability.
8. **Free hand sketching:** Introduction, need for free hand sketching, Free hand sketching of some machine component for skill development and employability.

Course Outcome: On successful completion of the course, the student will be able to:

CO1: Identify the national and international standards pertaining to machine drawing for skill development and employability.
CO2: Illustrate various machine components through drawings for skill development and employability in achieving national and international interest.
CO3: Student will get the concept of orthographic projection at the same time he will also be able to draw orthographic projections of isometric views for entrepreneurship, skill development and employability.
CO4: Student will understand about the threaded fasteners for skill development and employability and develops local and global interest.
CO5: Student will know about the keys, cotter, rivet joint and shaft couplings and also able to make assembly drawing as well as free hand sketching of various mechanical parts for entrepreneurship, skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	3	2	2	1	2	1	1	1	3
CO2	3	3	1	2	2	1	3	2	1	3	1	2
CO3	2	1	3	1	3	3	3	2	1	3	1	1
CO4	1	1	3	2	1	3	2	1	2	3	1	3
CO5	2	3	1	2	1	2	1	2	1	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	3
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

- Engineering Graphics by K.C. John
- Machine Drawing by N.D. Bhatt
- Machine Drawing by P.S. Gill
- Machine Drawing by Dr R K Dhawan

Website Sources:

- https://d2t1xqejof9utc.cloudfront.net/files/16515/MachineDrawing.pdf?1354775841
- https://www.pdfdrive.com/machine-drawing-books.html
- https://easyengineering.net/machine-drawing-by-narayana/
- https://in.pinterest.com/pin/274367802285638925/
- https://www.researchgate.net/publication/313472842_Machine_Drawing

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME353: FLUID MECHANICS LAB

Objective: The objective of this course is to familiarize the students with the application of Bernoulli's theorem for calculating velocity of flow and discharge through different types of notches and weirs, calculation of the discharge through orifice meter and venturimeter. To study the significance of Reynolds number and friction factor in pipe flow for entrepreneurship, skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) **(16 Sessions)**

1. To determine the energy at a particular point in a pipe or verify the Bernoulli's theorem for skill development and employability.
2. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape for skill development and employability.
3. To measure the velocity of water flow in an open channel by a current meter for skill development and employability.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number for skill development and employability.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile using Pitot static tube apparatus for skill development and employability.
6. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes for skill development and employability.
7. To verify the momentum equation experimentally by use of Impact of jet on vane apparatus for skill development and employability.
8. To study about Notches and weirs for skill development and employability.
9. To measure the surface tension of a liquid for skill development and employability.
10. To study the flow behavior in a pipe bend and to calibrate the pipes bend for discharge measurement for skill development and employability.
11. To determine coefficient of discharge of a Venturimeter for skill development and employability.
12. To determine coefficient of discharge of an Orifice meter for skill development and employability.

Course Outcome: Students completing this course will be able to:

CO1: Achieving national and international interest to understand the application of Bernoulli's theorem to various flow measuring devices for skill development and employability.
CO2: Understand the significance of Reynolds number for skill development and employability.
CO3: Learn the concept of surface tension of various liquids for skill development and employability.
CO4: Understand the application of momentum equation in turbines for skill development and employability.
CO5: Understand the concept of friction factor in pipe flow for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

School of Engineering & Technology ★ IFTM University Moradabad ★
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	1	3	3	1	2	1	2	1	1	1	3
CO2	3	1	1	2	1	1	3	2	1	3	1	2
CO3	2	1	3	1	3	1	3	1	1	1	1	1
CO4	1	1	3	2	1	3	2	1	2	3	1	3
CO5	2	3	1	2	1	2	1	2	3	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	2
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Som, S K &Biswas, G: Introduction of fluid mechanics and fluid machines, TMH, 2000, 2nd edition.
2. Das, M M: Fluid mechanics &turbomachines , Oxford University Press.
3. Agarwal, S K: Fluid mechanics and machinery, TMH.
4. Garde, R J: Fluid mechanics through problems, New Age International Pvt. Ltd, New Delhi, 2nd Edition.
5. Rouse, H: Elementary mechanics of fluids, John Wiley & Sons, 1946.
6. Gupta, V and Gupta, S K: Fluid Mechanics and its Applications, Wiley Eastern Ltd, 1984.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme

TEME354: MEASUREMENT & METROLOGY LAB

Objective: The objective of this course is to provide students with the necessary skills for calibration and testing of different gauges and instruments. To provide students with the necessary skills to collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments for entrepreneurship, skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) (16 Sessions)

1. Study & working of simple measuring instruments- Vernier calipers, micrometer, tachometer for skill development and employability.
2. Measurement of effective diameter of a screw thread using 3 wire method for skill development and employability.
3. Measurement of angle using sine bar& slip gauges for skill development and employability.
4. Study of limit gauges for skill development and employability.
5. Study & angular measurement using level protector for skill development and employability
6. Adjustment of spark plug gap using feeler gauges for skill development and employability.
7. Study of dial indicator & its constructional details for skill development and employability.
8. Use of dial indicator to check a shape run use for entrepreneurship, skill development and employability.
9. Study and understanding of limits, fits & tolerances for skill development and employability
10. Study of Pressure & Temperature measuring equipment for skill development and employability
11. Strain gauge measurement for entrepreneurship, skill development and employability.
12. Speed measurement using stroboscope for entrepreneurship, skill development and employability.
13. Flow measurement experiment for skill development and employability
14. Vibration/work measuring experiment for skill development and employability.
15. Experiment on Dynamometers for skill development and employability.

Course Outcome: Upon completion of this course, students should be able to:

CO1: Demonstrate the necessary skills for calibration and testing of different gauges and instruments for entrepreneurship.
CO2: Demonstrate the necessary skills to collect data perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments for entrepreneurship and in achieving national and international interest.
CO3: Understand the measurement and working of measuring instruments for entrepreneurship.
CO4: Understand the standards of length and develops local and global interest.
CO5: Understand and apply various geometrical forms like straightness, flatness etc. for skill development.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	1	3	3	1	2	1	2	1	1	1	3
CO2	3	1	1	2	1	1	3	3	1	3	1	2
CO3	2	1	3	1	3	3	3	3	3	1	1	1
CO4	1	1	3	2	1	3	2	3	2	3	1	3
CO5	2	3	1	2	1	2	1	3	3	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., "Measurement Systems, Application Design", McGraw Hill, 1990.
3. Kumar D.S., "Mechanical Measurements and Control", Metropolitan, N. Delhi.
4. Hume K.J., "Engineering Metrology", MacDonald and Co. 1963
5. Gupta, I.C., "Engineering Metrology", DhanpatRai& Sons, New Delhi, 1994
6. Jain, R.K., "Engineering Metrology" Khanna Publishers
7. Jain, R.K., "Mechanical Measurement" Khanna Publishers

Website Sources:

- https://www.mechanical.in/engineering-metrology-and-measurements-subject-notes/
- http://www.darshan.ac.in/Upload/DIET/Documents/ME/2141901_MMM_E-Note_22032016_031012AM.pdf
- https://easyengineering.net/me6504-metrology-and-measurements/
- https://lecturenotes.in/subject/239/engineering-metrology-and-measurements-emm

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University * Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME401: APPLIED THERMODYNAMICS

Objective: The objective of this course is to familiarize the students able to use the First Law of Thermodynamics to estimate the potential for thermo-mechanical energy conversion in aerospace power and propulsion systems for entrepreneurship and skill development and employability.

UNIT I **(06 Sessions)**

Thermodynamic relations: Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic & Isothermal compressibility for skill development and employability.

Fuels and Combustion: Combustion analysis, Heating Values, Air requirement, Air/Fuel ratio, Standard heat of Reaction and effect of temperature on standard heat of reaction, heat of formation, adiabatic flame temperature for skill development and employability.

Unit II **(06 Sessions)**

Boilers: Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, Draught & its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance for skill development and employability.

Condenser: Classification of condenser, Air leakage, Condenser performance parameters for skill development and employability.

Unit III **(08 Sessions)**

Steam Engines: Rankine and modified Rankine cycles, Working of stream engine, Classification of steam engines, Indicator diagram, Saturation curve, Missing quantity, Heat balance for skill development and employability.

Steam& Gas Nozzles: Flow through nozzle, Variation of velocity, Area and specific volume, Choked flow, Throat area, Nozzle efficiency, off design operation of nozzle, Effect of friction on nozzle, super saturated flow for skill development and employability.

Unit IV **(10 Sessions)**

Vapour Power cycles: Carnot vapour power cycle, Effect of pressure & temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, combined cycles, Cogeneration for skill development and employability.

Steam Turbines : Classification of steam turbine, Impulse and reaction turbines, Staging, Stage and overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, Impulse reaction Turbines, state point locus, Comparison with steam engines, Losses in steam turbines, Governing of turbines for skill development and employability.

Unit V **(10 Sessions)**

Gas Turbine: Gas turbine classification Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles for skill development and employability.

School of Engineering & Technology * IFTM University * Moradabad
Director

Sanjeev Dawal
Registrar
IFTM University
Moradabad.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines & their processes, Principle of rocket propulsion, Introduction to Rocket Engine for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: To understand the Thermodynamics relations and fuel and their combustions for skill development and employability in achieving national and international interest.

CO2: To understand the Boilers and Condenser for skill development and employability.

CO3: To understand the Steam Engine and Steam & Gas Nozzle for skill development and employability.

CO4: To understand the Vapor power cycles and Steam turbines for skill development and employability.

CO5: To understand the Gas Turbine and Jet Propulsion for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	1	3	1	2	1	2	1	3	1	2	1
CO2	1	2	1	2	3	2	1	3	3	2	1	2
CO3	2	1	2	3	1	2	1	3	2	1	3	3
CO4	1	3	3	1	2	1	3	2	1	3	1	2
CO5	1	2	3	3	1	2	1	3	1	2	1	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Applied thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
2. Basic and Applied Thermodynamics by P.K. Nag, Tata McGraw Hill Pub.
3. Thermal Engg. By P.L. Ballaney, Khanna Publisher
4. Theory of Stream Turbine by W.J. Kearton
5. Steam & Gas Turbine by R.Yadav, CPH Allahabad
6. Thermal Engg. By R.K. Rajput, Laxmi Publication
7. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.
8. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man

Website Sources:

- https://nptel.ac.in/courses/112/106/112106133/
- https://www.wikipedia.org/
- https://www.youtube.com/
- https://www.pdfdrive.com/applied-thermodynamics-books.html

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ MLN University, Moradabad ★ Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME402: ADVANCE MECHANICS OF SOLIDS

Objective: This subject is useful for a detailed study of forces and their effects which is very essential for an engineer, to enable him, in designing all type of structure and machine. To provide the basic concepts and principles of strength of materials and to give an ability to analyze a given problem in a simple manner. The subject gives an ability to calculate stresses and deformations of objects under external forces, to give an ability to apply the knowledge of strength of materials on engineering applications and design problems for entrepreneurship and skill development and employability.

UNIT I **(08 Sessions)**

3-D Stress, Theory of failure, Castigliano's Theorem, Impact load: Three-dimensional state of stress & strain, equilibrium equations. Generalized Hook's Law. Theories of Failure. Castigliano's Theorem. Impact load & stresses for skill development.

UNIT II **(08 Sessions)**

Stresses in Beams: Review of pure Bending. Direct and shear stresses in beams due to transverse and axial loads, composite beams for skill development and employability.

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams for skill development and employability.

UNIT III **08 Sessions)**

Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs for skill development and employability.

UNIT IV **(08 Sessions)**

Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipments and machines for skill development and employability.

UNIT V **(08 Sessions)**

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression for skill development and employability.

Unsymmetrical Bending: Properties of beam cross-section slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section for skill development and employability.

Course outcomes: Students completing this course will be able to:

CO1: Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials for skill development.

School of Engineering & Technology IFTM University Director

Sanjeev Dawal
Registrar
IFTM University
Moradabad.

CO2: Achieving national and international interest by utilizing appropriate materials in design considering engineering properties, sustainability, cost and weight for skill development and employability.
CO3: Understand basic concept and function of different types of spring for skill development and employability
CO4: Analyze stress in column and strut subjected to different end condition for skill development and employability.
CO5: Develops local and global interest by performing engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	2	1	2	1	3	3	2	1	2	1	1	1
CO2	3	2	3	1	2	3	1	3	1	2	1	2
CO3	1	1	2	1	2	1	3	2	1	3	1	3
CO4	1	2	1	3	1	2	1	1	3	2	1	3
CO5	2	1	1	3	3	1	2	2	1	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Mechanics of Materials by Pytel
2. Strength of Materials by Ryder
3. Strength of Materials by Timoshenko and &Yσungs
4. Mechanics of Materials by Bear Jhonson

Website Sources:

- https://web.mit.edu/emech/dontindex-build/
- https://www.britannica.com/science/mechanics-of-solids
- https://www.springer.com/journal/11964
- https://nptel.ac.in/courses/105/104/105104160/
- https://www.sciencedirect.com/topics/engineering/solid-mechanics

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME403: MATERIALS SCIENCE

Objective: To study how the properties of materials may be changed through understanding atomic, molecular, crystalline and microscopic structures of engineering materials. To test and analyze the engineering properties of metals, nonmetals and composites for entrepreneurship and skill development and employability.

Unit I **08 Sessions)**

Introduction: Historical perspective and importance of materials. Brief review of modern atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bonding for skill development.
Crystallography and Imperfections: Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices X-ray crystallography techniques. Imperfections/defects in solids for skill development.

Unit II **(10 Sessions)**

Mechanical properties and Testing: Stress/Strength, Stress strain diagram for ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep, Testing such as Hardness testing, Impact testings, Fatigue testing Creep testing, Non-destructive testing (NDT) for employment.
Micro structural Exam: Microscope principle and methods. Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals and alloys such as Mild steel, Cast Iron and Brass for employment.
Phase Diagram and Equilibrium Diagram: Phase rules, Unary and Binary diagrams, Types of equilibrium diagrams: Solid solution, eutectic type and combination type. Iron-carbon equilibrium diagram for employment.

Unit III **(08 Sessions)**

Ferrous materials: Brief introduction of iron and steel making furnaces. Type of carbon steels, alloy steels and cast irons. Properties and uses for skill development and employability.
Non-Ferrous metals and alloys: Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and their applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin for skill development and employability.
Heat Treatment: Various types of heat treatment process such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams for skill development and employability.

Unit IV **(08 Sessions)**

Magnetic properties: Concept of magnetism, magnetic materials and their classification, Hysteresis curve. Soft and hard magnetic materials, Magnetic storages for employment.
Electric properties: Energy band concept of conductor, insulator and semi-conductor. Intrinsic and extrinsic semi-conductors, P-n junction and transistors. Basic devices and its application. Diffusion of Solid. Messier effect, Super conductivity and its applications. Type I& II superconductors. High T_c superconductors for employment

Unit V **(06 Sessions)**

Ceramics: Structure types and properties, Processing of Ceramics, Mechanical and Electrical behavior. Applications of ceramics for skill development and employability.

School of Engineering & Technology ★ IFTM University ★
Director

Registrar
IFTM University
Moradabad.

Plastics: Various types of polymers/plastics. Processing of plastics, Mechanical behavior, Applications and future of plastics for skill development and employability.

Other materials: Brief description of other material such as optical, thermal materials, concrete, composite materials and its uses. Introduction to Smart materials/ Nano-materials.Corrosion and its control for skill development and employability.

Course Outcomes: After completion of this course the students will be able to:

CO1: Achieving national and international interest by applying the knowledge of science, engineering and technology in synthesis of new materials with upgrading for their skill development.

CO2: Explain the testing, micro-structural exam and phase diagram of ferrous and non-ferrous metals and can get employment in testing labs.

CO3: Understand the properties and application of ferrous and no-ferrous metals and requirement of heat treatment process for skill development and employability.

CO4: Understand the magnetic and electrical properties of materials for various applications and can get **employment** in new Era of Automobile Electric Vehicle and develops local and global interest.

CO5: Select advanced materials or non-metals based on their application for designing of new materials, which will be beneficial for getting employment and skill development.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	1	2	1	1	2	3	1	1	2	1	2
CO2	1	2	3	1	3	1	2	1	2	1	3	3
CO3	1	1	2	3	1	3	1	2	3	1	2	3
CO4	1	2	1	3	2	3	1	2	3	1	2	3
CO5	2	3	1	2	1	3	3	2	1	2	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	2	3	1
CO3	3	3	3
CO4	1	3	1
CO5	3	3	1

Suggested Readings:

1. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesley Publication.
2. K.M.Gupta, Materials Science, Umesh Publication.
3. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.
4. V. Raghvan - Material Science, Prentice Hall.
5. Narula - Material Science, TMH.

Website Sources:

- www.e-education.psu.edu/matse81/node/2094
- http://nptel.ac.in
- http://lecturenotes.in/notes/23951-note-for-material-science-and-engineering
- https://www.youtube.com/watch?v=b4jvpYxxZco

Note: Latest editions of all the suggested readings must be use

School of Engineering & Technology * IFTM University *
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME404: KINEMATICS OF MACHINES

Objective: The study of kinematics is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. We have to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces for entrepreneurship and skill development and employability.

UNIT I **(12 Sessions)**

Introduction Links-types, Kinematics pairs-classification, Constraints-types, Degree of Freedom, Grubler's equation, linkage mechanisms, inversions of four bar linkage, slider crank chain and double slider crank chain for skill development.

Velocity in Mechanisms Velocity of point in mechanism, relative velocity method, instantaneous point in mechanism, Kennedy's theorem, instantaneous center method **for** skill development.

UNIT II **(10 Sessions)**

Acceleration in Mechanisms Acceleration diagram, Coriolis component of acceleration, Klein's construction for Slider Crank and Four Bar mechanism, Analytic method for slider crank mechanism for skill development and employability.

Mechanisms with Lower Pairs Pantograph, Exact straight line motion mechanisms - Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms – Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hook's joint, Davis and Ackermann Steering gears for skill development and employability.

UNIT III **(06 Sessions)**

Kinematics Synthesis of Planar Linkages Movability of four bar linkages, Grashoff's law, Graphical methods of synthesis – Two and Three position synthesis of four bars and slider crank mechanisms, Analytical method-Freudenstein's equation for function generation (three positions)for skill development and employability.

UNIT IV **(06 Sessions)**

CAM Cams and Followers - Classification & terminology, Cam profile by graphical methods for uniform velocity, simple harmonic motion and parabolic motion of followers, Analytical cam design – tangent and circular cams for skill development and employability.

UNIT V **(06 Sessions)**

Gears Classification & terminology, law of gearing, tooth forms, interference, under cutting, minimum number of teeth on gear and pinion to avoid interference, simple, compound and planetary gear trains for skill development and employability.

Course outcomes: Students completing this course will be able to:

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

CO1: Understanding the kinematic links, pairs and kinetic linkages. Describe the velocity diagram for skill development.

CO2: Identify the basic relations between distance, time, velocity, and acceleration in achieving national and international interest. Drawing velocity and acceleration diagrams for different mechanisms for skill development and employability.

CO3: Analyzing the kinematics synthesis of planner Linkages for skill development and employability.

CO4: Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of follower's for skill development and employability.

CO5: Define and selecting gear and gear train depending on application for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	2	1	3	3	2	3	2	1	2	2	1	3
CO2	2	1	2	1	3	1	1	1	3	1	3	2
CO3	2	1	1	1	3	1	2	3	1	2	1	1
CO4	2	3	2	1	2	3	1	1	2	1	2	3
CO5	2	1	1	3	1	3	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	1

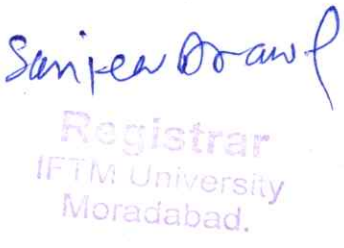
Suggested Readings:

1. Theory of machines - Thomas Bevan
2. Theory of machines and mechanisms- Shigley
3. Theory of machines and mechanisms-Ghosh&Mallik
4. Theory of machines and mechanisms- Rao&Dukkipati
5. Theory of Machines – R. K. Bansal

Website Sources:

- https://www.youtube.com/watch?v=pTJWuvDlTNU
- https://www.youtube.com/watch?v=MJeRFzs4oRU
- https://www.springer.com/gp/book/9789400711556
- https://www.nature.com/articles/014213a0
- https://www.coursera.org/lecture/dynamics/module-1-course-introduction-v9YXC

Note: Latest editions of all the suggested readings must be used.



IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEEE405: ELECTRICAL MACHINE & AUTOMATIC CONTROL

Objective: To understand the concepts of different types of machines and also analyze the time response and frequency response of open loop and closed loop systems for entrepreneurship and skill development and employability.

UNIT I: **(08 Sessions)**

Single phase Transformer: Efficiency Voltage regulation, O.C. & S.C. Tests. **Three Phase Transformer:** Three phase transformer connections, 3-phase to 2-phaseor6-phase connections and their applications. **Auto Transformer:** Volt- Amp relations, efficiency, advantages & disadvantages, applications. **D.C. Motors:** Concept of starting, speed control, losses and efficiency for skill development.

UNIT II: **(08 Sessions)**

Three phases Induction Motor: Construction, equivalent circuit, torque equation and torque- slip characteristics, speed control. **Alternator:** Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. **Synchronous Motor:** Starting, effect of excitation on line current (V-curves), synchronous condenser. **Servo Motor:** Two phase a.c. servo motor & its application for skill development and employability.

UNIT III: **(08 Sessions)**

Modeling of Mechanical System: linear mechanical elements, force-voltage and force current analogy, and electrical analog of simple mechanical systems; concept of transfer function& its determination for simple systems. **Control System:** Open loop & closed loop controls, servo mechanisms; concept of various types of system. **Signals:** Unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics for entrepreneurship and skill development and employability.

UNIT IV: **(08 Sessions)**

Time Response Analysis: Time response of a standard second order system and response specifications, steady state errors and error constants. **Stability:** Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, limitations for entrepreneurship and skill development and employability.

UNIT V: **(08 Sessions)**

Root Locus Techniques: Concept of root locus, construction of root loci **Frequency Response Analysis:** Correlation between time and frequency responses of a second order system; Bode plot, gain margin and phase margin and their determination from Bode and Polar plots. **Process control:** Introduction to PD, PI and PID controllers their characteristics, representation and applications for entrepreneurship and skill development and employability.

Course Outcomes: The students completing this course will be able to:

CO1: Differentiate between single phase, three phase and auto transformer for skill development and also understand the concept of dc motors in achieving national and international interest.
CO2: Acquire knowledge about the three phase induction motor, synchronous motor and servo motor for skill development.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO3: Differentiate different types of signal & systems and also understand the modeling of mechanical systems for entrepreneurship.
CO4: Analyze the time response and stability of open loop and closed loop systems and develops local and global interest.
CO5: Understand the root locus techniques and analyze the frequency response along with the characteristics of different types of controllers for entrepreneurship and skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	2	1	1	2	2	3	1
CO2	2	3	2	1	1	1	2	2	3	1	2	1
CO3	2	2	3	2	2	3	2	1	1	2	1	1
CO4	2	1	2	3	2	1	3	2	2	1	2	1
CO5	1	1	1	2	3	1	1	1	1	2	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. I. J. Nagrath& D. P. Kothari, "Electrical machines" Tata McGraw Hill.
2.B.C. Kuo, "Automatic Control systems." Wiley India Ltd.
3B.R. Gupta &VandanaSinghal, "Fundamentals of Electrical Machines", New Age International.
4. K. Ogata, "Modern Control Engineering" Prentice Hall of India.
5. Irvin L. Kosow, "Electric Machinery and Transformers" Prentice Hall of India.

Website Sources:

- www.lecturenotes.in
- www.academia.edu
- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.newtondesk.com

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology IFTM University
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TPSD401: PROFESSIONAL SKILL DEVELOPMENT-II

Objectives: The objectives of course is to develop critical thinking and abilities to make correct use of grammar, to enhance competencies in written and oral communication, to develop mutually beneficial relationships through communication and cooperation with others, collaborate to achieve group goals, practice living and leading with integrity and learn about issues of local and global significance in order to become active members of communities for entrepreneurship and skill development and employability .

Unit I: Communicative Skills **(Session-05)**

Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words for skill development.

Unit II: Intrapersonal Relationship Skills **(Session-07)**

Personality: Characteristics of Healthy & Sick Personality, Self-Awareness, Self Esteem, Self Confidence, Assertiveness V/S Aggressiveness, Values: Types & Importance for skill development

Unit III: Interpersonal Relationship Skills **(Session-08)**

Group: Concepts, Types, Stages, Team: Concepts, Elements, Types, Stages, Presentation Skills& strategies, Interview: Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes for skill development and employability.

Unit IV: Argumentative Skills **(Session-10)**

Debate, Role Play, Speeches, Elocution, Group Discussion for skill development and employability

Unit V: Campus to Company Skills **(Session-08)**

The corporate Fit: Dressing and Grooming, Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email, Dealing with People in Corporate for skill development and employability

Course Outcomes: Students completing this course will be able to:

CO1: Communicate effectively verbally and non-verbally for skill development and employability.
CO2: Develop national and international repute by exhibit accurate sense of self and to demonstrate knowledge of personal belief and values.
CO3: Learn Work well with other people in teams or group formally and informally and to face interview with confidence for skill development and employability.
CO4: Develop and articulate respect for the diversity of talents, ways of knowing and learning for skill development and employability.
CO5: Gain not just a positive impression but also respect in the workplace and to know how to cope up according to the organization culture and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

School of Engineering & Technology * IFTM University * Director

Registrar
IFTM University
Moradabad.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	2	1	3	3	2	3	2	1	2	2	1	3
CO2	2	1	2	1	3	1	1	1	3	1	3	2
CO3	2	1	1	1	3	1	2	3	1	2	1	1
CO4	2	3	2	1	2	3	1	1	2	1	2	3
CO5	2	1	1	3	1	3	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. M.K. Sehgal & V. Khetrapal's Business Communication published by Excel Books.
2. Rajendra Pal's Business Communication published by Sultan Chand & Sons Publication.
3. P. D. Chaturvedi's Busines Communication published by Pearson Education, Delhi.
4. Elizabeth B. Hurlock's Personality Development by Tata McGraw Hills, Delhi.

Website Sources:

- www.wikipedia.com
- www.fluentu.com
- www.mindstool.com
- www.digitalcommons.pace.edu

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEHU401: DISASTER MANAGEMENT

Objective: The objective of this course is to provide students an understanding to the concepts and aspects of disaster and its relationship with development. To ensure awareness of Disaster Risk Reduction (DRR) approaches among students. To assist students develop ability to respond to their environment with potential response to disaster for entrepreneurship and skill development and employability.

UNIT I: Introduction to Disasters **(12 Sessions)**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks; Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.; Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc.; Differential impacts- in terms of caste, class, gender, age, location, disability; Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters for skill development.

UNIT II: Approaches To Disaster Risk Reduction **(10 Sessions)**

Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness; Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures; Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders for employability.

UNIT III: Inter-Relationship between Disasters and Development **(08 Sessions)**

Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.; Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources; Role of international cooperation's in Disaster Management for skill development

UNIT IV: Disaster Risk Management In India **(08 Sessions)**

Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management; Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment for employability.

UNIT V: Disaster Management: Applications, Case Studies and Field Works **(07 Sessions)**

The project /fieldwork are meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located for skill development. A few ideas or suggestions are discussed below:

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations for skill development.

School of Engineering & Technology ★ IFTM University, Moradabad ★ Director

Registrar
IFTM University
Moradabad.

Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs for skill development.
Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid. Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work for skill development.

The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Course Outcomes: Students completing this course will be able to:

CO1: Achieving national and international interest and ability to understand major types of disaster in Indian context for skill development.
CO2: Understanding of approaches to reduce disaster risks for employability.
CO3: Capable of understanding relationship between development and disaster. Sustainable development for skill development.
CO4: Understanding of when an event becomes disaster and the phases to handle the situation for employability and develops local and global interest.
CO5: Ability to analyze how to handle a situation of disaster by taking case studies of events in past for skill development.
PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	1	3	1	3	2	1	1	1	1	3
CO2	2	2	3	2	2	1	1	2	3	1	2	3
CO3	3	1	1	2	1	2	3	1	2	1	3	1
CO4	1	2	1	3	2	1	2	1	1	2	3	3
CO5	2	1	1	1	3	1	1	2	3	1	2	2

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	1
CO3	3	2	1
CO4	2	3	1
CO5	3	2	1

Suggested Readings:

1. SatishModh, Introduction to Disaster Management, Macmillan Publisher India Ltd
2. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
3. Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
4. Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
5. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., . ISBN-10: 1259007367, ISBN-13: 978-1259007361]
6. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
7. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
8. Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.

Website sources:

- https://www.physio-pedia.com/Disaster_Management
- http://www.ifrc.org/en/what-we-do/disaster-management
- http://www.wcpt.org/disaster-management/what-is-disaster-management
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology IFTM University
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME451: APPLIED THERMODYNAMICS LAB

Objective: The objective of this lab is to familiarize the students able to find out the Indicated H.P. of I.C. Engine by Morse Test, Prepare the heat balance sheet for Diesel Engine and Petrol Engine by test rig and also understand the working of velocity and pressure compounded steam turbine and Impulse & Reaction turbine. Students also understand the working of vapour compression Refrigerator unit tutor / refrigerator and window type Air conditioner. Moreover students also understand the working of braking system of any vehicle and types of Dynamometer for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed)
(16 Sessions)

1. Determination of Indicated H.P. of I.C. Engine by Morse Test for skill development and employability
2. Prepare the heat balance sheet for Diesel Engine test rig for skill development and employability
3. Prepare the heat balance sheet for Petrol Engine test rig for skill development and employability
4. Study of Velocity compounded steam turbine for skill development and employability
5. Study of Pressure compounded steam turbine for skill development and employability
6. Study of Impulse & Reaction turbine for skill development and employability
7. To study of vapor compression Refrigerator unit tutor / refrigerator for skill development and employability
8. To study of window type Air conditioner for skill development and employability.
9. Study of braking system of any vehicle for skill development and employability.
10. Study of types of Dynamometer for skill development and employability.

Course Outcome: The students will be able to understand the knowledge of:

CO1: Find out the Indicated H.P. of I.C. Engine by Morse Test for skill development and employability.
CO2: Prepare the heat balance sheet for Diesel Engine and Petrol Engine by test rig for skill development and employability improving national and international interest.
CO3: Understand the working of velocity and pressure compounded steam turbine and Impulse & Reaction turbine for skill development and employability.
CO4: Students also understand the working of vapor compression Refrigerator unit tutor / refrigerator and window type Air conditioner for entrepreneurship, skill development and employability.
CO5: Moreover students also understand the working of braking system of any vehicle and types of Dynamometer for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	1	3	3	1	3	1	3	1	1	1	3
CO2	3	3	1	3	1	1	3	3	1	3	1	3
CO3	3	1	3	1	3	3	3	2	3	1	1	1
CO4	1	1	3	2	1	3	2	3	2	3	1	3
CO5	2	3	1	2	1	2	1	3	3	1	3	1

School of Engineering & Technology IFTM University
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	3
CO5	3	3	1

Suggested Readings:

1. Applied thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
2. Basic and Applied Thermodynamics by P.K. Nag, Tata McGraw Hill Pub.
3. Thermal Engg. By P.L. Ballaney, Khanna Publisher
4. Theory of Stream Turbine by W.J. Kearton
5. Steam & Gas Turbine by R.Yadav, CPH Allahabad
6. Thermal Engg. By R.K. Rajput, Laxmi Publication
7. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.
8. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man

Website Sources:

- https://nptel.ac.in
- https://www.wikipedia.org
- https://www.youtube.com

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME452: MACHINE DRAWING -II LAB

Objective: The objective of this lab is to explain about the basics (IS codes for machine drawing, lines, scales, dimensioning and standard abbreviations) of engineering drawing. To explain about the basic of orthographic drawing (First angle projection, Third angle projection),To understand the concept of assembly drawing of various parts (Engine parts, stuffing box, Lathe head stock, connecting rod, screw jack, etc.),To give the knowledge of specifications of material. To give the knowledge of limits, fits and tolerances, To explain about surface roughness their different symbols and drawing, To understand and apply national and international standards while drawing machine component, To explain about basic concept of production drawing for entrepreneurship and skill development and employability.

List of experiments:
(16 Sessions)

1. Review: Orthographic drawing for skill development and employability
2. Parts and assembly drawing: Introduction, Assembly drawing of machine component like screw jack, stuffing box, lathe head stock, connecting rod, crankshaft, spark plug, tool post, safety valves, etc. for skill development and employability
3. Specification of material: Designation of material and their representation for skill development and employability.
4. Limits, fits and tolerances: Introduction, limit system, tolerance, fits, drawing and exercise for skill development and employability.
5. Surface roughness: Introduction, surface roughness, machining symbols, indication of surface roughness, drawing and exercise for skill development and employability.
6. Production drawing: Introduction to developing and reading of production drawing of simple machine elements like gears, flange, connecting rod, etc. for skill development and employability

Course Outcome: The students will be able to understand the knowledge of:

CO1: Identify the national and international standards pertaining to machine drawing for skill development and employability.
CO2: Student will get the concept of orthographic projection at the same time he will also be able to draw orthographic projections of isometric views for skill development and employability.
CO3: Student will be able to make assembly drawing of different mechanical components like as (Screw jack, connecting rod, stuffing box etc.) for skill development and employability and develops local and global interest.
CO4: Student will learn to specify the material; he will also understand material different designation system for skill development and employability.
CO5: Student will learn about the limits, fits and tolerances system, he will also understand the meaning of different system for skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	1	1	3	3	1	2	1	2	1	1	1	3
CO2	3	1	1	2	1	1	3	3	1	3	1	2
CO3	2	1	3	1	3	3	3	3	3	1	1	1
CO4	1	1	3	2	1	3	2	3	2	3	1	3
CO5	2	3	1	2	1	2	1	3	3	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	1
CO2	3	3	2
CO3	3	3	2
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Engineering Graphics by K.C. John
2. Machine Drawing by N.D. Bhatt
3. Machine Drawing by P.S. Gill
4. Machine Drawing by Dr R K Dhawan

Website Sources:

- https://d2t1xqejof9utc.cloudfront.net/files/16515/MachineDrawing.pdf?1354775841
- https://www.pdfdrive.com/machine-drawing-books.html
- https://easyengineering.net/machine-drawing-by-narayana/
- https://in.pinterest.com/pin/274367802285638925/
- https://www.researchgate.net/publication/313472842_Machine_Drawing

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME453: MATERIALS TESTING LAB

Objective: The objective of this course is to familiarize the students with the physical, electrical, thermal and mechanical properties of materials by performing tests on different testing machines. Second objective is to make them understand various destructive and non-destructive testing methods and examining the properties of materials for entrepreneurship and skill development and employability.

List of experiments (Part A): (Minimum 4 experiments are required to be performed)
(08 Sessions)

1. Making a plastic mould for small metallic specimen for skill development and employability.
2. Specimen preparation for micro structural examination - cutting, grinding, polishing and etching for skill development and employability.
3. Grain size determination of a given specimen for skill development and employability.
4. Comparative study of microstructures of different given specimen (mild steel, grey cast iron, brass, copper, etc.) for skill development and employability
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after for skill development and employability.
6. Material identification of, say, 50 common items kept in a box for skill development and employability.
7. Faradays law of electrolysis experiment for skill development and employability.
8. Study of corrosion and its effects for skill development and employability.
9. Study of microstructure of welded component and HAZ. Macro and micro examination for skill development and employability.
10. Suitable experiment on Magnetic/ Electrical/Electronic materials for skill development and employability.

List of experiments (Part B): (Minimum 4 experiments are required to be performed)
(08 Sessions)

1. Strength testing of a given mild steel specimen on UTM with full details and stress-strain plot on the machine for skill development and employability.
2. Other tests such as shear bend test on UTM for skill development and employability.
3. Impact testing on impact testing machine like Charpy, Izod or both for skill development and employability.
4. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines for skill development and employability.
5. Spring index testing on spring testing machine for skill development and employability.
6. Fatigue testing on fatigue testing machine for skill development and employability.
7. Creep testing on creep testing machine for skill development and employability.
8. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge with the calculated one and evaluation of young's modulus of beam for skill development and employability.
9. Torsion testing of a rod on torsion testing machine for skill development and employability.
10. Study of non-destructive testing methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant test for skill development and employability.

School of Engineering & Technology ★ IFTM University ★
Director

Registrar
IFTM University
Moradabad.

Course Outcome: Students completing this course will be able to:

CO1: Understand the physical properties of various materials by examining the color, odor, density and surface finish for skill development and employability in achieving national and international interest.
CO2: Understand the mechanical properties of materials by performing tests on Universal Testing Machine (UTM), Impact Testing Machine, Hardness Testing Machine, Creep Testing Machine, Fatigue Testing Machine and Spring Testing Machine for employability and entrepreneurship skills.
CO3: Understand the micro structure of different materials by examining them under microscope for employability and skill development.
CO4: Understand the basics of Non Destructive Testing methods for skill development and employability and develops local and global interest.
CO5: Understand the concept and importance of various heat treatment processes such as annealing, normalizing, quenching, case hardening, etc. for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	2	2	1	2	1	2	2	3
CO2	3	3	2	2	1	1	3	1	2	1	1	1
CO3	1	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	1	3
CO3	2	3	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Gupta, N, 'Principles of Materials Science and Engineering', DhanpatRai& Co. Publications.
2. Gupta, K M, 'Materials Science in Engineering', Umesh Publications.
3. Rajput, R K, 'Material Science', Kataria Publications.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEEE455: ELECTRICAL M/C AND AUTOMATIC CONTROL LAB

Objective: The objective of this lab is to examine the performance analysis of 3-phase induction motor, to perform the speed control methods of 3-phase induction motor, to understand the stability analysis and transient response of various systems, to understand the efficiency and characteristics of dc motor for entrepreneurship and skill development and employability.

List of Experiments:
(20 Sessions)

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading for skill development and employability.
2. To obtain efficiency of a dc shunt machine by no load test for skill development and employability.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control for skill development.
4. To determine polarity and voltage ratio of single phase and three phase transformers for skill development.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading for entrepreneurship and skill development and employability.
6. To perform load test on a 3-phase induction motor and determine (i) speed- torque characteristics (ii) power factor v/s line current characteristics for entrepreneurship and skill development and employability.
7. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control for skill development.
8. To study D.C. speed control system on open loop and close loop for skill development.
9. To study of speed control of AC servo motor for skill development.
10. To study of performance of PID controller for skill development.

Course Outcomes: After successfully studying this course, students will be able to:

CO1: Explain the methods of speed control and efficiency of DC motor in achieving national and international repute.

CO2: Perform OC & SC Tests on a single phase transformer for skill development and employability.

CO3: Know about the concept of stability and transient response for skill development and employability.

CO4: Obtain speed control and load test on a three phase induction motor for skill development and employability.

CO5: Check the performance of controllers for skill development.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	3	1	1	1	2	2	1
CO2	2	3	2	2	2	1	3	2	2	1	1	2
CO3	2	1	3	1	2	2	1	1	3	2	2	1
CO4	2	1	2	3	1	2	2	2	1	1	1	3
CO5	1	1	1	1	3	2	2	1	2	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	2	1

Suggested Readings:

1. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India
3. B.C. Kuo & FaridGolnaraghi, "Automatic Control System" Wiley IndiaLtd, 2008.
4. D. Roy Choudhary, "Modern Control Engineering", Prentice Hall of India
5. Fitzerald, A. E., Kingsley and S. D. Umans "Electric Machinery", MC Graw Hill.
6. P. S. Bhimbhra, "Electrical Machinery", Khanna Publisher
7. M. G. Say, "Alternating Current Machines", Pitman & Sons

Website Sources:

- www.tutorialspoint.com
- www.electrical4u.com
- www.nptel.ac.in
- www.javatpoint.com
- www.electronicscoach.com
- www.easyengineering.net

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME501: HEAT TRANSFER

Objective: This course is designed to introduce a basic study of the phenomena of heat transfer such as conduction convection and radiation, and to provide useful information concerning the performance and design of particular heat exchanger systems and processes. A knowledge-based design problem requiring the formulations of solid conduction and fluid convection and the technique of numerical computation progressively elucidated in different chapters will be assigned and studied in detail for entrepreneurship and skill development and employability.

UNIT I **(10 Sessions)**

Introduction to Heat Transfer: Introduction and mechanisms of heat flows; Conduction (Fourier's law), convection and radiation; Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism for skill development.

Conduction: One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; Initial boundary conditions for skill development.

Steady State one-dimensional Heat conduction: Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Thermal resistance concept; Analogy between heat and electricity flow; Thermal contact resistance; Critical thickness of insulation, concept of lagging for skill development.

UNIT II **(06 Sessions)**

Fins: Heat transfer from extended surfaces, Type of fins, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells for skill development. and employability.

Transient Conduction: Transient heat conduction; Lumped capacitance method; Time constant; unsteady state heat conduction in one dimension only, Heisler charts for skill development. and employability.

UNIT III **(10 Sessions)**

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer for skill development.

Natural Convection : Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined Natural and forced convection for skill development.

UNIT IV **(07 Sessions)**

Heat Exchanger: Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) Effectiveness-NTU method; Compact heat exchangers for skill development and entrepreneurship development.

Condensation and Boiling: Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Drop wise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convective boiling for skill development and entrepreneurship development.

UNIT V **(07 Sessions)**

Thermal Radiation: Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non-black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Greenhouse effect for skill development. and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Achieving national and international interest by understand the basic laws of heat transfer for skill development.

School of Engineering & Technology * IFTM University * Director

Registrar
IFTM University
Moradabad.

CO2: Analyze problems involving steady state heat conduction in simple geometries for skill development. and employability.
CO3: Understand the fundamentals of convective heat transfer process for skill development.
CO4: Analyze problems involving effectiveness and LMTD of different heat exchanger for skill development and entrepreneurship development.
CO5: Calculate radiation heat transfer between black body surfaces & heat exchange between gray body surfaces for skill development. and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	1	2	1	2	1	2	1	3
CO2	1	1	3	1	3	1	3	1	3	1	2	1
CO3	1	3	1	3	2	1	2	1	3	2	1	2
CO4	3	2	1	2	3	2	3	2	1	3	2	1
CO5	1	2	3	1	3	2	1	3	2	1	1	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	1	2
CO4	3	2	3
CO5	3	3	1

Suggested Readings:

1. Heat Transfer, by J.P. Holman, McGraw-Hill International edition.
2. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
3. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
4. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers

Website Sources:

- https://www.brighthubengineering.com/hvac/5231-what-is-heat-transfer/
- https://scholars.unh.edu/day20/33/
- https://nptel.ac.in/courses/112/107/112107211/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME502: MACHINE DESIGN-I

Objective: To familiarize the students how to apply the concepts of stress analysis, Data book techniques in the analysis, theories of failure and material science to analyze, design and/or select commonly used machine components for entrepreneurship and skill development and employability.

UNIT I **(06 Sessions)**

(a) Introduction: Definition, Design requirement of machine component, Design procedure, Types of design, Standards in design, preferred numbers, Indian standards of designation of cast iron and different types of steel, Ergonomics in design, Aesthetic consideration in design for entrepreneurship and skill development and employability.

(b) Material properties and selection for design: Stress strain diagram, Mechanical properties, cast iron, plain carbon steel, Alloy steels, Heat treatment process, Nonferrous metals and their alloys, Ceramics, Plastics, Nature and synthetic rubber, Creep, Selection of materia l for entrepreneurship and skill development and employability.

UNIT II **(10 Sessions)**

(a)Design for static load: Types of failure, Factor of safety, Shear stress and shear strain, Stresses due to bending and torsion, Eccentric loading, Principal stresses, Theories of failure, selection and use of theories of failure, Design of simple machine component and lever for skill development and entrepreneurship.

(b) Design for fluctuating load: Stress concentration, stress concentration factor, Fluctuating stress, Fatigue failure, Endurance strength, Notch sensitivity, Endurance strength approximation, Fatigue design under combined stress, Use of Gerber equation, and Goodman and soderberg method for skill development and entrepreneurship.

UNIT III **(08 Sessions)**

(a) Power screws: Introduction, Forms of thread, Terminology of power screws, Torque requirement to raise and to lower the load, Efficiency of Screw, ACME Thread, Collar friction, Design of screw jack, Recirculation ball screws for skill development and employability.

(b)Shaft, Keys and coupling: Introduction, Shaft design based on strength, Torsional rigidity, ASME code for design, Design of hollow shaft for skill development and employability.

Keys: Introduction, Types, Designing for skill development and employability.

Coupling: Introduction, Requirement of coupling, Flexible and rigid coupling for skill development and employability.

UNIT IV **(08 Sessions)**

(a)Springs: Introduction, Types, Terminology, Material, End connection, Stress& deflection in springs, Design of helical spring for static and fluctuating load, Surge and Buckling of spring, Leaf springs, nipping of leaf springs, designing of leaf springs for skill development and entrepreneurship.

(b) Riveted joint: Introduction, Method of riveting, Materials, Types, Caulking and fullering, Failure of joint, Efficiency, Design of boiler joint for skill development and entrepreneurship.

UNIT V **(08 Sessions)**

(a) Welded joint: Introduction, Types, Strength, Axially loaded unsymmetrical welded joint, eccentric loading of welded joint, Welded joint subjected to bending and torsion for skill development and employability.

(b) Cotter and Knuckle Joint: Introduction, Types of cotter joint, Socket and spigot cotter joint, Design of sleeve and cotter joint, Dimension of various parts of the knuckle joint. Methods of failure of knuckle joint. Design procedure of Knuckle joint for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Define the basic concepts of design and describe basic process design for skill development and employability. It also deals with introduction of materials for entrepreneurship.

CO2: Provides the information about static load & fluctuating load, It also provides the design procedures when

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

different mechanical components are subjected to such loading for skill development and entrepreneurship helps in achieving national and international interest.

CO3: Describe and discuss different types of threads, power screw, shaft, keys and couplings and their designing procedures for skill development and employability.

CO4: Develops local and global interest by providing the information about springs and riveted joints. It also develops the ability of designing of these components for skill development and entrepreneurship.

CO5: Provide information relating to welded joint, knuckle joint and cotter joint, it also provides the information about the application and designing of these joint at different places for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	2	1	1	2	1	3
CO2	2	1	1	3	3	2	1	2	1	1	2	3
CO3	1	2	2	2	3	3	2	1	3	2	1	2
CO4	2	3	3	3	2	3	1	2	1	1	2	1
CO5	2	3	3	1	3	1	2	1	1	2	3	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	2	3
CO3	3	3	1
CO4	3	2	3
CO5	3	3	1

Suggested Readings:

1. Design of machine element by B. V. Bhandri
2. Machine Design by R. S. khurmi
3. Machine Design by Sharma & Agrawal
4. Machine Design by Sadhu Singh
5. Design Data Book by B V Bhandari
6. Design Data Book by Abdullaha Shareef

Website Sources:

- https://www.machinedesign.com/
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125510
- https://www.autodesk.in/solutions/3d-mechanical-engineering
- https://onlinecourses.nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME503: MANUFACTURING ENGINEERING-I

Objective: The objective of this course is to familiarize the students about various basic Manufacturing processes used in industry for converting raw materials into finished products and the principles and science of various basic manufacturing processes for entrepreneurship and skill development and employability.

UNIT **(08 Sessions)**

Introduction: Importance of manufacturing, Economic & technological considerations in manufacturing, Classification of manufacturing processes, Materials & manufacturing processes for common items, Metal Forming Processes:Elastic& plastic deformation, yield criteria, Hot working vs cold working, Analysis (equilibrium equation method) of forging process for load estimation with sliding friction sticking friction and mixed condition for slab and disc, Work required for forging, Hand, Power, Drop Forging for skill development, employability and entrepreneurship.

UNIT **(08 Sessions)**

Metal Forming Processes (continued): Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application, Condition for Rolling force and power in rolling, Rolling mills & rolled-sections, Design, lubrication and defects in metal forming processes for skill development, employability and entrepreneurship.

UNITII **(07 Sessions)**

Sheet Metal working: Presses and their classification Die & punch assembly and press work methods and processes, Cutting/Punching mechanism, Blanking vs Piercing, Compound vs Progressive die, Flat-face vs. Inclined-face punch and Load (capacity) needed, Analysis of forming process like cup/deep drawing, Bending & spring-back for skill development, employability and entrepreneurship.

UNIT **(09 Sessions)**

Unconventional Metal forming processes: Unconventional metal forming processes such as explosive forming, electromagnetic, electro-hydraulic forming, Powder Metallurgy: Powder metallurgy manufacturing process, The need, process, advantage and applications, Jigs & Fixtures: Locating & Clamping devices & principles, Jigs and Fixtures and its applications, Manufacturing of Plastic components: Review of plastics, and its past, present & future uses, Injection molding, Extrusion of plastic section, Welding of plastics, Future of plastic & its applications, Resins & Adhesives for skill development and employability.

UNITV **(08 Sessions)**

Casting (Foundry): Basic principle & survey of casting processes, Types of patterns and allowances, Types and properties of moulding sand, Elements of mould and design considerations, Gating, Riser, Runners, Core, Solidification of casting, Sand casting, defects & remedies and inspection, Cupola furnace, Die Casting, Centrifugal casting, Investment casting, CO2 casting and Stir casting etc. for skill development, employability and entrepreneurship.

Course Outcomes: Students completing this course will be able:

CO1: To acquire national and international interest by the knowledge of the tools, equipment, machinery and their applications use this knowledge for employability and entrepreneurship.
CO2: To acquire the knowledge of the tools, equipment, machinery and applications of drawing and extrusion process and use this knowledge for skill development.
CO3: To acquire the knowledge about the tools, equipment, machinery and operations of different sheet metal working operation and use this knowledge for skill development, employability and entrepreneurship.
CO4: To understand different unconventional metal forming processes e.g. explosive, electromagnetic forming etc. and use this knowledge for skill development and employability.
CO5: To acquire the knowledge of various types of casting processes and use this knowledge for skill development, employability and entrepreneurship and develops local and global interest.

School of Engineering & Technology ★ IFTM Uni
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	3	3	1	1	1	3	1	2	3
CO2	1	2	1	3	3	1	2	1	3	2	1	3
CO3	1	2	2	3	2	3	1	2	1	1	3	3
CO4	1	2	1	3	1	3	1	2	3	2	1	3
CO5	2	1	1	3	1	1	2	1	3	1	1	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Manufacturing Processes, H.N. Gupta & R.C. Gupta, New Age International Publishers.
2. Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. Production Technology, R.K. Jain, Khanna Publishers
4. Manufacturing Technology, R. K. Rajput, Laxmi Publications PVT. LTD.
5. Manufacturing Engineering & Technology, Kalpakjian, Pearson Publications.

Website Sources:

- www.wikipedia.org
- www.sciencedaily.com
- www.youtube.com
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ MJFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME504: FLUID MACHINERY

Objective: This course offers basic knowledge on fluid statics, dynamics and hydraulic machines. The objective of this course is to enable the student to understand laws of fluid mechanics and evaluate pressure, velocity and acceleration fields for various fluid flows and performance parameters for hydraulic machinery for entrepreneurship and skill development and employability.

UNIT I **(06 Sessions)**

Introduction: Classification of Fluid Mechanics, Application of momentum and momentum equation to flow through hydraulic machinery, Euler's fundamental equation for skill development and employability.

Impact of jet: Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), effect of inclination of jet with the surface for skill development and employability.

UNIT II **(08 Sessions)**

Hydraulic Turbines: Classification of turbines, Impulse turbines, constructional details, velocity triangles, power and efficiency calculations, governing of Pelton wheel for skill development and employability.

Reaction Turbines: Francis and Kaplan turbines, constructional details, velocity triangles, power and efficiency calculations, degree of reaction, draft tube, Cavitation's in turbines, principles of similarity, unit and specific speed, performance characteristics, selection of water turbines for skill development and employability.

UNIT III **(06 Sessions)**

Centrifugal Pumps: Classifications of centrifugal pumps, vector diagram, and work done by impellor, efficiencies of centrifugal pumps, specific speed, model testing, Cavitation's and separation, performance characteristics for skill development and employability.

UNIT IV **(10 Sessions)**

Positive Displacement Pumps: Reciprocating pump theory, slip and coefficient of discharges, indicator diagram, effect and acceleration work saved by fitting air vessels, comparison of centrifugal and reciprocating pumps, positive rotary pumps, Gear and Vane pumps, performance characteristics for skill development and employability.

UNIT V **(10 Sessions)**

Other Machines: Hydraulic accumulator, Intensifier, Hydraulic press, Lift and Cranes, theory of hydraulic coupling and torque converters, performance characteristics for skill development and employability.

Water Lifting Devices: Hydraulic ram, Jet pumps, Airlift pumps for skill development and employability.

Course Outcomes: Students completing this course will be able:

CO1: Understand the fluid mechanics and equations of the fluid. Describe the thrust of jet on fixed and moving surface for skill development and employability.

CO2: Derive and apply general governing equations for Impulse and reaction Turbines for skill development and employability in achieving national and international interest.

CO3: Understand and analyze the working of centrifugal pumps and also derive the different efficiencies of centrifugal pump for skill development and employability.

CO4: Understand and analyze the working of Reciprocating pumps and also derive the different efficiencies of Reciprocating pump for skill development and employability and develops local and global interest.

CO5: Understand the working of hydraulic machines like hydraulic accumulator, hydraulic press, cranes etc. Evaluate the performance characteristics of hydraulic Machines for skill development and employability.

School of Engineering & Technology IFTM University
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	1	3	2	1	2	1	1	3
CO2	2	3	1	2	1	3	3	2	1	3	2	1
CO3	2	3	2	3	3	2	3	1	2	1	1	3
CO4	2	3	1	3	3	1	3	2	1	2	2	3
CO5	1	1	3	1	2	3	2	1	3	2	1	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
3. Applied Hydraulics by Addison
4. Hydraulic Machines by R K Rajput, S.Chand& co Ltd.
5. Hydraulic Machines by D S Kumar

Website Sources:

- http: // nptel.ac.in / courses / 112105171/1 2.
- http: // web.mit.edu / hml / ncfmf.html
- https://easyengineering.net/fluid-machinery-handwritten-study-materials/
- http://www.crectirupati.com/sites/default/files/.pdf

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM Univ. Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME507: I.C.ENGINES

Objective: The objective of this course is to familiarize the students able to understand the operation of internal combustion engines. To perform theoretical calculations to obtain thermodynamic efficiencies and then assess operating losses. To calculate engine operating parameters. Tounderstand the implications of a trade-off between performance, efficiency, emissions for entrepreneurship and skill development and employability.

UNIT I **(06 Sessions)**

Introduction to I.C Engines: Engine classification, Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, Stirling cycle, Ericsson cycles, Atkinson cycle, Actual cycle analysis, Two and four stroke SI and CI engines, Valve timing diagram, Rotary engines, stratified charge engine for skill development and employability.

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines for skill development and employability.

UNIT II **(06 Sessions)**

SI Engines:
Combustion in SI engine, Flame speed, Ignition delay, abnormal combustion and its control, combustion chamber design for SI engines. Carburetion, Mixture requirements, Carburettor types, Theory of carburettor, MPFI. Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition for skill development and employability.

UNIT III **(08 Sessions)**

CI Engine:
Combustion in CI engines, Ignition delay, Knock and its control, Combustion chamber design of CI engines. Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings. Scavenging in 2 Stroke engines, pollution and its control for skill development and employability.

UNIT IV **(10 Sessions)**

Engine Cooling: Different cooling systems, Radiators, thermostat and cooling fans for skill development and employability.

Lubrication: Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation for skill development and employability.

Supercharging: Effect of altitude on power output, Types of supercharging, Turbo charging, Methods of Turbo charging for skill development and employability.

UNIT V **(10 Sessions)**

Compressors:
Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency. Rotary compressors, Classification, Centrifugal compressor, axial compressors, Surging, choking and stalling, Roots blower, sliding vane compressor for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Achieving national and international repute by understands the Fundamental Concepts of Air-Standard Cycles and types of fuels used in SI and CI engines for skill development and employability.
CO2: To understand the phenomenon of Combustion in SI engine for skill development and employability.
CO3: To understand the phenomenon of Combustion in CI engine for skill development and employability.
CO4: To understand the Engine cooling, lubrication and Supercharging for skill development and employability and develops local and global interest.
CO5: To understand the concept Compressor for skill development and employability.

School of Engineering & Technology * IFTM * Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	1	2	1	1	2	1	2	3
CO2	3	2	1	1	3	1	2	1	3	2	2	3
CO3	2	1	2	1	3	2	3	1	3	1	2	1
CO4	2	2	3	3	1	1	3	2	1	2	2	3
CO5	2	1	3	3	2	2	3	1	2	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing Co.
2. IC Engines, by Rogowsky, International Book Co.
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.

Website Sources:

- https://nptel.ac.in
- https://www.wikipedia.org
- https://www.youtube.com
- https://www.energy.gov
- https://energyeducation

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

DEPARTMENTAL ELECTIVE – I

EME011 GAS DYNAMICS

Objective: The students will be able to learn design internal and external supersonic diffusers. They will be able to learn basics of Fanno and Rayleigh flows. They learn the basics of normal and oblique shocks. They are conversant with design of converging-diverging nozzles. They learn the basics of subsonic (linear) and transonic (non-linear) velocity potential approach for skill development, employability and entrepreneurship.

UNIT I
(8 Sessions)
Introduction to Compressible flow and its applications, Review of Basic Equation in Differentialand Integral Form (Mass, Momentum and Energy) for a viscous compressible flow and equations of states. Review of concepts of speed of sound in a stationary compressible medium and the Mach. No Basic differential equations for inviscid compressible flow Dynamic similarity parameters in a compressible viscous flow for skill development and employability.

UNIT II **(8 Sessions)**
Steady One Dimensional Flow Model-Basic Equations, Normal Shock Waves (Stationary),Oblique Shock Waves, Reflection & Interaction of Oblique Shock Waves, Expansion Waves Adiabatic Flow in a Constant area passage with friction, frictionless flow in a constant area passage with heat addition/removal for skill development and employability.

UNIT III **(8 Sessions)**
Quasi-ID Steady Flows-Adiabatic Flow in a variable area passage without friction, Convergent divergent nozzles and their operating characteristics. Convergent-divergent Supersonic Diffusers, Generalized Quasi-ID Flow Governing Equations for skill development, employability and entrepreneurship.

UNIT IV **(8 Sessions)**
Unsteady wave motion Moving normal shocks, reflected shock waves, Physical aspects of wave propagation, Basic elements of acoustic theory. Finite (Non-Linear) waves, Shock-tube relations, Finite compression waves for skill development and employability.

UNIT V **(8 Sessions)**
Introduction to 2-Dimentional Compressible Flow Velocity considerations, velocity potential, linearized solutions, method of characteristics, numerical solutions for skill development, employability and entrepreneurship.

Course Outcomes: Students completing this course will be able to:

CO1: Understanding the different types of flow and its equation for skill development and employability.
CO2: Understanding the different types of waves of flow for skill development and employability helps in achieving national and international interest.
CO3: Explain design of converging-diverging nozzles and their characteristics for skill development, employability and entrepreneurship
CO4: Analyzing Unsteady wave motion, Moving normal shocks, reflected shock waves, Physical aspects of wave propagation and Basic elements of acoustic theory for skill development and employability
CO5: Describe 2-Dimentional Compressible Flow Velocity considerations, velocity potential, linearized solutions for skill development, employability and develops local and global interest.

Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	1	1	3	1	2	3	1	3
CO2	2	3	2	3	1	2	3	2	1	3	2	3
CO3	3	1	3	1	3	1	3	1	2	2	1	3
CO4	2	3	1	1	3	1	2	2	3	1	2	1
CO5	2	1	3	2	3	2	1	3	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Compressible Flow, SM Yahya, Wiley Eastern, New Delhi.
2. Gas Dynamics, Zucrow& Hoffman, Wiley, New York.
3. Dynamics & Theordynamics-Vol-1, Shapiro, Ronald Press New York.
4. Compressible Fluid Flow, Patrick H. Oosthuizen& William E. Carscallen, McGraw Hills, 1997.
5. Modern Compressible Flow with Historical Perspective, JD Anderson Jr., 2nd Ed., McGraw Hills,1990.

Website Sources:

- https://www3.nd.edu/powers/ame.30332/notes.pdf
- https://web.iitd.ac.in/pmvs/courses/mel140/notes.pdf
- https://www.academia.edu/37057082/LECTURE_NOTES_ON_GAS_DYNAMICS
- https://www.iare.ac.in/sites/default/files/PPT/AD%20II%20PPT.pdf
- https://lecturenotes.in/notes/14582-note-for-gas-dynamics-gd-by-jntu-heroes
- https://www.aoe.vt.edu/content/dam/aoe_vt_edu/programs/graduate/forms/lectnotes3-09All101812.pdf
- https://nptel.ac.in/courses/101106044

Note: Latest editions of the suggested readings must be used.

Director

Registrar
IFTM University
Moradabad

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME012 COMPUTATIONAL AERODYNAMICS

Objective: The students will be able to perform subsonic potential flow computations. They will become conversant with programming aspects of panel methods in 2D potential flows. They will be able to numerically solve linear advection equations using Godunov, vector splitting approaches. They will learn numerical techniques to solve Euler equations in 2D flows for skill development, employability and entrepreneurship.

UNIT I **(8 Sessions)**

Review of Basic Aerodynamics and its Models : Compressible flow Models and its governing equations; Non Dimensional flow parameters, Flow Regimes, Euler's equation and its different forms, Compressible potential flow mode for skill development and employability.

UNIT II **(8 Sessions)**

Classical Approach: Introduction to Panel method: Basic formulation, Boundary Conditions, Steps towards construction of numerical solution and aerodynamics loads. Viscous-inviscid Interaction, Coupling between boundary layer solvers and potential flow, influence of viscous flows effects on foil design for skill development, employability and entrepreneurship.

UNIT III **(6 Sessions)**

Wave based Approach: Wave Equation, scalar and vector model problem, characteristic form of the Euler Eqn. and its physical Interpretation, Riemann Problem and its solutions for skill development and employability.

UNIT IV **(10 Sessions)**

Basic Computational Method: Finite Difference Methods for Model Wave Equations (Linear advection, Viscous Burgers), up winding, CFL number, Application of Boundary Condition, Consistency, Convergence, Dispersion, Dissipation for skill development, employability and entrepreneurship.

UNIT V **(8 Sessions)**

Numerical Method for Euler's Equation/Navier Stokes Equation: Flux approach, Wave Approach: Flux vector splitting, Reconstruction Evolution, Boundary treatments for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand compressible flow model and its governing equation in achieving national and international interest. Execute Compressible potential flow model for skill development and employability

CO2: Understand and apply the Boundary Conditions, construction of numerical solution and aerodynamics loads, Viscous-inviscid Interaction, Coupling between boundary layer solvers for skill development, employability and entrepreneurship.

CO3: Understand and analyze characteristic form of the Euler Equation and its physical Interpretation, Riemann Problem and its solutions for skill development and employability.

CO4: Design Finite Difference Methods for Model Wave Equations for skill development, employability and entrepreneurship and develops local and global interest.

CO5: Analyze and apply the Numerical method for Euler's Equation/Navier Stokes Equation for skill development and employability.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	1	1	3	1	2	3	1	3
CO2	2	3	2	3	1	2	3	2	1	3	2	3
CO3	3	1	3	1	3	1	3	1	2	2	1	3
CO4	2	3	1	1	3	1	2	2	3	1	2	1
CO5	2	1	3	2	3	2	1	3	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	3
CO3	3	3	2
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. Low-speed Aerodynamics by J. Katz & A. Plotkin
2. Computational Gas Dynamics by Culbert B. Laney
3. Compressible Fluid Flow with Historical Perspectives by J. D. Anderson

Website Sources:

- https://iare.ac.in/sites/default/files/PPT/IARE_CAD_PPT_0.pdf
- https://lecturenotes.in/subject/508/computational-aerodynamics
- https://lecturenotes.in/download/note/41408-note-for-computational-aerodynamics-ca-by-ravichandran-rao
- https://engineering.purdue.edu/online/courses/computational-aerodynamics
- https://nptel.ac.in/courses/101106044

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology * IFTM University * Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME013: TRIBOLOGY

Objective: The students will be able to provide the knowledge and importance of tribology in design, friction, wear and lubrication aspects of machine components. It also describe to select proper grade lubricant for specific application. Understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques. Introduction of the concept of surface engineering and its importance in tribology. Understand the behavior of Tribological components for skill development, employability and entrepreneurship.

UNIT I: Introduction to Tribology **(8 Sessions)**
Definition, Scope, Applications, Friction, Definition, Scope, Laws of friction. Friction theories. Surface contaminants, Effect of sliding speed on friction for skill development.

UNIT II: Wear **(8 Sessions)**
Definition, Scope, wear of metals, Types, Classification. Mechanism of wear, Quantitative laws. Hypothesis of Holm. Hypothesis of Burwell and Strang. Hypothesis of Archard, Rawe, Rabinowicz.Quantitative law for Abrasive wear, Bayerku surface fatigue theory. Delamination theory & Fatigue theory of wear, wear resistant materials. Introduction to wear of Polymers and Ceramics. Wear reduction by Surface Improvements, Pitting, Erosion& Stress Corrosion for skill development.

UNIT III: Surface Interactions **(8 Sessions)**
Elastic & Plastic deformation of surfaces. Contact of Solids, Contact of Ideally Smooth Surfaces. Distribution of Pressure over elastic contact of two curvilinear bodies Formulae for calculation of contact area. Physico-Mechanical properties of surface layers, Characteristics of Surface Geometry. Classes of surface roughness. Contact of rough surfaces. Interaction of surface peaks. Real and contour area of contact for skill development and employability.

.UNIT IV: Lubrication **(8 Sessions)**
Definition &Scope. Generalized Reynold's equation. Flow and shear stress, energy equation. Mechanism of pressure development in bearings. Concept of Boundry Layer for skill development and employability.

UNIT V: Bearing design considerations & characteristics **(8 Sessions)**
Bearing design procedure &steps. Plain slider bearing. Step (Rayleigh step) bearing. Infinitely long journal bearing. Infinitely short journal bearing. Future scope and applications for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the different techniques used to solve mechanical engineering problems for skill development.
CO2: Achieving national and international interest by understand Mechanism of wear, Quantitative laws, Hypothesis, theories for skill development.
CO3: Explain the elastic &Plastic deformation of surfaces. Contact of Solids, Contact of Ideally Smooth Surfaces. Distribution of Pressure over elastic contact of two curvilinear bodies for skill development and employability
CO4: Analyze the generalized Reynold's equation. Flow and shear stress and boundary layers for skill development and employability.
CO5: Understand and apply Bearing design considerations & characteristics for skill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Introduction to Tribology of bearings by - B. C. Majumdar., S Chand & Co.
2. Hand Book of Tribology -- WHILEY
3. Fundamentals of Fluid film lubrication by – Bernard Hamrock, McGraw Hill International Edition.
4. Tribology in Industries by Sushil. K. Srivastava, S Chand & Publications.
5. Basic Lubrication theory by Alastair Cameron.

Website Sources:

- https://ocw.mit.edu/courses/2-800-tribology-fall-2004/pages/lecture-notes/
- https://nptel.ac.in/courses/112102015
- https://lecturenotes.in/subject/252
- https://lecturenotes.in/download/note/44152-note-for-engineering-tribology-et-by-tarun-dalai
- https://lecturenotes.in/subject/252/engineering-tribology
- https://link.springer.com/content/pdf/bfm%3A978-81-322-1656-8%2F1.pdf

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME014: ADVANCED WELDING TECHNOLOGY

Objective: The objective of this course is to familiarize the students with application, principle and working of various existing as well as advanced welding techniques and their selection in different environmental conditions for entrepreneurship and skill development and employability.

UNIT I **(09 Sessions)**

Introduction: Importance and application of welding, classification of welding process, Selection of welding process.

Brief review of conventional welding process: Gas welding, Arc welding, MIG, TIG welding, Resistance welding, Electro slag welding, Friction welding etc. Welding of MS, CI, Al, and Stainless steel & Maurer/Schaefflar Diagram. Soldering &brazing for skill development, employability and entrepreneurship.

UNIT II **(07 Sessions)**

Advanced welding Techniques- Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc. for skill development, employability and entrepreneurship.

UNIT III **(08 Sessions)**

Advanced welding Techniques (continued): Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metalizing, Hard facing for skill development and employability.

UNIT IV **(08 Sessions)**

Weld Design: Welding machines/equipment's and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels, Life predication for skill development and employability.

UNIT V **(08 Sessions)**

Thermal and Metallurgical consideration: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves, Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure, Solidification of weld and their properties for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: To acquire the knowledge about the principle, working and applications of different conventional welding techniques such as gas welding, arc welding etc. and use this knowledge for skill development, employability and entrepreneurship in achieving national and international interest.

CO2: To acquire the knowledge about the principle, working and applications of different unconventional welding techniques such as plasma arc welding, electron beam welding etc. and use this knowledge for skill development, employability and entrepreneurship.

CO3: To acquire the knowledge of various welding defects their causes and remedies for skill development and employability.

CO4: To prepare various types of welding joints for skill development and employability and develops local and global interest.

CO5: To determine/inspect and analyze the weld through various destructive and non-destructive techniques for skill development and employability.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	1	1	3	1	2	3	1	3
CO2	2	3	2	3	1	2	3	2	1	3	2	3
CO3	3	1	3	1	3	1	3	1	2	2	1	3
CO4	2	3	1	1	3	1	2	2	3	1	2	1
CO5	2	1	3	2	3	2	1	3	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Parmar R. S., Advanced welding Technology. Khanna Publisher.
2. Yadav K. S., "Advanced welding Technology". Rajsons Publication Pvt. Ltd.
3. Khanna O. P., A Text Book of Welding Technology. DhanpatRai Publications.
4. Norrish J., Advanced Welding Processes. Woodhead Publishing Ltd. Cambridge, London.
5. Rizvi S. A., Advanced Welding Technology. S. K. Kataria and Sons.
6. Welding Hand Book

Website Sources:

- nptel.ac.in/course.html
- http://www.faadooengineers.com/threads/25093-Advance-welding-technology
- en.wikipedia.org
- http://www.elcoweld.com/files/editor/downloads/elmi/AWP1
- www.slideshare.net
- https://lecturenotes.in/subject/1132/advanced-welding-technology-awt
- www.sanfoundry.com

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME015: FINITE ELEMENT METHODS

Objective: The objectives of this course are to Equip the students with the Finite Element Analysis fundamentals. Enable the students to formulate the design problems into FEA. Enable the students to perform engineering simulations using Finite Element Analysis software(ANSYS & ABAQUS).Enable the students to understand the ethical issues related to the utilization of FEA in the industry for skill development, employability and entrepreneurship.

UNIT I **(8 Sessions)**

Basic concept of finite element method, approximate solution; Basic principle of structural dynamics, boundary, initial and Eigen value problems, Integral relations, functional, the vibrational symbols; Weak formulation of boundary value problems; Rayleigh-Ritz method, Galerkin's method and method of weighted residuals for skill development.

UNIT II **(8 Sessions)**

Finite element analysis of one dimensional problems-second order boundary value problems, basic steps of finite element analysis e.g. modeling of boundary value problems, Discretisation of domain, derivation of element equations, connectivity of elements, imposition of boundary conditions, solution of equations; Application of finite element analysis to heat transfer, fluid mechanics and solid mechanics for skill development and employability.

UNIT III **(8 Sessions)**

Bending of beams. Finite element error analysis, approximation errors, various measures of errors, conversions of solutions, accuracy of solutions, problems based on error analysis, Eigenvalue and time dependant problems for skill development and employability.

UNIT IV **(8 Sessions)**

Isoperimetric formulations and numerical integration, natural coordinates, approximation of geometry, Pre-processor, calculation of element matrices, assembly of element equations, imposition of boundary conditions, solution of equations and post-processing for skill development and employability.

UNIT V **(8 Sessions)**

Finite element analysis of two dimensional problems. Interpolation functions, numerical integration and modeling considerations. Application of finite element 2-D analysis to heat transfer, fluid mechanics and solid mechanics for skill development and employability.

Course Outcomes: After taking this course the students should be able to:

CO1: Understand the structural dynamics, boundary, initial and Eigen value for skill development.
CO2: Analyze the Finite element analysis of one dimensional problems-second order boundary value problems for skill development and employability in achieving national and international repute.
CO3: Solve structural, thermal, fluid flow and impact problems for skill development and employability.
CO4: Formulate the numerical integration, natural coordinates, approximation of geometry for skill development and employability and develops local and global interest.
CO5: Solve the finite element analysis of 2D problems for skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	3	1	3	3	2	1	2	2	1	3
CO4	2	2	3	1	3	3	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Tripathi R. Chandrupatla&Ashoke D. Belegundu; Introduction to Finite Element in Engineering, Prentice Hall of India, Pvt. Ltd.
2. O.C. Zienkiewiez& K. Morgan; Fnite Elements & Approximations, John Willey & Sons, New York.
3. C.S. Krishnamurthy, Finite Element Analysis, Theory & Programming, Tata McGraw Hills.
4. J.N. Reddy; An introduction to Finite Element Methods

Website Sources:

- https://lecturenotes.in/subject/201
- https://www.kth.se/social/upload/5261b9c6f276543474835292/main.pdf
- https://people.maths.ox.ac.uk/suli/fem.pdf
- https://www.youtube.com/watch?v=MldJ6WHCsvQ
- https://www.youtube.com/watch?v=QnVH9N1eIc4
- https://backbencher.club/finite-element-methods/
- https://nptel.ac.in/courses/112104116

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME016: OPERATIONS RESEARCH

Objective: Center Objective of operation research is optimization. To develop Decision-making skills. To Get clarity on various dimension of OR and their interconnection in business Organizations. To understand the various business situations for skill development, employability and entrepreneurship.

UNIT I **(6 Sessions)**

Introduction: Basics of Operations Research

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal & dual problem sensitivity analysis for skill development.

UNIT II **(8 Sessions)**

Transportation & Assignment problems.

Deterministic Dynamic Programming: Multistage decision problems & solution, Principle of optimality for skill development and employability.

UNIT III **(10 Sessions)**

Decision theory: Decision under various conditions for skill development and employability.

Game Theory: Two Person Zero sum game, Solution with / without Saddle point, Dominance Rule, Different Methods like Algebraic, Graphical, Liner Programming for skill development and employability.

Sequencing: Basic assumption, n Jobs through two / three machines, 2 Jobs on m machines for skill development and employability.

UNIT IV **(8 Sessions)**

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy for skill development and employability.

Simulations: Use, advantages& limitations, Monte-Carlo simulation, Application to queuing, inventory & other problems for skill development and employability.

UNIT V **(8 Sessions)**

Queuing models: Characteristics of Queuing Model, M/M/1 & M/M/S system, cost consideration for skill development and employability

Project Management: Basic concept, Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation for skill development and employability.

Course Outcomes: After taking this course the students should be able to:

CO1: Achieving national and international repute by understanding the Basics of Operation research like linear programming and its problem solving techniques for skill development.
CO2: Analyze the transportation & assignment problems like deterministic dynamic problem and its solution for skill development and employability.
CO3: Solve Decision theory, Game Theory, Sequencing problems for skill development and employability.
CO4: Formulate the Stochastic inventory models, Monte-Carlo simulation and Application to queuing, inventory & other problems for skill development and employability.
CO5: Solve Queuing models and Applications of CPM and PERT techniques in Project planning and control for skill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM Uni
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Operations Research by Wangner
2. Operations Research by Taha
3. Introduction to Management Science by Hiller & Hiller
4. Operations Research by Wayne L. Winston
5. Operation Research By Hiragupta

Website Sources:

- https://lecturenotes.in/subject/201
- https://www.kth.se/social/upload/5261b9c6f276543474835292/main.pdf
- https://people.maths.ox.ac.uk/suli/fem.pdf
- https://www.youtube.com/watch?v=MldJ6WHCsvQ
- https://www.youtube.com/watch?v=QnVH9N1eIc4
- https://nptel.ac.in/courses/112104116

Note: Latest editions of the suggested readings must be used.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME017: MECHANICAL SYSTEM DESIGN

Objective: To form professionals in Mechanical Design Engineering to manage, design, implement, adapt and evaluate tools, machines, products and mechanical components based on structural criteria and security that allows the transformation and use of energy in a rational, sustainable and efficient way in the fields of Design and Manufacturing respecting the corresponding regulations, from a humanistic perspective and with social responsibility for skill development, employability and entrepreneurship.

UNIT I **(8 Sessions)**

Engineering Process and Systems Approach: Basic concepts of systems, attributes characterizing a system, system types. Application of systems concepts in Engineering, advantages of systems approach, basic problems concerning systems, Concurrent Engineering. A case study: e.g. viscous lubrication system in wire drawing for skill development and employability.

Problem Formulation: Nature of engineering problems, Needs statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraints. A case Study: e.g. heating duct insulation – system high- speed belt drive system for skill development and employability.

UNIT II **(8 Sessions)**

System Theories: System analysis, Black Box approach, state theory approach, component integration approach, Decision process approach; A case study: e.g. automobile instrumentation panel system for skill development and employability.

System Modeling: Need of modeling, Model types and purpose, linear systems, mathematical modeling, Concepts; A case study: e.g. a compound bars system for skill development and employability.

UNIT III **(8 Sessions)**

Graph Modeling and Analysis: Graph Modeling and analysis process, path problem, Network flow problem, A case study: e.g. material handling system for skill development and employability.

Optimization Concepts: Optimization process, selection of goals and objectives- Criteria, methods of optimization analytical, combinational, subjective. A case study: e.g. aluminum extrusion ion system for skill development and employability.

UNIT IV **(8 Sessions)**

System Evaluation: Feasibility assessment, planning horizon, time value of money, financial analysis. A case study: e.g. manufacture of a Maize-Starch system for skill development and employability.

Calculus Methods for optimization: Model with one decision variable, model with two decision variables, model with equality constraint, Model with inequality constraint. A case study: e.g. optimization of insulation – system for skill development and employability.

UNIT-V **(8 Sessions)**

Decision Analysis: Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict Probability density function, Expected monetary value, utility value, Baye's theorem: A case study: e.g. Installation of a Machinery for skill development, employability and entrepreneurship.

System Simulation: Simulation concepts, simulation models, computer applications in simulation, spread sheet simulation. Simulation process, problem definition, input model construction and solution, limitations of simulation approach. A case study: e.g. An inventory control in a Production – Plant for skill development, employability and entrepreneurship.

Course Outcomes: After taking this course the students should be able to:

CO1: Understand the Basics concept of systems, system types and its application for skill development and also he can able to formulate the problem related to high speed belt drive systems for employability.

CO2: Analyze the system and the system theories & system models for skill development and employability achieving national and international repute.

School of Engineering & Technology ★ IFTM University ★ Director

Registrar
IFTM University
Moradabad

CO3: Solve the Optimization Concepts, and graph modeling problems for skill development and employability.
CO4: Evaluate the system and he can optimize the models by various methods for skill development and employability.
CO5: Analyze the decision problems under certainty and uncertainty risk and also simulate the system for skill development, employability and entrepreneurship and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	1
CO2	3	3	3	2	1	2	2	2	1	3	2	2
CO3	3	1	2	1	2	1	2	1	2	2	1	1
CO4	2	2	1	1	3	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	2	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Design And Planning of Engineering Systems – by D.D.Reredith,
2. Design Engineering- by J.R.Dixon, Tata McGraw Hill Publishing Company, New Delhi.
3. An Introduction to Engineering Design Method – by V.Gupta and P.N. Murthy, Tata Mc. Graw Hill.
4. Engineering Design – Robert Matousck, Blackie and Son Ltd., Glasgow.
5. Optimisation Techniques – S.S.Rao.

Website Sources:

- https://www.mitmuzaffarpur.org/wp-content/uploads/2018/08/Mechanical-System-Design.pdf
- https://www.youtube.com/watch?v=5oWXczZJT4w
- https://www.udemy.com/course/learning-concepts-of-mechanical-system-design/
- https://www.digimat.in/nptel/courses/video/112107249/L01.html

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology * IFTM University
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME018: RELIABILITY ENGINEERING

Objective: The objectives of reliability engineering, in decreasing order of priority, are: To apply engineering knowledge and specialist techniques to prevent or to reduce the likelihood or frequency of failures. To identify and correct the causes of failures that does occur despite the efforts to prevent them for skill development, employability and entrepreneurship.

UNIT I Introduction: **(6 Sessions)**
Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness for skill development.

UNIT II Reliability Mathematics: **(10 Sessions)**
Definition of probability, laws of probability, conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis Procedures, empirical reliability calculations for skill development and employability.

UNIT III Reliability: **(8 Sessions)**
Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method for skill development and employability.

UNIT IV Reliability Improvements: **(8 Sessions)**
Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance for skill development and employability.

UNIT V Reliability Testing: **(8 Sessions)**
Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards for skill development, employability and entrepreneurship.

Course Outcomes: After taking this course the students should be able to:

CO1: Gaining national and international repute by understanding the Basics of reliability engineering, its definition and factors which affect the system effectiveness for skill development.
CO2: Analyze the probability of system effectiveness by various methods for skill development and employability.
CO3: Understand the types of system and methods of reliability evaluation methods for skill development and employability.
CO4: Analyze the reliability improvements, component redundancy and system redundancy for skill development and employability and develops local and global interest.
CO5: Test all the reliability testing like life testing, testing planning and test standards for skill development, employability and entrepreneurship.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.

Website Sources:

- http://emhernandez.com/reliability-lecture-notes-summary/
- https://vardhaman.org/wp-content/uploads/2021/03/Reliability-Engineering.pdf
- https://studymaterialspdf.com/me8098-quality-control-and-reliability-engineering-mech/
- https://www.youtube.com/watch?v=uw8-XO630dw
- https://archive.nptel.ac.in/courses/105/108/105108128/

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology ★ IFTM Uni ★ Director

Registrar
IFTM University
Moradabad

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME019: THERMAL TURBO MACHINES

Objective: It is major branch of mechanics. It introduces students about fluid and its difference with solids. Geometry of fluid flow can be visualized. Its importance lies in its wide ranging applications in fluid power engineering and mechanics of fluid flow. It also discusses various empirical relations which are helpful in boundary layer applications. It provides basis for computational fluid dynamics for skill development, employability and entrepreneurship

UNIT I **(8 Sessions)**

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam & gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbo machinery, Energy transfer in turbo machines, Euler's equation, Definition of various efficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology, Cascade testing, Velocity diagrams for axial and radial turbo machinery and pumps for skill development.

UNIT II **(10 Sessions)**

Centrifugal compressors- Principle of operation, work done and pressure rise, Velocity diagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient, Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guide vanes, Centrifugal Compressor characteristic curves for skill development and employability.

Axial flow compressor- Principle of operation and working, Energy transfer, Velocity diagram for axial compressor, Factors affecting stage pressure ratio, Blockage in compressor annulus, Degree of reaction, 3-D flow, Design process, blade design, calculation of stage performance, Axial compressor performance characteristic curves for skill development and employability.

UNIT III **(6 Sessions)**

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocity diagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord, Estimation of stage performance, Characteristic curves for skill development and employability.

UNIT IV **(8 Sessions)**

Steam turbines- Constructional details, working of steam turbine for skill development and employability.

Pumps: Classification of Pumps, Main components, indicator diagram and modification due to piston acceleration, Performance characteristics, Cavitation and its control, miscellaneous types of pumps for skill development and employability.

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropy diagram, State losses, Estimation of stage performance, Performance characteristics for skill development and employability.

UNIT V **(8 Sessions)**

Gas Turbine Starting & Control Systems: Starting ignition system, Combustion system types, Safety limits & control for skill development and employability.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparative evaluation of different cooling techniques for skill development and employability.

Mechanical Design consideration: Overall design choices, Material selection, Design with traditional materials for skill development employability and entrepreneurship.

Course Outcomes: After taking this course the students should be able to:

CO1: Understand the Basics of blower, pumps, compressors, turbojets for skill development.
CO2: Analyze the working of centrifugal compressors and axial flow and its characteristics and application and also degree of reaction for skill development and employability achieving national and international repute.
CO3: Solve the elementary theory of axial flow turbine, energy transfer equation and vortex theory for skill development and employability.

Director

Registrar
IFTM University
Moradabad.

CO4: Understand the working of steam turbines, pumps, radial flow turbines and its construction and performance for skill development and employability.
CO5: Analyze the gas turbine starting and control system, turbine blades coding and its design choices for skill development employability and entrepreneurship and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Gas turbine theory: Cohen & Rogers, Addison Weslay Longman Ltd.
3. Turbomachinery : S.M. Yahya.
4. Turbine, Compressors and Fans, S.M. Yahya, Tata McGraw Hill.
5. Gas Turbine- Ganeshan, Tata McGraw Hill.

Website Sources:

- https://lecturenotes.in/subject/1405/thermal-turbomachines-tt
- https://lecturenotes.in/subject/598/turbo-machines-tm
- https://bmsit.ac.in/public/assets/pdf/mech/studymaterial/18ME54%20-%20Keerthi%20Kumar.pdf
- https://www.youtube.com/watch?v=ZevnM-couyQ
- https://www.youtube.com/watch?v=sdRQYw8sd-U

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME020: COMPOSITE MATERIALS

Objective: The objective for this course is to develop an understanding of the linear elastic analysis of composite materials. This understanding will include concepts such as anisotropic material behavior and the analysis of laminated plates. The students will undertake a design project involving application of fiber reinforced laminates. Detailed study of biaxial strength theories of orthotropic materials are also of interest. Fundamentals of engineering constants, special cases of laminates are emphasized. The students are introduced to reinforced materials, their base materials, selection and applications for skill development, employability and entrepreneurship.

UNIT I **(8 Session)**

Introduction to Composite Materials: Definition, Classification, Types of Matrices Material and Reinforcements ,Characteristics & Selection, Fiber Composites, Laminated Composites, Particulate Composites, Prepegs, and Sandwich Construction for skill development.

UNIT II **(8 Session)**

Macro Mechanics of A Lamina: Hooke's Law for Different Types of Materials, Number of Elastic Constants, Derivation of Nine Independent Constants for Orthotropic Material, Two-Dimensional Relationship of Compliance and Stiffness Matrix. Hooke's aw for Two Dimensional Angle Lamina, Engineering Constants-Numerical Problems. Invariant Properties. Stress-Strain Relations for Lamina of Arbitrary Orientation, Numerical Problems for skill development and employability.

UNIT III **(8 Session)**

Micro Mechanical Analysis of A Lamina: Introduction, Evaluation of the Four Elastic Moduli, Rule of Mixture, Numerical Problems.

Biaxial Strength Theories: Maximum Stress Theory, Maximum StrainTheory, TSA-HillTheory, Tsai,WuTensor Theory, Numerical Problems for skill development and employability.

UNIT IV **(8 Session)**

Macro Mechanical analysis of Laminate: Introduction, Code, Kirchhoff Hypothesis, CLT, A ,B, and D Matrices (Detailed Derivation)Engineering Constants, Special Cases of Laminates, Numerical Problems for skill development and employability.

Manufacturing: Lay Up and Curing - Open and Closed Mould Processing, Hand Lay, Up Techniques, Bag Moulding and Filament Winding. Pultrusion, Pulforming, Thermo forming, Injection Moulding, Cutting, Machining and Joining, Tooling for skill development and employability.

UNIT V **(8 Session)**

Application Developments: Aircrafts, Missiles, Space Hardware, Automobile, Marine, Recreational and Sports Equipment-Future Potential of Composites for skill development and employability.

Metal Matrix composites: Re- Inforcement Materials, Types, Characteristics and Selection, Base Metals, Selection, Applications for skill development and employability.

Course Outcomes: After taking this course the students should be able to:

CO1: Understand the Basics of composite materials, its types and the types of matrices material and reinforced materials achieving national and international repute for skill development.
CO2: Understand the macro mechanics of a lamina and also solve the problems for skill development and employability.
CO3: Understand the macro mechanical analysis of a lamina and biaxial strength theories and also solve the problems for skill development and employability.
CO4: Understand the macro mechanical analysis of a laminate and its manufacturing process for skill development and employability and develops local and global interest.
CO5: Analyze the application of the composite materials and reinforced materials for skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	3	1	2	3	1	3
CO2	3	3	2	2	1	2	3	2	1	3	2	2
CO3	3	1	2	1	3	1	2	1	2	2	1	3
CO4	2	2	1	1	2	1	2	2	2	1	2	1
CO5	3	1	3	2	3	2	1	3	3	3	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Schwartz Mein, "Composite Materials Handbook", Mc Graw Hill Book Company.
2. K. Kaw Autar "Mechanics of Composite Materials", CRC Press New York.
3. MukhopadhyayMadhujit, "Mechanics of Composite Materials and Structures", University Press.

Website Sources:

- https://snscourseware.org/snsctnew/notes.php?cw=CW_5d1c6d661c72f
- https://mrcet.com/downloads/digital_notes/ME/III%20year/COMPOSITE%20%20MATERIALS%20NEW.pdf
- https://lecturenotes.in/subject/1072/composite-material-and-structure-cms
- https://www.youtube.com/watch?v=Y7MeN9oSmik
- https://www.digimat.in/nptel/courses/video/112104229/L01.html

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME551: HEAT TRANSFER LAB

Objective: Define the fundamental concepts to students in the area of heat transfer and its applications and Recognize the practical significance of various parameters those are involved in different modes of heat transfer, also enable them to apply the knowledge of heat transfer in an effective manner for different applications for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) **(16 Sessions)**

1. Conduction - Composite wall experiment for skill development and employability
2. Conduction - Composite cylinder experiment for skill development and employability
3. Convection - Pool Boiling experiment for skill development and employability
4. Convection - Experiment on heat transfer from tube-natural convection for skill development and employability.
5. Convection - Heat Pipe experiment for skill development and employability.
6. Convection - Heat transfer through fin-natural convection for skill development and employability.
7. Convection - Heat transfer through tube/fin-forced convection for skill development and employability.
8. Any experiment on radiation - Such as on Stefen's Law, determination of emissivity, etc. for skill development and employability
9. Any experiment on radiation - Such as on solar collector, etc. for skill development and employability
10. Heat exchanger - Parallel flow experiment. for skill development and employability
11. Heat exchanger - Counter flow experiment for skill development and employability
12. Any other suitable experiment such as on critical insulation thickness for skill development and employability.
13. Conduction - Determination of thermal conductivity of fluids for skill development and employability.
14. Conduction - Thermal Contact Resistance Effect for skill development and employability.

Course Outcome: Students completing this course will be able to:

CO1: Evaluate heat transfer through lagged pipe, Insulating powder and Drop and Film wise condensation for skill development and employability.
CO2: Experiment the Thermal conductivity of a given metal Rod for skill development and employability achieving national and international repute.
CO3: Measure the Heat transfer coefficient for Pin Fin, Forced convection, Natural Convection for employability and entrepreneurship skills.
CO4: Measure the parallel and counter flow heat exchanger and to Experiment on Transient heat conduction for employability and skill development.
CO5: Test Emissivity, Stefan Boltzmann Constant and Critical Heat flux for skill development and employability and develop local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	2	2	2	1	2	3	2	3	3
CO2	3	2	2	2	1	1	3	1	2	1	1	1
CO3	3	3	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	2	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	3	2
CO3	2	2	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Heat Transfer, by J.P. Holman, McGraw-Hill International edition.
2. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
3. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
4. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers

Website Sources:

- https://www.youtube.com/watch?v=x484U7M5L28
- https://www.youtube.com/watch?v=HbzUeBCmjNQ
- https://www.youtube.com/watch?v=EZ2aUI_f4l8
- https://www.youtube.com/watch?v=GmggAmO7pJg
- https://books.google.com/books/about/Heat_Transfer_Laboratory_Manual.html?id=BezANxDVK-0C

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad

Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME552: MACHINE DESIGN – I LAB

Objective: To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components, To illustrate to students the variety of mechanical components available and emphasize the need to continue learning, To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems, To teach students how to apply Data book techniques in the analysis, design and/or selection of machine components for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) **(16 Sessions)**

1. Design for static load for skill development and employability
2. Design for fluctuating load for skill development and employability
3. Design of riveted joint for skill development and employability
4. Design of welded joint for skill development and employability
5. Design of shaft for skill development and employability
6. Design of coupling for skill development and employability
7. Design of Keys for skill development and employability
8. Design of screw jack for skill development and employability
9. Design of springs for employability and entrepreneurship skills.

Course Outcome: Students completing this course will be able to:

CO1: The students will demonstrate the ability to apply the fundamentals of stress analysis, theories of failure and material science in the design of machine components for skill development and employability achieving national and international repute.
CO2: The students will demonstrate the ability to make proper assumptions, perform correct analysis while drawing upon various mechanical engineering subject areas for skill development and employability.
CO3: Specifically, the students will demonstrate the preceding abilities by performing correctly: The design, analysis and sizing of shafts, Keys and Coupling. Student will learn how to design a power screw, rivet joint and welded joint, The selection, sizing and analysis of springs, the selection, sizing, design, and analysis of other mechanical components/systems for employability and entrepreneurship skills.
CO4: Students will demonstrate the ability to seek and learn new material in addition to the class topics through the completion of an open-ended project. The amounts as well as the depth of new material identified and used by the students are measurable indicators of the students' performance for employability and skill development.
CO5: The breadth and depth of the issues taken into account by students are measurable indicators of their performance for skill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	3	2	2	1	2	1	2	2	3
CO2	3	3	2	2	1	1	3	1	2	1	3	1
CO3	1	2	3	3	2	2	3	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	1	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	1	1
CO3	2	3	3
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. Design of machine element by B. V. Bhandari
2. Machine Design by R. S. khurmi
3. Machine Design by Sharma & Agrawal
4. Machine Design by Sadhu Singh
5. Design Data Book by Sadhu Singh
6. Design Data Book by B V Bhandari
7. Design Data Book by Abdullaha Shareef

Website Sources:

- https://www.sciencedirect.com/topics/engineering/machinedesign#:~:text=Machine%20design%20focuses%20on%20the,basic%20mechanical%20parts%20of%20machines.
- https://www.machinedesign.com/
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125510
- https://www.autodesk.in/solutions/3d-mechanical-engineering
- https://onlinecourses.nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME553: MANUFACTURING ENGINEERING LAB

Objective: The objective of this course is to meet curriculum requirements and provide knowledge of different types of tools, instruments and machines and their applications in manufacturing to produce different metal components and articles and develop skills in the students for entrepreneurship and skill development and employability.

List of experiments: (Minimum 10 experiments are required to be performed) **(20 Sessions)**

1. Design of patterns for desired casting (containing hole) for employability and entrepreneurship skills.
2. Pattern making for employability and entrepreneurship skills.
3. Making a mould (with core) and casting for employability and entrepreneurship skills.
4. Sand testing (at least one such as grain fineness number determination) for employability and entrepreneurship skills.
5. Injection molding with plastics for employability and entrepreneurship skills.
6. Forging - hand forging processes for employability and entrepreneurship skills.
7. Forging – power hammer study & operation for employability and entrepreneurship skills.
8. Tube bending with the use of sand and on tube bending m/c for employability and entrepreneurship skills.
9. Press work experiment such as blanking/piercing, washer making etc. for employability and entrepreneurship skills.
10. Wire drawing/extrusion on soft material for employability and entrepreneurship skills.
11. Jigs & Fixture experiment for employability and entrepreneurship skills.
12. Gas welding experiment for employability and entrepreneurship skills.
13. Arc welding experiment for employability and entrepreneurship skills.
14. Experiment on TIG/MIG Welding for employability and entrepreneurship skills.
15. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine for employability and entrepreneurship skills.
16. Bolt (thread) making on Lathe machine for employability and entrepreneurship skills.
17. Gear cutting on milling machine for employability and entrepreneurship skills.
18. Machining a block on shaper machine for employability and entrepreneurship skills.
19. Drilling holes on drilling machine and study of twist-drill for employability and entrepreneurship skills.
20. Finishing of a surface on surface-grinding machine for employability and entrepreneurship skills.
21. Resistance welding experiment (Spot Welding) for employability and entrepreneurship skills.

Course Outcome: Students completing this course will be able:

CO1: To acquire knowledge about the various tools, equipment, machinery and operations required for these basic manufacturing processes for skill development and employability.
CO2: To define and use different manufacturing process e.g. casting, forging, turning, drilling etc. for skill development and employability achieving national and international repute.
CO3: To define and use different welding processes e.g. gas welding and electric arc welding for employability and entrepreneurship skills.
CO4: Develops local and global interest by the use of forging like hand forging processes, power hammer study &operation for employability and entrepreneurship skills.
CO5: To acquire thorough knowledge of carrying out various operations in this lab for skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	3	2	2	1	2	3	2	2	3
CO2	3	3	2	2	1	1	3	1	2	1	1	1
CO3	1	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	3	1
CO2	3	1	3
CO3	2	3	3
CO4	3	3	3
CO5	3	3	2

Suggested Readings:

1 Manufacturing Process, B.S Raghuvanshi, DhanpatRai Publication.
2 Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3 Workshop/Manufacturing Practices, VirenderNarula, Bhavya Books.
4 Manufacturing Technology, R. K. Rajput, Laxmi Publications Private Limited.

Website Sources:

- www.wikipedia.org
- www.brcmcet.edu.
- www.youtube.com
- www.slideshare.net

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME554: FLUID MACHINERY LAB

Objective: The objective of this course is to familiarize the students to gain insight about to conduct experimentation for Calibration of flow measuring devices, Determination of friction factor for pipes, minor losses in pipes, Bernoulli's theorem and the performance of hydraulic turbines and pumps for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) **(16 Sessions)**

1. Impact of Jet experiment for skill development and employability.
2. Turbine exp. on Pelton wheel for skill development and employability.
3. Turbine exp. on Francis turbine for skill development and employability.
4. Turbine exp. on Kaplan turbine for skill development and employability.
5. Exp. on reciprocating pump for skill development and employability.
6. Exp. on centrifugal pump for skill development and employability.
7. Exp. on Hydraulic Jack/Press for skill development and employability
8. Exp. on Hydraulic Brake for skill development and employability
9. Exp. on Hydraulic Ram for skill development and employability
10. Study through first visit of any pumping station/plant for skill development and employability
11. Study through second visit of any pumping station/plant for skill development and employability.

Course Outcome: Students completing this course will be able to:

CO1: Calibrate flow measuring devices such as Venturimeter, orifice meter and v-notch for skill development and employability achieving national and international repute.
CO2: Determine friction factor in pipes for employability and skill development.
CO3: Determine minor losses in the pipes for employability and entrepreneurship skills.
CO4: Verify Bernoulli's theorem for skill development and employability and develops local and global interest.
CO5: Understand the performance of hydraulic turbine and pumps under different working conditions for employability and skill development.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	2	2	1	2	1	2	2	3
CO2	3	3	2	2	1	1	3	1	2	1	1	1
CO3	1	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

School of Engineering & Technology * IFTM University
Director

Registrar
IFTM University
Moradabad

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	1	3
CO3	2	3	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1 Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2 Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
3 Applied Hydraulics by Addison
4 Hydraulic Machines by R K Rajput, S.Chand& co Ltd.
5 Hydraulic Machines by D S Kumar

Website Sources:

- http: // nptel.ac.in / courses / 112105171/1 2.
- http: // web.mit.edu / hml / ncfmf.html
- https://easyengineering.net/fluid-machinery-handwritten-study-materials/
- http://www.crectirupati.com/sites/default/files/.pdf

Note: Latest editions of all the suggested readings must be used.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME601: REFRIGERATION AND AIR CONDITIONING

Objective: The objective of this course is to familiarize the students with the fundamental principles and different methods of refrigeration and air conditioning. Study of various refrigeration cycles and evaluate performance using Mollier charts and refrigerant property tables. Comparative study of different refrigerants with respect to properties, applications and environmental issues. Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning. Study of the various equipment's operating principles and safety controls employed in refrigeration air conditioning systems for entrepreneurship and skill development and employability.

UNIT I **(08 Sessions)**

Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P, working principle of Refrigerator for skill development and employability.

Air Refrigeration cycle: Air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART) for skill development and employability.

UNIT II **(08 Sessions)**

Vapor Compression System: Single stage system, Analysis of vapor compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapor on C.O.P of the cycle, Actual vapor compression refrigeration cycle, Multistage vapor compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system for skill development and employability.

UNIT III **(08 Sessions)**

Vapor Absorption system: Working Principal of vapor absorption refrigeration system and its significance Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapor absorption system, Lithium- Bromide water vapor absorption system, Comparison for skill development and employability.

Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants for skill development and employability.

UNIT IV **(08 Sessions)**

Air Conditioning: Introduction to air conditioning, Psychometric properties uses and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP) for skill development and employability.

UNIT V **(08 Sessions)**

Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipment's e.g. compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning for skill development and employability.

Course Outcome: Students completing this course will be able to:

CO1: Understanding the method of refrigeration, Air craft refrigeration systems and DART for skill development and employability.

School of Engineering & Technology IFTM Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad

CO2: Understand vapor compression system and determine the COP of vapor compression refrigeration system achieving national and international repute. Also describe the use of T-S diagram and P-H chart for skill development and employability.
CO3: Understand the working of vapor absorption cycle and component assemblies. Also know about the refrigerants and its nomenclature and properties for skill development and employability.
CO4: Introduction of air conditioning and its properties and Evaluating and interpret different psychometric process, cooling and heating load calculations and grand sensible heat factor for skill development and employability and develops local and global interest.
CO5: Elementary knowledge of air conditioning equipment's like compressors, condensers, evaporators etc. And also knowledge about cold storage, Ice plants, water cooler etc. for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	1	2	2	3	2	1	1	3
CO2	3	3	2	1	2	1	3	1	2	2	2	1
CO3	2	2	1	3	3	2	1	2	3	3	1	2
CO4	2	1	3	2	1	3	2	1	1	1	3	1
CO5	1	3	2	2	1	3	1	2	3	2	1	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Prasad, M. 'Refrigeration and Air conditioning', New Age International (P) Ltd. Publications.
2. Arora, C P, 'Refrigeration and Air conditioning', McGraw Publications.
3. Rajpur, R K, 'Refrigeration and Air conditioning', Katson Publications.
4. Arora and Domkundwar, 'Refrigeration and Air conditioning', Dhanpat& Co. Publications.

Website Sources:

- nptel.ac.in/course.html
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology IFTM University Director

Registrar IFTM University Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME602: MACHINE DESIGN-II

Objective: The objective of this course isto teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components like as gear, bearings and I.C. engine parts. To illustrate to students the variety of gears and bearings available and emphasize the need to continue learning. To teach students how to design a gear, bearing and I.C. engine components for entrepreneurship and skill development and employability.

UNIT I **(12 Sessions)**

Spur gear: Mechanical drives, Gear drives, classification, selection, law of gearing, nomenclature of gear, gear System, Interference, backlash, force analysis, gear tooth failure, Beam strength of gear tooth, permissible Bending stress, Effective load on gear tooth, estimation of module, Wear strength of gear tooth, gear lubrication for skill development and entrepreneurship.

Helical gear: Introduction, nomenclature, virtual number of teeth, tooth proportions, force analysis, beam strength, Effective load, wear Strength, Herringbone gear for skill development and entrepreneurship.

UNIT II **(08 Sessions)**

Bevel Gear: Introduction, nomenclature, force analysis, beam & wear strength, Effective load, spiral gear for entrepreneurship and employability

Worm gear: Introduction, nomenclature, proportions, force analysis, friction, selection of material, strength rating, Wear rating, thermal considerations for entrepreneurship and employability

UNIT III **(05 Sessions)**

Sliding contact bearing: Basics of lubrication, viscosity, petroff equation, McKee investigation, Hydrostatic step bearing Energy losses, Reynolds equation, Raimondi Boyd method, Bearing design, material, lubricating oil, selection of lubricants, failure, comparison with rolling bearing for skill development, entrepreneurship and employability.

UNIT IV **(05 Sessions)**

Rolling contact bearing: Introduction, types, selection, static & dynamic load carrying rating, Stribecks equation, Load factor,

Design of cyclic load and speed, needle. Bearing, bearing failure, lubrication, mounting for skill development and entrepreneurship.

UNIT V **(10 Sessions)**

Design of I.C. Engine component: Cylinder, piston, connecting rod, crankshaft, valves, rocker arms for skill development, entrepreneurship and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Define the basic concepts of gear, their classification, their designing and their selection for different machinery for skill development and entrepreneurship achieving national and international repute.

CO2: Provides the information about bevel gear and worm gears. It also provides the design procedures of bevel gears and worm gears for entrepreneurship and employability.

CO3: Describe and discuss different types of sliding contact bearing, hydrodynamic bearing, and hydrostatic bearings, it also provides the information about lubrication and importance of lubrication for skill development, entrepreneurship and employability.

CO4: This unit of course explorers the world of anti-friction bearings, ball bearing and roller bearings, It provides the information about bearing selection process and their designing for skill development and entrepreneurship and develops local and global interest.

CO5: Describe and discuss some important components of internal combustion engines (cylinder, piston, crank shaft and connecting rod, etc), it also provides basic knowledge of these components, selection of material for these components and designing process of these mentioned components for skill development, entrepreneurship and employability.

School of Engineering & Technology ★ IFTM University ★ Peace
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	1	1	2	1	1	1	3
CO2	2	3	1	2	3	3	2	1	2	1	3	1
CO3	2	1	2	1	3	3	1	2	1	2	1	3
CO4	1	2	1	3	1	1	3	1	3	1	2	3
CO5	2	1	3	3	2	3	2	3	2	2	1	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	1	3	3
CO3	3	3	3
CO4	3	1	3
CO5	3	3	3

Suggested Readings:

1. Design of machine element by B. V. Bhandri
2. Machine Design by R. S. khurmi
3. Machine Design by Sharma & Agrawal
4. Machine Design by Sadhu Singh
5. Design Data Book by B V Bhandari
6. Design Data Book by Abdullaha Shareef

Website Sources:

- https://www.sciencedirect.com/topics/engineering/machinedesign#:~:text=Machine%20design%20focuses%20on%20the,basic%20mechanical%20parts%20of%20machines.
- https://www.machinedesign.com/
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125510
- https://www.autodesk.in/solutions/3d-mechanical-engineering
- https://onlinecourses.nptel.ac.in/

Note: Latest editions of the suggested readings must be used.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME603: DYNAMICS OF MACHINE

Objective: The objective is to introduce some of the components mainly used in IC Engines and make analysis of various forces involved. Subject's deals with topics like inertia forces in slider crank mechanism; IC Engine components & the analysis like governors is introduced. It also deals with balancing of rotating & reciprocating parts. The study deals with linear, longitudinal, & torsional vibrations. The idea is to introduce the concept of natural frequency and the importance of resonance and critical speeds for entrepreneurship and skill development and employability.

UNIT I **(12 Sessions)**

Static & Dynamic Force Analysis Static equilibrium of two/three force members, Static equilibrium of member with two forces and torque, Static force analysis of linkages, D'Alembert's principle, Equivalent offset inertia force, Dynamic force analysis of four link mechanism and slider crank mechanism, Engine force analysis-Piston and crank effort for skill development, entrepreneurship and employability.

Turning Moment & Flywheel Turning moment on crankshaft, Turning moment diagrams-single cylinder double acting steam engine, four stroke IC engine and multi-cylinder steam engine, Fluctuation of energy, Flywheel for skill development, entrepreneurship and employability.

UNIT II **(06 Sessions)**

Balancing of machines: Static and dynamic balancing, Balancing of several masses in the same plane and different planes, Balancing of reciprocating masses, Balancing of primary force in reciprocating engine, Partial balancing of two cylinder locomotives, Variation of tractive force, swaying couple, hammer blow for skill development, entrepreneurship and employability.

UNIT III **(10 Sessions)**

Friction: Laws of friction, Friction on inclined plane, Efficiency on inclined plane, Friction in journal bearing-friction circle, Pivots and collar friction-uniform pressure and uniform wear, Belt and pulley drive, Length of open and cross belt drive, Ratio of driving tensions for flat belt drive, centrifugal tension, condition for maximum power transmission, V belt drive for skill development, entrepreneurship and employability.

Brakes and Dynamometers (Mechanical Type): Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers for skill development, entrepreneurship and employability

UNIT IV **(06 Sessions)**

Governors: Terminology, Centrifugal governors-Watt governor, Dead weight governors-Porter & Proell governor, Spring controlled governor-Hartnell governor, Sensitivity, Stability, Hunting, Isochronism, Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors for skill development, entrepreneurship and employability.

UNIT V **(06 Sessions)**

Gyroscopic Motion Principles, Gyroscopic torque, Effect of gyroscopic couple on the stability of aero planes & automobiles

Mechanical Vibrations Types of vibrations, Degrees of freedom, Single degree free & damped vibrations, Forced vibration of single degree system under harmonic excitation, Critical speeds of shaft for skill development, entrepreneurship and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understanding the static & dynamics force analysis of objects, turning moment and flywheel for skill development and employability.
CO2: Applying the theoretical balancing of rotating masses, variation of tractive force, swaying couple, and hammer blow for skill development and employability achieving national and international repute.
CO3: Be proficient in the use of mathematical methods to analyze the friction forces on belt, gears and brakes for skill development and employability.
CO4: Analyzing problems related to governors for skill development and employability.
CO5: Evaluating problems related to flywheel, effect of gyroscopic couple upon the stability of aero planes, ships, two & four-wheelers and mechanical vibrations for skill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	3	1	2	1	3	2	1	3
CO2	1	3	2	1	1	2	3	2	1	3	2	1
CO3	2	1	1	3	3	1	2	1	3	2	1	2
CO5	1	2	3	2	3	2	1	2	1	1	2	1
CO5	2	3	2	1	3	1	2	3	3	2	1	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO5	3	3	1
CO5	3	3	1

Suggested Readings:

1. Theory of Machine: Thomas Bevan (ELBS/CBS pub. New Delhi)
2. Theory of Machine: S.S.Ratan (TMH)
3. Theory of Machine & Mechanism-Shiglay
4. Theory of Machine- R.K.Bansal (Laxmi publication)

Website Sources:

- https://www.springer.com/gp/book/9783540899396
- https://www.youtube.com/watch?v=GYtQFPA4DNI
- https://www.coursera.org/lecture/dynamics/module-21-acceleration-of-a-wheel-rolling-on-a-fixed-plane-curve-xAqsp
- https://www.youtube.com/watch?v=UFBSYk3aOcI&list=PLzkMouYverAJopEC46Cj_BwtZBlK-Oaak

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology * IFTM University * Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME604: MANUFACTURING ENGINEERING-II

Objective: The objective of this course is to familiarize the students with the theory of metal cutting and Identify the mechanism of metal cutting process and recognize the working principles of different machine tools and various operations performed to produce different products from raw materials for entrepreneurship and skill development and employability.

UNIT I **(09 Sessions)**

Metal Cutting: Mechanics of metal cutting, Geometry of tool and nomenclature, ASA system Orthogonal vs. oblique cutting, Mechanics of chip formation, types of chips, Shear angle relationship, Merchant's force circle diagram, Cutting forces, power required, Cutting fluids/lubricants, Tool materials, Tool wear and tool life, Machinability, Dynamometer, Brief introduction to machine tool vibration and surface finish, Economics of metal cutting for skill development and employability.

UNIT II **(09 Sessions)**

Machine Tools: Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout, Shaper, slotter, planer: Construction, operations & drives, Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing, Max chip thickness & power required Drilling and boring: Drilling, boring, reaming tools, Geometry of twist drills for skill development, employability and entrepreneurship.

UNIT III **(06 Sessions)**

Grinding & Super finishing: Grinding: Grinding wheels, abrasive & bonds, cutting action, Grinding wheel specification, Grinding wheel wear – attritions wear, fracture wears, Dressing and Truing. Max chip thickness and Guest criteria, Surface and cylindrical grinding. Center less grinding, Super finishing: Honing, lapping and polishing, Standardization & Interchangeability, Limits, Fits & Tolerance and Surface roughness: Introduction to Standardization & Interchangeability Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness for skill development, employability and entrepreneurship.

UNITI V **(08 Sessions)**

Metal Joining (Welding): Survey of welding and allied processes, Gas welding and cutting, process and equipment, Arc welding: Power sources and consumables, TIG & MIG processes and their parameters, Resistance welding – spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding, Soldering & Brazing, Thermodynamic and Metallurgical aspects in welding and weld, Shrinkage/residual stress in welds, Distortions & Defects in welds and remedies, Weld decay in HAZ for skill development and employability.

UNIT V **(08 Sessions)**

Introduction to Un-conventional Machining and Welding: Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM, Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma-arc welding, Diffusion welding, Explosive welding/cladding for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: To understand the mechanism of metal cutting and different parameters involving in metal cutting achieving national and international repute for skill development and employability.
CO2: To acquire the knowledge about the principle and working of different machine tools used in metal cutting such as lathe, shaper, drilling machine etc. and use this knowledge for skill development, employability and entrepreneurship.
CO3: To acquire the knowledge about the principle and working of different grinding machines and super finishing process and use this knowledge for skill development, employability and entrepreneurship.
CO4: To understand the principle and working of different welding process, welding defects and residual stresses in weld for skill development and employability and develop local and global interest.
CO5: To understand different unconventional machining and welding processes such as EDM, ECM and LBW, USW etc. for skill development and employability.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	1	1	2	1	1	2	3
CO2	2	3	1	3	1	3	2	1	3	2	1	3
CO3	1	2	3	3	2	3	1	2	2	1	2	1
CO4	2	1	2	3	1	2	2	1	3	2	1	3
CO5	2	1	3	3	2	1	3	1	1	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	3
CO3	3	3	3
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Manufacturing Process, B.S Raghuvanshi, DhanpatRai Publication.
2. Manufacturing Processes, R.S. Khurmi and J.K. Gupta, S. Chand Publishing.
3. Manufacturing Technology Vol. II (Metal Cutting), Narula&Narula, McGraw Hill Education Private Limited.
4. Manufacturing Technology, R. K. Rajput, Laxmi Publications PVT. LTD.
5. Workshop Technology Vol. II (Machine Tools), B.S. Raghuwanshi, DhanpatRai& Co.

Website Sources:

- www.wikipedia.org
- www.sciencedaily.com
- www.youtube.com
- www.slideshare.net
- https://onlinecourses.nptel.ac.in

Note: Latest editions of the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME605: PRODUCTION PLANNING & CONTROL

Objective: The objective of this course is to understand the production planning and control function in both manufacturing and service organizations and ability to apply principles and techniques in the design, planning and control for entrepreneurship and skill development and employability.

UNIT I **(10 Sessions)**

Introduction: Types and characteristics of production systems Objective and functions of Production, Planning & Control, Place of production, planning in Engineering, manufactures organization for skill development and employability.

Preplanning: Forecasting & Market Analysis. Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning for skill development and employability.

UNIT II **(08 Sessions)**

Production Planning: Aggregate Planning, MPS, Material Resource Planning, Selection of material methods, machines & manpower. Routing, Scheduling and Dispatching and its sheets & charts, Production Line Balancing for skill development and employability.

UNIT III **(10 Sessions)**

Production and Inventory Control: Progress control through records and charts. Types of inventories, Inventory Classification. Inventory Control under constraints Economic lot (batch) size. Trends in purchasing and store keeping, JIT production MRP II, comparison of Push & Pull systems, ERP, CAPPC for skill development and employability

UNIT IV **(06 Sessions)**

Productivity: Importance, Productivity patterns, productivity measurements & ratios, improvement-maintenance process for skill development and employability

UNIT V **(06 Sessions)**

Human Factors & Ergonomics: Human abilities, Training & motivation safety programs, workplace design & working conditions for skill development, employability and entrepreneurship development.

Course Outcomes: Students completing this course will be able:

CO1: To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, logistics etc. Applying various techniques of forecasting and production planning for skill development and employability.

CO2: Achieving national and international repute by applying functions of PPC like routing, scheduling, dispatching, loading & follow-up in industry for skill development and employability.

CO3: Applying inventory management techniques for skill development and employability.

CO4: To understand various concepts and techniques like productivity and Maintenance Process for skill development and employability.

CO5: Evaluating human abilities and creating workplace for skill development, employability and entrepreneurship development and develops local and global interest.

Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	3	1	1	3	1	2
CO2	1	2	3	2	1	2	3	2	3	3	1	1
CO3	3	3	1	1	2	1	3	1	1	3	1	2
CO4	2	2	2	3	1	1	1	1	3	2	1	3
CO5	2	3	3	2	3	2	2	1	2	1	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	2
CO2	3	3	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	3

Suggested Readings:

1. Elements of Production Planning & Control –Eilon
2. Production Planning & Control – Jain and Agarwal
3. Operations Management – Buffa.
4. Production System – J.L. Riggs.
5. Production Planning & Control – Dr. R. K. Singal, S.K. Kataria& Sons Publication (Katson), New Delhi.

Website Sources:

- www.researchgate.net/journal/0953-7287_Production_Planning_and_Control
- https://new.siemens.com/global/en/markets/automotive-manufacturing/digital-twin-production.html
- www.tandfonline.com/toc/tppc20/11/5
- http://www.ddegjust.ac.in/2017/Uploads/11/POM-326.pdf
- www.slideshare.net/kshipra007/production-planning-control-72991897
- onlinecourses.nptel.ac.in
- www.editage.com/journal/production-planning-control

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EHU 601: HUMAN VALUES & PROFESSIONAL ETHICS

Objective:
- To create awareness on Engineering Ethics and Human Values for skill development and employability.
- To understand social responsibility of an engineer for skill development and employability.
- To appreciate ethical dilemma while discharging duties in professional life for skill development.

UNIT I **(06 Sessions)**

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethic – Service – Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing - Honesty – Courage –Valuing Time – Co-operation – Commitment - Empathy – Self-Confidence – Character – Spirituality for skill development and employability.

UNIT II **(07 Sessions)**

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - custom and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment for entrepreneurship skills

UNIT III **(05 Sessions)**

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study for skill development and employability.

UNIT IV **(11 Sessions)**

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies for skill development.

Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination for skill development.

UNIT V **(11 Sessions)**

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc. for skill development and entrepreneurship.

Course Outcomes: Students completing this course will be able to:

CO1: It ensures students sustained happiness through identifying the essentials of human values for skill development and employability achieving national and international repute.
CO2: It facilitates a correct understanding between profession and happiness resulting in the development of entrepreneurship skills.
CO3: It helps students in skill development and employability by understanding practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
CO4: Provide ability to develop appropriate technologies for employability and management patterns to create harmony in professional and personal life for skill development.
CO5: Understanding about the global issues for skill development and entrepreneurship and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	1	1	1	3	3	3	1
CO2	2	2	1	3	2	1	3	1	1	1	1	3
CO3	2	2	2	2	1	2	1	3	3	3	3	1
CO4	3	3	1	1	1	1	2	1	3	1	1	1
CO5	1	1	2	3	1	2	3	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	1	3
CO3	3	3	1
CO4	3	3	2
CO5	3	2	3

Suggested Readings:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. 3.Jayshree Suresh and B.S.Raghavan, "Human values and Professional Ethics", S.Chand& Company Ltd., New Delhi.

Website Sources:

- https://examupdates.in/professional-ethics-and-human-values
- https://www.uptunotes.com/universal-human-values-and-professional-ethics
- https://lecturenotes.in/

Note: Latest editions of all the suggested readings must be used.

Registrar
IFTM University
Moradabad

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME651: REFRIGERATION AND AIR CONDITIONING LAB

Objective: The objective of this course is to familiarize the students with the fundamental principles and different methods of refrigeration and air conditioning, Study of various refrigeration cycles and evaluate the performance, Comparative study of different refrigerants with respect to properties, applications and environmental issues, Study of the various equipment's, operating principles and safety controls employed in refrigeration air conditioning systems for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) (16 Sessions)

1. Experiment on refrigeration test rig and calculation of various performance parameters for skill development and employability.
2. To study different types of expansion devices used in refrigeration system for skill development and employability.
3. To study different types of evaporators used in refrigeration systems for skill development and employability.
4. To study basic components of air-conditioning system for employability and entrepreneurship skills.
5. Experiment on air-conditioning test rig & calculation of various performance parameters for employability and entrepreneurship skills.
6. To study air washers for skill development and employability
7. Study of window air conditioner for skill development and employability.
8. Study & determination of volumetric efficiency of compressor for skill development and employability.
9. Visit of a central air conditioning plant for skill development and employability.
10. Visit of cold storage for skill development and employability.

Course Outcome: Students completing this course will be able to:

CO1: Understand different refrigeration cycles for skill development and employability.
CO2: Understand the functions of basic components of air conditioning systems for skill development and employability achieving national and international repute.
CO3: Understand the working of window air conditioner for employability and entrepreneurship skills.
CO4: Develops local and global interest by determining the volumetric efficiency of compressor for skill development and employability.
CO5: Understand the working of a central air conditioning plant for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	2	2	3	2	1	2	2	1
CO2	2	3	3	2	1	1	3	1	2	1	1	3
CO3	1	2	3	1	2	2	1	2	3	2	2	1
CO4	2	3	2	3	1	1	1	3	1	1	1	3
CO5	3	1	1	3	2	2	3	1	3	2	3	1

School of Engineering & Technology Director IFTM University

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	2	3	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Prasad, M. 'Refrigeration and Air conditioning', New Age International (P) Ltd. Publications.
2. Arora, C P, 'Refrigeration and Air conditioning', McGraw Publications.
3. Rajpur, R K, 'Refrigeration and Air conditioning', Katson Publications.
4. Arora and Domkundwar, 'Refrigeration and Air conditioning', Dhanpat& Co. Publications.

Website Sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME652: MACHINE DESIGN – II LAB

Objective: To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components like as gear, bearings and I.C. engine parts, To illustrate to students the variety of gears and bearings available and emphasize the need to continue learning, To teach students how to design a gear, bearing and I.C. engine components, To teach students how to apply Data book techniques in the analysis, design and/or selection of machine components for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) **(16 Sessions)**

1. Design of spur gear for employability and skill development
2. Design of helical gear for employability and skill development
3. Design of bevel gear for employability and skill development
4. Design of worm gear for employability and skill development
5. Design of sliding bearing for employability and skill development
6. Design of rolling bearing for employability and skill development
7. Design of cylinder for employability and skill development
8. Design of piston for employability and skill development
9. Design of connecting rod for employability and skill development
10. Design of crank shaft for employability and skill development
11. Design of valves for employability and skill development
12. Design of rocker arms for employability and skill development.

Course Outcome:

CO1: The students will demonstrate the ability to apply the fundamentals of stress analysis, theories of failure and material science in the design of gears, bearings and I.C. Engine components for employability and skill development.
CO2: The students will demonstrate the ability to make proper assumptions, perform correct analysis while drawing upon various mechanical engineering subject areas for skill development and employability.
CO3: Specifically, the students will demonstrate the preceding abilities by performing correctly: The design, analysis and sizing of spur gear, helical gear, bevel gear and worm and worm gear, Student will learn how to design and select a bearing for different purpose for employability and entrepreneurship skills.
CO4: Students will demonstrate the ability to seek and learn new material in addition to the class topics through the completion of an open-ended project. The amounts as well as the depth of new material identified and used by the students are measurable indicators of the students' performance for employability and skill development and develop local and global interest.
CO5: The breadth and depth of the issues taken into account by students are measurable indicators of their performance for skill development and employability.

Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	3	2	2	1	2	1	3	2	3
CO2	2	3	2	1	1	2	3	1	2	1	1	1
CO3	1	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	2	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping(Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	2
CO3	2	3	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Design of machine element by B.V.Bhandri
2. Machine Design by R.S.khurmi
3. Machine Design by Sharma &Agrawal
4. Machine Design by Sadhu Singh
5. Design Data Book by Sadhu Singh
6. Design Data Book by B V Bhandari

Website Sources:

- https://www.sciencedirect.com/topics/engineering/machinedesign#:~:text=Machine%20design%20focuses%20on%20the,basic%20mechanical%20parts%20of%20machines.
- https://www.machinedesign.com/
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125510
- https://www.autodesk.in/solutions/3d-mechanical-engineering
- https://onlinecourses.nptel.ac.in/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME653: DYNAMICS OF MACHINE LAB

Objective: The objective of this lab is to impart practical knowledge on design and analysis of mechanisms in the machine tools and automobiles. The experiments related to their theory subjects like Engineering Mechanics, Machines and Mechanisms and Fundamentals of Vibration and Noise, Various equipment like governors, gyroscopes, balancing machines and universal vibration testing are done to understand machine dynamics. The vibration equipment is well established in dynamics lab. The vibration exciter, accelerometers (uni-axial and tri axial), data acquisition system, force hammer are used to measure the vibration response under induced and self-excitation conditions for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed) (16 Sessions)

1. Study of simple linkers/models/mechanisms for skill development and employability.
2. Exp. on Velocity acceleration for skill development and employability.
3. Exp. on cam for skill development and employability.
4. Exp. on Governor for skill development and employability.
5. Exp. on critical speed of shaft (whirling of shaft) for employability and entrepreneurship skills
6. Exp. on Gyroscope for employability and entrepreneurship skills
7. Exp. on Balancing (static & dynamic) for employability and entrepreneurship skills
8. Exp. on 4-bar mechanism for employability and entrepreneurship skills
9. Exp. on Gears (tooth profile, interference etc.) for employability and entrepreneurship skills
10. Exp. on Gear trains for employability and entrepreneurship skills.
11. Exp. on Brakes for employability and entrepreneurship skills
12. Exp. on clutch for skill development and employability
13. Exp. on synthesis of planner linkages for skill development and employability
14. Exp. on Mechanism for skill development and employability
15. Exp. on Vibration (spring) for skill development and employability
16. Exp. on Vibration (beam)for skill development and employability
17. Exp. on Vibration (Torsional)for skill development and employability
18. Exp. on Engine for skill development and employability

Course Outcome: Students completing this course will be able to:

CO1: To analyze the forces and motion of complex systems of linkages, gears and cams for skill development and employability.
CO2: Achieving national and international repute by Designing linkage, cam and gear mechanisms for a given motion or a given input/output motion or force relationship for employability and entrepreneurship skills.
CO3: Analyze the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams for employability and entrepreneurship skills.
CO4: Analyzing problems related to governors for skill development and employability and develops local and global interest.
CO5: Evaluating problems related to flywheel, effect of gyroscopic couple upon the stability of aero planes, ships, two & four-wheelers and mechanical vibrations for employability and skill development.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	3	2	2	1	2	1	3	2	3
CO2	2	2	2	2	1	1	3	1	2	1	1	1
CO3	1	3	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping(Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	1	3
CO3	2	3	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Theory of Machine by Thomas Bevan (ELBS/CBS pub. New Delhi)
2. Theory of Machine by S.S.Ratan (TMH)
3. Theory of Machine & Mechanism by Shiglay
4. Theory of Machine by R.K.Bansal (Laxmi publication)

Website Sources:

- https://www.slideshare.net/rajasekaranp/dom-lab-manual-new
- http://lab.fs.uni-lj.si/ladisk/?what=incfl&flnm=research.php
- https://www.youtube.com/watch?v=Ru_4Z22PrRA
- https://www.youtube.com/watch?v=exQt6FGYOvc
- https://lemonbin.com/types-of-brake-pads-and-brakes/
- https://www.youtube.com/watch?v=VdKqwZCWrdk

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Department of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME701: POWER PLANT ENGINEERING

Objective: To introduce students to different aspects of power plant engineering & familiarize the students to the working of power plants based on different fuels. Also expose the students to the principles of safety and environmental issues for entrepreneurship and skill development and employability.

Unit I **(06 Sessions)**

Introduction: Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units. Power plant economics and selection Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection for skill development and employability.

Unit II **(12 Sessions)**

Steam power plant: General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizes and coal burners, combustion system, draft, ash handling system, Dust collection system, condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant for skill development and employability.

Water Treatment: Impurities in water and methods to resolve it, Working of DM Plant and its component for skill development and employability.

Unit III **(10 Sessions)**

Diesel power plant: General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

Gas turbine power plant: Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant for skill development and employability.

Unit IV **(06 Sessions)**

Nuclear power plant: Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, nuclear waste disposal, Site selection of nuclear power plants. Hydroelectric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems for skill development and employability.

Unit V **(06 Sessions)**

Electrical system: Generators and generator cooling, transformers and their cooling, bus bar, etc. for skill development and employability.

Instrumentation: Purpose, classification, selection and application, recorders and their use, listing of various control rooms for skill development and employability.

Pollution: Pollution due to power **generation for skill development and employability**.

Course Outcome: Students completing this course will be able to:

CO1: To understand the Power and Energy for skill development and employability achieving national and international repute.
CO2: To understand the Steam Power Plant and Water Treatment forskill development and employability.
CO3: To understand the Diesel Power Plant and Gas Turbine Power Plant for skill development and employability.
CO4: To understand the Nuclear Power Plant for skill development and employability.

School of Engineering & Technology IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

CO5: To understand the Electrical System, Instrumentation and Pollution for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	3	2	1	1	1	2	3
CO2	1	2	1	2	3	2	3	2	2	3	1	1
CO3	2	1	3	3	2	1	3	1	1	1	2	2
CO4	1	3	2	1	3	3	2	3	2	2	1	2
CO5	3	2	3	2	1	3	1	2	3	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. "Power Plant Engineering" F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras.
2. "Power Plant Engineering" Mahesh Verma, Metropolitan Book Company Pvt. Ltd. New Delhi.
3. "Power Plant Technology" El-Vakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.

Website Sources:

- http://www.syriadirect.org/power_plant_engineering_book.pdf
- https://nptel.ac.in/courses/112/107/112107291/
- https://www.youtube.com/watch?v=hZ66Xgr8ULE
- https://www.youtube.com/watch?v=1dLYszAypJw

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME702: COMPUTER AIDED DESIGN

Objective: The objective of the Computer-Aided Design Project is to evolve a man- machine system which will permit the human designer and the computer to work together on creative design problems. This document states the philosophy of approach being used by the computer applications group of the project for entrepreneurship and skill development and employability.

UNIT I **(10 Sessions)**

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications for skill development and employability.

Computer Graphics-I: CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Colour CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters for skill development and employability.

UNIT II **(08 Sessions)**

Computer Graphics-II: Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm for skill development and employability.

Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation for skill development and employability.

UNIT III **(06 Sessions)**

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves for skill development and employability.

UNIT IV **(08 Sessions)**

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Super quadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Application commands for AutoCAD &ProE software for skill development and employability.

UNIT V **(08 Sessions)**

Numerical Methods: Introduction, Errors in numbers, Binary representation of numbers, Root finding- Bisection method, Newton Raphson method, Curve fitting-Least square method, Numerical differentiation-Newton's interpolation, Numerical Integration-Trapezoidal and Simpson method for skill development and employability.

Finite Element Method: Introduction, Principles of Finite elements modeling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2D space (truss element) for skill development and employability.

Course Outcome: Students completing this course will be able to:

CO 1: Able to get familiar with the elements of CAD, its necessity, importance and application in field of engineering. Also various components of computer graphics like input, output devices, storage devices, display devices for skill development and employability.

CO 2: A Able to understand software configuration, standard geometric transformations in 2D & 3D followed by composite & multiple transformation for skill development and employability achieving national and international repute.

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad

CO 3: Understand the significance of different curves, their properties and application in the field of computer graphics for skill development and employability.
CO 4: Able to the key concepts of solid modeling, constructive solid geometry, color models and application commands of AutoCAD &ProE software for skill development and employability and develops local and global interest.
CO 5: Able to understand the various techniques of numerical methods and finite element method for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	3	1	2	1	2	1	2
CO2	2	1	1	3	2	3	2	1	2	1	2	3
CO3	1	2	2	3	1	1	1	3	1	2	1	3
CO5	3	3	1	2	3	2	2	1	2	1	2	1
CO5	2	3	2	3	2	3	1	2	1	2	3	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	2
CO5	3	3	2
CO5	3	3	1

Suggested Readings:

1. Computer Graphics by Hearn & Baker (Pearson / Prentice hall)
2. Computer Aided Design by R.K.Srivastava.
3. CAD/CAM Theory and Practice – Ibrahim Zeid (McGraw Hill International)
4. Computer Aided Analysis & Design of Machine Elements (Rao&Dukkipati)
5. FEM – SS. Rao.
6. Grover Mikell P. 2003. Automation, Production Systems and Computer Integrated Manufacturing. Prentice-Hall of India.
7. Radhakrishnan P, Subramanyan S &Raju V. 2003. CAD/CAM/CIM. New Age International.
8. Rao PN. 2002. CAD/CAM Principles and Applications. Tata McGraw Hill.

Website Sources:

- Computer-aided Drawing and Design
- Authors: Davies
- https://www.slideshare.net/search/slideshow
- https://www.researchgate.net

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★ Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME703: COMPUTER AIDED MANUFACTURING

Objective: To acquaint and equip with the computer aided manufacturing of farm machinery with the help of CAM. Its primary purpose is to create a faster production process and components and tooling with more precise dimensions and material consistency, which in some cases, uses only the required amount of raw material (thus minimizing waste), while simultaneously reducing energy consumption for entrepreneurship and skill development and employability.

UNIT I **(08 Sessions)**

Automation: Introduction to CAM; Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends for skill development and employability.

Features of NC Machines: Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity for skill development and employability.

UNIT II **(08 Sessions)**

NC Part Programming-: (a) Manual (word address format) programming. Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro for skill development and employability.

(b) APT programming. Geometry, Motion and Additional statements, Macro- statement for skill development and employability.

UNIT III **(10 Sessions)**

System Devices: Introduction to DC motors, stepping motors, feedback devices such as encoder, counting devices, digital to analog converter and vice versa for skill development and employability.

Interpolators: Digital differential Integrator-Principle of operation, exponential decelarion; DDA Hardware Interpolator- Linear, Circular; DDA Software Interpolator for skill development and employability.

Control of NC Systems: Open and closed loops. Control of point to point systems- Incremental open loop control, Incremental close loop, Absolute close loop; Control loop in contouring systems; Adaptive control for skill development and employability.

UNIT IV **(06 Sessions)**

Computer Integrated manufacturing system: Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning-Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection for skill development and employability.

UNIT V **(08 Sessions)**

Robotics: Types and generations of Robots, Structure and operation of Robot, Robot applications. Economics, Robot programming methods, VAL and AML with examples for skill development and employability.

Intelligent Manufacturing: Introduction to Artificial Intelligence for Intelligent manufacturing for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Able to understand the requirement, advantages and disadvantages of automation in manufacturing system achieving national and international repute. Also the fundamentals, classification of NC system and its correlation with factors like productivity for skill development and employability.

CO2: Able to understand part programming & ATP programming followed by examples like drilling, turning, subroutines & macro statement for skill development and employability.

CO3: Able to be familiar with system devices like controller, converters interpolators followed by various controls in NC systems like open loop, closed loop, contouring systems and adaptive control for skill development and employability.

School of Engineering & Technology ★★ IFTM University, Moradabad ★★
Director

Registrar
IFTM University
Moradabad.

CO4: Able to application of group technology, FMS, CIM, CAPP, mechatronics and computer aided inspection for skill development and employability and develops local and global interest.
CO5: Able to understand the concept of robotics, operation and application and application followed by the concept of artificial Intelligence for intelligent manufacturing for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	3	1	1	2	2	2	1	2	3
CO2	1	3	2	1	2	3	3	3	1	2	1	2
CO3	3	1	1	2	3	2	2	1	2	1	3	1
CO5	2	2	3	3	1	2	1	2	1	2	2	3
CO5	1	3	3	3	2	3	1	1	3	1	1	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1w required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	3	3	1
CO5	3	3	1
CO5	3	3	1

Suggested Readings:

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover
2. Computer Aided Manufacturing by Kundra and Rao
3. 3. Computer control of manufacturing systems by Koren
4. NC Machine Tools by S.J. Martin.
5. NC Machines by Koren
6. CAD/CAM by Groover.

Website Sources:

- https://www.youtube.com/watch?v=vO1lc75jtiM
- https://www.youtube.com/watch?v=00TqO1pBEro
- https://www.youtube.com/watch?v=7od3g2Su5RM

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME704: AUTOMOBILE ENGINEERING

Objective: Automobile engineering is a branch study of engineering which teaches manufacturing, designing, mechanical mechanisms as well as operations of automobiles. It is an introduction to vehicle engineering which deals with motorcycles, cars, buses, trucks, etc. It includes branch study of mechanical, electronic, software and safety elements. Some of the engineering attributes and disciplines that are of importance to the automotive engineer and many of the other aspects are included in it for entrepreneurship and skill development and employability.

Unit I **(08 Sessions)**

Power Unit and Gear Box: Principles of Design of main components. Valve mechanism.Power and Torque characteristics.Rolling, air and gradient resistance, Tractive effort Gear Box, Gear ratio determination.Design of Gear box for skill development, employability and entrepreneurship.

Unit II **(06 Sessions)**

Transmission System: Requirements, Clutches, Torque converters, Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle, Automatic transmission, Steering and Front Axle.Castor Angle, wheel camber & Toe-in, Toe-out etc, Steering geometry.Ackerman mechanism, under steer and over steer for skilldevelopment, employability and entrepreneurship.

Unit III **(08 Sessions)**

Braking System: General requirements, Road, tyre adhesion, weight transfer, braking ratio.Mechanical brakes, Hydraulic brakes.Vacuum and air brakes.Thermal aspects for skill development, employability and entrepreneurship.

Chasis and Suspension System: Loads on the frame. Strength and stiffness, various suspension systems for skill development, employability and entrepreneurship.

Unit IV **(08 Sessions)**

Electrical System: Types of starting motors, generator& regulators, lighting system, Ignition system, Horn, Battery etc. for skill development, employability and entrepreneurship.

Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI for skill development, employability and entrepreneurship.

Unit V **(10 Sessions)**

Automobile Air Conditioning: Requirements, Cooling & heating systems for skill development, employability and entrepreneurship.

Cooling & Lubrication System: Different type of cooling system and lubrication system for skill development, employability and entrepreneurship.

Maintenance system: Preventive maintenance, break down maintenance and over hauling for skill development, employability and entrepreneurship.

Course Outcome: Students completing this course will be able to:

CO1: To acquire the knowledge of various components and working of IC engine in details and use this knowledge for skill development.
CO2: To understand working of transmission system (gear box) and steering system and their functions and use this knowledge for skill development achieving national and international repute.
CO3: To acquire the knowledge of different types of braking system and suspension system their functions and use this knowledge for skill development, employability and entrepreneurship.
CO4: To acquire the knowledge of starting system and develops local and global interest for skill development.
CO5: To understand the working and function of air conditioning for skill development.

School of Engineering & Technology
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	2	1	3	2	1	1
CO2	2	2	1	3	1	1	3	2	1	1	2	3
CO3	3	1	3	2	2	2	1	1	2	2	1	3
CO4	3	2	3	2	1	1	2	1	1	1	2	3
CO5	1	1	2	3	2	3	1	2	2	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

Website Sources:

- https://www.slideshare.net
- https://www.slideshare.net/search/slideshow
- https://www.slideshare.net/divyansh395/automobile-engineering-kirpal-singh-vol-1
- https://www.youtube.com/watch?v=EROmKPAd4Wk
- https://www.youtube.com/watch?v=2JLxRf2cLG0&list=PLOG9l_LGgDfJfqk64KQCznBlE7GU3oKak

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME705: UNCONVENTIONAL MANUFACTURING PROCESSES

Objective: The objective of this course is to familiarize the students with the principle, working and applications of unconventional machining, welding and forming processes and develop their skills, conceptual abilities and substantive knowledge in the aforesaid field for entrepreneurship and skill development and employability.

Unit I **(07 Sessions)**
Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes & its classification and its future possibilities for skill development and employability.

Unit II **(09 Sessions)**
Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electro-chemical machining, ultrasonic machining, Abrasive jet machining etc. for skill development and employability

Unit III **(09 Sessions)**
Unconventional Machining Process (continued): Principle and working and application of unconventional machining processes such as Laser beam machining, Electron beam machining, Ultrasonic machining etc. (these can also be used for welding) for skill development and employability.

Unit IV **(07 Sessions)**
Unconventional welding processes: Explosive welding, Cladding etc. Under water welding, Metalizing, Plasma are welding/cutting etc. for skill development and employability.

Unit V **(08 Sessions)**
Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro- Discharge forming, water hammer forming, explosive compaction etc. for skill development, employability and entrepreneurship development.
Electronic-device Manufacturing: Brief description of Diffusion and Photo- Lithography process for electronic-device manufacturing for skill development, employability and entrepreneurship development.

Course Outcomes: Students completing this course will be able to:

CO1: Achieving national and international repute by understanding the limitations of conventional/traditional manufacturing Processes for skill development and employability.
CO2: Applying the best suitable machining process for a work piece based on its material properties for skill development and employability.
CO3: Analyzing working principles and processing characteristics of ultra-precision machining processes for skill development and employability.
CO4: Develops local and global interest by evaluating the precision using high speed machining methods, and nontraditional machining to the production of precision components for skill development and employability.
CO5: Creating an in-depth approach regarding application of unconventional manufacturing processes for Industrial production for skill development, employability and entrepreneurship development.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	3	2	1	2	1	3	2	1	3
CO2	3	3	1	2	1	2	3	2	1	1	2	1
CO3	2	1	2	1	3	2	2	1	3	2	1	2
CO4	1	3	3	1	1	3	1	2	1	1	2	1
CO5	1	3	2	2	2	3	2	1	3	2	1	2

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill development	Employability	Entrepreneurship development
CO1	3	3	2
CO2	3	3	2
CO3	3	3	1
CO4	3	3	1
CO5	3	3	3

Suggested Readings:

1. Pandey P. C. Modern Machining Processes. McGraw Hills, 2013.
2. Jain V. K. Unconventional Machining Processes. Katson Publication. 2011
3. Jain R. Unconventional Manufacturing Processes. S. K. Kataria& Sons. 2009
4. Adithan M. Unconventional Machining Processes. Atlantic Publishers & Distributors Pvt Ltd.
5. Kumar N. S. Unconventional Machining Processes. ARS Publications, 2014.

Website sources:

- onlinecourses.nptel.ac.in
- https://easyengineering.net/advanced-machining-processes-by-jain/
- en.wikipedia.org
- https://www.scribd.com/document/128348651/Unit-4-Unconventional-Manufacturing-Process
- https://www.osti.gov/servlets/purl/4553660/
- https://www.researchgate.net/publication/293183705_Welding_Processes_Handbook_Second_Edition

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

DEPARTMENTAL ELECTIVE – II

EME021: TOTAL QUALITY MANAGEMENT

Objective: The objective of this course is to familiarize the students with the concept of Total Quality Management and its design structure and develop their skills, conceptual abilities and substantive knowledge in the aforesaid field for entrepreneurship and skill development and employability.

Unit I **(08 Sessions)**

Quality Concepts
Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type for employability.

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure for employability.

Manufacturing Quality
Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims for employability.

Unit II **(08 Sessions)**

Quality Management
Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction Programme for skill development and employability.

Human Factor in Quality
Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods for skill development and employability.

Unit III **(09 Sessions)**

Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts for develop entrepreneurship skills.

Attributes of Control Charts
Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart for develop entrepreneurship skills.

Unit IV **(08 Sessions)**

Defects Diagnosis and Prevention
Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle for skill development and entrepreneurship.

Unit V **(07 Sessions)**

IS0-9000 and its concept of Quality Management:
ISO 9000 series, Taguchi method, JIT in some details for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the quality concept and its application in producing quality product leading to employability by developing better relation between producer and consumer.
CO2: Understand various organizational structures with the techniques of redesigning, identifying and evaluate strategies to increase organizational effectiveness for skill development and employability achieving national and international interest.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO3: Develop entrepreneurship skills by understanding the cost associated to produce quality product and importance of manpower and its coordination to develop user friendly environment.
CO4: Provide information to use control charts effectively to minimize losses improving entrepreneurship skills. Analyze reliability and defect analysis methods and apply them to diagnose problems for skill development.
CO5: T o understand ISO standards and various methods of developing quality awareness and its evaluation for skill development and to minimize losses facilitating employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3	2	3	2	1	2	1	2	3
CO2	2	1	3	1	3	3	1	2	3	1	2	1
CO3	1	2	2	3	2	3	2	1	1	2	1	3
CO4	3	2	3	2	3	1	1	2	3	1	2	1
CO5	2	2	1	3	1	3	2	1	3	2	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	3	1
CO2	3	3	2
CO3	2	2	3
CO4	3	1	3
CO5	3	3	1

Suggested Readings:

1. Lt. Gen. H.LaI, "Total Quality Management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. "Beyond Total Quality Management".McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992
4. Kumar S., "Total Quality Management", Laxmi Publications (P) Ltd. 2007.
5. Evans J. R. and Lindsay W. M., "The Management and Control of Quality" South Western College Pub. 2005.

Website sources:

- www.researchgate.net
- www.academia.edu
- en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME022: ERGONOMICS

Objective: After taking this course the students should be able to understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace. Understand ergonomic risk assessments and appropriate control measure. Understand the causes of upper and lower limb disorders and how to reduce them. Appreciate workplace layout and equipment design. Appreciate environmental aspects of good ergonomic design. Understand and exercise social responsibility and ethics in the industrial context for entrepreneurship and skill development and employability

Unit I **(08 Session)**
Introduction to Ergonomics, Information Theory, Model of Information Processing, Signal Detection Theory, Man-Man and Man- Machine Communications for skill development and employment.

Unit II **(06 Session)**
Human Physiology, Work measurement, Motor activities, Cognitive abilities, Compatibility for skill development and employment.

Unit III **(08 Session)**
Anthropometry: static and Dynamic, Work space, design of work surface, Work station and task, Dynamic loading for skill development and employment.

Unit IV **(08 Session)**
Effect of Environmental stressors like Noise, vibration, Heat and illumination, International standards related to those for skill development and employment.

Unit V **(10 Session)**
Human error Accident and safety, Human factors in Automobiles, Working with computers and other systems, Recent trend in the Field for skill development and employment.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the importance of ergonomics and its theories like information theory achieving national and international interest.
CO2: Analyze the human physiology, work measurement and compatibility for skill development and employment
CO3: Able to get a brief knowledge of Anthropometry: static and Dynamic, Work space, design of work surface for skill development and employment.
CO4: Able to understand the effect of environmental stressors like Noise, vibration, Heat and illumination for skill development and employment.
CO5: Able to understand Human error Accident and safety, Human factors in Automobiles, Working with computers and other systems for skill development and employment

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	1	2	3	2	1	1
CO2	2	1	1	3	1	2	3	1	1	1	1	1
CO3	3	1	1	2	1	1	2	1	1	2	3	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Mark S. Senders & E J Mac Cormic: Human Factors in Engineering & design, McGraw Hills- Text Book
2. D J Oborne: Ergo at work, John Wiley & sons- Reference book
3. Stephen Pheasant: Ergonomics, work & Health. MacMillan Press- Reference Book
4. Encyclopedia of Human Factors and Ergonomics- Reference Book

Website Sources:

- www.oshatrain.org/courses/studyguides/711studyguide.pdf
- www.studocu.com/en-us/document/texas-christian-university/security-analysis/ergonomics-in-office-lecture-notes-1/9607772
- www.youtube.com/watch?v=5FC9kpRKYIU
- ocw.tudelft.nl/course-lectures/ergo-l1-intro-to-1d-ergo/
- archive.nptel.ac.in/courses/112/104/112104222/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME023: NUMERICAL CONTROL OF MACHINE TOOL

Objective: This is a departmental elective course designed to provide necessary knowledge for the operation and programming of numerical control machines. Instruction in Programming using G-Code will be provided. Demonstrations using both onboard programming software and CAM software (Swansoft CNC) will be given to the students. Use will be made of the MTAB MAXTURN PLUS lathe for entrepreneurship and skill development and employability

Unit I **(08 Session)**
Numerical Control: Basic Concept, point to point and controlling system, Axis standards, program control, NC components, Testingfor skill development.

Unit II **(06 Session)**
NC Machine Tools, Structure, Drives, Actuation system, Tool and Work handling devices, controller unit for skill development and employment.

Unit III **(10Session)**
CNC, DNC and Adaptive Controls, Manual Part Programming, Preparatory & Miscellaneous function, formats, Coding for entrepreneurship and skill development and employability.

Unit IV **(08 Session)**
Drilling, Milling and Lathe programming, Parametric solutions for entrepreneurship and skill development and employability.

Unit V **(08 Session)**
Programming language, Geometry, Motion and Part processor statements for entrepreneurship and skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand basic concepts of machines operated through numerical control for skill development.
CO2: Investigate; understand new and ongoing developments in the area of numerical control of machine tool for skill development and employment achieving national and international interest.
CO3: Understand the principles of computer numerical control (CNC) and machine Structures for entrepreneurship and skill development and employability.
CO4: Be able to interpret a component specification and produce an operational plan for its manufacture for entrepreneurship and skill development and employability and develops local and global interest.
CO5: Develop simple part programs with the help of programming languages and manufacture a component for entrepreneurship and skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

School of Engineering & Technology ★ IFTM University ★
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	1	3

Suggested Readings:

1. Barry Leathem Jones, Introduction to Computer Numerical Contro, Pitman/ John Wiley
2. Thyzer. G.E, Computer Numerical Control of Machine Tools, Heinemann Profnl.Pub., Oxford.
3. Kundra Rao & Tiwari, Numerical Control & Computer Aided manufacturing, Tata Mc Graw Hill Pub. New Delhi.

Website Sources:

- www.iare.ac.in/sites/default/files/lecture_notes/CIM%20Lecture%20Notes.pdf
- nptel.ac.in/courses/112105211
- www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT-4_9.pdf
- www.slideshare.net/Narsaiahboshalla1/numerical-control-machines-tool

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME024: APPLIED COMPUTATIONAL FLUID DYNAMICS

Objective: Set up the most appropriate CFD model (in terms of boundary conditions, material properties, solution control parameters, solution monitor, etc.) for the problem in hand. Set up the most appropriate turbulence model for their particular applications. Explain how to conduct both Steady state and Transient (time dependent) fluid flow simulations. Explain how to solve for both isothermal and non-isothermal thermo-fluid applications, by including all the necessary modes of heat transfer i.e. conduction, convection and radiation, in their CFD model set up. Explain how to solve for both Incompressible and Compressible fluid flow applications. Explain how to solve for Fluid Structure Interactions. Describe how and extract the required results and plots from the wealth of information available at the solution stage for entrepreneurship and skill development and employability

Unit I **(08 Session)**
Review of Fluid Mechanics Fundamentals: Basic Governing Equation of Mass, Momentum and Energy, Boundary Conditions, Modeling of Fluid Flow and coupled problems for skill development.
Unit II **(07 Session)**
Numerical Methods: Fundamentals of Finite Difference and Finite Volume Approaches, Fundamentals of time stepping, general description of solution to ODE's for skill development and employment
Unit III **(09 Session)**
CFD Fundamentals: Principles, Model set up procedures including Grid Considerations and requirements, Boundary Conditions types and the user input for each boundary type, Physical properties of materials and the required user input, Turbulence modeling, solution control parameters and discretization schemes for skill development and employment
Unit IV **(08 Session)**
Case studies of Model Problems on Incompressible flows: Fluid Flow and heat transfer of a uniform flow past bodies; Modeling periodic flow and heat transfer in a channel for skill development and employment.
Unit V **(08 Session)**
Case studies of Model Problems on Compressible flows: Fluid Flow on a uniform flow Airfoil and other bodies forskill development and employment.
Case studies of Model Problems on Multi-physics: 1way and 2 way Fluid structure interaction problems transient as well as steady for skill development and employment.

Course Outcomes: Students completing this course will be able to:

CO1: Understand basic governing equation of mass and modeling of fluid flow for skill development achieving national and international interest.
CO2: Propose the most appropriate CFD model for the problem in hand and use commercial CFD packages for skill development and employment.
CO3: Model most appropriate turbulence prediction methodology for their particular applications for skill development and employment.
CO4: Be able to interpret a component specification and produce an operational plan for its manufacture for skill development and employment.
CO5: Propose numerical simulation to design and improve experiments and equipment for skill development and employment and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★ Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. J. D. Anderson Jr., Introduction to Computer fluid dynamics, Mc Graw Hill
2. CH, Hirsch; Numerical internal and external flows Vol1 & 2, Mc Graw Hill
3. ANSYS User Manual R-14.2

Website Sources:

- lecturenotes.in/subject/1068/computational-fluid-dynamics-cfd/all
- www.bakker.org/Lectures-Applied-CFD.pdf
- lecturenotes.in/subject/1068
- www.youtube.com/watch?v=WeoHG6opWMg

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME025: MICRO MANUFACTURING

Objective: Meso and micro manufacturing are emerging as an important technology especially in the areas where miniaturization yields economic and technical benefits, namely, aerospace, automotive, optical, biomedical and similar other areas. The basic objective of the present course is to acquaint the participants with the principles, basic machine tools, developments in the micro-manufacturing processes, micro and nano metrology and research trends in the area of micro manufacturing processes. Thus, this course will deal with various area so micro manufacturing including for entrepreneurship and skill development and employability.

Unit I **(08 Session)**

Introduction: Micro Manufacturing: An Introduction, Challenges in Meso-, Micro-, and Nano-Manufacturing, Materials and their Properties for Micro manufacturing for skill development.

Unit II **(08 Session)**

Micromachining: Micro-Turning, Micro-Grinding, Bio-Machining, Genus-Based Metal Removal, Micro- and Nano Manufacturing by Focused Ion Beam for skill development and employment.

Unit III **(08 Session)**

Micro Joining: Laser Micro-Welding, Electron Beams for Macro- and Micro-Welding Applications for entrepreneurship and skill development and employability.

Micro Forming: Micro- and Nanostructured Surface Development by Nano Plastic Forming and Roller Imprinting, Micro extrusion, Micro bending With Laser, Micro-Fabrication Processes in Semiconductor Industryfor entrepreneurship and skill development and employability.

Unit IV **(08 Session)**

Micro Molding: A Soft Lithography Technique, Polymer Micro-Molding, Metal Injection Molding At Micro Scales for entrepreneurship and skill development and employability.

Unit V **(08 Session)**

Dimensional Metrology for Micro/Mesoscale Manufacturing, Fabrication of Microelectronic Devices, An Integrated Wafer Surface Evolution Model for Chemical Mechanical Planarization (CMP), Nano finishing, Magneto rheological and Allied Finishing Processes, Magnetic Abrasive Finishing (MAF), Abrasive Flow Finishing (AFF) for Micromanufacturingfor entrepreneurship and skill development and employability,

Course Outcomes: Students completing this course will be able to:

CO1: Understand basic concepts of macro manufacturing and also the challenges in meso, micro and nano manufacturing for skill development.
CO2: Investigate; understand new and ongoing developments in the area of micromachining for skill development and employment
CO3: Understand the principles of micro joining, micro forming and micro fabrication for entrepreneurship and skill development and employability.
CO4: Be able apply the micro molding processes like soft lithography technique, polymer micro molding etc. for entrepreneurship and skill development and employability.
CO5: Analyze the dimensional metrology for micro manufacturing and fabrication for entrepreneurship and skill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	1	1
CO3	3	3	3
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. Jain V.K., "Micro manufacturing Processes", CRC Press.
2. MuameerKoç "Micro Manufacturing: Design and Manufacturing of Micro-Products", John Wiley & Sons.
3. F. Ehmann Kornel, "Micromanufacturing: International Assessment of Research and Development", Springer.

Website Sources:

- www.iare.ac.in/sites/default/files/lecture_notes/CIM%20Lecture%20Notes.pdf
- nptel.ac.in/courses/112105211
- www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT-4_9.pdf
- www.slideshare.net/Narsaiahboshalla1/numerical-control-machines-tool

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME026: MECHANICAL VIBRATIONS

Objective: At the end of this course, the students will able to fully understand and appreciate the importance of vibrations in mechanical design of machine parts that operate in vibratory conditions. Be able to obtain linear vibratory models of dynamic systems with changing complexities (SDOF, MDOF). Be able to write the differential equation of motion of vibratory systems. Be able to make free and forced (harmonic, periodic, non-periodic) vibration analysis of single and multi-degree of freedom linear systems for entrepreneurship and skill development and employability

UNIT I **(08 Session)**

Introduction

Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis for skill development.

Single Degree Freedom System

Free vibration, Natural frequency, Equivalent systems, Energy method for determining natural frequency, response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement for skill development.

UNIT II **(08 Session)**

Single Degree Freedom: Forced Vibration

Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments for skill development and employability.

UNIT III **(08 Session)**

Two Degree Freedom systems

Introduction, Principal modes, Double pendulum, Torsional system with damping, coupled system, undamped dynamic vibration absorbers, Centrifugal pendulum absorbers, Dry friction damper for skill development and employability

UNIT IV **(08 Session)**

Multi Degree Freedom system: Exact Analysis

Undamped free and forced vibrations of multi-degree freedom systems, influence number, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts for skill development and employability

UNIT V **(08 Session)**

Multi Degree Freedom system: Numerical Analysis

Rayleigh's, Dunkerely's, Holzer's ad Stodola methods, Rayleigh-Ritz method for skill development and employability.

CRITICAL SPEED OF SHAFTS

Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Achieving national and international interest by understand basic concepts of mechanical vibrational motions and some theories of vibrations for skill development.
CO2: Understand the single degree freedom and Harmonic excitation with viscous damping and also use of some vibration measuring machines for skill development and employment
CO3: Understand the principles of two degree freedom systems for skill development and employability.

School of Engineering & Technology ★ IFTM University Moradabad ★ Director

Registrar
IFTM University
Moradabad.

CO4: Abilitytoanalyzethemathematicalmodelofalinearvibratorysystemtodetermineitsresponse for skill development and employability and develops local and global interest.
CO5: Analyzing the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions for entrepreneurship and skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Mechanical Vibrations – P. Srinivasan, TMH
2. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee
3. Mechanical Vibrations – W. T. Thomson
4. Mechanical Vibrations – JS Rao& K Gupta, New Age
5. Mechanical Vibrations – Tse, Morse & Hinkle
6. Mechanical Vibrations – V. Rama Murthy, Narosa Publications

Website Sources:

- www.vssut.ac.in/lecture_notes/lecture1530518026.pdf
- www.iare.ac.in/sites/default/files/lecture_notes/MV_LECTURE_NOTES.pdf
- lecturenotes.in/subject/148/mechanical-vibration

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME027: OPTIMIZATION TECHNIQUES IN ENGINEERING

Objective: To Create an Engineering design methodology using a mathematical formulation of a design problem to support selection of the optimal design among alternatives for entrepreneurship and skill development and employability.

Unit I **(6 Session)**

Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions for skill development.

Unit II **(9 Session)**

Constrained Optimization: Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn – Tucker Sufficient Conditions for skill development.

Unit III **(8 Session)**

Optimization: Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg-Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Liner Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Algorithms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches – Blue for skill development and employability.

Unit IV **(9 Session)**

Optimization and Functions of a Complex Variable and Numerical Analysis: The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runga-Kutta Method for Ordinary Differential Equations, Gaussian QuardativeTranzoidal Rule and Simpson's 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi's Iteration method for entrepreneurship and skill development and employability.

Unit V **(8 Session)**

Optimization in Operation Research: Dynamic Programming, Transportation – Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming – Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods for entrepreneurship and skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand basic concepts of unconstrained optimization and some terms used in it for skill development.
CO2: Understand basic concepts of constrained optimization and some terms used in it for skill development achieving national and international interest.
CO3: Formulate the method and its linear programing for some problem for skill development and employability.
CO4: Analyze the optimization and functions of a complex variable and numerical analysis for entrepreneurship and skill development and employability and develops local and global interest.
CO5: Develop some programming for optimization in operation research like transportation, discrete simulation and integer programming for entrepreneurship and skill development and employability.

Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	2	1	1	2	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	3	2
CO5	2	3	1	2	3	1	1	1	1	1	1	2

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	1	1
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Winston W L: Operations Research: Applications and Algorithms
2. Rao S.S., Optimization: Theory and Applications.
3. Walsh G R: M methods of Optimization.
4. Williams H.P.: Model Building in Mathematics Programming.
5. Williams H.P.: Model Solving in Mathematics Programming
6. G.L. Nemhauser and L.A. Wolsey: Intger and Combinational Optimization.
7. R.G. Parker and R.L. Rardin:Discrete Optimization.

Website Sources:

- www.iare.ac.in/sites/default/files/OT%20Complete%20Notes_1.pdf
- lecturenotes.in/subject/26/optimization-in-engineering
- lecturenotes.in/subject/1364/optimization-techniques
- www.youtube.com/watch?v=aJKuM4U-eYg
- www.youtube.com/watch?v=_awAywLKuEQ

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME028: MANAGEMENT INFORMATION SYSTEM

Objective: the objective of management information system is to provide information for decision making on planning, initiating, organizing, and controlling the operations of the subsystems of the firm and to provide a synergistic organization in the process for entrepreneurship and skill development and employability.

Unit I **(8 Session)**
Organization& Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS for skill development .

Unit II **(8 Session)**
Foundation of Information System : Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS- dataflow diagram, flow chart etc. for skill development and employability

Unit III **(8 Session)**
Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage. for skill development and employability

Unit IV **(8 Session)**
Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change. Reports: Various types of MIS reports, GUI & Other Presentation tools for skill development and employability

Unit V **(8 Session)**
Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, production & Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand basic concepts of organization, types and characteristics of information for skill development achieving national and international interest.
CO2: Investigate and understand the foundation of information system in business and its problems for skill development and employment
CO3: Understand the business application of information technology like internet, intranet, extranet etc. for entrepreneurship and skill development and employability.
CO4: Be able to manage the information technology for global management for entrepreneurship and skill development and employability.
CO5: Understand the advanced concept in information system and enterprise resource planning for entrepreneurship and skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	2	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	2	1	3	2	3	1
CO4	2	1	1	2	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. O.Brian, "Introduction to Information System", Mc-Graw Hill.
2. O.Brian, "Management Information System", TMH.
3. Alter, "Information Systems : A Management Perspective", Addison Wesley.
4. Arora& Bhatia, "Information Systems for Managers", Excel
5. Bansal, "Information System Analysis & Design", TMH.
6. Jawadegar, "Management Information System", TMH.
7. Murdick, "Information System for Modern Management", PHI.
8. Alexis Leon, "Enterprise Resource Planning", TMH.

Website Sources:

- www.iare.ac.in/sites/default/files/OT%20Complete%20Notes_1.pdf
- lecturenotes.in/subject/26/optimization-in-engineering
- lecturenotes.in/subject/1364/optimization-techniques
- www.youtube.com/watch?v=aJKuM4U-eYg
- www.youtube.com/watch?v=_awAywLKuEQ

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★ Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME029: SUPPLY CHAIN MANAGEMENT

Objective: Supply chain management is concerned with the efficient integration of suppliers, factories, warehouses and stores so that merchandise is produced and distributed: – In the right quantities – To the right locations – At the right time. In order to – Minimize total system cost – Satisfy customer service requirements –-face global competition–Improve standardization for entrepreneurship and skill development and employability.

Unit I **(8 Session)**

Introduction to Supply Chain Management (SCM)

Role of Supply Chain Management, Scope and Importance: Historical Evolution of SCM, Building Blocks of Supply Chains: In bound Logistics, Operations, Outbound Logistics for skill development.

Unit II **(8 Session)**

Forecasting, Inventory Strategy, Transportation Strategy, Warehouse Management. Information Strategy for SCM. Supply Chain Performance, Supply Chain Drivers and Metrics for skill development.

Unit III **(8 Session)**

Capacity Planning and Forecasting in Supply Chains

Demand Forecasting is Supply Chains, Aggregate Planning in Supply Chains, Managing Predictable Variability in Demand and Supply in Supply Chains for skill development and employment.

Unit IV **(8 Session)**

Managing Economics of Scale: Cycle Inventory, Managing Uncertainty in A Supply Chain: Safety Inventory, Determining the Optimal Level of Product Availability for skill development and employment.

Unit V **(8 Session)**

Design of Networks

DesigningDistributionNetworksandApplicationstoE-Business,NetworkDesign in the Supply Chain , Network Design in An Uncertain Environment, Sourcing Decisions in A Supply Chain , Pricing and Revenue Management in ASupplyChain,InformationTechnologyinASupplyChain,CoordinationinA Supply Chain for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the role of supply chain management, scope and its importance for skill development.
CO2: Understand the forecasting, inventory strategy, transportation strategy,warehousemanagement for skill development achieving national and international interest.
CO3: Analyze the capacity planning and forecasting in supply chains for skill development and employability.
CO4: Be able to learn the management and economics of inventory and supply chain for skill development and employability and develops local and global interest.
CO5: Develop design of network of distribution and application of E- business for skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	1	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Chopra Sunil, MeindlPeterandKalaraD.V.,"SupplyChainManagement,Strategy,PlanningandOperation", Pearson Education Inc,2007.
2. Ronald H. Ballou, "Business Logistics Management", Prentice Hall.
3. Mohanty R. P., S. G. Deshmukh, "Supply chain Management", Phoenix Publishing.

Website Sources:

- ocw.mit.edu/courses/esd-273j-logistics-and-supply-chain-management-fall-2009/pages/lecture-notes/
- aims. Education/supply-chain-management-notes/
- www.studocu.com/en-gb/document/the-university-of-warwick/supply-chain-management/scm-lectures-lecture-notes-1-10/1398318
- www.youtube.com/watch?v=kFCEMGYeHww
- www.youtube.com/watch?v=qahtk6gvk_4

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IIFTM University, Moradabad

Sanjeev Agrawal
Registrar
IIFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME 030: ENTREPRENEURSHIPDEVELOPMENTPROGRAMME

Objective: The main objective of an entrepreneurship development programme is to widen the base of entrepreneurship by development achievement motivation and entrepreneurial skills among the less privileged sections of the society. Entrepreneurship Development Programme is designed to help an individual in strengthening his entrepreneurial motive and in acquiring skills and capabilities necessary for playing his entrepreneurial role effectively for entrepreneurship and skill development and employability.

Unit I **(6 Session)**

Introduction To Entrepreneurship: Evolution of the Concept of Entrepreneur Functions of Entrepreneur, Characteristics of An Entrepreneur, Types of Entrepreneur, Concept of Entrepreneurship, Growth of Entrepreneurship, Barriers of Entrepreneurship, Role of Entrepreneurship in India, Entrepreneurial Motivation, Major Entrepreneurial Competencies for skill development and employability.

Unit II **(10 Session)**

Small Scale Industries (SSI): Characteristics of Small Scale Industry, Basis for Classification of Small Scale Industry: Resource Based, Demand Based, Ancillary, Subsidiary Based or Sub – Controlled Type, Technology Based Etc. Government Policy for Small Scale Industry, Growth of SSI in Developing Countries, Role of National and State Agencies Providing Assistance To SSI's,RelationshipBetweenSmallandBigIndustries,OwnershipStructure,RegistrationofSSI for skill development and employability.

Project Identification and Project Formulation: Meaning of Project, Project Identification and Selection, Elements of Project Formulation, Concept and Significance of Project Formulation, Meaning, Significance and Contents of Project Report for skill development and employability.

Unit III **(8 Session)**

Accounting for Small Enterprises: Objective of Accounting, Accounting Process, Journal, Ledger, Preparation of Balance Sheet and Assessment of Economic Viability for entrepreneurship and skill development and employability.

Project Appraisal: Concept of Project Appraisal, Project Appraisal Methods Cash Flows As Costs and Benefits, Payback Period, Average Rate of Return for entrepreneurship and skill development and employability.

Discounted Cash Flow Techniques, Working Capital Management, Cost of Capital, Financing of Enterprises, Project Sickness & Corrective Measures for entrepreneurship and skill development and employability.

Unit IV **(8 Session)**

Marketing Management: Market Segmentation, Marketing Mix, and Packaging, Pricing Policy, Distribution Channels, And Govt. Purchases From SSIS for entrepreneurship and skill development and employability.

Laws Concerning Entrepreneur: Income Tax Laws, Excise Duty, The Central Sales Tax ACT, Professional Tax, Value Added Tax (VAT), Service Tax, The Workmen Compensation Act, The Minimum Wages Act, The Maternity Benefit Act, The Payment of Bonus Act for entrepreneurship and skill development and employability.

Unit V **(8 Session)**

Institutional Support: Government Policies for Small Scale Entrepreneurs, Institutional Setup, District Industries Centers, Industrial Estates ,SIDCO, NSIC, Directorate of Industries, Commercial Banks, New Entrepreneurial Development Agencies.

Women Entrepreneurship: Growth, Problems, Recent Trends for entrepreneurship and skill development and employability

.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the evolutionoftheConceptofEntrepreneur Functions of Entrepreneur for skill development achieving national and international interest.

CO2: Investigate and understand the small scale industries and project identification and project formulation for skill development and employment

School of Engineering & Technology * Director * MLV University, Moradabad

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

CO3: Understand the principles of accounting for small enterprises, and project appraisal for entrepreneurship, skill development and employability.
CO4: Be able to interpret the marketing management and laws concerning entrepreneur for entrepreneurship, skill development and employability.
CO5: Develops local and global interest by gaining knowledge about the government policies for small scale entrepreneurs, institutional setup and women entrepreneurship for entrepreneurship, skill development and employability.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Khanka S.S., "Entrepreneurial Development", S. Chand & Company Ltd.
2. Gupta C.B., Srinivasan N.P., "Entrepreneurship Development in India", S. Chand & Sons.
3. BadhaiB.,"EntrepreneurshipDevelopmentProgramme",MansellPublishingLtd.
4. DesaiV.,"DynamicsofEntrepreneurialDevelopment&Management",HindustanPublishingHouse.
5. Holt David. H., "Entrepreneurship", PHI Learning.
6. Roy Rajeev, "Entrepreneurship", Oxford University Press.

Website Sources:

- lecturenotes.in/subject/35/entrepreneurship-development
- www.pasc.edu.in/wp-content/uploads/2021/04/ENTREPRENEURSHIP-DEVELOPMENT-III-BBA.pdf
- www.slideshare.net/sonam1987kapil/entrepreneurship-development-programme-notes
- www.youtube.com/watch?v=lr4yb4OTvts
- phcet.ac.in/guest-lecture-on-entrepreneurship-skill-development-among-students

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME031: RENEWAL ENERGY RESOURCES AND ITS UTILIZATION

Objective: To make students aware of importance of Energy. To tell students the importance of Renewable energy and its forms in India.To tell students how to harness the renewable energy.To make student aware of new R&D in the field on energy for skill development, employability and entrepreneurship.

Unit I **(8 Session)**

Review and Impact of Fossil Fuel Based Systems. Traditional Energy Sources:-Features, Characteristics and Applications. Non-Conventional Energy– Introduction, Seasonal Variations and Availability, Features Advantage, Disadvantage. Criteria for Assessing the Potential of NCER.Classification of NCER. Comparison of NCER With Traditional and Fossil Based System. Distributed Energy Systems and Dispersed Generation (DG), Energy Exploited, Energy Planning.

Solar Energy: Solar Radiation and Its Characteristics Solar Constant, Different Sun Earth Angles, Calculation of Solar Radiation, Solar Time, Day Length, Sunrise and Sunset, Solar Radiation Spectrum Solar Thermal Energy. Solar Collector: Introduction, Classification and Application. Solar Pond: Introduction and Its Types. Application of Solar Thermal Energy: Cooling, Drying, Distillation, Power Generation, Solar Cooking, Space Heating and Cooling, Solar Water Heating for skill development.

Solar Photovoltaic Systems: Basic Concept, Operating Principles Its Application for skill development.

Unit-II **(8 Session)**

Wind Energy:

Principle of Wind Energy Conversion, Site Selection Criterion, Concept of Lift and Drag for skill development and employability.

Wind Turbine: Design Consideration, Types of Wind Mill, Construction Details of Wind Turbine, Wind Turbine Rotor and Its Types for skill development and employability.

Application of Wind Energy. Advantage and Limitation of Wind Energy Conversion. Determination of Torque Coefficient for skill development and employability..

Unit-III **(8 Session)**

Bio-Mass: Availability of Bio-Mass and Its Conversion Theory. Design Consideration of Biogas Plants. Different Biogas Generation Plants and Their Construction Details. Biomass Gasifier for skill development and employability.

Biogas: Properties and Utilization

Concept of Bio Diesel:- Development , Advantage and Limitation for skill development and employability.

Unit-IV **(8 Session)**

Wave Energy Systems: Shoreline Systems. Near Shore Systems. Off Shore Systems for skill development and employability.

Ocean Thermal Energy Conversion (OTEC): Basic Concept, Working Principle, Performance, Types and Limitations for skill development and employability.

Tidal Wave: Principle of Working, Performance, Types and Limitations for skill development and employability.

Unit-V **(8 Session)**

Hybrid Systems: Need for Hybrid Systems. Range and Type of Hybrid Systems.Case Studies of Diesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel Systems, Electric and Hybrid Electric Vehicles for skill development and employability.

Fuel Cells: Basic Concept and Working Principle Fuel Cells, Application Advantage And limitations for skill development and employability.

Geo Thermal Energy: Nature of Geothermal Sources, Principle, Location, Economics and Prospect. Classification of Resources, Utilization for Electric Generation and Direct Heating, Well Head Power Generating Units for skill development and employability.

Energy Management: Energy Economics, Energy Audit. Contribution of NCER At Global and Indian Level for skill development and employability.

School of Engineering & Technology * IFTM University, Moradabad *
Director

Registrar
IFTM University
Moradabad.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the review and Impact of Fossil Fuel Based Systems. Traditional Energy Sourcesand also the basic of solar energy for skill development.
CO2: Understand the principle of wind energy conversion, wind turbine and application of wind energyfor skill development and employment achieving national and international interest.
CO3: Knowledge about the biomass, biogas and concept of bio diesel for skill development and employability.
CO4: Analyze the component of wave energy system, ocean thermal energy conversion and tidal wave for skill development and employability.
CO5: Investigate the hybrid system, fuel cell, geothermal energy and energy management for skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. GabdelAndra, "A Handbook for Engineers and Economists", TMH.
2. Auer Peter, "Advances in Energy System and Technology", Vol. 1 & II Edited by Academic Press.
3. F.R. the MITTRE, "Wind Machines", by Energy Resources and Environmental Series.
4. Chermisinogg N. and Thomes, Regin C., "Principles and Application of Solar Energy", WDL Pub.
5. Palz W., Chartier P. and Hall D.O., "Energy from Biomass", Applied Science Publishers.
6. Rai G.D., "Non-conventional Energy sources", Khanna Publishers.
7. Khan B.H., "Non-Conventional Energy Resources", Tata McGraw-Hill Education.

Website Sources:

- www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
- mrcet.com/downloads/digital_notes/ME/IV%20year/Renewable%20Energy%20Sources.
- www.iare.ac.in/sites/default/files/lecture_notes/IARE_RES_LECTURE_NOTES_0.
- www.cs.kumamoto-u.ac.jp/epslab/APSF/Lecture%20Notes/lecture-1.pdf

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University * Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME032: INDUSTRIAL AUTOMATION & CONTROL SYSTEMS

Objective: Introduction to the concept of industrial automation, scope of automation and study of socio-economic effects. Introduction to the fluid power control and study of the different fluid power systems working. Introduction to the automated material handling system used in automated industry. Study of the working principle Mechatronics devices and different types of controllers.Introduction to the control systems for skill development, employability and entrepreneurship.

UNIT I **(8 Session)**
Introduction: Concept and Scope of Industrial Automation, Socio-Economic Considerations, And Pneumatic Logic Circuits: Un-Complementation Algorithm for skill development.

UNIT II **(8 Session)**
Fluid Power Control: Fluid Power Control Elements and Standard Graphical Symbols for them, Construction and Performance of Fluid Power Generators, Hydraulic & Pneumatic Cylinders - Construction, Design and Mounting, Hydraulic & Pneumatic Valves for Pressure, Flow & Direction Control, Servo Valves and Simple Servo Systems With Mechanical Feedback, Simple Hydraulic and Pneumatic Circuits for skill development, employability.

UNIT III **(8 Session)**
High Volume Production Systems: Transfer Devices & Feeder, Classification, Construction & Application, Automated Flow Lines, Analysis of Automated Flow Lines for Reliability and Efficiency, Assembly Systems for skill development, employability.

UNIT IV **(8 Session)**
Mechatronics: Mechanical System Interfacing, Simple Mechatronics Devices: Servo Motors, Stepping Motors, DC Motors, Analog / Digital Convertors. Types and Function of Controllers for skill development, employability and entrepreneurship.

UNIT V **(8 Session)**
Mathematical Modeling of Physical System and Concept of Transfer Function System.Representation through Block Diagram and Signal Flow Graph. Time Domain Response Analysis Under Transient Input& Frequency Domain Analysis Root - Locus Techniques, Bode Plofor skill development, employability and entrepreneurship.

Course Outcomes: Students completing this course will be able to:

CO1: Achieving national and international interest by understanding the concept and scope of industrial automation, socio-economic considerations of automation for skill development.
CO2: Understand the fluid power control elements and standard graphical symbols for them and simple hydraulic and pneumatic circuit for skill development and employment
CO3: Knowledge regarding the working of elements such as hydraulic generator, hydraulic & pneumatic actuator, hydraulic& pneumatic valves used in heavy construction equipment for skill development and employability.
CO4: Knowledgeregardingkeycomponentsandfunctioningofanautomatedindustryfor skill development and employability.
CO5: Knowledgeregardingthemethodsusedtohandlethematerialsinautomatedindustry,suchasAGV's for skill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Nagrath&Gopal"ControlSystem",TMH.
2. MajumdarS.R.,"PneumaticSystems",TataMcGrawHill,NewDelhi.
3. EspositoA.,"FluidPowerwithApplications",PrenticeHalofIndia,NewDelhi.
4. Groover,M.P.,"Automation,ProductionSystems&ComputerIntegratedManufacturing",Prenti ceHallofIndia, NewDelhi.
5. Nise,"ControlsystemEngineering"Willey.

Website Sources:

- lecturenotes.in/subject/116/industrial-automation-and-control
- lecturenotes.in/download/note/14330-note-for-industrial-automation-and-control-iac-by-khushal-agrawal
- nptel.ac.in/courses/108105063
- www.youtube.com/watch?v=oxMdDsud5vg
- www.youtube.com/watch?v=3N0kWzC6jmE

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME033: BASICS OF NANO TECHNOLOGY

Objective: Subject structure mainly concerned with detailed introduction of nanomaterials. Why nanomaterials different with macro scale and microscale materials adequately discussed in this subject. Different manufacturing and synthesis techniques for nanoscale material and devices are major focus of the subject structure design. Various characterization techniques along with application in nano-micro equipment design is aim of this subject for skill development, employability and entrepreneurship.

Unit I **(8 Session)**

Introduction: Size and Shape Dependence of Material Properties at the Nanoscale, Why is Small Good? Limits to Smallness, Scaling Relations, Can Nanorobots Walk and Nanoplanes Fly? Nanoscale Elements in Conventional Technologiesfor skill development and employability.

Unit II **(8 Session)**

Top-Down and Bottom-Up Nanofabrication: The Intel-IBM Approach to Nanotechnology: Lithography, Etching, Ion Implantation, Thin Film Deposition, Electron Beam Lithography, Soft Lithography: Nano Imprinting and Micro Contact Printing, Solution/Plasma-Phase Nanofabrication, Sol-Gel Methods, Template Techniques for skill development and employability.

Unit III **(8 Session)**

Self Assembly and Self-Organization: Functional Coatings With Self Assembled Monolayers of Molecules and Nanoparticles Langmuir-Blodgett Films, Layer-by-Layer Growth for skill development and employability.

Imaging/Characterization of Nanostructures: General Considerations for Imaging, Scanning Probe Techniques: SEM, STM, AFM, And NSOM for skill development and employability.

Unit IV **(8 Session)**

Metal and Semiconductor Nanoparticles: Synthesis, Stability, Control of Size, Optical and Electronic Properties, Ultra-Sensitive Imaging and Detection With Nanoparticles, Bioengineering Applications, and Catalysis for skill development, employability and entrepreneurship.

Semiconductor and Metal Nanowires: Vapor/Liquid/Solid Growth and Other Synthesis Techniques, Nanowire Transistors and Sensors for skill development, employability and entrepreneurship.

Unit V **(8 Session)**

Carbon Nanotubes: Structure and Synthesis, Electronic, Vibration, and Mechanical Properties, How Can C Nanotubes Enable Faster Computers, Brighter TV Screens, and Stronger Mechanical Reinforcement for skill development, employability and entrepreneurship.

Mechanics at Nanoscale: Enhancement of Mechanical Properties With Decreasing Size, Nanoelectromechanical Systems, Nanomachines, Nanofluidics, Filtration, Sorting, Molecular Motors for skill development, employability and entrepreneurship.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the size and shape dependence of material properties at the nanoscale for skill development.
CO2: Understand the intel-IBM approach to nanotechnology: lithography, etching, ion implantation, thin film deposition for skill development and employability and develops local and global interest.
CO3: Knowledge about the Difference in nano and macro material along with various approaches of manufacturing and synthesis of nanomaterials for skill development, employability and entrepreneurship.
CO4: Importance of characterization and characterization devices is main outcome of this for skill development and employability and develops local and global interest.
CO5: Provides expertise to develop new nanomaterials with the help of chemical synthesis and laser ablation techniques for skill development, employability and entrepreneurship.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Kelsall, Hamley, and Geoghegan "Nanoscale Science and Technology", Wiley.
2. Di Ventra, Evoy, and Heflin "Introduction to Nanoscale Science and Technology", Kluwer Academic Publishers.
3. Poole and Owens, "Introduction to Nanotechnology", Wiley.
4. Ozin and Arsenault, "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing.

Website Sources:

- www.studocu.com/in/document/mahatma-gandhi-university/engineering-physics/nanotechnology-lecture-notes-module-2/22678449
- ijsea.com/archive/volume3/issue5/IJSEA03051003.pdf
- lecturenotes.in/subject/563/introduction-to-nanotechnology-in
- www.youtube.com/watch?v=ebO38bbq0_4
- www.youtube.com/watch?v=qUEbxTkPIWI

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME034: MODERN MANUFACTURING PROCESSES

Objective: Aims to provide broad overview of modern manufacturing technologies to ensure the students understand their fundamental principles and processes. . Modern Manufacturing Process enhances the students' appreciation for modern manufacturing technologies up to date applications from manufacturing industries are presented for skill development, employability and entrepreneurship.

Unit I **(8 Session)**

Introduction: Limitations of Conventional Manufacturing Processes Need of Modern (Unconventional) Manufacturing Processes, Its Classification Based on Their Principal Mechanism and Resources for skill development and employability.

Unit II **(8 Session)**

Modern Machining Process: Principle, Working and Applications of Modern Machining Processes Such as Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Ultrasonic Machining (USM), Electro-Discharge Machining (EDM) for skill development, employability and entrepreneurship.

Modern Machining Process (Continued): Chemical Machining (CM), Electrochemical Machining (ECM), Electron Beam Machining (EBM), Laser Beam Machining (LBM), Plasma Arc Machining (PAM) Etc.for skill development, employability and entrepreneurship.

Unit III **(8 Session)**

Modern Forming Processes: Principle, Working and Application of High Energy Rate Forming (HERF) Processes Such as Explosive Forming, Electromagnetic Forming, Electro-Discharge Forming, WaterHameer Forming, Explosive Compaction Etc.for skill development, employability and entrepreneurship

Unit IV **(8 Session)**

Modern Joining Processes: Principle, Working and Application of Modern Joining Processes Such as Ultrasonic Welding (USW), Electron Beam Welding (EBW), Laser Beam Welding (LBW), Plasma Arc Welding (PAW), Under Water Welding, Metalizing, Explosive Welding, Cladding Etc.for skill development, employability and entrepreneurship

Unit V **(8 Session)**

Electronic-Device Manufacturing: Brief Description of Diffusion (I.E., Rapid Prototyping) and Photo-Lithography Processes for Electronic-Device Manufacturingfor skill development, employability and entrepreneurship

Course Outcomes: Students completing this course will be able to:

CO1: Understand the limitations of conventional manufacturing processes need of modern manufacturing processes for skill development and employability and develops local and global interest.
CO2: Describe the specific process characteristics of various modern manufacturing technologies and identify their possible applications for skill development, employability and entrepreneurship
CO3: Describe the working and application of high energy rate forming processes for skill development, employability and entrepreneurship
CO4: Analyze the working and application of modern joining processes such as ultrasonic welding for skill development and employability and develops local and global interest.
CO5: Comparatively analyze and evaluate the benefits of modern manufacturing processes and discuss their limitations for skill development, employability and entrepreneurship

School of Engineering & Technology * IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Jain V. K., "Advanced Machining Processes", Allied Publishers Private Limited.
2. Groover M. P., "Fundamentals of Modern Manufacturing", John Wiley and Sons.
3. El-Hofy H., "Advanced Machining Processes", McGraw-Hill.
4. Benedict, G. F., "Nontraditional Manufacturing Processes", Marcel Dekker, New York.

Website Sources:

- www.cet.edu.in/noticefiles/261_MMP%20Lecture%20Notes-ilovepdf-compressed.pdf
- lecturenotes.in/subject/164/modern-manufacturing-process
- home.iitk.ac.in/vkjain/Lecture%205_AMP_MM_NF-200914.pdf
- www.youtube.com/watch?v=x0wT9R4oWmE
- www.digimat.in/nptel/courses/video/112107078/L13.html

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME035: PROJECT MANAGEMENT

Objective: The main objectives of project management are understood exactly what a project is meant to do and what it is meant to deliver. To learn the scope, timescales, cost and quality of a project.How to maintain a schedule and project plan.To estimate the cost of project. Different finance institute available for financial add. Deliver the agreed outcomes of the project to the right scope, timescales, cost and quality. Provide communications, reports and progress updates throughout the lifecycle of the project. To let students know how to manage risks, issues and dependencies for skill development, employability and entrepreneurship.

Unit I **(8 Session)**

Introduction: Project Characteristics, Attributes of a Good Project Manager, Taxonomy of Projects for skill development.

Project Identification & Formation: Project Identification, Demand Forecasting, Project Preparation, Zero Based Project Formulation, Preliminary Project Report, and Comparison of Project Alternatives for skill development.

Unit II **(8 Session)**

Project Appraisal: Technical Appraisal, Commercial Appraisal, Economical Appraisal, Management Appraisal, Social Cost Benefit Analysis, NPV, IRR, BCR, NBCRfor skill development and employability.

Unit III **(8 Session)**

Financing of Projects: Estimation of Cost Components of Projects.Sources of Finances, Role of Financial Institutions, Cash Inflow and Cash Outflow, Cost of Capital for skill development and employability.

Unit IV **(8 Session)**

Project Planning & Scheduling: Scheduling Techniques, PERT & CPM, Network Preparation, Updating Network, Line of Balance Technique, Performance Analysis of Projects, Cost Vs Time of Completion, Normal Time and Crash Time, Resource Allocation Techniques, Work Breakdown Structure for skill development and employability.

Unit V **(8 Session)**

Project Contracts: Types of Contract, Sub-Contract, Tenders & Types of Payment to Contractors.

Computer Aided Project Management: Essential Requirements of Software's, Software Packages, Enterprise-Wide Project Management, Spread Sheets for skill development and employability.

Project Organization, Post Project Evaluation, Project Sickness – Causes, Prediction of Causes, Rehabilitation, Project Audit, Risk Analysis for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the project characteristics, project identification & formation for skill development.
CO2: Understand the project appraisal and its typesfor skill development and employability and develops local and global interest.
CO3: Estimate of cost components of projects, sources of finances, role of financial institutionsfor skill development and employability.
CO4: Analyze the scheduling techniques, pert &cpm, network preparation, updating network of project management skill development and employability and develops local and global interest.
CO5: Enhances career development prospects through having achieved recognized project management knowledgefor skill development and employability.

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Nagarajan K., "Project Management", New Age International Publishers.
2. Panneerselvam R. &Senthilkumar P., "Project Management", PHI Learning.
3. Patel Bhavesh M, "Project Management", Vikas Publishing Home.
4. Scelharaman S. &Ramnath Vijay, "Project Management" Breweries; Education.

Website Sources:

- bookdown.org/content/e12712f9-eea3-49cb-ad8d-a3e908f52a2f/an-introduction-to-project-management.html
- lecturenotes.in/subject/171/project-management-pm
- aims.education/project-management-lecture-notes/
- www.youtube.com/watch?v=Wk607ruc8P0

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

TEME036: ROBOTICS & FMS

Objective: Robotics is a combined study of mechanical engineering, electrical engineering, electronic engineering and computer science, deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing and Flexible manufacturing systems are regarded as one of the most efficient methods to employ in reducing or eliminating problems in manufacturing industries for skill development, employability and entrepreneurship..

Unit I **(6 Session)**
Persisted Inefficiency & Desired System, System Configuration, Concept of Flexibility, Flexible Automations-Productivity, Purpose & Motives of Robotizationfor skill development.

Unit II **(8 Session)**

Robot & Robotics, Basic Element of Robot, Robot Classification, Physical Configuration, Robotic Motion, Resolution, Accuracy & Repeatability, Functional Parameters for skill development and employability.

Unit III **(8 Session)**
Robotic System, End Effectors and Grippers, Kinematics & Dynamics of Manipulators, Robot Capabilities, Robot Application-Process Wise & Industry Wise, Selection & Performance Criteria, Robotic Workstation Design, Robot Modularity for skill development and employability.

Unit IV **(10 Session)**
Planning of Robotized Projects &Economic Justification. Concept, Objectives & Benefits of FMS, Decision & Choice Regarding FMS Configuration, Data Files & Report for skill development and employability.

Unit V **(8 Session)**
Justification & Implements Requirements, Selection of Different System Component, Criteria, Modeling & Performance Evaluationfor skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the persisted inefficiency & desired system of robotics for skill development.
CO2: Understand the robot & robotics, basic element of robot, robot classification for skill development and employment achieving national and international interest.
CO3: Embedded intelligence is now in products ranging from cars to domestic appliances for skill development and employability.
CO4: Intelligent systems range from unmanned vehicles in aerospace and robots in sub-sea exploration, to consumer products and the creative arts for skill development and employability.
CO5: FMS is not an end in itself, but a means to an end and the natural partner to integrate to existing CAD/CAM systems and progress toward CIM skill development and employability and develops local and global interest.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	1	1	1	1	1	2	2	2	1	1
CO2	2	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	3	1	1	3	1	1	2	1	1	3	2	3
CO5	2	3	1	2	3	2	1	1	3	1	1	3

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	3	1
CO3	3	3	2
CO4	3	3	2
CO5	3	3	1

Suggested Readings:

1. Kumar Surender, "Industrial Robots and Computer Integrated Manufacturing", Oxford & IBH Publishing Co., New Delhi.
2. Groover, "Automation, Production System & Computer Integrated Manufacturing", Prentice Hall India.
3. Mukherjee S.K., Kumar Surender, "Robotic Engineering", Satya Prakashan, New Delhi.
4. Matthew T. Mason, "Mechanics of Robotic Manipulation", Prentice Hall of India, New Delhi.
5. RachidManseur, "Robot Modeling and Kinematics", Firewall Media, New Delhi.

Website Sources:

- www.iare.ac.in/sites/default/files/lecture_notes/ROBOTICS_LECURE_NOTES.pdf
- lecturenotes.in/download/note/19718
- ocw.mit.edu/courses/2-12-introduction-to-robotics-fall-2005/pages/lecture-notes/
- www.youtube.com/watch?v=EPZzMmasCJA
- www.youtube.com/watch?v=xrwz9IxpMJg
- nptel.ac.in/courses/112101098

Note: Latest editions of all the suggested readings must be used

School of Engineering & Technology
Director
IFTM University, Moradabad

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME752: COMPUTER AIDED DESIGN (CAD) LAB

Objective: The objective of this lab is to impart practical knowledge on design and mainly used for detailed engineering of 3D models or 2D drawings of physical components, but it is also used throughout the engineering process from conceptual design and layout of products, through strength and dynamic analysis of assemblies to definition of manufacturing methods of components. CAD allows for the easier development of products and product management integration. It also allows for greater modeling and even provides a basis for virtual networking! In the engineering world, CAD is extremely important and widely used to design and develop products to be used by consumers for entrepreneurship and skill development and employability.

List of experiments: (Minimum 8 experiments are required to be performed)
(16 Sessions)

1. Line drawing or Circle drawing algorithm experiment: writing the program and running it on computer **for skill** development and employability.
2. Transformations algorithm experiment for translation/rotation/scaling: writing program and running it on computer for skill development and employability.
3. Design problem experiment: writing the program for design of machine element or other system and running it on computer for skill development and employability.
4. Optimization problem experiment: writing a program for optimizing a function and running it on computer for skill development and employability.
5. Auto CAD experiment: understanding and use of 2 –D Auto CAD commands for employability and entrepreneurship skills.
6. Auto CAD experiment: understanding and use of 3 –D Auto CAD commands for employability and entrepreneurship skills.
7. Writing a small program for FEM for 2 spring system and running it or using a FEM package for employability and entrepreneurship skills.
8. Use of sketch on Pro/E. for employability and entrepreneurship skills
9. Use of Surface on Pro/E. for employability and entrepreneurship skills

Course Outcome: Students completing this course will be able to:

CO1: Be able to create a detailed drawing and assemble a manufacturing environment for skill development and employability.
CO2: Be able to create basic NC sequences necessary for material removal for skill development and employment achieving national and international interest.
CO3: Be able to use a commercial CAD software package as an engineering tool for employability and entrepreneurship skills.
CO4: Analyze the technical drawings using both CAD and basic manual tools to develop entrepreneurship skills anddevelops local and global interest.
CO5: Apply the stages of the design process from scratch using engineering graphics techniques such as sectional projections, dimensioning and computer-generated drawings (2D) for employability and skill development.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	2	2	1	2	1	2	2	3
CO2	1	3	2	2	1	1	3	1	2	1	1	1
CO3	3	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	2	1	1	3	3	1	3	1
CO5	3	1	1	3	1	2	3	1	2	2	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	3	1
CO3	2	1	3
CO4	3	3	3
CO5	3	3	2

Suggested Readings:

1. Computer Graphics by Hearn & Baker (Pearson / Prentice hall)
2. Computer Aided Design by R. K. Srivastava.
3. CAD/CAM Theory and Practice – Ibrahim Zeid (McGraw Hill International)
4. Computer Aided Analysis & Design of Machine Elements (Rao&Dukkipati)
5. Computer Oriented Numerical Methods – Raja Raman (Prentice Hall)
6. FEM – SS. Rao.
7. Grover Mikell P. 2003. Automation, Production Systems and Computer Integrated Manufacturing. Prentice-Hall of India.
8. RadhaKrishnan P, Subramanian S &Raju V. 2003. CAD/CAM/CIM. New Age International.
9. Rao PN. 2002. CAD/CAM Principles and Applications. Tata McGraw Hill.

Website Sources:

- https://www.slideshare.net/search/slideshow
- https://www.researchgate.net
- https://www.youtube.com/watch?v=QuR-VKis3jU
- https://www.youtube.com/watch?v=WROFrYJ5rGs
- https://www.youtube.com/watch?v=PihEGns8USc

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME753: COMPUTER AIDED MANUFACTURING (CAM) LAB

Objective: The objective of the lab is to develop the designs of various mechanical components using 2D and 3D Software. This lab is available to graduate the students in the fields of Computer Aided Design and Computer Aided Manufacturing. The basic knowledge can be used for successful accomplishment of project works for entrepreneurship and skill development and employability.

List of experiments: (Minimum 6 experiments are required to be performed)
(12 Sessions)

1. Writing a part-programming (in word address format or in APT) for a job for drilling operation (point-to-point) and running on NC machine for skill development and employability.
2. Writing a part programming (in word address format or in APT) for a job for milling operation (contouring) and running on NC machine to develop entrepreneurship skills. .
3. Experiment on Robots and it programs to develop entrepreneurship skills..
4. Experiment on Transfer line/Material handling to develop entrepreneurship skills..
5. Experiment on difference between ordinary machine and NC machine, study or retrofitting to develop entrepreneurship skills.
6. Experiment on study of system devices such as motors and feedback devices for skill development and employability.
7. Study of Robot structure for skill development and employability.
8. Writing a part-programming (in word address format or in APT) for turning operation to develop entrepreneurship skills.
9. Experiment on Mechatronics and controls to develop entrepreneurship skills.

Course Outcome: Students completing this course will be able to:

CO1: Understand the environmental impact of the investigation, work individually and in a team for conducting the experiments for employability and skill development.
CO2: Be able to create a detailed drawing and assemble a manufacturing environmentto develop entrepreneurship skills achieving national and international interest.
CO3: Be able to create basic NC sequences necessary for material removal for skill development and employability.
CO4: Use modern tools for measurements/modeling and simulation/draw the graphs etc. for employability and entrepreneurship skills.
CO5: Effectively communicate and explain the experimental analysis for skill development and employability and develops local and global interest.

PO-CO Mapping(Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	3	2	2	1	2	1	1	1	3
CO2	2	3	2	2	1	1	3	1	2	2	2	1
CO3	1	2	2	3	3	2	2	2	3	2	2	3
CO4	3	3	3	1	2	1	1	3	1	1	1	1
CO5	2	1	1	3	2	2	3	1	3	2	3	1

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	3	1
CO2	3	1	3
CO3	2	3	1
CO4	3	3	3
CO5	3	3	2

Suggested Readings:

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover
2. Computer Aided Manufacturing by Kundra and Rao
3. Computer control of manufacturing systems by Koren
4. NC Machine Tools by S.J. Martin.
5. NC Machines by Koren
6. CAD/CAM by Groover.

Website Sources:

- https://www.youtube.com/watch?v=vO1lc75jtiM
- https://www.youtube.com/watch?v=00TqO1pBEro
- https://www.youtube.com/watch?v=7od3g2Su5RM
- https://www.slideshare.net/AjaySingh718/cad-cam-61993043

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME754: AUTOMOBILE ENGINEERING LAB

Objective: Use core competence acquired in various areas of Mechanical Engineering to solve techno-managerial issues for creating innovative products that lead to better livelihoods & economy of resources, to establish themselves as effective collaborators and innovators to address technical, managerial and social challenges, to equip students for their professional development through lifelong learning and career advancement along with organizational growth. Serve as a driving force for proactive change in industry, society and nation for entrepreneurship and skill development and employability.

List of experiments: (Minimum 08 experiments are required to be performed)
(12 Sessions)

1. Study & experiment on Valve mechanism for employability and skill development.
2. Study & experiment on Gear Box for employability and skill development.
3. Study & experiment on Differential Gear Mechanism of Rear Axle for employability and skill development.
4. Study & experiment on Steering System for employability and skill development.
5. Study & experiment on Automobile Braking System for employability and skill development.
6. Study & experiment on Chassis and Suspension System for employability and skill development.
7. Study & experiment on Ignition system for employability and skill development.
8. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI for employability and skill development.
9. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump for employability and skill development.
10. Study & experiment on lighting system for employability and skill development.
11. Study & experiments on Lubrication system for employability and skill development.
12. Study & experiments on cooling system for employability and skill development.

Course Outcome: Students completing this course will be able to:

CO1: Achieving national and international interest understanding the environmental impact of the investigation and Work individually and in a team for conducting the experiments for employability and skill development.
CO2: Ability to work professionally in mechanical systems including design, analysis, production, measurement and quality control for skill development and employability.
CO3: Ability to work on diverse disciplinary tasks including manufacturing, materials, thermal, automobile, robotics, Mechatronics, engineering software tools, automation and computational fluid dynamics for employability and entrepreneurship skills.
CO4: To enable students for higher studies and competitive examinationsfor skill development and develops local and global interest.
CO5: To facilitate students and industry professionals for continuous improvement and innovation for employability and entrepreneurship skills.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad

PO-CO Mapping(Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	2	2	1	2	1	2	2	3
CO2	3	3	2	2	1	1	3	1	2	1	1	1
CO3	1	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	2	1	3
CO4	3	3	3
CO5	3	3	2

Suggested Readings:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

Website Sources:

- https://sites.google.com/view/autoleengineeringbyrbgupta
- https://www.springer.com/journal/12239
- https://www.youtube.com/watch?v=sYnd6fI-ugo
- https://www.youtube.com/watch?v=SHl0TdnbP1Y
- https://www.slideshare.net/palsons/automobile-engineering-ppt-76816480

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★ Director

Registrar
IFTM University
Moradabad

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME801: MAINTENANCE ENGINEERING & MANAGEMENT

Objective: The objective of this course is to familiarize the students with the maintenance strategies and their management and develop their skills, conceptual abilities and substantive knowledge in the aforesaid field for entrepreneurship and skill development and employability.

Unit I **(08 Sessions)**

Introduction, operating life cycle, reliability, Failure data analysis, failure rate curve, hazard models, elements in series, parallel, mix, logic diagrams, improving reliability, redundancy-element, unit, standby, maintainability, availability, reliability and maintainability tradeoff for skill development and employability.

Unit II **(08 Sessions)**

Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, zero break down, preventive inspection of equipment used in emergency for skill development and employability.

Unit III **(08 Sessions)**

Condition Based Maintenance: Principles of CBM, Pillars of condition Monitoring, CBM implementation and benefits, condition monitoring techniques – visual monitoring, vibration monitoring, wear debris monitoring, corrosion monitoring, performance monitoring, Replacement planning maintain or replace decision for skill development and employability.

Unit IV **(08 Sessions)**

Maintenance Planning and scheduling, GANTT chart, PERT, CPM and CPA networks, Advantage and Disadvantage of PERT/CPM, Computerized maintenance management system(CMMS), component features of CMMS, Future of CMMS for skill development and employability.

Unit V **(08 Sessions)**

Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning, materials planning, spare parts planning and control, evaluation of maintenance management for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understanding principles and practices of maintenance planning forskill development and employability gaining national and international interest.
CO2: Applying policies of planned maintenance. Also describe the strategies of preventive maintenance and breakdown maintenance for skill development and employability.
CO3: Applying methods of condition based maintenance like pillars of condition monitoring, CBM and its implementation and its benefits. Also understand condition monitoring techniques for skill development and employability.
CO4: Analyzing the maintenance planning and scheduling and also describe the GANTT chart, PERT, CPM and CPA network etc. knowledge about the CMMS and components of CMMS for skill development and employability.
CO5: Knowledge about maintenance management and production management. Also describe the material planning, parts planning and control forskill development and employability and develops local and global interest.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

PO-CO Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	3	2	2	1	2	3	2	1	3
CO2	3	3	2	1	2	1	3	1	2	3	2	1
CO3	1	3	1	2	1	2	3	2	1	3	1	2
CO4	2	1	3	2	3	3	2	1	2	1	2	1
CO5	1	2	2	1	3	2	3	2	1	2	1	2

CO-Curriculum Enrichment Mapping Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. Mishra R. C. & Pathak K. Maintenance Engineering & Management. Prentice Hall India Learning Private Limited, 2012.
2. Venkataraman V. Maintenance Engineering & Management. 2007
3. Chandra S. Maintenance Engineering & Management. S. K. Kataria& sons.
4. Srivastava S. K. 2011. Maintenance Engineering. S. Chand and Company Ltd., ISBN: 81-219-2644-0
5. .Nauhria R. N. & Prakash R. Management of systems. 2013
6. Niebel B. W. Engineering Maintenance Management. CRC Press, 1994
7. Wagner D. H. Operations Research. John Wiley and Sons. 2014

Website sources:

- nptel.ac.in/course.html
- https://en.wikipedia.org/wiki/Maintenance_engineering en.wikipedia.org
- www.sciencedirect.com
- https://www.wiley.com/en-us/Introduction+to+Maintenance+Engineering
- www.slideshare.net
- https://www.mscdirect.com/product/details/61299327
- https://www.researchgate.net/publication/297575957_Maintenance_Engineering_Management_Principles_and_Applications

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EME802: NON–CONVENTIONAL ENERGY RESOURCES

Objective: To understand the various forms of conventional energy resources, also study the present energy scenario and the need for energy conservation. Grab the concept of various forms of renewable energy. To learn Outline division aspects and utilization of renewable energy sources for both domestics and industrial application. To analyze the environmental aspects of renewable energy resources for entrepreneurship and skill development and employability.

UNIT I **(08 Sessions)**

Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations for skill development and entrepreneurship.

UNIT II **(08 Sessions)**

Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations for entrepreneurship and employability.

UNIT III **(08 Sessions)**

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations for skill development, entrepreneurship and employability.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations for skill development, entrepreneurship and employability.

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations for skill development, entrepreneurship and employability.

UNIT IV **(08 Sessions)**

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations for skill development and entrepreneurship.

Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems for skill development and entrepreneurship.

UNIT V **(08 Sessions)**

Bio-mass: Availability of bio-mass and its conversion theory for development, entrepreneurship and employability.

Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations for development, entrepreneurship and employability.

Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants for development, entrepreneurship and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Define the basic concepts of conventional & non-conventional energy resources, Introduction, availability, classification, merits and demerits of conventional & non-conventional energy resources for skill development and entrepreneurship.

CO2: It provides the information about the importance of solar energy, its application, new technology by we can extract the solar energy for entrepreneurship and employability gaining national and international interest.

CO3: Describe and discuss geothermal energy, MHD power plants and fuel cells. It also provides the information about MHD power plants, fuel cells for skill development, entrepreneurship and employability.

CO4: This unit of this explorers the world of wind energy, its classification, uses, merits, demerits and designing of wind energy power plant. It also provides a basic knowledge about thermo electrical and thermionic conversions for skill development and entrepreneurship.

School of Engineering & Technology ★ IFTM University, Moradabad ★ Director

Registrar
IFTM University
Moradabad

CO5: This unit explores the world of wind energy, its classification, uses, merits, demerits and designing of wind energy power plant. It also provides a basic knowledge about thermo electrical and thermionic conversions for skill development and entrepreneurship and develops local and global interest

.PO-CO Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	2	1	2	1	2	1	2	3
CO2	1	3	1	3	1	2	1	2	1	2	1	3
CO3	2	1	2	1	2	3	2	1	3	1	3	1
CO4	1	2	2	3	1	2	1	2	3	2	1	3
CO5	2	1	3	1	2	3	2	3	2	1	2	1

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	2	3	3
CO3	3	3	3
CO4	3	1	3
CO5	3	3	3

Suggested Readings:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. KoteswaraRao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.

Website Sources:

- https://www.toppr.com/guides/physics/sources-of-energy/non-conventional-sources-of-energy/
- https://nptel.ac.in/courses/121/106/121106014/
- https://www.nationalgeographic.com/environment/energy/reference/renewable-energy/
- http://quiznext.in/study-material/learning_material/CBSE-10-Physics/Sources-of-Energy/alternative-or-non-conventional-sources-of-energy/

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology * IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Mechanical Engineering

Bachelor of Technology (B. Tech) Programme
(Effective from Session 2021-22)

EHU801: INDUSTRIAL MANAGEMENT

Objective: The objective of this course is to familiarize the students to gain insight about managerial techniques through various assessment tools/models to control and enhance the productivity of the work environment for entrepreneurship and skill development and employability.

Unit I **(10 Sessions)**

Introduction: Concept, Development, application and scope of Industrial Management for employability and skill development.

Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership for employability and skill development.

Unit II **(08 Sessions)**

Management Function: Principles of Management- Management Tools – time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Production requirements to develop entrepreneurship skills.

Unit III **(08 Sessions)**

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain management for employability and entrepreneurship skills.

Unit IV **(07 Sessions)**

Quality control: Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM for skill development and employability.

Unit V **(07 Sessions)**

Environmental Issues: Environmental Pollution – various management techniques to control Environmental pollution – Various control acts for Air, Water, Solid waste and Noise pollution for skill development and employability.

Course Outcomes: Students completing this course will be able to:

CO1: Understand the concept, development, application and scope of Industrial Management for employability and skill development.

CO2: To apply various management tools in systems of different industrial configurations to develop entrepreneurship skills gaining national and international interest.

CO3: Facilitate employability and entrepreneurship skills by understanding the importance of inventory and the concept of supply chain management.

CO4: Analyze the mechanism and tools of quality control enhancing employability and introduction to total quality management for skill development.

CO5: To control and develop models for environmental pollution by various management techniques gaining insight for skill development and employability and develops local and global interest.

PO-CO Mapping(Please Write 3, 2, 1 Wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	2	2	1	2	1	2	2	3
CO2	3	3	2	2	1	1	3	1	2	1	1	1
CO3	1	2	3	3	2	2	2	2	3	2	2	3
CO4	2	3	2	1	1	1	1	3	1	1	1	1
CO5	3	1	1	3	2	2	3	1	3	2	3	1

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad

CO-Curriculum Enrichment Mapping (Please Write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	1	3
CO3	2	3	3
CO4	3	3	1
CO5	3	3	2

Suggested Readings:

1. Khanna O.P.: Industrial Engineering
2. T.R. Banga: Industrial Engineering and Management
3. Sharma B.R.: Environmental and Pollution Awareness.
4. R.K.Singal: Industrial Management, Vayu Education of India Pub.
5. Onkar N. Pandey: Industrial Management, S.K.Kataria& Sons (Katson) Pub.
6. Dewan J. M. and Sudarshan K. N.: Industrial Management, Discovery Publishing Pvt. Ltd

Website sources:

- nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net
- www.sanfoundry.com

Note: Latest editions of all the suggested readings must be used.

School of Engineering & Technology ★ IFTM University, Moradabad ★
Director

Registrar
IFTM University
Moradabad.