आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

Course Structure

&

Syllabus

Of

B.Tech
Electrical Engineering

[Applicable w.e.f. Academic Session - 2022-23]

[As per CBCS guidelines given by UGC]

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

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

Programme:	***Bachelor of Technology in Electrical 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:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems which is relevant to the global developmental needs.

PO2. 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 at national and international levels.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations for regional developmental needs.

PO4. 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 at global levels.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations for regional developmental needs.

PO6. Identify Solutions: Dedication to work as an electrical or electronics engineer who is capable of identifying solutions to various local and global problems faced by the society.

PO7. Design Modern Systems: Ability to design and develop modern systems for the upkeep of pollution free environment for local developmental needs as well.

PO8. Ethics & Social values: Willingness and ability to upkeep professional ethics and social values at local level.

PO9. Independent Thinking: Willingness and ability to think independently, take initiative and lead a team of engineers or researchers at national and international levels.

PO10. Communication: Ability to express ideas clearly and communicate orally as well as in writing with others even at local level.

PO11. Lifelong Learning: Willingness and ability to maintain lifelong learning process by way of participating in

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

various professional activities for the fulfilment of regional developmental needs.

PO12. Administrative responsibilities: Willingness and ability to take up administrative responsibilities involving both project and financial management confidently which is relevant to the global developmental needs.

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:

PSO1: 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.

PSO2: Applying Electrical Engineering concepts and tools to solve complex engineering and industrial problems in the field of High Voltage Engineering, Machine Engineering and Power System Engineering.

PSO3: Analyzing managerial and entrepreneurial skills to work effectively in multidisciplinary teams for building nation and helping society by following ethical and environmentally friendly practices.

PSO4: Evaluating the need of lifelong learning and will engage in learning modern techniques and engineering tools like Matlab and Power system Analysis, 3D printing etc.

PSO5: 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 course 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 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

Director

Registrar
IFTM University
Moradabad.

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. – Electrical Engineering 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, sub mission 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 and performs 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 with a stake in teaching guide them, drive the learning. All student courage 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 visit students' exposure to practical learning and work out for are port of such a visit relating to their specific topic, course or even domain.

Director

Registrar
IFTM University
Moradabad.

B.Tech Electrical 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)**	12 Courses of 4 Credits each (Total Credit 12X4)	48
3	**Engineering Core courses (ECC)**	25 Courses of 4 Credits each (Total Credit 25X4)	100
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.

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, and Dissertation, Seminar etc.: Summer Training, Project, Seminar, Dissertation, 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'.

Director

Registrar
IFTM University
Moradabad.

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

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 corporate 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.

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

•**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 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, Comparing, 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.

Director

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLGY
IFTM UNIVERSITY, MORADABAD
(EstablishedunderUPGovt.ActNo.24of 2010 and approvedundersection22ofUGC Act 1956)
LodhipurRajput, Delhi Road, Moradabad- 244102,U.P.
Telephone: 0591-2360817,2360818 **Email:**admissions@iftmuniversity.ac.in
Website: www.iftmuniversity.ac.in

DEPARTMENT OF ELECTRICAL ENGINEERING
CBCS Programme
Effective from Session 2021-22

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
TPSD401	Professional Skill Development-II	3	1	0	4
TEHU501	Human Values & Professional Ethics	3	1	0	4
TEHU701	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
TECH201	Engineering Chemistry	3	1	0	4
TEEE101	Electrical Engineering	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
TEME102	Materials & Manufacturing	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
TEMA401	Computer based Numerical &Statistical Techniques	3	1	0	4
Engineering Core Courses(ECC)		**L**	**T**	**P**	**C**
TEEE301	Electrical Machine-I	3	1	0	4
TEEE302	Electrical Measurements And Measuring Instruments-I	3	1	0	4
TEEE303	Analog Electronic Devices	3	1	0	4
TEEE304	Electromagnetic Field Theory	3	1	0	4
TEEE305	Networks and Systems	3	1	0	4
TEEE401	Electrical Measurements And Measuring Instrument-II	3	1	0	4
TEEE402	Electrical Machine –II	3	1	0	4
TEEE403	Digital Electronics	3	1	0	4
TEEE404	Signal and Systems	3	1	0	4
TEEE501	Microprocessor Engineering	3	1	0	4
TEEE502	Electrical Engineering Material Science	3	1	0	4
TEEE503	Commutating Machines	3	1	0	4
TEEE504	Control System	3	1	0	4
TEEE505	Instrumentation Engineering	3	1	0	4
TEEE601	Power System Protection	3	1	0	4
TEEE602	Power Electronics	3	1	0	4
TEEE603	Principles of Electrical Machine Design	3	1	0	4
TEEE604	Digital Signal Processing	3	1	0	4
TEEE606	Electrical Power Transmission & Distribution	3	1	0	4
TEEE702	Power System Analysis	3	1	0	4
TEEE703	Electrical Drives	3	1	0	4
TEEE704	Utilization of Electrical Energy and Traction	3	1	0	4
TEEE706	Intelligent Instrumentation	3	1	0	4
TEEE801	Non Conventional Energy Resources	3	1	0	4

Director

Registrar
IFTM University
Moradabad.

TEEE802		Power System Operation and Control	3	1	0	4
TEEE803		Power Station Practice	3	1	0	4
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
TEEE351		Electrical Machine -I Lab	0	0	2	1
TEEE352		Network Lab	0	0	2	1
TEEE353		Electronic Devices Lab	0	0	2	1
TEEE354		Electrical Measurements -I Lab	0	0	2	1
TEEE451		MATLAB and SIMULINK Lab	0	0	2	1
TEEE452		Digital Electronics Lab	0	0	2	1
TEEE453		Electrical Measurements -II Lab	0	0	2	1
TEEE454		Electrical Machine -II Lab	0	0	2	1
TEEE551		Microprocessor Lab	0	0	2	1
TEEE552		Electrical Machine-III Lab	0	0	2	1
TEEE553		Control System Lab	0	0	2	1
TEEE554		Instrumentation Engineering Lab	0	0	2	1
TEEE651		Power System Protection Lab	0	0	2	1
TEEE652		Power Electronics Lab	0	0	2	1
TEEE653		Electrical Machine Design Lab	0	0	2	1
TEEE654		Digital Signal Processing Lab	0	0	2	1
TEEE752		Power System Analysis Lab	0	0	2	1
TEEE753		Electrical Drives Lab	0	0	2	1
Engineering Departmental Elective (EDE)			**L**	**T**	**P**	**C**
Elective-I	TEEE605(A)	High Voltage Engineering	3	1	0	4
	TEEE605(B)	Special Electrical Machines	3	1	0	4
	TEEE605(C)	Digital Communication	3	1	0	4
	TEEE605(D)	Robotics	3	1	0	4
	TEEE605(E)	Electrical and Hybrid Vehicles	3	1	0	4
	TEEE605(F)	ENERGY MANAGEMENT SYSTEMS	3	1	0	4
	TEEE605(G)	Power Theft and Energy Management	3	1	0	4
	TEEE605(H)	Conventional & CAD of Electrical Machines	3	1	0	4
	TEEE605(I)	Smart Energy Delivery Systems	3	1	0	4
	TEEE605(J)	Analog & Digital Communication	3	1	0	4
	TEEE605(K)	Telemetry & Data Transmission	3	1	0	4
	NCC01	NCC General	3	1	0	4
Elective-II	TEEE705(A)	Artificial Neural Network & Fuzzy System	3	1	0	4
	TEEE705(B)	Generalized Theory of Elect. Machines	3	1	0	4
	TEEE705(C)	Embedded Systems	3	1	0	4
	TEEE705(D)	Advanced Digital Signal Processing	3	1	0	4
	TEEE705(E)	Deregulated Power System	3	1	0	4
	TEEE705(F)	Electrical Standards and Engineering Practices	3	1	0	4
	TEEE705(G)	Entrepreneurship Development	3	1	0	4
	TEEE705 (H)	ADVANCED CONTROL SYSTEM	3	1	0	4
	TEEE705 (I)	Power Quality & FACTS	3	1	0	4
	TEEE705 (J)	Deregulated Power System	3	1	0	4
	TEEE705 (K)	Energy Conservation & Auditing	3	1	0	4
	TEEE705 (L)	Bio-medical Instrumentation	3	1	0	4
	TEEE705 (M)	Application of Power Electronics to power system	3	1	0	4
MOOCs/NPTEL/ Mandatory Course/ Value added courses (VAC)			**L**	**T**	**P**	**C**
TECE101		Environmental Science	3	1	0	4

Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

TEHU301	Disaster Management (Audit Paper)	2	1	0	0
Project/ Seminar/Industrial Training/ General Proficiency (PST)		**L**	**T**	**P**	**C**
TGP101	General Proficiency	-	-	-	1
TGP201	General Proficiency	-	-	-	1
TGP301	General Proficiency	-	-	-	1
TGP401	General Proficiency	-	-	-	1
TGP501	General Proficiency	-	-	-	1
TGP601	General Proficiency	-	-	-	1
TGP701	General Proficiency	-	-	-	1
TGP801	General Proficiency	-	-	-	1
TEEE751	Seminar*	0	0	2	1
TEEE754	Industrial Training (Evaluation & Viva)	0	0	2	1
TEEE851	Project	0	0	20	10

Director

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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 / FSC	TECE101	**Environmental Science**	3	1	0	20	10	30	70	100	4
4.	HML/FSC	TPSD101	**Professional Skill Development-I**	3	1	0	20	10	30	70	100	4
5.	FSC / FSC	TEEE101	**Electrical Engineering**	3	1	0	20	10	30	70	100	4
6.	FSC / 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	TEEE151	**Electrical Engg. Lab**	0	0	2	-	-	30	70	100	1
9.	ELC	TEME152	**Materials & Manufacturing 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**

Director

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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 / VAC	TECH201	**Engineering Chemistry**	3	1	0	20	10	30	70	100	4
4.	FSC/ HML	TEME201	**Engineering Mechanics**	3	1	0	20	10	30	70	100	4
5.	FSC / FSC	TEEC201	**Electronics Engineering**	3	1	0	20	10	30	70	100	4
6.	FSC / FSC	TECS201	**Computer Fundamentals & Programming**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TECH251	**Chemistry Lab**	0	0	2	-	-	30	70	100	1
8.	ELC	TEEC251	**Electronics Engg. Lab**	0	0	2	-	-	30	70	100	1
9.	ELC	TECS251	**Computer 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**

Director

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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	TEEE301	Electrical Machine-I	3	1	0	20	10	30	70	100	4
3.	ECC	TEEE302	Electrical Measurements And Measuring Instruments-I	3	1	0	20	10	30	70	100	4
4.	ECC	TEEE303	Analog Electronic Devices	3	1	0	20	10	30	70	100	4
5.	ECC	TEEE304	Electromagnetic Field Theory	3	1	0	20	10	30	70	100	4
6.	ECC	TEEE305	Networks and Systems	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												
7.	ELC	TEEE351	Electrical Machine -I Lab	0	0	2	-	-	30	70	100	1
8.	ELC	TEEE352	Network Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TEEE353	Electronic Devices Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TEEE354	Electrical Measurements -I Lab	0	0	2	-	-	30	70	100	1
11.	PST	TGP301	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

*** Internal Assessment**

 # The Subject (TEHU-301), 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.

Director

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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.	FSC	TEMA401	Computer based Numerical &Statistical Techniques	3	1	0	20	10	30	70	100	4
2.	ECC	TEEE401	Electrical Measurements And Measuring Instrument-II	3	1	0	20	10	30	70	100	4
3.	ECC	TEEE402	Electrical Machine –II	3	1	0	20	10	30	70	100	4
4.	ECC	TEEE403	Digital Electronics	3	1	0	20	10	30	70	100	4
5.	ECC	TEEE404	Signal and Systems	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
PRACTICALS / PROJECT												
8.	ELC	TEEE451	MATLAB and SIMULINK Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TEEE452	Digital Electronics Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TEEE453	Electrical Measurements -II Lab	0	0	2	-	-	30	70	100	1
11.	ELC	TEEE454	Electrical Machine -II Lab	0	0	2	-	-	30	70	100	1
12.	PST	TGP401	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Director

Registrar
IFTM University
Moradabad

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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	TEEE501	Microprocessor Engineering	3	1	0	20	10	30	70	100	4
2.	ECC	TEEE502	Electrical Engineering Material Science	3	1	0	20	10	30	70	100	4
3.	ECC	TEEE503	Commutating Machines	3	1	0	20	10	30	70	100	4
4.	ECC	TEEE504	Control System	3	1	0	20	10	30	70	100	4
5.	HML	TEHU501	Human Values & Professional Ethics	3	1	0	20	10	30	70	100	4
6.	EDE	TEEE505	Instrumentation Engineering	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TEEE551	Microprocessor Lab	0	0	2	-	-	30	70	100	1
8.	ELC	TEEE552	Electrical Machine-III Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TEEE553	Control System Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TEEE554	Instrumentation Engineering Lab	0	0	2	-	-	30	70	100	1
11.	PST	TGP501	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Director

Registrar
IFTM University
Moradabad

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

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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	TEEE601	Power System Protection	3	1	0	20	10	30	70	100	4
2.	ECC	TEEE602	Power Electronics	3	1	0	20	10	30	70	100	4
3.	ECC	TEEE603	Principles of Electrical Machine Design	3	1	0	20	10	30	70	100	4
4.	ECC	TEEE604	Digital Signal Processing	3	1	0	20	10	30	70	100	4
5.	EDE	TEEEI	Elective-I	3	1	0	20	10	30	70	100	4
6.	ECC	TEEE606	Electrical Power Transmission & Distribution	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
8.	ELC	TEEE651	Power System Protection Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TEEE652	Power Electronics Lab	0	0	2	-	-	30	70	100	1
10.	ELC	TEEE653	Electrical Machine Design Lab	0	0	2	-	-	30	70	100	1
11.	ELC	TEEE654	Digital Signal Processing Lab	0	0	2	-	-	30	70	100	1
12.	PST	TGP601	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Departmental Elective – I

TEEE605(A)	High Voltage Engineering
TEEE605(B)	Special Electrical Machines
TEEE605(C)	Digital Communication
TEEE605(D)	Robotics
TEEE605(E)	Electrical And Hybrid Vehicles
TEEE605(F)	Energy Management Systems
TEEE605(G)	Power Theft And Energy Management
TEEE605(H)	Conventional & CAD of Electrical Machines
TEEE605(I)	Smart Energy Delivery Systems
TEEE605(J)	Analog & Digital Communication
TEEE605(K)	Telemetry & Data Transmission
NCC01	NCC General

Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

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

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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.	HML	TEHU701	Industrial Management	3	1	0	20	10	30	70	100	4
2.	ECC	TEEE702	Power System Analysis	3	1	0	20	10	30	70	100	4
3.	ECC	TEEE703	Electrical Drives	3	1	0	20	10	30	70	100	4
4.	ECC	TEEE704	Utilization of Electrical Energy and Traction	3	1	0	20	10	30	70	100	4
5.	ECC	TEEEII	Elective-II	3	1	0	20	10	30	70	100	4
6.	ECC	TEEE706	Intelligent Instrumentation	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	PDT	TEEE751	Seminar*	-	-	2	-	-	100	-	100	1
8.	ELC	TEEE752	Power System Analysis Lab	0	0	2	-	-	30	70	100	1
9.	ELC	TEEE753	Electrical Drives Lab	0	0	2	-	-	30	70	100	1
10.	PDT	TEEE754	Industrial Training (Evaluation & Viva)	0	0	2	-	-	100	-	100	1
11.	PST	TGP701	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-	**1100**	**29**

Departmental Elective – II

TEEE705(A)	Artificial Neural Network & Fuzzy System
TEEE705(B)	Generalized Theory Of Elect. Machines
TEEE705(C)	Embedded Systems
TEEE705(D)	Advanced Digital Signal Processing
TEEE705(E)	Deregulated Power System
TEEE705(F)	Electrical Standards And Engineering Practices
TEEE705(G)	Entrepreneurship Development
TEEE705 (H)	Advanced Control System
TEEE705 (I)	Power Quality & Facts
TEEE705 (J)	Deregulated Power System
TEEE705 (K)	Energy Conservation & Auditing
TEEE705 (L)	Bio-Medical Instrumentation
TEEE705 (M)	Application of Power Electronics To Power System

Director

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electrical Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
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.	VAC	TEE-801	Non Conventional Energy Resources	3	1	0	20	10	30	70	100	4
2.	ECC	TEEE802	Power System Operation and Control	3	1	0	20	10	30	70	100	4
3.	ECC	TEEE803	Power Station Practice	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
4.	PST	TEEE851	Project	0	0	20	-	-	300	400	700	10
5.	PST	TGP801	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**09**	**03**	**20**	-	-	-	-	**1100**	**23**

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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 and employability.

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 and employability

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 and employability.

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 and employability.

Course Outcomes:

Students completing this course will be able to:

CO1: Remember the basics of matrices and apply the concept of rank for solving linear simultaneous equations for skill development and employability

CO2: Apply the concept of limit, continuity and differentiability in the study of Rolle's, Lagrange's, Cauchy mean value theorem and Leibnitz theorem at National level for skill development and employability

CO3: Apply partial differentiation for evaluating extreme values, expansion off unction and Jacobian for skill development and employability

CO4: Apply the methods of multiple integral for finding area, volume, centre of mass and centre of gravity at Global level for skill development and employability

CO5: Apply the concept of vector for evaluating directional derivatives, tangent and normal planes, line, surface and volume integrals at Local level 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	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	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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 them for skill development and employability, including interactions across local to global scales.

UNIT I **(8 Sessions)**
Environment: Definition of environment. Environmental education. Need for the public awareness. : Concept of Ecology: Ecosystem, energy and nutrients flow in ecosystem food chain.
Environmental segment: Atmospheric structure. Classification of air pollutants, sources of air pollution and their effect on human health and property

UNIT II **(8 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.

UNIT III **(8 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 **(8 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.

UNIT V **(8 Sessions)**
Air and Noise Pollution: Air pollution chemistry, meteorological aspects of air pollution dispersion. Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels. Noise indices. Noise control methods

Course outcome:
After completion of this course student will be able to:
CO1: Understand the issues and challenges related to environmental and ecosystem for global, national and international importance due to some human activities, it will develop the skills of students.
CO2: Understand 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 and control methods for the same, to develop the skills of students.
CO5: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world, at local and global level it will develop the entrepreneurship skill of student.

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)

Director

Registrar
IFTM University
Moradabad.

	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:

- "Environmental studies" Benny Joseph, Tata McgrawHill-2005
- "Environmental studies"-Dr D.L. Manjunath, Pearson Education-2006
- "Environmental studies" R. Rajagopalan, Oxford Publication-2005
- "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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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 I **(08 sessions)**

Relativistic Mechanics: Frame of reference, Michelson-Morley Experiment, Develop skills to understand the employability of Lorentz transformation equation, Length contraction & Time dilation, Addition of velocities, Variation of mass with velocity and Mass energy relation.

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.
Develop skills to understand Fermi –Dirac statistics, Distribution law and its application to electrons in metals, Calculation of Fermi energy and average energy of electrons in metals.

UNIT III **(10 sessions)**

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

UNIT IV **(08 sessions)**

Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Develop skills to understand the application of Lasers.

UNIT V **(08 sessions)**

Fibre Optics: Develop skills to understand the 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.

Course Outcomes:

Students completing this course will be able to:
CO1: Develop skills to understand and learn Frame of reference, Lorentz transformationequation at International
CO2: Develop skills to understand Statistical Mechanics, Maxwell- Boltzmann statistics andits application.
CO3: Understand De-Broglie Hypothesis, Davisson -Germer Experiment at Local level bydeveloping skills.
CO4: Develop skills to attain basic knowledge on different types of LASERs and theirapplications.
CO5: Gain knowledge of optical fibre and its applications at Global level for skilldevelopment, employability & 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	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. Beiser, "Concepts of Modern Physics".
2. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TPSD101: PROFESSIONAL SKILL DEVELOPMENT-I

Course 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 resume, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

Unit I **(08 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 for skill development and employability, Omission of Articles, Repetition of Articles. **Verbs:** Kinds: Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

Unit II

Basic Applied Grammar Continued **(06 Sessions)**

Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. **Adverbs:** Kinds and Usage for skill development and employability. **Prepositions:** Kinds and Usage. **Conjunctions:** Kinds; Usage. **Interjections:** Definition; Usage.

Unit III **(10 Sessions)**

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

Unit IV **(06 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.

Unit V **(08 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:

Students completing this course will be able to:

CO1: Write paragraph, gist or abstract/précis of the passage in their own words/language, resume, bio-data, letters and applications of different kinds for skill development and employability.

CO2: Use targeted grammatical structures meaningfully and appropriately in oral and writtenproduction at international level for skill development and employability.

CO3: Enhance competence in the four modes of literacy: writing, speaking, reading &listening for skill development and employability.

CO4: Understand and recall facts and main idea locally for skill development and employability.

CO5: Understand writing of resume, bio-data, Letters & Applications 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	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	2	1
CO2	3	2	1
CO3	3	2	1

Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources

- www.wikipedia.com
- www.englishgrammar.org
- www.usingenglish.com
- www.grammarly.com

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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: Draw the relevant phasor diagrams and waveform diagrams of voltage and current along with the concepts of reactance and impedance and power factor. Use of resonance and implications for practical circuits nationally for skill development and employability.

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 globally 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 internationally 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	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)

Director

Registrar
IFTM University
Moradabad.

	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. Hayt P, "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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Electrical 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.

UNIT I **(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 ofmaterials, plant layout and production locally for skill development.

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 Nationally for skill development andemployment.

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.

CO5: Able to understand various type of welding process and their application in specific field nationally 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	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

Director

Sanjeev Agrawal
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	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
- https://onlinecourses.nptel.ac.in

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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 and employability development.

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

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
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 to generate employability.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter and their employability scopes.
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.
11. To determine energy band gap of a given semiconductor material and its employability scope.
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 its employability scope.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

Course Outcomes:
The students completing this course will be able to:
CO1: Develop skills locally to understand principle, concept, working and application oftechnology and comparison of results with theoretical calculations.
CO2: Apply the various procedures and techniques for the experiments to createemployability scopes.
CO3: Develop skills to understand usage of instruments and real time applications inengineering studies.
CO4: Develop skills nationally to understand the basic communication skills throughworking in groups in performing the laboratory experiments and by interpreting the results.
CO5: Determine the wavelength of monochromatic light & spectral lines using differentmethods to create employability scopes.

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. Engineering Practical Physics by S. L. Gupta

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

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 Electrical Engineering

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

TEEE151: ELECTRICAL ENGINEERING LAB

Objective: **(20 Sessions)**

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

LIST OF EXPERIMENTS:

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 transformer for 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: Explain 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 Internationally 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 globally for employability and entrepreneurship development.

CO5: Acquire skills in using electrical measuring devices 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	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	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

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Electrical 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 lathe for 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. locally for skill development, employability and entrepreneurship.

CO2: To define and use different welding processes e.g. gas welding and electric arc welding for skill development, employability and entrepreneurship.

CO3: To acquire thorough knowledge of carrying out various operations on lathe machine nationally for skill development, employability and entrepreneurship.

CO4: To acquire skills for creating different objects from raw materials for skill development,, employability and entrepreneurship.

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

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department Of Electrical 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 for skill development, employability and entrepreneurship.

Unit I

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.

Unit II

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

Unit III

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.

Unit IV

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 outcomes:

Students completing this course will be able to:

CO1: Use the drawing instruments effectively and able to dimension the given figures skilldevelopment and employability.

CO2: Appreciate the usage of engineering curves in tracing the paths of simple machine components nationally skill development and employability.

CO3: Understand the concept of projection and acquire visualization skills, projection of points globally for skill development and employability.

CO4: Able to draw the basic views related to orthographic projections of Lines, Planes skilldevelopment, employability and entrepreneurship.

CO5: Able to draw the basic views related to isometric projections of Lines, Planes skilldevelopment, 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	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	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	3

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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.
CO2: To draw Free Body Diagram and label the reactions on it locally 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 locally for skill development and employability.
CO5: Understand Newton's law in motion, and recognize different kinds of particle motions for kill 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	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

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEMA201: ENGINEERING MATHEMATICS–II

Objective: - 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 development and employability.

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) for skill development and employability.

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 for 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 for skill development and employability.

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 for 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 upto two-dimensions. Equations of transmission Lines for skill development and employability.

Course Outcomes:

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

CO1: Apply differential calculus and higher order problems and necessary and sufficientcondition for total differential equations nationally for skill development and employability.

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

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

CO4: Solve second and higher order linear Partial differential equations with constant coefficients and construct all solutions from the linearly independent solutions for skilldevelopment and employability.

CO5: Solve partial differential equations with methods & its Applications 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	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	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TECH201: ENGINEERING CHEMISTRY

Objectives

- 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.

UNIT I: Matter - Chemical Bonding and its States **(10 Sessions)**

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 development and employability.

UNIT II: Chemical Kinetics and Electrochemistry **(10 Sessions)**

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 for skill development and employability and classification of corrosion, electrochemical corrosion.

UNIT III: Reaction Mechanism and Spectroscopy **(10 Sessions)**

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 development and employability.

UNIT IV: Polymers **(10 Sessions)**

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 development and employability

UNIT V: Water Treatment And Fuels **(10 Sessions)**

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 development. employability & entrepreneurship development.

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)

Course Outcomes:

Upon completion of course, students will be able to:

CO1: Gain knowledge about the basic concepts of chemistry and states of matter for skill development and employability.

CO2: Understand kinetic and electrochemical methods for various reactions nationally for skill development and employability.

CO3: Demonstrate the mechanism of different reactions and their characterization using spectroscopy for skill development and employability.

CO4: Learn about the various kinds of polymers and their applications locally for skill development and employability.

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 development, employability & 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	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

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	2	1
CO3	1	3	1
CO4	3	1	2
CO5	1	1	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 Engineering by M.G. Fontana McGraw 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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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 and employability development.

UNIT I **(10 Sessions)**

Electromagnetic Theory

Gauss law, continuity equation, Ampere's Law, Maxwell's equations (differential and integral forms), Poynting vector and Poynting Theorem, propagation of plane electromagnetic waves in free space Non conducting and in conducting media, Skin depth and its employability scopes.

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.

Magnetic Properties: Magnetization, Magnetic moment, Skills to understand Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve.

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 and their scopes in employability.

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 and their scopes in employability.

Ultrasonics: Introduction, Production of Ultrasonics (Magneto striction and piezoelectric methods), properties & applications of Ultrasonic waves.

Course Outcome:

The students completing this course will be able to:

CO1: Develop skills locally to understand Gauss law, Ampere's Law, Maxwell's equations and their applications.

CO2: Develop skills to understand Dielectric and magnetic properties of the materials.

CO3: Develop skills to explain intrinsic and extrinsic semiconductors and the construction, operation and characteristics of diodes.

CO4: Develop skills internationally to understand concepts of superconductors, Properties of superconductors & applications of superconductors and the basic principle of nano science and technology and applications of nanotechnology.

CO5: Gain basic knowledge on the properties, production, applications and employability scopes of X-rays.

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

Director

Registrar
IFTM University
Moradabad.

CO5	1	1	3

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TECS201: COMPUTER FUNDAMENTALS & PROGRAMMING

Objective: The objective of this course is to introduce 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 and employability.

UNIT I **(08 Sessions)**

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 for skill development. File Allocation Table, Hardware.

UNIT II **(10 Sessions)**

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 for skill development and employability. Use of high level programming languages for the development of programs.

UNIT III **(08 Sessions)**

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 for skill development and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity.

UNIT IV **(09 Sessions)**

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.

UNIT V **(07 Sessions)**

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 helpful in skill development and employability.

Course Outcome:

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

CO1: Understand Basic knowledge of components of Computer Locally for skilldevelopment.

CO2: Understand 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.

CO3: Understand how to write, compile and debug programs in C language and use different data types for writing the programs internationally for skill development.

CO4: Understand how to design programs using the concepts decision statements, loops, functions, arrays pointers etc. for skill enhancement.

CO5: Do Programming by using function, recursion and pointers which is helpful in 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	1	1	1	1	1	1	1	1	1	1
CO2	2	2	1	1	1	1	1	1	1	1	2	1
CO3	3	2	1	1	1	2	1	1	1	1	1	1
CO4	3	3	1	3	1	2	1	1	1	1	2	1
CO5	3	3	1	3	1	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)

Director

Registrar
IFTM University
Moradabad.

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

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 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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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, minimization using K-map (Upto four variable, don't care conditions also)

UNIT V **(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.

Course Outcome:

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

CO1: Understand the basics of semiconductor technology globally for skill development and Employability.
CO2: Understand P-N junction diode and its applications for Employability.
CO3: Understand the basics of BJT and MOSFET for Employability.
CO4: develop understanding of numbers system and basics of Logic Gates Nationally for skill development.
CO5: discuss the operational amplifier and its application and the need of modulation in the communication system 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
CO 1	3	1	1	1	1	1	1	2	1	1	1	1
CO 2	1	1	1	1	1	1	1	2	1	1	1	1
CO 3	1	3	2	1	1	1	1	1	2	1	1	1
CO 4	1	1	1	1	1	1	1	1	1	3	1	1
CO 5	1	1	1	1	1	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	1	3	1
CO2	2	3	1
CO3	1	3	1
CO4	2	1	1
CO5	2	1	1

Suggested readings:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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 for 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 behaviour of materials upon normal external loads locally for skill development and employability.
CO2: Predict the behaviour of the material under impact conditions for skill development and employability.
CO3: Recognize the mechanical behaviour of materials locally for skill development and employability.
CO4: Recognize parts of IC engines for skill development and employability.
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

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:

Director

Registrar
IFTM University
Moradabad.

- 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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TECH251: CHEMISTRY LAB

Objectives

- 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 for skill development and employability.
- To provide an overview of preparation and identification of organic compounds

List of Experiments **(20 Sessions)**

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 Outcomes:
Upon completion of course, students will be able to:
CO1: Estimate the impurities present in water for skill development and employability.
CO2: Prepare advanced polymer materials locally for skill development, employability and entrepreneurship development.
CO3: Know the strength of an acid present in secondary batteries for skill development and employability.
CO4: find the Fe^{+2}, Ca^{+2}& Cl^{-} present in unknown substances using titrimetric and instrumental methods for skill development, employability and entrepreneurship development.
CO5: Element detection and functional group identification in organic compounds nationally 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	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. Applied Chemistry by R. S. Katiyar & J.P. Chaudhary Publication B.B.P. & Co. Meerut

Director

Registrar
IFTM University
Moradabad.

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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical 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.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance.
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)
9. To build and test the clipper circuit using diode.
10. To build and test the clamper circuit using diode for skill development.

Course Outcome:
Students taking this lab will be able to:
CO1: understand the basics of semiconductor technology globally for skill development and Employability.
CO2: understand P-N junction diode and its applications for Employability.
CO3: understand the basics of BJT and MOSFET for Employability.
CO4: develop understanding of numbers system and basics of Logic Gates nationally for skill development.
CO5: discuss the operational amplifier and its application and the need of modulation in the communication system 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	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

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 edition of all the suggested readings must be used.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TECS251: COMPUTER LAB

List of Experiments **(20 Sessions)**

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

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: Understand Basic knowledge of components of Computer Locally for skilldevelopment.
CO2: Understand 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.
CO3: Understand how to write, compile and debug programs in C language and use different data types for writing the programs internationally for skill development.
CO4: Understand how to design programs using the concepts decision statements, loops, functions, arrays pointers etc. for skill enhancement.
CO5: Do Programming by using function, recursion and pointers which is helpful in 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	1	1	1	1	1	1	1	1	1	1
CO2	2	2	1	1	1	1	1	1	1	1	2	1
CO3	3	2	1	1	1	2	1	1	1	1	1	1
CO4	3	3	1	3	1	2	1	1	1	1	2	1
CO5	3	3	1	3	1	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	1	1	1
CO2	1	2	1
CO3	3	1	1
CO4	3	1	1
CO5	3	3	1

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 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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE301: ELECTRICAL MACHINES-I

Objective: Electrical machines course is one of the important courses of the Electrical discipline. This course includes Working principles, construction and operation of single phase and three phase transformers will be studied. This course includes AC machines fundamentals and production of rotating magnetic field to provide skill development, employability and entrepreneurship development.

UNIT I **(09 Sessions)**

Transformers: Constructional features & principle of working, shell type & core type transformers, phasor diagram of ideal transformer under no load, lagging load & leading type of loads for skill development, Phasor diagram of practical transformer under various types of loads, Equivalent circuit of a transformer, Rating of transformer for entrepreneurship development, open circuit & short circuit tests, Per unit system, voltage regulation, losses & efficiency, Separation of hysteresis and eddy current losses for employability.

UNIT II **(08 Sessions)**

Transformers (Continued): Division of load between two transformers in parallel, phasor diagram, testing of transformers, load test(Back to Back Test), Method of cooling transformer, three phase transformers- various types of connections ΔΔ, YY, ΔY & YΔ, zigzag, open V, T & Scott connections & their transformation ratios. Tests on three phase transformer for skill development and employability.

UNIT III **(05 Sessions)**

Rotating Magnetic fields: Ferrari's principle- two phase supply- three phase supply, Rotating field of a three phase machine. Principle of working, concept of torque production for skill development and employability.

UNIT IV **(09 Sessions)**

Induction Motor: Synchronous speed & slip, constructional features & working principle. Flux &mmf phasors. Squirrel cage & phase wound rotors, production of torque, relation between slip & rotor copper loss, methods of starting squirrel cage rotor, equivalent circuit & its analysis for skill development, Torque- slip characteristics. Operating characteristics of induction motors. Crawling of induction motors, magnetic locking. The circuit diagram of induction motor, The effect of magnetic leakage on the operation of motor for employability.

UNIT V **(09 Sessions)**

The Induction motor (Continued): Starting of poly phase wound rotor induction motors, Squirrel cage motor with higher starting torque. Power factor control of 3 phase induction motors, testing of induction motor- no load test & blocked rotor test. Induction generators- working principle, single phase induction motor- working of 1 phase induction motor, torque-slip curve for single phase induction motor, various methods of starting for skill development and employability and entrepreneurship development.

Course Outcomes:

On completion of the course, student will be able to

CO1: Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers locally for skill development, employability and entrepreneurship development.

CO2: Determine and interpret efficiency and regulation of a 1 Ph transformer and also operate two single phase Transformers in parallel, Test and identify faults in transformer for skill development and employability.

CO3: Understand the principle of operation and the effect of pulsating, rotating magnetic fields on the working of AC machines for skill development and employability.

CO4: Understand the basic concept of Three-phase induction motor and its torque slipcharacteristics along with their equivalent circuit for skill development and employability.

CO5: Understand the testing methods of induction motor and working of single phaseinduction motor along with its various methods of starting & concept of induction generator locally 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	3	3	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	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)

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

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

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

Suggested Readings:

1. D. P. Kothari & I. J. Nagrath, "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans "Electric Machinery", MC Graw Hill.
3. P. S. Bhimbhra, "Electrical Machinery", Khanna Publisher
4. M. G. Say, "Alternating Current Machines", Pitman & Sons

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, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE302: ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS- I

Objective: To provide in-depth understanding of Measurement errors, Bridge measurements for skill development, employability and entrepreneurship development.

UNIT I **(08 Sessions)**

Units, Dimensions & Standards: C.G.S. electrostatic & electromagnetic system of units – The connection between such systems – Practical units & their relationship to the absolute units – Dimensions' of electrical quantities – the M.K.S. system of units – Rationalized system of units. International and absolute units and standards, Primary, Secondary and working standards of resistance, self & mutual inductance and capacitance, Errors & their classification, Statistical analysis of errors & their measurements for skill development.

UNIT II **(05 Sessions)**

Measuring Instruments: Classification – Absolute & secondary instruments – control, damping & balancing – constructional details, Recording & Integrating Instruments for skill development and employability.

UNIT III **(09 Sessions)**

Measurement of current & voltage: Error in ammeter & voltmeter, classification of instruments Construction and working of Moving iron instruments, Moving coil instruments – P.M.M.C. type & Dynamometer type moving coil instruments for skill development and employability, Electrostatic instruments, Thermal Instruments & Rectifier Instruments. Range extension of indicating instruments. Potentiometers – simple d.c. potentiometer – a.c. potentiometer – Measurement of current & voltage using potentiometer.

UNIT IV **(09 Sessions)**

Measurement of power: Mean power in a.c. circuits – Wattmeter measurement in single phase circuits, Measurement of power without using a wattmeter, Measurement of three phase power using three, two & one wattmeter method, Wattmeter errors. Wattmeter – Dynamometer type, induction type & Electrostatic type, Poly phase wattmeter. Measurement of reactive power for skill development, employability and entrepreneurship development.

UNIT V **(09 Sessions)**

Measurement of Resistance Classification of Resistances-Low resistances, Medium resistances and High resistances. Measurement of Low resistance- Kelvin's double Bridge, Measurement of medium resistance-Ammeter & voltmeter method. Method of substitution Wheatstone Bridge method, Method of measurement of high resistance-Deflection method, Loss of charge method, Ohm-meters, Megger, Measurement of Surface and Volume resistivity for skill development and employability.

Course Outcome:

On completion of the course, student will be able to

CO1: Compare calibrated meter readings with standard meters (digital meters) for skill development.
CO2: Classify and understand the constructional details of measuring instruments locally for skill development and employability.
CO3: Ability to understand the moving iron type, moving coil type and many otherinstruments for skill development.
CO4: Ability to measure power using wattmeter method nationally for skill development,employability and entrepreneurship development.
CO5: Ability to measure low, medium and high resistances for skill development andemployability.

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	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	2	2	2	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	1	1
CO4	3	3	3
CO5	3	3	1

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

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Electrical and Electronic Measurements - G.K. Banerjee (PHI Learning)
2. Electrical Measurements & Measuring Instruments– E.W. Golding &Widdis (Sir Issac Pitman)
3. Electrical Measurements – M.B.Stout

Website Sources:

- www.lecturenotes.in
- www.academia.edu
- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.newtondesk.com
- www.vlab.co.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 Electrical Engineering

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

TEEE303: ANALOG ELECTRONIC DEVICES

Objective: To expose the students to the semiconductor device, performance characteristics and their application for skill development and employability.

UNIT I **(08 Sessions)**

Introduction: Classification of Solids: - conductors, insulators & semiconductors, Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, mobility of charge carriers and conductivity of semiconductor, drift velocity and collision time for skill development and employability.

UNIT II **(08 Sessions)**

Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions, Current & voltage relationship of a p-n junction diode, Ratings & Applications of a P-N junction diode-rectifiers, clipper & clamper, Applications of Zener diode, Zener diode as a voltage regulator. Numerical Problems K for skill development and employability.

UNIT III **(09 Sessions)**

Bipolar junction transistor: Construction & working of n-p-n & p-n-p transistor, biasing, Effect of temperature on leakage current, Transistor load line analysis – Operating point, Transistor as a switch, Transistor configurations- common emitter, common base & common collector and their characteristics, Transistor as an amplifier:- common emitter amplifier circuit, common base amplifier circuit & common collector amplifier circuit, Frequency response for skill development, Numerical Problems

UNIT IV **(08 Sessions)**

Operation Amplifier: Differential Amplifier circuit, Op-Amp Basics & Specifications, Op-amp circuits- inverting and non-inverting amplifier, Buffers, Adders, Sub tractors, Multipliers, Differentiators, Integrators, Comparators for skill development, employability and entrepreneurship development, Numerical Problems ,

UNIT V **(07 Sessions)**

Some special Transistors & Devices:- FET, Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Photo diodes, photo detectors, solar cell, light emitting diodes, Tunnel diode for skill development.

Course Outcomes:

On completion of the course, student will be able to

CO1: Understand operation of semiconductor devices nationally for skill development andemployability.
CO2: Understand the junction properties with the help of diode for skill development andemployability.
CO3: Understand the concept of BJT nationally for skill development.
CO4: Understand the Op-Amps and their use for skill development, employability andentrepreneurship development.
CO5: Differentiate types of transistors 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	3	2	2	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	2	2	2	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	3	1
CO2	3	3	1
CO3	3	1	1
CO4	3	3	3
CO5	3	1	1

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

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Electronic Devices & Circuit Theory by R.L .Boylestad& L. Nashelsky, Pearson India
2. Electronics Engineering by Sanjay Sharma, S.K. Kataria& Sons
3. Electronics Engineering by J.S. Katre, Tech Max Publications
4. Electronic Principles by A.P. Malvino& Bates, Tata Mc-Graw-Hill
5. Solid State Electronic Devices by B.G. Streetman & S. Banerjee, Prentice Hall of India

Website Sources:

- www.lecturenotes.in
- 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, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE304: ELECTROMAGNETIC FIELD THEORY

Objective: Electromagnetic is a branch of physics or electrical engineering which is used to study the electric and magnetic phenomena to provide skill development, employability and entrepreneurship development.

UNIT I: **(09 Sessions)**

Vector Analysis: Scalar and vectors, Addition and subtraction of vectors, multiplication and division of a vector by a scalar Multiplication of two vectors, The unit vector. **Coordinate systems and transformation:** Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector, The divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar for skill development.

UNIT II: **(08 Sessions)**

Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for solving Poission's and Laplace's equations, resistance and capacitance, method of images for skill development.

UNIT III: **(08 Sessions)**

Magneto-statics: Magneto-static fields, Bio-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy for skill development and employability.

UNIT IV: **(08 Sessions)**

Electromagnetic Waves and Maxwell's equations: Faraday's Law, Transformer and motional electromotive forces, displacement current, Maxwell's equation in differential and integral form. **Electromagnetic wave propagation:** Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence for skill development and employability.

UNIT V: **(07 Sessions)**

Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, some applications of transmission lines for skill development, employability and entrepreneurship development.

Course Outcomes:

On completion of the course, student will be able to

CO1: Define and recognize different co-ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time. Apply different techniques of vector calculus to understand different concepts of electromagnetic field theory nationally for skill development.

CO2: Explain fundamental laws governing electrostatic fields and evaluate the physical quantities of electrostatic fields (Field intensity, Flux density etc.) in different media usingthe fundamental laws for skill development.

CO3: Determine the magnetic force exerted on charged particles, current elements, working principle of various magnetic and electromagnetic energy conversion devices are based onthis force for skill development and employability.

CO4: Deduce and justify the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves, TV signals, radar beams and light rays globally for skill development and employability.

CO5: Generalize the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	2	1	1	1	2	1	1	2
CO4	3	3	3	3	3	1	1	1	2	1	1	2
CO5	3	3	3	3	3	1	1	1	2	1	2	2

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

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

Sanjiv Agrawal
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	1	1
CO2	3	1	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	3

Suggested Readings:

1. W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH.
2. M. N. O. Sadiku, "Elements of Electromagnetics", 4th Ed, Oxford University Press
3. P.V.Gupta , "Electromagnetic field theory"

Website Sources:

- www.ocw.mit.edu
- www.springer.com
- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.academia.edu

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 Electrical Engineering

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

TEEE305: NETWORKS AND SYSTEMS

Objective: To learn about the network and circuit solving theorems & also to design the circuits with the help of various theories to provide skill development and employability.

UNIT I **(08 Sessions)**

Network Analysis: Concepts of linear networks, Mesh analysis, Nodal analysis, Network Duality, Matrix Method of Analysis, Analysis of AC Circuits

Network Theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum Power Transfer Theorem, Tellegen's theorem, Millman's theorem, Reciprocity theorem - For Both AC and DC Networks for skill development.

UNIT II **(08 Sessions)**

Graph Theory: Graph of a Network, Definitions of Tree, Co-Tree, Link, Basic Loop, Basic Cut Set, Incidence Matrix, Cut Set Matrix, Tie Set Matrix, Duality, Relationship among A, B and Q, Loop and Node Methods of Analysis for skill development.

UNIT III **(08 Sessions)**

Two Port Networks: Characteristics of LTI Two Port Networks [Z], [Y], ABCD and h-parameters, Reciprocity and Symmetry, Inter Relationships between the parameters, Interconnection of Two Port Networks, T And Π Representations, Ladder and Lattice Networks for skill development and employability.

UNIT IV **(08 Sessions)**

Network Synthesis: Laplace Transform and its applications In Electrical Circuit Analysis, Concepts Of Poles and Zeros, Driving Point Functions, necessary conditions for Transfer Functions, Routh Hurwitz Criteria, Positive Real(PR) Functions and necessary conditions for PR Functions, Cauer and Foster forms, Applicability of Cauer and Foster forms for skill development and employability.

UNIT V **(08 Sessions)**

Analysis of Coupled Circuits: Self Inductance, Mutual Inductance, Coefficient of Coupling, Dot Convention in Coupled Coils

Network Filters: Image Parameters and Characteristic Impedance, Passive and Active Filters, Low Pass, Band Pass, High Pass and Band Elimination Filters for skill development.

Course Outcomes:

On completion of the course, student will be able to

CO1: Analyze the Network & apply their knowledge in analyzing Circuits by using network theorems globally for skill development.

CO2: Study the concept of Graph Theory for skill development.

CO3: Find the various parameters of two port network nationally for skill development and employability.

CO4: Synthesize the network using passive elements for skill development and employability.

CO5: Understand the analysis of coupled circuits and different types of network filters 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	1	1
CO3	3	3	1
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. Network Analysis and Synthesis, A. Chakrabarti

Director

Registrar
IFTM University
Moradabad.

2. Network Analysis, M.E. Van Valkenburg
3. Circuit Theory (Analysis and Synthesis), A. Chakrabarti
4. Franklin F. Kuo- "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt. Ltd.

Website Sources:

- www.springer.com
- www.nptel.ac.in
- www.ocw.mit.edu
- www.electrical-engineering-portal.com

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 Electrical 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.

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 to provide employability & develop skills.

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 to provide employability & develop skills.

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 to provide employability & develop skills.

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 to provide employability & develop skills.

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 to provide employability & develop skills.

Course Outcomes:

Students completing this course will be able to:

CO1: Develop the concepts of Laplace transformation & Inverse Laplace Transformation with its property to solve PDE which is helpful in all engineering & research work locally to provide employability & develop skills.

CO2: Gain knowledge of Fourier series representation for even/odd functions and Z- transforms and its applications nationally to provide employability & develop skills.

CO3: Apply the concept of analyticity and the Cauchy-Riemann equations to analyze results on harmonic and including the fundamental theorem of algebra to provide employability & develop skills.

CO4: Learn about Cauchy's theorem and its uses in complex integration. Taylor's and Laurent's series in complex Form to provide employability & develop skills.

CO5: To be able to apply the knowledge of least square and curve fitting of straight lines to provide employability & develop 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)

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

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

CO5	3	2	1

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 Electrical Engineering

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

TEHU301: 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 developement.

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.

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
- Planning Nutrition intervention programmes
- 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

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

- 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: 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 for skill development.
CO4: Understanding of when an event becomes disaster and the phases to handle thesituation locally for employability.
CO5: Ability to analyze how to handle a situation of disaster by taking case studies of events in past locally 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	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

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, Moradabad ★★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE306: ELECTRICAL MACHINES AND POWER UTILIZATION

Objective:

1. Electrical machines course is one of the important courses of the Electrical discipline.
2. In this course the different types of DC generators and motors which are widely used in industry are covered and their performance aspects will be studied.

UNIT-I:

A.C. Circuit: **(08 Sessions)**

Various methods of three phase power measurement, power factor, reactive and apparent power, concept and analysis of balanced poly-phase circuits for skill development and employability, series and parallel resonance

UNIT-II:

Magnetic Circuit: **(08 Sessions)**

Electro motive force, reluctance, laws of magnetic circuits, analogy between electric & magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, B-H Curve, hysteresis and eddy current losses for skill development and employability.

UNIT-III:

Transformer: **(08 Sessions)**

Principle of working, construction of single phase transformer, types of transformers, ratio of transformation, EMF equation, phasor diagram on load, leakage reactance, voltage regulation, losses and efficiency, open circuit and short circuit tests, Back to Back test, method of cooling transformers for skill development and employability.

UNIT-IV: **(08 Sessions)**

Polyphase Induction Motor: Synchronous speed & slip, construction, operation, phasor diagram, effect of rotor resistance, torque equation, starting and speed control methods for skill development and employability.

Single Phase Induction Motor: Double field revolving theory, equivalent circuit, characteristics, various methods of starting, phase split, shaded pole motors.

UNIT-V : **(08 Sessions)**

DC Machine: Principles, operation and performance of DC machine (generator and motor), types of D.C. machine, EMF and torque equations, armature reaction, commutation, excitation of DC generator and their characteristics, condition for self excitation, DC motor characteristics, starting of shunt and series motor, starters, speed control methods-field and armature control for skill development and employability.

Course Outcomes:

On completion of the course, student will be able to

CO1: Develop the equivalent circuit and phasor diagram of different machines and analyze their performance using the equivalent circuit nationally for skill development and employability.

CO2: Acquire knowledge about the fundamental principles and classification of electromagnetic machines for skill development and employability.

CO3: Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers nationally for skill development and employability.

CO4: Acquire knowledge about the working of Induction Motor for skill development and employability.

CO5: Acquire knowledge about testing and applications of dc machines 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	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	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	3	3
CO2	3	3	1

Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

CO3	3	3	1
CO4	3	3	1
CO5	3	3	3

Suggested Readings:

1. D. P. Kothari & I. J. Nagrath, "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans "Electric Machinery", MC Graw Hill.
3. P. S. Bhimbhra, "Electrical Machinery", Khanna Publisher
4. M. G. Say, "Alternating Current Machines", Pitman & Sons

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, Moradabad ★

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE356: ELECTRICAL MACHINES AND POWER UTILIZATION LAB

Objective:

1. To study and perform the different operating tests on 1-phase transformer.
2. To analyze the variation in load characteristics of induction motor.
3. To examine the performance analysis of 3-phase induction motor for skill development and employability.
4. To perform the speed control methods of 3-phase induction motor.
5. To examine the performance of different types of starters of induction motor.

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

1. To determine the transformation ratio, turns ratio and current ratio of a transformer & prove that they are equal to develop skill.
2. To determine efficiency and voltage regulation of a single phase transformer by load test for better employability in industry.
3. To determine efficiency and voltage regulation of a single phase transformer by open circuit and short circuit test for better employability in industry.
4. To perform load-test on three phase induction motor & to plot torque-speed characteristics for skill development and employability.
5. To perform no-load & blocked-rotor tests on 3 ph. Induction motor to obtain equivalent circuit parameters for skill development and employability.
6. To start a 3-phase slip-ring induction motor by inserting different levels of resistance in the rotor circuit and to plot torque-speed characteristics for skill development and employability.
7. To perform load-test on single phase induction motor & plot torque–speed characteristics for skill development and employability.
8. To control the speed of a D.C. shunt motor using (a) armature control method (b) field control method for skill development and employability.
9. To plot load characteristics of a D.C. shunt generator for skill development and employability.
10. To plot load characteristics of a D.C. series generator for skill development and employability.

Course Outcomes:

On completion of the course, student will be able to

CO1: Develop the equivalent circuit and phasor diagram of different machines and analyze their performance using the equivalent circuit locally for skill development and employability.

CO2: Acquire knowledge about the fundamental principles and classification of electromagnetic machines for skill development and employability.

CO3: Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers locally for skill development and employability.

CO4: Acquire knowledge about the working of Induction Motor for skill development and employability.

CO5: Acquire knowledge about testing and applications of dc machines 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	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	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	3	3
CO2	3	3	1
CO3	3	3	1

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

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

CO4	3	3	1
CO5	3	3	3

Suggested Readings:

1. D. P. Kothari & I. J. Nagrath, "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans "Electric Machinery", MC Graw Hill.
3. P. S. Bhimbhra, "Electrical Machinery", Khanna Publisher
4. M. G. Say, "Alternating Current Machines", Pitman & Sons

Website Sources:

- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.newtondesk.com
- www.academia.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 Electrical Engineering

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

TEEE351: ELECTRICAL MACHINES-I LAB

Objective:

1. To study and perform the different operating tests on 1-phase transformer.
1. To analyze the variation in load characteristics of induction motor.
2. To examine the performance analysis of 3-phase induction motor for skill development and employability.
3. To perform the speed control methods of 3-phase induction motor.
4. To examine the performance of different types of starters of induction motor.

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

1. To determine the transformation ratio and turns ratio and current ratio of a transformer & prove that they are equal to provide employability & skills.
2. To determine efficiency and voltage regulation of a single phase transformer by load test to develop skill.
3. To determine efficiency and voltage regulation of a single phase transformer by open circuit and short circuit test to develop skill.
4. To determine the efficiency of a pair of transformers by Sumpner's test to provide employability & skills.
5. To verify the star-delta, delta-delta, delta-star and star-star connections on a three phase transformer for entrepreneurship & employability.
6. To determine the variation of speed, efficiency, power factor, stator current , torque and slip of an induction motor with load to provide employability & skills.
7. To perform No- Load test and Blocked rotor test on a 3 phase induction motor and determine its equivalent circuit parameters for better employability in industry.
8. To perform load test on a three phase induction motor to develop skill.
9. To control the speed of three phase slip-ring induction motor using rheostatic control method to develop skill.
10. To study a Single phase induction motor and its various method of starting for better employability in industry

Course Outcomes:

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

CO1: Acknowledge the principles of operation and the main features of transformers andtheir applications locally for employability and entrepreneurship development.
CO2: Explain the circuit parameters and its performance analysis for employability.
CO3: Acknowledge the principles of operation and the performance analysis of three phaseinduction motor for skill development and entrepreneurship development.
CO4: Perform the speed control techniques on induction motors globally for employability.
CO5: Acquire skills in using electrical machines like transformer and induction motors forskill development 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	1	3	3
CO2	1	3	2
CO3	3	1	3
CO4	1	3	2
CO5	3	1	3

Suggested Readings:

1. D. P. Kothari & I. J. Nagrath, "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans "Electric Machinery", MC Graw Hill.
3. P. S. Bhimbhra, "Electrical Machinery", Khanna Publisher

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

Registrar
IFTM University
Moradabad.

4. M. G. Say, "Alternating Current Machines", Pitman & Sons

Website Sources:

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

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 Electrical Engineering

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

TEEE352: NETWORKS LAB

Objective:

1. To study and verify the different DC circuit solving theorems using bread board and kit.
2. To analyze the resonance circuits (both series & parallel RLC network) for skill development and employability.
3. To examine the performance of different kinds of filters.

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

1. Verification of principle of superposition with D.C. sources for skill development and employability.
2. Verification of Thevenin's& Norton's theorem in DC circuits to develop skill.
3. Verification of Maximum power transfer theorems in DC circuits to develop skill.
4. Verification of Tellegen's theorem to develop skill.
5. Verification of Reciprocity theorem to develop skill.
6. Determination of transient response of current in series RLC circuit with step voltage input for skill development and employability.
7. Study and computation of Z , H, Y and ABCD parameters of a two port network to develop skill.
8. Determination of resonance frequency for a series RLC circuit to provide employability & skills.
9. To plot the resonance curve for a parallel RLC circuit to provide employability & skills.
10. To study the attenuation characteristics of a low pass / high pass RC filter for better employability in industry.

Course Outcomes:

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

CO1: Understand the DC network theorems for solving DC circuits locally for skilldevelopment.
CO2: Obtain the circuit parameters for skill development.
CO3: Design and explain the filters and resonance circuits for skill development andemployability.
CO4: Determine transient responses nationally for skill development.
CO5: Study of attenuation characteristics of RC filters 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	1
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. Network Analysis and Synthesis, A. Chakrabarti
2. Network Analysis, M.E. Van Valkenburg
3. Circuit Theory (Analysis and Synthesis), A. Chakrabarti
4. Franklin F. Kuo- "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt. Ltd.

Website Sources:

- www.springer.com
- www.nptel.ac.in
- www.ocw.mit.edu
- www.britannica.com
- www.electrical-engineering-portal.com

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 Electrical Engineering

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

TEEE353: ANALOG ELECTRONIC DEVICES LAB

Objective:

1. To study different lab equipment's like CRO, bread board etc.
2. To analyze the performance characteristics of different electronic devices like PN junction, FET-devices, BJT, Zener diode etc for skill development and employability.

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

1. To study the followings lab equipments and equipments: CRO, Multi-meter, Function Generator. Power supply. Active & Passive components & Bread Board to develop skill
2. To plot thecharacteristics of PN Junction Diode and determine its static and dynamic resistance from graphical measurement for better employability in industry.
3. To use PN junction diode as Half & Full wave rectifier and measure V_{rms}, V_{dc}, and ripple factor for better employability in industry
4. To use Zener diode as voltage regulator and measure percentage regulation by varying load resistor to provide employability & skills
5. To determine the characteristic of BJT in CB and CE configuration and measure Av, Ai, R_o and R_i of CE amplifier with potential divider biasing to provide employability & skills
6. To determine the characteristic of FET in common source configuration. And measurement its parameters g_m, r_d&r_o from input and output characteristics graphically to develop skill
7. To measure the gain of Op-Amp when used as inverting and non-inverting amplifiers and buffers to provide employability & skills
8. To verify the performance of Op-Amp based differentiator and integrator circuits to develop skill
9. To verify the performance of Op-Amp based subtracter, multiplier and comparator circuits for better employability in industry.
10. Study the characteristics of MOSFET to develop skill

Course Outcomes:

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

CO1: Understand the different experimental input and output equipment's nationally for skill development and employability.
CO2: Draw and explain the performance of different kinds of electronic devices for skill development and employability.
CO3: Use Zener diode as a voltage regulator for skill development.
CO4: Measure the gain of Op-Amp Internationally for employability.
CO5: Performance of Op-Amp 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	3	1
CO2	3	3	1
CO3	3	1	1
CO4	1	3	1
CO5	3	1	1

Suggested Readings:

1. Electronic Devices & Circuit Theory by R.L .Boylestad& L. Nashelsky, Pearson India
2. Electronics Engineering by Sanjay Sharma, S.K. Kataria& Sons
3. Electronics Engineering by J.S. Katre, Tech Max Publications

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

4. Electronic Principles by A.P. Malvino& Bates, Tata Mc-Graw-Hill
5. Solid State Electronic Devices by B.G. Streetman & S. Banerjee, Prentice Hall of India

Website Sources:

- 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
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE354: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS-I LAB

Objective:

1. To study the methods of calibration of different electrical lab equipment's like ammeter, voltmeter and watt-meters.
2. To be familiar with the methods of measuring different kinds of resistances for skill development and employability

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

1. To calibrate an ammeter & a voltmeter using a standard ammeter & standard voltmeter to provide employability & skills.
2. To calibrate a wattmeter using a standard wattmeter to develop skill.
3. To measure unknown resistance using ammeter –voltmeter method to provide employability & skills.
4. To measure power & power factor in a single phase circuit using ammeter voltmeter & wattmeter to develop skill.
5. To study megger & measure insulation resistance using it understanding for entrepreneurial skill.
6. To measurement of low resistance Kelvin's Double Bridge to provide employability & skills
7. To measurement of unknown resistance by using Wheatstone bridge to develop skill.
8. To measure power & power factor in a 3 phase circuit using two watt meters method to provide employability & skills
9. To measure earth resistance using fall of potential method understanding for entrepreneurial skill.
10. To study a current transformer and a potential transformer and verify their ratio of transformations to develop skill.

Course Outcomes:

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

CO1: Understand the different resistance measuring devices and circuits for skill development and employability.
CO2: Study and calibrate the different electrical equipment locally for skill development and employability.
CO3: Measure power & power factor in single phase circuit for skill development and employability.
CO4: Measure earth resistance for skill development.
CO5: Study CT & PT Locally 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	1	1
CO5	3	1	1

Suggested Readings:

1. Electrical and Electronic Measurements - G.K. Banerjee (PHI Learning)
2. Electrical Measurements & Measuring Instruments– E.W. Golding &Widdis (Sir Issac Pitman)
3. Electrical Measurements – M.B.Stout

Website Sources:

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

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEMA401: COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Objective: - The main aims of this course are to provide suitable and effective methods by numerical analysis, for obtaining approximate representative numerical results of the problems. To have a proper understanding of Statistical applications in different areas to provide skill development and employability.

UNIT I **(12 Sessions)**

Introduction: Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation

Solution of Algebraic and Transcendental Equations: Bisection Method, Iteration method, Method of false position, Newton- Raphson method, Methods of finding complex roots, Muller's method, Rate of Convergence, Polynomial equations to provide skill development and employability.

UNIT II **(10 Sessions)**

Solution system of linear equations: Gauss-Seidal method, LU decomposition method.

Interpolation: Finite differences, Differences tables

Polynomial Interpolation: Newton's forward and backward formula.

Interpolation with unequal intervals: Lagrange's interpolation, Newton divided difference formula to provide skill development and employability.

UNIT III **(10 Sessions)**

Numerical Integration and Differentiation: Introduction to numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Boole's rule, Waddle's rule.

Solution of differential equations: Picard's method, Euler's method, Taylor's method, Runga- Kutta methods, Predictor-Corrector methods to provide skill development and employability.

UNIT IV **(10 Sessions)**

Statistical Techniques –I: Moments, Moment generating functions, Skewness, Kurtosis, Linear, non- Linear and multiple regression analysis, Probability theory, Correlation, Binomial, Poisson and Normal distributions to provide skill development and employability.

UNIT V **(10 Sessions)**

Statistical Techniques –II: Sampling theory (small and large), Test of significances: Chi-square test, t- test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, X, R, p, np, and c charts to provide skill development and employability.

Course Outcomes:

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

CO1: Apply Numerical analysis which has enormous application in the field of Science and Engineering to provide skill development and employability.

CO2: Understand numerical integration and differentiation, numerical solution of ordinary differential equations to provide skill development and employability.

CO3: Compare and analyze the methods statistical analysis and the omnipresent role of variability nationally to provide skill development and employability.

CO4: Predict and evaluate the efficient design of studies and construction of effective sampling plans locally to provide skill development and employability.

CO5: Exploratory data analysis and formal inference process to provide skill developmentand 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	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	2	1	1	1	2	1	1	2
CO4	3	3	3	3	3	1	1	1	2	1	1	2
CO5	3	3	3	3	3	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	2	1

School of Engineering & Technology
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. V. Raja Raman: "Computer Oriented Numerical Methods", PHI.
2. P.P. Gupta & G. S. Malik: "Numerical Analysis", Krishna Prakashan media, Meerut.
3. B. S. Grewal: "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
4. Pradip Niyogi: "Numerical Analysis and Algorithms", TMH.
5. S. C. Gupta & V.K. Kapoor: "Fundamentals of Mathematical Statistics", Sultan Chand& Sons, Delhi.

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE401: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS-II

Objective: To learn about connections of different measuring instruments in electrical systems to provide skill development, employability and entrepreneurship development.

UNIT I **(08 Sessions)**

Measurement of energy: Classification of energy meters-Ampere-hour-meters, Motor meters & Clock meters. Constructional details and working principle of Single phase induction type energy meters, Errors, Poly phase watt hour meters, clock meters, E.M testing methods, Measurement of Vah&VArh meter, Tri-vector meter, Maximum demand indicators for skill development and employability.

UNIT II **(08 Sessions)**

Instrument Transformers-Theory of C.T &P.T-Ratio and phase angle errors, Design considerations Characteristics of C.T. Effect of variation of p.f, secondary burden &frequency, Voltage Transformers –theory, ratio & phase angle errors-Design considerations-characteristics of Voltage Transformer-.Effect of variation of p.f. secondary burden & frequency. Testing of C.T & P.T.-Absolute & comparison methods for skill development, employability and entrepreneurship development.

UNIT III **(08 Sessions)**

Classification of magnetic measurements: The ballistic galvanometer, flux meter & other oscillatory apparatus, Methods of calibrating ballistic galvanometer. Hall effect devices. Ring & bar specimens Determination of magnetization using methods of reversals & step-by-step methods, leakage factor, Determination of Hysteresis loop. Magnetic measurements using Bar & yoke methods, Permeameters- Fahy's Simplex Permeameter-Burrow's permeameter, Magnetic testing with a.c. Measurement of iron losses in a magnetic sample - separation of iron losses, Wattmeter, A.C. bridge, Potentiometer & Oscilloscopic methods of iron loss measurements for skill development and employability.

UNIT IV **(08 Sessions)**

High-voltage Measurements-General classification & various H.V testing methods. High voltage testing apparatus-H.V.Transformer, Voltage regulation, Control gear & connections , Apparatus for voltage measurement. Sphere-gap Voltmeters, Voltage dividers-Measurement of Peak a.c. voltages, Measurement of high D.C. voltages, Measurement of ripple voltages, Testing of Insulating materials for skill development.

UNIT V **(08 Sessions)**

Cathode Ray Oscilloscope- Constructional feature, working and block diagram, How does an oscilloscope display a signal, Display subsystems, Oscilloscope Probes, Electrostatic Focusing, Vertical deflection system. Horizontal deflection system, Oscilloscope Controls, Measurements using Oscilloscope-Measurement of voltage, current and phase angle, Special Purpose Oscilloscopes for skill development and employability.

Course Outcomes:

On completion of the course, student will be able to

CO1: Measure the energy using different energy meters locally to provide skill development and employability.
CO2: Understand the different types of Instrument Transformers to provide skill development and employability.
CO3: Classify different Magnetic measurements nationally to provide skill development and employability.
CO4: Measure the High AC & DC Voltage for skill development.
CO5: Explain the basic features of oscilloscope and different types of oscilloscopes to provide 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	2	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	1	2
CO5	3	2	2	2	2	1	1	1	2	1	2	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	3
CO3	3	3	1
CO4	3	1	1

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

Registrar
IFTM University
Moradabad.

CO5	3	3	1

Suggested Readings:

1. Electrical Measurements & Measuring Instruments– Golding &Widdis
2. Electrical and Electronic Measurements - G.K.Banerjee
3. Electronic Instrumentation & Measurements Technique – W.D. cooper &Helfrick
4. A Course in Electrical and Electronic Instrumentation- A.K.Sawhney

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, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE402: ELECTRICAL MACHINES-II

Objective: To learn about the working of synchronous machine & its applications to understand the working of special motors used in electrical systems to provide skill development and employability.

UNIT I **(08 Sessions)**

Three phase Synchronous Generators: Constructional features, EMF Equation, Theory of cylindrical rotor generator, Armature winding, Winding coefficients, Armature reaction, Synchronous reactance, Equivalent circuit and phasor diagrams, O. C. & S. C. tests, Voltage Regulation, Determination of voltage regulation by e.m.f. &m.m.f. methods, zero power factor method, saturated synchronous reactance method, Numerical problems for skill development and employability.

UNIT II **(08 Sessions)**

Extension to salient pole synchronous generators, Two-reaction theory, Direct axis and quadrature axis synchronous reactance, Slip test, Operation of synchronous machine connected to infinite bus, Parallel operation of synchronous generators, Numerical problems for skill development.

UNIT III **(08 Sessions)**

Parallel Operation of Alternators: Introduction, Requirements For Parallel Operation, Synchronizing Current, Synchronizing Power, Synchronizing Torque, Effect of Reactance, Effect of Increasing The Excitation of One of The Alternators, Effect of Increasing The Driving Torque of One of The Alternators, Effect of Change in Speed of One of The Alternators, Effect of Unequal Voltages, Load Sharing Between Two Alternators, Synchronous Machines on Infinite Bus-Bars, Power Output, Hunting for skill development.

UNIT IV **(08 Sessions)**

Three phase Synchronous motor: Principle of operation and production of torque, Power-angle curves, Power factor improvement, V-curves, power angle characteristics, Hunting or phase swinging, Numerical problems for skill development.

UNIT V **(08 Sessions)**

Special Motors: Stepping motors – Variable reluctance stepping motors, Permanent magnet stepping motors, Hybrid stepping motors- their characteristics, drive circuits and applications. Brushless D.C. motors, Variable Reluctance motors- their constructional features, working principles and applications, Numerical problems for skill development and employability.

Course Outcomes:

On completion of the course, student will be able to

CO1: Understand the concept of three phase Synchronous Generators internationally for skill development and employability.
CO2: Impart knowledge on Construction and performance of salient and non – salient type synchronous generators for skill development.
CO3: Understand the parallel operation of Alternators for skill development, employability and entrepreneurship development.
CO4: Impart knowledge on Principle of operation and performance of synchronous motor for skill development.
CO5: Impart knowledge on Construction, principle of operation and performance of special machines nationally 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	2	2	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	3	1
CO2	3	1	1
CO3	3	3	3
CO4	3	1	1
CO5	3	3	1

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

Suggested Readings:

1. D. P. Kothari & I. J. Nagrath,- "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans- "Electric Machinery", MC Graw Hill.
3. P. S. Bimbhra- "Electrical Machinery", Khanna Publisher
4. M.G. Say -"Alternating Current Machines", Pitman & Sons
5. J. B. Gupta- "Electrical Machinery"

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, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE403: DIGITAL ELECTRONICS

Objective: To learn about different number systems and their applications in electrical circuits & to design and solve different logic circuits using digital theorem to develop skill and employability.

UNIT I **(08 Sessions)**

Number Systems and Boolean Algebra: Review of binary, octal and hexadecimal number systems - conversion methods- number representations, Binary code BCD, Gray code - error detection and correction codes - parity codes- Boolean algebra – basic postulates, theorems – canonical forms-Simplification of Boolean function using Karnaugh map – Implementations of logic functions using gates, NAND –NOR implementations for skill development.

UNIT II **(08 Sessions)**

Sequential Circuits: General model of sequential circuits- flip-flops- latches – level triggering, edge triggering- master slave configuration - concept of state, state diagram , state table, state reduction procedures , Design of synchronous sequential circuits , up/down, modulus counters, shift registers, Ring counter - Johnson counter - timing diagram – serial adder - parity checker for skill development.

UNIT III **(08 Sessions)**

Combinational Circuits: Half adder, full adder, Half subtraction, full subtract or parallel adder, Carry look ahead adder , binary adder , Magnitude comparator, encoder and decoders, multiplexers and demultiplexers, code converters, parity generator/checker- implementation of combinational circuits using multiplexers for skill development and employability.

UNIT IV **(08 Sessions)**

Memory: Classification of memories, RAM, Memory decoding, Error Detection and correction, Read only Memory, Types of ROM, Details of Hard disk, Floppy Disk, Flash Drive, Compact Disk, etc for skill development.

UNIT V **(08 Sessions)**

Logic Families: Input characteristics and output characteristics of logic gates, Fan-in, Fan-out, Noise margin, circuit concept of various logic families: TTL, DTL, ECL, NMOS, CMOS Tri-state logic, open collector output for skill development and employability.

Course Outcomes:

On completion of the course, student will be able to

CO1: Review the different number systems and Boolean Algebra Locally for skilldevelopment.
CO2: Design model of sequential circuits for skill development.
CO3: Design of Combinational circuit for BCD to decimal conversion to drive 7- segmentdisplay using Multiplexer for skill development and employability.
CO4: Classify different types of memories locally for skill development.
CO5: Conceptualize various logic families 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	2	2	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	3	3	1	2	1	2	1	2	2
CO4	3	3	3	2	2	1	2	1	2	1	2	2
CO5	3	3	3	3	3	1	2	1	2	1	2	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	1
CO4	3	1	1
CO5	3	3	1

Suggested Readings:

1. Floyd, -"Digital Fundamentals", Universal Book Stall, New Delhi.
2. Albert Paul Malvino and Donald P Leach,-"Digital Principles and Applications" McGraw Hill
3. R P Jain - " Modern Digital Electronics", TMH, New Delhi.

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

4. Morris Mano - "Digital Design", PHI Learning, fourth edition, 2008.

Website Sources:

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

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 Electrical Engineering

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

TEEE404: SIGNAL AND SYSTEMS

Objective: To understand the different signals as input source and their impact on electrical circuits &to deal with Laplace, Fourier & Z-transformation to develop skill and employability.

UNIT I **(09 Sessions)**

Signals: Definition, types of signals and their representations continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/multi-dimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables) for skill development.

UNIT II **(08 Sessions)**

Systems: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density for skill development and employability.

UNIT III **(07 Sessions)**

Laplace-Transform (LT): Laplace Transform, Region of convergence, inverse Laplace Transform. Analysis and characterization of LTI System, System function of continuous time system, Block diagram representation, Unilateral Laplace transform. Solutions of differential equation using Laplace transform for skill development and employability.

UNIT IV **(08 Sessions)**

Fourier Transforms (FT):(i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT,FFT for skill development.

UNIT V **(08 Sessions)**

Z-Transform: Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, System function of discrete time system Block diagram representation, Unilateral Z transform. Solution of differential equation using Z transforms for skill development.

Course Outcomes:

On completion of the course, student will be able to

CO1: Understand mathematical description and representation of continuous and discrete time signals for skill development.
CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system nationally for skill development and employability.
CO3: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain for skill development and employability.
CO4: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms for skill development.
CO5: Understand and resolve the signals in Z-Transform Locally 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	3	3	3	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	3	3	1	2	1	2	1	2	2
CO4	3	3	3	3	3	1	2	1	2	1	2	2
CO5	3	3	3	3	3	1	2	1	2	1	2	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	1
CO4	3	1	1
CO5	3	1	1

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

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'signals &System',Pearson Education, Second Edition, 2003.
2. Roberts, "Signals and Systems" TATA Mcgraw Hills.
3. P. Ramesh Babu, R. Ananda Natarajan, "Signals and Systems", Scitech Publications**4.** Charles L. Phillips, John 4..M. Parr and EveaRiskin, "Signals Systems and Transforms", Pearson Education

Website Sources:

- www.tutorialspoint.com
- www.dspguide.com
- https://ocw.mit.edu
- www.edx.org

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 Electrical Engineering

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

TPSD401: PROFESSIONAL SKILL DEVELOPMENT-II

Objectives: The objectives of Professional Skill Development-II are:

- To develop knowledge and abilities to make correct use of the grammar in own writing English.
- To build vocabulary and to enhance the ability to correct the sentences.
- To enhance competencies in written and oral communication for skill development and employability.
- To increase understanding and recall of what is read and listen including facts and importance of the main idea

Unit I:Communicative Skills **(05 Sessions)**

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 employability & skills development.

Unit II: Intrapersonal Relationship Skills **(07 Sessions)**

Personality: Characteristics of Healthy & Sick Personality
Self Awareness
Self Esteem
Self Confidence
Assertiveness V/S Aggressiveness
Values:Types & Importance for employability & skills development.

Unit III: Interpersonal Relationship Skills **(08 Sessions)**

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 employability & skills development.

Unit IV: Argumentative Skills **(10 Sessions)**

Debate
Role Play
Speeches
Elocution
Group Discussion for employability & skills development.

Unit V: Campus to Company Skills **(08 Sessions)**

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 employability & skills development.

Course outcomes:

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

CO1: Improve communicative skills locally for employability & skills development.
CO2: Improve Intrapersonal relationship skills for employability & skills development.
CO3: Improve Interpersonal relationship skills nationally for employability & skills development.
CO4: Improve Argumentative skills for employability & skills development.
CO5: Understand the importance of Campus to Company skills for employability & skills 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	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	2	1
CO2	3	2	1

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

Registrar
IFTM University
Moradabad.

CO3	3	2	1
CO4	3	2	1
CO5	3	2	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.tutorialspoint.com
- www.dspguide.com
- https://ocw.mit.edu
- www.edx.org

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 Electrical Engineering

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

TEEE405: ELECTRICAL MACHINES& 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 employability & skills development.

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 employability & skills 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 employability & skills development.

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 employability & skills development.

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 employability & skills development.

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 employability & skills development.

Course Outcomes:
The students completing this course will be able to:
CO1: Differentiate between single phase, three phase and auto transformer and alsounderstand the concept of dc motors for employability & skills development.
CO2: Acquire knowledge about the three phase induction motor, synchronous motor andservo motor nationally for employability & skills development.
CO3: Differentiate different types of signal & systems and also understand the modelling of mechanical systems for employability & skills development.
CO4: Analyze the time response and stability of open loop and closed loop systems internationally for employability & skills development.
CO5: Understand the root locus techniques and analyze the frequency response along with the characteristics of different types of controllers for employability & skills 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	3	3	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	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	3	3
CO2	3	3	1
CO3	3	3	1

Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

CO4	3	3	1
CO5	3	3	3

Suggested Readings:

1. J. Nagrath& D. P. Kothari, "Electrical machines" Tata McGraw Hill.
2. B.C. Kuo, "Automatic Control systems." Wiley India Ltd.
3. B.R. Gupta &Vandana Singhal, "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, Moradabad * (Solapur)
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE455: ELECTRICAL M/C AND AUTOMATIC CONTROL LAB

Objective:

1. To examine the performance analysis of 3-phase induction motor.
2. To perform the speed control methods of 3-phase induction motor.
3. To understand the stability analysis and transient response of various systems for employability & skills development.
4. To understand the efficiency and characteristics of dc motor.

List of Experiments: (20 Sessions)

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading for employability
2. To obtain efficiency of a dc shunt machine by no load test for employability & skills development.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control for employability & skills development.
4. To determine polarity and voltage ratio of single phase and three phase transformers for employability.
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 employability & skills development.
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 employability & skills development.
7. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control for employability & skills development.
8. To study D.C. speed control system on open loop and close loop for employability.
9. To study of speed control of AC servo motor for employability & skills development.
10. To study of performance of PID controller for employability & skills 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 for employability.
CO2: Perform OC & SC Tests on a single phase transformer locally for employability & skills development.
CO3: Know about the concept of stability and transient response for employability & skills development.
CO4: Obtain speed control and load test on a three phase induction motor for employability & skills development.
CO5: Check the performance of controllers nationally for employability & skills 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	3	3	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	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	3	3
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	3

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 & Farid Golnaraghi, "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

Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

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 Electrical Engineering

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

TEEE451: MATLAB AND SIMULINK LAB

Objective:

1. To design the electrical systems on software platform (Matlab/Simulink).
2. Verify the different circuits in Matlab/Simulation environment for skill development and employability.

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

1. Write a program in MATLAB to compute
   (i) C = A+ B (ii) D = A-B (iii) E = A* B (iv) F = A / B
   Where A = [1 4 5; 3 6 2; 1 2 3] and B = [5 4 3 ; 2 4 1 ; 1 4 2]
2. Write a program in MATLAB to plot (i) Sine and (ii) Cosine waveforms to provide employability & skills.
3. Write a program in MATLAB to plot (i) Ramp signal and (ii) Impulse signal to provide employability & skills.
4. To simulate Half Wave Rectifier Circuit and Full Wave Rectifier Circuit to provide employability & skill.
5. To simulate Half Wave Controlled Rectifier Circuit to provide employability & skills.
6. To simulate Full Wave Controlled Rectifier Circuit to provide employability & skills.
7. To simulate the performance of a 3 phase induction motor to provide employability & skills.
8. To control the speed of a D.C Motor to provide employability & skills.
9. To simulate a P.W.M Inverter for single pulse and multi Pulse modulation to provide employability & skills.
10. To simulate a P.W.M Inverter for SVPWM to provide employability & skills.

Course outcomes:

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

CO1: Write the program for obtaining the performance results for electrical circuits in software environment nationally for employability & skills development.
CO2: Visualize the experimental results in software environment for employability & skills development.
CO3: Verify the different circuits in MATLAB/SIMULATION environment internationally for employability & skills development.
CO4: Write program to compute mathematical operations for employability & skills development.
CO5: Control the speed of DC motor for employability & skills 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	1	3	3
CO3	3	3	1
CO4	3	1	1
CO5	1	3	3

Suggested Readings:

1. J. Nagrath& D. P. Kothari, "Electrical machines" Tata McGraw Hill.
2. Fundamental of electrical circuits;7th edition "Charles K. Alexander, Matthew N.O. Sadiku" Tata McGraw Hill.

Website Sources:

- www.electrical-engineering-portal.com
- www.mathworks.com
- https://www.gnu.org/software/octave

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 Electrical Engineering

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

TEEE452: DIGITAL ELECTRONICS LAB

Objective:

1. To expose the students to electrical world of digital languages.
2. To analyze the different controllers used in electrical systems for skill development and employability.

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

1. Study of logic families and their nomenclature to develop skill.
2. Verification of truth tables of logic gates to develop skill.
3. Implementation of Boolean function in SOP and POS form understanding for entrepreneurial skill.
4. Study of Universal gates to develop skill.
5. Implementation of 4:1 multiplexer and a 1:4 demultiplexer to provide employability & skills.
6. Implementation of a half adder to develop skill.
7. Implementation of a full adder and a 4 bit binary counter to provide employability & skills.
8. Study of R-S, J-K and T flip-flops to provide employability & skills.
9. Study of Registers understanding for entrepreneurial skill.
10. Implementation of an up and a down counter understanding for entrepreneurial skill.

Course Outcomes:

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

CO1: Study of logic families for skill development.
CO2: Explain different digital languages like binary, grey, decimal etc for employability and entrepreneurship development.
CO3: Implement logic analysis to the digital circuits for skill development and employability.
CO4: Study of logic gates for skill development.
CO5: Understand flip flops & Registers for 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	1	1
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. Floyd, -"Digital Fundamentals", Universal Book Stall, New Delhi.
2. Albert Paul Malvino and Donald P Leach,-"Digital Principles and Applications" McGraw Hill
3. R P Jain -" Modern Digital Electronics", TMH, New Delhi.
4. Morris Mano -"Digital Design", PHI Learning, fourth edition, 2008.

Website Sources:

- https://biyanitechnologies.com/Digital-Language-Lab.php
- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.newtondesk.com
- www.vlab.co.in
- www.eletimes.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 Electrical Engineering

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

TEEE453: ELECTRICAL MEASUREMENT-II LAB

Objective:

1. To analyze and design calibration of different measuring instruments for skill development and employability.
2. To analyze a given network for measuring the resistance of coils.
3. To expose the students to the operation and working of an oscilloscope.

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

1. To calibrate a single phase induction type energy meter using a standard wattmeter and a stop watch to develop skill.
2. To measure inductance by Maxwell's bridge to provide employability & skills.
3. To measure inductance & resistance of a coil using Hay's bridge to provide employability & skills.
4. To measure inductance by Owen's bridge to develop skill.
5. To measure capacitance and its loss angle using a Schering bridge understanding for entrepreneurial skill.
6. To study an LCR bridge and measure RLC using it to provide employability & skills.
7. To study a Cathode Ray Oscilloscope to develop skill.
8. To measure amplitude, time period & frequency of a signal using an Oscilloscope understanding for entrepreneurial skill.
9. To measure frequency of a source by Lissajou's patterns on a CRO to provide employability & skills.
10. To measure power in a single phase AC circuit using C.T. & P.T. to develop skill.

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

CO1: Study of logic families locally for skill development.
CO2: Explain different digital languages like binary, grey, decimal etc for employability andentrepreneurship development.
CO3: Implement logic analysis to the digital circuits for skill development and employability.
CO4: Study of logic gates for skill development.
CO5: Understand flip flops & Registers nationally for 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	1	1
CO4	3	3	1
CO5	3	1	1

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

CO1: Explain the concept of energy meters and calibration methods of measuring devices nationally for skill development.
CO2: Understand the working of CRO and oscilloscope for skill development and employability.
CO3: Measure Inductance using Bridge method locally for skill development.
CO4: Measure power in single phase AC circuit for skill development and employability.
CO5: Measure frequency using CRO for skill development.

Suggested Readings:

1. Electrical Measurements & Measuring Instruments– Golding & Widdis
2. Electrical and Electronic Measurements - G.K.Banerjee

Director

Registrar
IFTM University
Moradabad.

3. Electronic Instrumentation & Measurements Technique – W.D. cooper &Helfrick
4. A Course in Electrical and Electronic Instrumentation- A.K.Sawhney

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, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

TEEE454: ELECTRICAL MACHINE-II LAB

Objective:

1. To expose the students with the working principle and performance of synchronous machine for skill development and employability.
2. To analyze the load characteristics of synchroscope.

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

1. To perform open circuit & short circuit test on a three phase alternator and determine its Synchronous impedance to provide employability & skills.
2. To perform open circuit & short circuit test on a three phase alternator and determine Voltage regulation at lagging and leading power factors of load to develop skill.
3. To perform load test on a three phase alternator understanding for entrepreneurial skill.
4. To perform load test on a three phase synchronous motor using electrical load and draw V- curves to provide employability & skills.
5. To perform load test on a three phase synchronous motor using electrical load and draw Inverted V-curves to develop skill.
6. To perform load test on a three phase synchronous motor using mechanical load and draw V- curves understanding for entrepreneurial skill.
7. To perform load test on a three phase synchronous motor using mechanical load and draw Inverted V-curves to provide employability & skills.
8. To study parallel operation of three-phase alternator using synchronizing panel (with dark/bright lamp method) to develop skill.
9. To study parallel operation of three-phase alternator using synchroscope understanding for entrepreneurial skill
10. To study and measurement of direct axis synchronous reactance X_d and quadrature axis synchronous reactance X_q of a synchronous generator by slip test to provide employability & skills.

Course outcomes:

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

CO1: Explain the concept of synchronous machine for skill development.
CO2: Familiar with the load analysis of three phase alternator nationally for skill development and employability.
CO3: Perform load test on three phase synchronous motor for skill development.
CO4: Study parallel operation of three phase alternator nationally for skill development and employability.
CO5: Measure X_d & X_q 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	3	3	3	3	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	1	1
CO4	3	3	1
CO5	3	1	1

Suggested Readings:

1. D. P. Kothari & I. J. Nagrath,- "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans- "Electric Machinery", MC Graw Hill.
3. P. S. Bimbhra- "Electrical Machinery", Khanna Publisher

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

Registrar
IFTM University
Moradabad.

4. M.G. Say -"Alternating Current Machines", Pitman & Sons
5. J. B. Gupta- "Electrical Machinery"

Website Sources:

- 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, Moradabad ★
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE501: MICROPROCESSOR ENGINEERING

Objective: To learn about microprocessor 8085 & 8086 with its applications for skill development and employability.

UNIT I **(09 Sessions)**

Introduction to Microprocessor 8085: Evolution of µp, Register structure ALU, Bus organization. Timing & control Instruction set, Architecture of 16 bit µp, Architecture of 8085 (Bus Interface Unit, Execution unit) Register organization. Bus operation, Memory segmentation for skill development.

UNIT II **(06 Sessions)**

Assembly Language Programming: Addressing Modes & instruction set of 8085 Arithmetic & Logic instructions, Program Control Instructions, Loop & string instructions, Assembler Directives for skill development and employability.

UNIT III **(08 Sessions)**

CPU Module: Description of pins of 8086 & 8088 microprocessors, clock pulse generator, Address & Data bus, De-multiplexing, Buffering Memory Organization, Read & Write cycle timings, Interrupt structures, Minimum Mode & Maximum Mode operation for skill development and employability.

UNIT IV **(09 Sessions)**

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O DMA Parallel I/O, 8255 – PPI, 8253 programmable Timer/counter, 8259A Programmable Interrupt Controller (PIC),8237 DMA Controller Interfacing with ADC, 8255 Programmable Interrupt Controller for skill development.

UNIT V **(08 Sessions)**

Microprocessor Applications: Measurement of voltage, current power & energy using µp. Applications of µp in Power System and Instrumentation for skill development and employability.

Course Outcomes:

On completion of this course, the students will be able to

CO1: Explain the internal organization and operation of microprocessor and architecture of 8085 nationally for skill development.

CO2: Program 8085 Microprocessor 8051 for application specific solution for skilldevelopment and employability.

CO3: Design CPU module and describe 8086 & 8088 microprocessors for skill developmentand employability.

CO4: Gain an in-depth understanding of the operation of microprocessors & interfacing techniques with peripheral devices nationally for skill development.

CO5: Gain an understanding of applications of microprocessors in designing processor- based automated electronics system 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	2	2	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	3	3	2	2	1	2	1	2	1	2	2
CO5	3	3	3	2	2	1	2	1	2	1	2	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	1
CO4	3	1	1
CO5	3	3	1

Suggested Readings:

1. Gaonkar, Ramesh" Microprocessor, Architecture, Programming & Applications with 8085- Pen Ram International Publishing
2. B Ram. Fundamentals of Microcomputers Microprocessors, Dhanpat Rai Publications.:
3. Introduction to Microprocessors – A.P. Mathur

School of Engineering & Technology IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

4. Rafiquizzaman, M ,"Microprocessor theory & applications, Intel & Motorola.

Website Sources:

- www.geeksforgeeks.org
- www.sciencedirect.com
- www.elsevier.com
- www.tutorialspoint.com
- https://nptel.ac.in

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 Electrical Engineering

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

EEE502: ELECTRICAL ENGINEERING MATERIAL SCIENCE

Objective: To learn about different kinds of engineering materials used for the fabrication of electrical system components & to understand the electrical & magnetic properties of materials used in electrical system for skill development, employability and entrepreneurship development.

UNIT I **(07 Sessions)**

Atomic Structure of Materials: Fundamental concepts , The hydrogen atom according to old and new quantum mechanics. Nomenclature pertaining to electronic states , electronic configuration of atoms , The nature of chemical bond and classification of solids, Atomic arrangement in solids. Crystal Structure for Metallic elements, Bragg.s Law for skill development and employability.

UNIT II **(09 Sessions)**

Dielectric properties of insulators in static fields : The static dielectric constant, Polarization – Electronic , Ionic, Orientational and Interfacial polarization, The dielectric constant of polyatomic molecules, The internal field in solids and liquids, The static dielectric constant of solids, Ferroelectric materials and their properties, Spontaneous polarization for skill development.

Behavior of Dielectrics in Alternating Fields

Frequency dependence of electronic polarizability, Ionic polarization of as a function of frequency, the complex dielectric constant of non-polar solids, Dipolar relaxation, Dielectric losses.

UNIT III **(08 Sessions)**

Insulating Materials and their applications: Solid and liquid insulating materials and films, Dielectric gases Modern trend in electrical insulation, Insulating materials for electrical and electronic devices, Insulation measurements , Factors influencing the characteristics of the insulating materials. Applications of insulating materials in Electrical Engineering for skill development, employability and entrepreneurship development.

UNIT IV **(07 Sessions)**

Magnetic Properties of Materials: Magnetic parameters- Orbital magnetic dipole moments, angular dipole momentum and induced dipole moment, Classification of magnetic materials- Diamagnetic materials, Paramagnetic materials ,Ferromagnetic materials, Anti-ferromagnetic materials and Ferri-magnetic materials, Spontaneous magnetization, Weiss theory of magnetization for skill development.

UNIT V **(09 Sessions)**

Conductor Materials: Electrical conductivity, Joule's law, Factors effecting the conductivity of conducting materials. Relaxation time, collision time and mean free path, Electron scattering and resistivity of materials. The heat developed in a current carrying conductor, Thermal conductivity- Widemann-Franz law, Superconductivity-The free electron model. Characteristics of superconductors for skill development and employability.

Materials for Direct Energy conversion Devices: Solar Cells, Fuel Cells, MHD Generators, Thermo Electric Generators and Thermionic Converters

Course Outcomes:

On completion of this course, the students will be able to

CO1: Given a type of material, be able to qualitatively describe the bonding scheme and its general physical properties, as well as possible applications for skill development and employability.

CO2: Determine the dielectric properties of insulators in static fields & their behaviour inalternating fields nationally for skill development.

CO3: Classify different types of insulating materials and their applications for skill development, employability and entrepreneurship development.

CO4: Determine different types of magnetic properties of materials nationally for skill development and employability.

CO5: Learn about different conducting materials and energy conversion devices 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	3	2	2	1	2	1	2	1	2	2
CO2	3	2	2	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	2	2	2	2	1	2	1	2	1	2	2
CO5	3	3	3	2	2	1	2	1	2	1	2	2

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

Director
IFTM University, Moradabad

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	1	1
CO3	3	3	3
CO4	3	1	1
CO5	3	3	1

Suggested Readings:

1. Electrical Engineering Material Science - A.J.Dekker (PHI Publications)
2. Electrical and Electronics Engineering Materials- G.K.Banerjee, PHI learning
3. Electrical Engineering Material Science - G.C.Jain

Website Sources:

- www.electrical4u.com
- https://global.oup.com
- https://easyengineering.net
- www.lecturenotes.in
- https://nptel.ac.in

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 Electrical Engineering

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

EEE503: COMMUTATING MACHINES

Objective: To learn about DC machines and their applications & to understand the output characteristics of DC machine and commutation methods for skill development and employability.

UNIT I **(06 Sessions)**

DC Machines: Basic Features Of D.C. Machines; Constructional Details, Armature Windings, Winding Layout, Position Of Brushes, Parallel Paths, Equalizer Connections, E.M.F. induced in D.C. Armature Winding for skill development.

UNIT II **(07 Sessions)**

Commutation in D.C. machines : Factors Affecting Current In The Short-Circuited Coil, Resistance And Ideal Straight Line Commutation, Improvement In Commutation, Methods To Eliminate Reduce The Effect Of Armature Reaction, Interpoles And Compensating Winding for skill development and employability.

UNIT III **(09 Sessions)**

D.C. Generator: Method Of Excitation, Operation At No-Load, No-Load (Open-Circuit) Characteristics Of Separately Excited Generator Residual Magnetism, Process Of Self Excitation, Causes Of Failure Of Voltage Build Up, Critical Resistance, Influence Of Speed. Operation On Load - External Characteristics: Flat, Under &Over Compound Generators, Voltage Regulation Application And Parallel Operation, Causes Of Voltage Drop; Armature Reaction for skill development and employability.

UNIT IV **(09 Sessions)**

D.C. Motors: Electromagnetic Torque In D.C. Machines, Shunt And Separately Excited, Series And Compound Motors-Differential And Cumulative Type. Speed-Current, Torque-Current And Speed-Torque Characteristics,

Starting: Manual Starters, 3-Point And 4 - Point, Starters For Shunt/Compound Motors, Series Motor Starters And Controllers

Speed Control: Characterizing Parameters, Basic Methods Of Speed Control, Field Flux Control, Armature Resistance, Control, Voltage Control, Ward Leonard System for skill development and employability.

UNIT V **(08 Sessions)**

A.C. Commutator Machines: Action Of Commutator As Frequency Converter, Effect Of Injected Emf In The Secondary Of 3-Phase Induction Motor, Speed And Power Factor Control, Slip Power Recovery Schemes, Constant Torque And Constant Power Drive, Schrage Motor, Commutator Motors - Universal Motor, Repulsion Motor and Applications for skill development and employability.

Course Outcomes:

On completion of this course, the students will be able to

CO1: Provide the basic concept of DC machines locally for skill development.
CO2: Describe the commutation in DC machines for skill development and employability.
CO3: Explain the performance characteristics of various DC Generators for skill development and employability.
CO4: Describe the performance characteristics of various DC Motors, starting and speed control methods nationally for skill development and employability.
CO5: Discuss the various AC Commutator Machines 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	2	2	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	3	3	3	3	1	2	1	2	1	2	2
CO5	3	3	3	3	3	1	2	1	2	1	2	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	1
CO4	3	3	1

Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

CO5	3	3	1

Suggested Readings:

1. Electrical Technology – H. Cotton
2. Performance and design of A.C. Commutator Motors – E.O. Taylor
3. Direct current Machines - Say and Taylor.
4. Performance and design of direct current machine-Clayton and Hancock

Website Sources:

- www.circuitglobe.com
- www.electrical4u.com
- https://ocw.mit.edu
- www.electricalengineeringinfo.com
- www.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 Electrical Engineering

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

EEE504: CONTROL SYSTEM

Objective: To understand the stability analysis and transient response of various systems for skill development and employability.

UNIT I **(08 Sessions)**

The Control System: Introduction, Open loop & closed control systems, Use of Laplace transformations in control system, Servomechanism, Physical examples, Transfer functions, Poles and Zeros of transfer functions , Block diagram ,Transfer function and its relationship with Impulse transform, Procedure for determining the Transfer Function of a control system, Signal flow graph, Manson's gain formula, Drawing signal flow graph from a given block diagram, Reduction of parameter variation and effects of disturbance by using negative feedback. Solved examples for skill development.

UNIT II **(09Sessions)**

Time Response analysis: Standard test signals, Time response of first order, second order and third order systems, time response specifications, Steady state errors –steady state error coefficients, Generalized error coefficients, Performance Indices, Sensitivity –Effect of transfer function parameter variation s in open loop control system and closed loop control system. Sensitivity of overall transfer function M(s) with respect to forward path transfer function G(s). Solved examples for skill development and employability.

Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations. Design considerations for higher order systems, performance indices. Solved examples

UNIT III **(07Sessions)**

Control System Components: Constructional features and working concept of ac servomotor, synchros and stepper motor. Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations. Solved examples for skill development.

Root Locus Technique: The root locus concepts, Salient features of root locus, Procedure of plotting root locus, Root contours, Solved examples.

UNIT IV **(09Sessions)**

Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots, Determination of static error coefficients from initial slope of Bode plot. Procedure for determining bode plot and determination of gain margin , phase margin and stability, Solved examples for skill development.
Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, Solved examples

UNIT V **(07Sessions)**

State variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing. Solved examples for skill development and employability.

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

CO1: Develop the mathematical model of the physical systems and can analyze the response& stability of the closed and open loop systems for skill development.

CO2: Understand the time response analysis & ability to formulate transfer function for given control system problems nationally for skill development and employability.

CO3: Classify different components of control system & plot Root Locus for given control system model for skill development.

CO4: Ability to understand frequency response analysis & plot Bode plots for given control system model for skill development.

CO5: Ability to design State variable technique for given control system model nationally 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	3	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	3	3	2	2	1	2	1	2	1	2	2

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

CO5	3	3	3	2	2	1	2	1	2	1	2	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	1	1
CO4	3	1	1
CO5	3	3	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.RoyChoudhary, "Modern Control Engineering", Prentice Hall of India

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 Electrical Engineering

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

EEE505: INSTRUMENTATIONENGINEERING

Objective: To study the transducers and its applications in electrical systems & to know about the output recorders and waveform generators for skill development, employability and entrepreneurship development.

UNIT I **(07 Sessions)**

General introduction & scope of instrumentation engineering, Introduction of Transducers, Electrical Transducers, Advantages of Electrical Transducers, **Classification of Transducers-** Active & Passive Transducers, Primary & Secondary Transducers, Analog & Digital Transducers, Inverse Transducers, Input, Output and Transfer Characteristics of Transducers, Choice of transducers for skill development and employability.

UNIT II **(08 Sessions)**

Resistive Transducers- Potentiometers, Strain Gauges, RTD, Thermistor, etc Advantages and Disadvantages of resistance potentiometers, Measurement of strain:- Strain Gauges and their theory, types of electrical Strain gauges, Measurement of torque, force, pressure, using it, Numerical problems, **Inductive Transducers: -** Principle, Applications, LVDT- Theory & uses, numerical problems, **Capacitive Transducers: -** Principle, Applications and examples for skill development and employability.

UNIT III **(09 Sessions)**

Transducer (continued): Measurement of temperature – RTD, Thermistor, Thermocouples- Theory, Construction and applications. Solid state temperature sensors, **Piezoelectric Transducers-** Properties of Piezoelectric crystals, Equivalent circuit and applications of Piezoelectric Transducers in measurement of force, pressure, velocity, acceleration etc Photo-optic transducers:- Photo emissive cells , photo voltaic cells, Photo conductive cells, **Measurement of flow :-** Electromagnetic flow meters, Ultrasonic flow meters for skill development, employability and entrepreneurship development.

UNIT IV **(07 Sessions)**

Signal conditioning and conversion: Analog & Digital Signal conditioning systems, **Operational-amplifier circuits-** Inverting and non-inverting amplifiers, adders, subtractors, multipliers, Differentiators, Integrators, and Comparators, Basic instrumentation amplifier and its advantages, Isolation amplifier. Modulators &Demodulators Filters. Numerical examples for skill development, employability and entrepreneurship development.

UNIT V **(09 Sessions)**

Data transmission and Output Devices :- Introduction, General telemetry system- Voltage , current and position telemetry system ,Radio frequency telemetry –Amplitude, frequency and Phase modulation, Time division multiplexing system and frequency division multiplexing system for skill development and employability.

Digital displays and recorders – Analog displays and recorders, - Graphic recorders- strip chart recorder & X-Y recorder, Incandescent displays, Fluorescent display, Segmental display-LEDs, LCDS, Digital Recorders

Course Outcomes:

On completion of this course, the students will be able to

CO1: Understand the term transducer and classify them along with their characteristics for nationally for skill development and employability.

CO2: Differentiate between resistive, inductive and capacitive transducers for skill development and employability.

CO3: Measure the temperature and flow using transducers and the concept of piezoelectric transducers for skill development, employability and entrepreneurship development.

CO4: Discuss various signal conditioning systems and Op-amps internationally for skill development, employability and entrepreneurship development.

CO5: Ability to understand the general telemetry system & analog and digital recorders 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	2	2	2	2	2	2	1	2	1	2	2
CO2	3	3	3	2	2	2	2	1	2	1	2	2
CO3	3	3	3	3	3	2	2	1	2	1	2	2
CO4	3	3	3	3	3	2	2	1	2	1	2	2
CO5	3	3	3	3	3	2	2	1	2	1	2	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)

Director

Registrar
IFTM University
Moradabad.

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

Suggested Readings:

1. Instrumentation & Process Control by A.K.Sawhney, Dhanpat Rai &Co. P.Ltd.
2. Electrical & Electronic Measurements by .G.K.Banerjee, PHI Learning Private Ltd.
3. Electronic Instrumentation by H.Kalsi, Tata Mcgraw-Hill
4. Modern Electronic Instrumentation & Measurement Techniques by A.D.Helfrick& W.D.Cooper, PHI Learng
5. Instrumentation Systems & Devices by Rangan,Sarma& Mani, Tata Mcgraw-Hill

Website Sources:

- www.lecturenotes.in
- www.studocu.com
- www.researchgate.net
- www.engineersinstitute.com
- www.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)

EHU501: HUMAN VALUES & PROFESSIONAL ETHICS

Objective: To learn about the morals and ethics & social responsibility and right of human for skill development and employability.

UNIT I: **(08 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.

UNIT II: **(08 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 skill development and employability.

UNIT III: **(08 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: **(08 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 to provide employability & skills. Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination.

UNIT V: **(08 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 to get knowledge for better employability in industry.

Course Outcomes:
At the end of the course, a student will be able to:
CO1: Appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings locally for skill development.
CO2: Facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature for skill development and employability.
CO3: Understand Engineering as social Experimentation for skill development.
CO4: Acquire knowledge about safety, responsibilities and Rights of Human globally for skill development.
CO5: Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life 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	3	2	2	3	3	3	3	2	2	3
CO2	3	3	3	2	2	3	3	3	3	2	2	3
CO3	3	3	3	3	3	3	3	3	3	2	2	3
CO4	3	3	3	2	2	3	3	3	3	2	2	3
CO5	3	3	3	2	3	3	3	3	3	2	2	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	2
CO2	3	2	1
CO3	1	3	1

Director

Registrar
IFTM University
Moradabad.

CO4	3	1	2
CO5	2	2	2

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. Jayshree Suresh and B.S.Raghavan, "Human values and Professional Ethics", S.Chand& Company Ltd., New Delhi.
4. Charles E Harris, Michael S. Protchard and Michael J Rabins, 'Engineering Ethics - Concept and Case', Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
5. 'Concepts and Cases', Thompson Learning (2000)
6. John R Boatright, 'Ethics and Conduct of Business', Pearson Education, New Delhi, 2003.
7. Edmund G Seebauer and Robert L Barry, 'Fundamentals of Ethics for Scientists and Engineers', Oxford University of Press, Oxford, 2001.

Website Sources:

- www.examupdates.in
- www.academia.edu
- www.lecturenotes.in

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

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

Sanjeev Sharma
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE551: MICROPROCESSOR LABORATORY

Objective:

1. To expose the students for the microprocessor kits of 8085 for skill development and employability.
2. To analyze a given program for the output in 8085 module microprocessor kits.

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

1. To study 8085 based microprocessor system for skill development and employability
2. To study 8086 and 8086A based microprocessor system for skill development and employability
3. To add two 8 bit binary numbers using 8085 microprocessor to develop skill
4. To subtract two 8 bit binary numbers using 8085 microprocessor for better employability in industry.
5. To develop the program to find out the smallest number from a given set of numbers to develop skill.
6. To develop the program to find out the largest number from a given set of numbers for entrepreneurship & employability.
7. To develop and run the program for the multiplication of two 8 bit numbers to provide employability & skills.
8. To develop and run the program to transfer a block of data to develop skill.
9. To develop and run the program for masking the higher nibble of an 8 bit number to develop skill.
10. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa to develop skill.

Course Outcomes:

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

CO1: Explain the concepts of 8085 microprocessor kit locally for skill development.
CO2: Write the program in the form of microprocessor assembly language to provide employability & skills.
CO3: Develop the program for mathematical operations nationally to provide employability & skills.
CO4: Perform conversion of temperature to develop skill.
CO5: Understand the 8086 microprocessor system 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	3	2	2	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	3	3	2	2	1	2	1	2	1	2	2
CO5	3	3	3	2	2	1	2	1	2	1	2	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	2	1	1
CO2	3	2	2
CO3	3	3	1
CO4	2	2	2
CO5	3	3	1

Suggested Readings:

1. Gaonkar, Ramesh" Microprocessor, Architecture, Programming & Applications with 8085- Pen Ram International Publishing
2. B Ram. Fundamentals of Microcomputers Microprocessors, Dhanpat Rai Publications.:
3. Introduction to Microprocessors – A.P. Mathur
4. Rafiquizzaman, M ,"Microprocessor theory & applications, Intel & Motorola.

Website Sources:

- www.geeksforgeeks.org
- www.sciencedirect.com
- www.elsevier.com
- www.tutorialspoint.com
- https://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 Electrical Engineering

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

EEE552: ELECTRICAL MACHINE-III LAB

Objective:

1. To expose the students towards DC machines and its classifications for skill development and employability.
2. To expose the student for the load and performance characteristics of different types of DC machines.

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

1. (a) To study a three point starter for skill development and employability.
   (b) To plot magnetization characteristics of a separately excited D.C. generator to provide employability & skills.
2. To plot load characteristics of a D.C. shunt generator for better employability in industry.
3. To plot speed-torque characteristics of a D.C. series motor to develop skill
4. To plot speed-voltage characteristics of a D.C. shunt generator for better employability in industry.
5. To plot load characteristics of a cumulatively compounded D.C. generator to develop skill.
6. To plot load characteristics of a differentially compounded D.C. generator for entrepreneurship & employability
7. To determine efficiency of a D.C. shunt machine using Swinburne's Test to develop skill
8. To perform brake test on a D.C. shunt motor and hence determine its efficiency for better employability in industry.
9. To plot load characteristics of a D.C. series motor for better employability in industry.
10. To control the speed of a D.C. shunt motor using (a) armature control method (b) field control method for better employability in industry.

Course Outcomes:

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

CO1: Explain and differentiate between the working principles of different kinds of DCmachines locally for skill development.
CO2: Understand the different speed control methods of DC machines for better employability in industry.
CO3: Obtain the performance analysis of DC machines to provide employability & skills.
CO4: Understand the use of starters locally for better employability in industry.
CO5: Expose themselves for the practical world applications of DC machines 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	2	2	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	3	3	3	3	1	2	1	2	1	2	2
CO5	3	3	3	3	3	1	2	1	2	1	2	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	2
CO2	2	3	1
CO3	3	2	2
CO4	3	3	1
CO5	2	1	1

Suggested Readings:

1. Electrical Technology – H. Cotton
2. Performance and design of A.C. Commutator Motors – E.O. Taylor
3. Direct current Machines - Say and Taylor.
4. Performance and design of direct current machine-Clayton and Hancock

Website Sources:

- www.circuitglobe.com
- www.electrical4u.com
- https://ocw.mit.edu
- www.electricalengineeringinfo.com
- www.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 Electrical Engineering

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

EEE553: CONTROL SYSTEM-I LAB

Objective:

1. To design the Matlab /Simulation software based model of DC machines for skill development and employability.
2. Exposer towards the stability analysis and transient repose of different kinds of control systems.

LIST OF EXPERIMENTS **(20 Sessions)**

1. To study D.C. speed control system on open loop and close loop for better employability in industry.
2. To study of speed control of AC servo motor to provide employability & skills.
3. To study characteristics of positional error detector by angular displacement of two servo potentiometers to develop skill.
4. To study of performance of PID controller for entrepreneurship & employability.
5. To study LAG compensator and draw its magnitude and phase plot for skill development and employability.
6. To study magnetic amplifier &plot its load current v/s control current characteristics for parallel mode to provide employability & skills.
7. Draw the characteristics of second order system using MATLAB to develop skill.
8. Draw the characteristics of a series motor using MATLAB v to develop skill
9. To show the Bode plot for a given transfer function using MATLAB to provide employability & skills.
10. To show Nyquist plot for a given transfer function using MATLAB to provide employability & skills.

Course Outcomes:

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

CO1: Explain the methods of speed control of DC motor for skill development andemployability.
CO2: Work under the Matlab/Simulation environment to develop skill.
CO3: Know about the concept of stability and transient response nationally to provide employability & skills.
CO4: Able to understand the concept of compensation techniques used for the performance enhancement locally for skill development and employability.
CO5: Draw Bode & Nyquist plot for different transfer functions to develop skill.

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	3	2	2	1	2	1	2	1	2	2
CO2	3	3	3	2	2	1	2	1	2	1	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2
CO4	3	3	3	2	2	1	2	1	2	1	2	2
CO5	3	3	3	2	2	1	2	1	2	1	2	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	2
CO2	2	3	1
CO3	3	2	2
CO4	2	1	1
CO5	3	2	2

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.RoyChoudhary, "Modern Control Engineering", Prentice Hall of India

Website Sources:

- 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.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE554: INSTRUMENTATION ENGINEERING LAB

Objective:

1. To design electrical circuits on bread board for skill development and employability.
2. To expose for the measurement of different parameters using electrical equipments like thermocouple, thermistors etc

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

1. To study a strain gauge transducer and measure strain using it to provide employability & skills..
2. To study LVDT transducer and measure displacement using it understanding for entrepreneurial skill.
3. To measure temperature using RTD to develop skill.
4. To measure temperature using Thermocouple for entrepreneurship & employability.
5. To measure temperature using Thermister for skill development and employability.
6. To design a square-wave generator using IC-555 Timer for skill development and employability
7. To measure speed using magnetic and photovoltaic pick up to provide employability & skills.
8. To design (i) mono-stable and (ii) bi-stable multi-vibrator using IC-555 to develop skill.
9. To design a pulse counting circuit to develop skill.
10. To design an Instrumentation Amplifier for a gain of (a) 50 and (b) 100 to provide employability & skills.

Course Outcomes:

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

CO1: Explain the concept of strain gauge for measuring the strain nationally for skill development and employability.
CO2: Measure displacement using LVDT for skill development.
CO3: Understand the working principle of thermocouple & thermistors nationally to develop skill.
CO4: Generate square-waves in timer for skill development and employability.
CO5: Design Op-Amps 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	2	2	2	2	2	2	1	2	1	2	2
CO2	3	3	3	2	2	2	2	1	2	1	2	2
CO3	3	3	3	3	3	2	2	1	2	1	2	2
CO4	3	3	3	3	3	2	2	1	2	1	2	2
CO5	3	3	3	3	3	2	2	1	2	1	2	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	2
CO2	3	2	1
CO3	2	3	3
CO4	3	2	3
CO5	2	3	1

Suggested Readings:

1. Instrumentation & Process Control by A.K.Sawhney, Dhanpat Rai &Co. P.Ltd.
2. Electrical & Electronic Measurements by .G.K.Banerjee, PHI Learning Private Ltd.
3. Electronic Instrumentation by H.Kalsi, Tata Mcgraw-Hill
4. Modern Electronic Instrumentation & Measurement Techniques by A.D.Helfrick&W.D.Cooper, PHI Learng
5. Instrumentation Systems & Devices by Rangan,Sarma& Mani, Tata Mcgraw-Hill

Website Sources:

- www.lecturenotes.in
- www.studocu.com
- www.researchgate.net
- www.engineersinstitute.com
- www.nptel.ac.in

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE601: POWER SYSTEM PROTECTION

Objective: To study about the fault analysis in power system transmission and distribution system & to learn about the different kinds of relays for the purpose of protecting the power system equipments to provide employability & skills.

UNIT I **(07 Sessions)**

Switchgear Equipments – Bus Bar Arrangements, Short Circuit, Short Circuit Currents, Types of Faults In a Power System. Symmetrical Faults On a 3phase System. Unsymmetrical Faults - Single Line to Ground Fault, Line– to–Line Fault, Double Line to Ground Faults, Concept of symmetrical components for skill development, Solved examples.

UNIT II **(07 Sessions)**

Symmetrical Faults & Their Analysis: Symmetrical Faults on A 3phase System, Limitation Of Fault Current, Percentage Reactance & Base KVA, Short Circuit KVA, Reactor Control of Short Circuit Currents, Location of Reactors Steps For Symmetrical Fault Calculations for understanding for entrepreneurial skill. Solved examples

UNIT III **(09 Sessions)**

Unsymmetrical Faults & Their Analysis: Unsymmetrical Faults & Their Analysis for better employability in industry, Symmetrical Components Method, Operator 'A', Symmetrical Components In Terms Of Phase Currents -Sequence Impedances, Sequence Impedance Of Power System Elements, Analysis Of Unsymmetrical Faults Single Line to Ground Fault , Line to Line Fault, Double Line To Ground Fault, Sequence Networks, Reference Bus for Sequence Networks. Solved examples

UNIT IV **(09 Sessions)**

Circuit Breakers – Are Phenomenon, Principles of Are Extinction, Methods Of Are Extinction, Important Terms, Classification Of Circuit Breakers to develop skill, Oil Circuit Breakers, Types Of OCB, Plain Bulk Oil Circuit Breakers, Arc Control of Oil Circuit Breakers, Low Oil Content Circuit Breakers, Air Blast CBS, Types Of Air Blast CBS, SF6 Circuit Breaker, Vacuum Circuit Breaker, Switchgear Components, Problems Of Circuit Interruption, Resistance Switching, Circuit Breaker Ratings for entrepreneurship & employability.

UNIT V **(08 Sessions)**

Protective Relays: Fundamental Requirements of Protective Relaying, Basic Relays, Electromagnetic Attraction Relays Induction Relays, Relay Timing **Important Terms:** Time P.S.M Curve – Calculation of Relay Operating Time, Functional Type Directional Power Relay, Distance or Impedance Type Relays, Differential Relays, Voltage Balance Differential Relay, Solid State Relays, Types of Protection for skill development and employability.

Course Outcomes:

On completion of this course, the students will be able to

CO1: Understand various switchgear equipments and different types of fault in a powersystem nationally or skill development, employability and entrepreneurship development **CO2:** Calculate symmetrical fault currents for skill development.

CO3: Calculate un-symmetrical fault currents for skill development.

CO4: Choose suitable circuit breakers etc for fulfilling power system protection system nationally for skill development and employability.

CO5: Understand the fundamentals of electromechanical relays and digital protective relaying & the basic methods of calculating the magnitude and angle of voltage and current for the digital relaying system 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	2	2	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	2	1
CO2	2	1	1
CO3	3	1	3

Director

Registrar
IFTM University
Moradabad.

CO4	1	2	2
CO5	2	2	1

Suggested Readings:

1. Principles of Power System – V.K. Mehta S. Chand & Co.
2. Power system Analysis – Nagsarkar&Sukhija – Oxford publications
3. Electrical. Power Systems:- Theory & Practice – Bandopadhyay – PHI Learning.

Website Sources:

- www.philadelphia.edu.jo
- www.nptel.ac.in
- www.lecturenotes.in
- www.electrical-engineering-portal.com
- www.electrical4u.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 Electrical Engineering

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

EEE602: POWER ELECTRONICS

Objective: To learn about the different power electronic devices used for the controlling purpose in electrical system to provide employability & skills.

UNIT I **(08 Sessions)**

Introduction: Principle of power electronics, classification of Power electronic circuits, Thyristor, Silicon controlled Rectifier (SCR) – Basic structure & important features-characteristics of SCR – operation of with SCR & without gate current SCR as a switch for skill development. Dynamic characteristics of SCR – SCR losses – SCR ratings, Commutation Techniques Natural commutation & forced commutation methods, Turn on methods – various turn on methods – Isolation circuits using opt couplen & pulse transformer SCR gate trigger circuit – Resistor triggering circuit, UJT Relaxation triggering circuit to develop skill. Numerical solved examples.

UNIT II **(08 Sessions)**

Phase controlled Rectifiers – principle of operation, single phase half wave controlled rectifier with resistive & inductive load, Effect of free-wheeling diode semi converter with R load & R-L load, Advantages, disadvantages & applications of semi converters, Full converters – Full wave converters & Bridge converters – Analysis of full wave converter with R load & RL load to get knowledge for better employability in industry. Two quadrant operation of full converter- Performance parameters comparison of semi converter & full converters Advantages disadvantages & its application of Full converter, Three-phase controlled Rectifiers Numerical solved examples.

UNIT III **(08 Sessions)**

Inverters: Principle of operation & classification of inverters for skill development and employability. Basic series inverter, Parallel inverter, single phase half bridge inverter-operation with R load & RL load, Mc Marry Commutated half bridge inverter Fourier analysis of load voltage waveform of a Half Bridge inverter, Performance parameters of inverters – Total harmonic distortion (THD) & Distortion factor (DF), Three phase Bridge inverter, Voltage control in Inverters: External control of AC output voltage, External control of DC input voltage, PWM inverters. Numerical Solved Examples

UNIT IV **(08 Sessions)**

Choppers – Step down & step up choppers control strategies- PWM choppers,, constant pulse width variable frequency choppers-current limit control – variable pulse width frequency. Step down chopper with RL load, chopper classification – Four quadrant chopper, step up chopper-Jones chopper, Applications to develop skill. Numerical Solved Examples

UNIT V **(08 Sessions)**

Cyclo-converters - Basic principle of operation, single phase to single phase to single phase cyclo converter, Three phase half wave cyclo converter, Single phase to single phase Circuit step up cyclo converter to provide employability & skills : Mid pointcyclo converter, Bridge type cyclo converter. Single phase to single phase Circuit step down cyclo converter: Mid pointcyclo converter, Bridge type cyclo converter.

Course Outcomes:

On completion of this course, the students will be able to

CO1: Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits and the different commutation techniquessystem internationally for skill development and employability.

CO2: Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields system for skill development and employability.

CO3: Discuss the principle of operation of inverters and their classifications system for skill development, employability and entrepreneurship development.

CO4: Discuss the different types of choppers and their applications for skill development.

CO5: Discuss the principle of operation of cyclo converters and their classifications system nationally 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	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	3	1	1	1	2	1	1	2
CO3	3	2	2	2	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)

Director

Registrar
IFTM University
Moradabad.

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

Suggested Readings:

1. Power Electronics – P.C. Sen
2. Modern Power Electronics: Evolution, Technology, & Application by B.K. Bose
3. Power Electronics By P. S. Bimbhra, Khanna Publications.
4. Power electronics By M D Singh and K B Khanchandani by TMH publication 2 edition.
5. "Power Electronics - circuits, devices and applications", Prentice Hall of India, 2nded., 2000- Muhammad H. Rashid.
6. Power Electronics by V. R. Moorthi, Oxferd University press.
7. Power Electronics – Devices, Converters and Applications", by VedamSubramanyam Revised 2nd edition, New Age Publications.
8. Introduction to Electric Drives – J.S. Katre

Website Sources:

- www.circuitglobe.com
- www.electrical4u.com
- https://ocw.mit.edu
- www.electricalengineeringinfo.com
- www.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 Electrical Engineering

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

EEE603: PRINCIPLES OF ELECTRICAL MACHINE DESIGN

Objective: To learn about the procedure to design an electrical machine for practical as well as theoretical analysis and obtain its characteristics for skill development and employability.

UNIT I **(06 Sessions)**

Basic design methodology & engineering considerations: Review of properties of electric, magnetic & insulating materials. Electric & magnetic loading, customer's & designer's Specifications to provide employability & skills, Main dimension output equation of d.c.& a.c machines, voltage per turn, specific loadings, core construction, Solved examples

UNIT II **(08 Sessions)**

Transformers: Main dimensions, output equation of transformers, voltage per turn, specific loadings, core construction. Transformer winding classifications & theirarrangement. Calculation of turns transformer in rush current, effect of tertiary winding, Three phase & a bank of three single phase transformers – consideration of harmonics, Mechanical forces on short circuit for skill development. Optimization techniques in transformer design. Solved examples

UNIT III **(09 Sessions)**

Induction Machines: Main dimensions, Output equation of induction machine, choice of specific electric & magnetic loadings, separation of D & L Magnetic circuit; Ampere turn calculation,, effect, leakage flux leakage reactance. Stator winding & rotor windings, squirrel cage rotor, insulating materials, Heating & cooling system. Temperature rise calculation, classification & determination of rating to provide employability & skill. Solved examples

UNIT IV **(08Sessions)**

Synchronous machines: Main dimensions, output equation of synchronous machine choice of specific electric & magnetic loadings separation of D & L. Magnetic circuit: Ampere turn calculation Effect of slots & ventilating ducts, carter's coefficients, saturation effect. Pole leakage flux, Armature leakage & reactance. Armature leakage &reactance . Armature winding & field winding . Insulating materials, Heating &cooling , cooling system, Temperature rise calculations, Classification & determination of rating for skill development. Solved examples

UNIT V **(09 Sessions)**

Design consideration in single phase induction motors: Optimization of capacitor start induction machine Performance equations from design data, computerization of design procedures Development of computer program & performance prediction optimization techniques & their application to design problems for entrepreneurship & employability. Solved examples

Course Outcomes:

On completion of this course, the students will be able to

CO1: Acquire knowledge to carry out a detailed design of methodology and engineering considerations locally for skill development.

CO2: Acquire knowledge to carry out a detailed design of a transformer and provide the information required for the fabrication of the same along with an estimate of various performance indices for skill development, employability and entrepreneurship development. **CO3:** Acquire knowledge to carry out a detailed design of an induction machine for skill development, employability and entrepreneurship development.

CO4: Acquire knowledge to carry out a detailed design of a synchronous machine and provide the information required for its fabrication for skill development and employability.

CO5: Acquire knowledge to carry out a detailed design of single phase induction motor andtheir applications nationally for skill development, employability and entrepreneurshipdevelopment.

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	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	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	3	2	1	1	1	2	1	1	2
CO5	3	3	3	3	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	2	2	2

Director

Registrar
IFTM University
Moradabad.

CO2	3	1	1
CO3	1	3	3
CO4	3	2	1
CO5	2	1	2

Suggested Readings:

1. A Course in Design of Electrical Machine – A.K. Sawhney
2. Performance & Design of A.C. Machine – M.G. Say.
3. Performance & Design of D.C. Machine – A.E. Clayton

Website Sources:

- www.lecturenotes.in
- www.fmcet.in
- www.academia.edu
- www.nptel.ac.in
- www.matterhere.com
- www.newtondesk.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 Electrical Engineering

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

EEE604: DIGITAL SIGNAL PROCESSING

Objective: To study about the different kinds of signals (analog, digital, continues and discrete) & about the convolution technique and fourier analysis for discrete systems for skill development.

UNIT I **(08 Sessions)**

Introduction: Why DSP is preferred over ASP, Applications of DSP, Block diagram of a digital system, Representation of Discrete Time signals, Sampling Theorem, Characterization of DT LSI systems- Difference equation & Impulse Response, Introduction to Digital Filters, Convolution sum, Z transform, transfer function to develop skill.

UNIT II **(09 Sessions)**

Discrete Fourier Transforms: Definitions, Properties of the DFT (Discrete Fourier transform), Linear Convolution and Circular Convolution. **Fast Fourier Transform Algorithms:** Introduction, Decimation –In Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm for skill development.

UNIT III **(09 Sessions)**

Realization of Digital Systems for skill development and employability Introduction, direct form realization of IIR (Infinite Impulse Response) systems, cascade realization of an IIR (Infinite Impulse Response) systems, parallel form realization of an IIR (Infinite Impulse Response) systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.

UNIT IV **(07Sessions)**

Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other commonly used Windows. Examples of Filter Design Using Windows to provide employability & skills.

UNIT V **(07 Sessions)**

Design of Infinite Impulse Response Digital Filters for entrepreneurship & employability, Impulse Invariant Transformation, Bi-Linear Transformation, All Pole analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth filter for skill development.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Differentiate and represent digital signals and analog signals and its impulse response nationally for skill development.
CO2: Define DFT & different convolution methods for skill development and employability.
CO3: Ability to design & analyze DSP systems like IIR Filter for skill development and employability.
CO4: Ability to design & analyze DSP systems like FIR Filter Nationally for skill development and employability.
CO5: Design, implementation, analysis and comparison of digital filters for processing of discrete time signals 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	3	3	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	2	3	2
CO2	3	1	2
CO3	1	3	3
CO4	3	2	1
CO5	2	1	2

Suggested Readings:

1. Sanjay Sharma,"Digital Signal Processing", S.K.Kataria& Sons.
2. Salivahnan, "Digital Signal Processing", Tata Mcgraw-Hill.

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

Registrar
IFTM University
Moradabad.

3. Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009
4. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
5. Oppenheim & Schafer, "Digital Signal Processing" PHI Learning

Website Sources:

- https://ocw.mit.edu
- www.lecturenotes.in
- www.examupdates.in
- www.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 Electrical Engineering

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

EEE605 (A): HIGH VOLTAGE ENGINEERING

Objective: To learn about the breakdown mechanisms of different media and the lightning phenomenon during clouding and the different theories behind it. Also, to study about the generation and measurement of high voltage practically (both AC & DC) to get knowledge for better employability in industry.

UNIT I **(08 Sessions)**

Breakdown Mechanism in Gases: Breakdown of insulators, Electric field & stress Ionization Townsend's mechanism, streamer's theory, post breakdown current voltage characteristics Paschen's low, Effect of temperature Deionization, Desirable properties of gaseous insulator SF6 as insulator vacuum as dielectric Factors affecting time lags for breakdown to provide skills. Breakdown in a non-uniform field.Effect of pressure on corona inception & breakdown voltage. Corona loss at d.c. voltage, corona loss at a.c. voltage, solved examples

UNIT II **(06 Sessions)**

Lightning phenomenon: charge formation in cloud – Wilson's theory, Simpson's theory for skill development, Different forms taken by lightning – cloud flashes – Air discharges. Forked lightning mechanism, Multiple strokes, Return stroke current, Energy in lightning

UNIT III **(07 Sessions)**

Breakdown in liquids & Solids: Breakdown in liquids: Classification of liquids, liquid breakdown test cells, Breakdown in pure liquids & commercial liquids cells, Breakdown in solids: Intrinsic breakdown, Electrochemical breakdown, thermal breakdown, Mechanism of breakdown occurring after prolonged operation Breakdown of composite dielectrics for skill development and employability.

UNIT IV **(10 Sessions)**

Generation of High Voltage: Impulse voltage & its characteristics single stage & multistage impulse generators constructional features, Generation of High A.C. voltage: Testing transformers, cascaded transformers, series resonant circuits. Generation of High D.C. Voltage: characteristic parameters, cascaded circuit, Van de Graaff Generator. Solved examples. Measurement of High A.C. Voltages – Peak voltage measurement using sphere-gaps, measuring capacitors & capacitor voltage divides Measuring of r.m.s. value using Electrostatic voltmeters, CVT & Digital recording, **Measurement of D.C. Voltage:** Electrostatic voltmeters Generating voltmeter & sphere gap, Measurement of ripple voltages for skill development and employability

UNIT V **(09 Sessions)**

High voltage Testing : High voltage test on Line insulators –Power frequency test, Impulse test, Impulse withstand tests, pollution testing, High voltage tests on Bushings -High voltage tests on transformers & cables, Non-destructive High voltage tests-Measurement of capacitance & dissipation factor, Measurement of partial discharge for skill development.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Familiarize with different dielectric materials and their break down mechanisms in gases for skill development.
CO2: Describe the lightning phenomenon during clouding and the different theories behind itfor skill development.
CO3: Acquire the knowledge of necessity and methods of testing various apparatus in power system internationally for skill development, employability and entrepreneurshipdevelopment.
CO4: Knowledge of various circuits for generating high voltages for testing various apparatus and their measurement method internationally for skill development andemployability.
CO5: To provide information on testing of electrical apparatus with high voltage 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

CO1	1	2	1
CO2	3	3	1
CO3	2	1	3
CO4	2	3	2
CO5	3	2	1

Suggested Readings:

1. An Introduction to High voltage Engineering – S. Ray
2. High voltage Engineering Fundamentals – Kuffel&Zaengl

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE 605(B): SPECIAL ELECTRICAL MACHINES

Objective: To learn about the poly phase induction machine and its applications & to study about different kinds of machines used in electrical systems to get knowledge for better employability in industry.

UNIT I **(08 Sessions)**

Poly-phase AC Machines: Construction And Performance of Double Cage and Deep Bar **Three Phase Induction Motors** to provide employability & skills; E.M.F. Injection In Rotor Circuit Of Slip Ring Induction Motor, Concept Of Constant Torque and Constant Power Controls, Static Slip Power Recovery Control Schemes (Constant Torque And Constant Power)

UNIT II **(08 Sessions)**

Single phase Induction Motors: Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start capacitor-run and shaded pole motors for better employability in industry. **Two Phase AC Servomotors:** Construction, torque-speed characteristics, performance and applications.

UNIT III **(08 Sessions)**

Stepper Motors: Principle of Operation, Variable Reluctance, Permanent Magnet And Hybrid Stepper Motors, Characteristics, Drive Circuits and Applications for skill development. **Switched Reluctance Motors:** Construction; Principle of Operation; Torque Production, Modes of Operation, Drive Circuits.

UNIT IV **(08 Sessions)**

Permanent Magnet Machines: Types Of Permanent Magnets And Their Magnetization Characteristics for entrepreneurship & employability, Demagnetizing Effect, Permanent Magnet Dc Motors, Sinusoidal PM Ac Motors, Brushless DC Motors And Their Important Features And Applications, PCB Motors. **Single Phase Synchronous Motor;** Construction, Operating Principle And Characteristics Of Reluctance And Hysteresis Motors; Introduction To Permanent Magnet Generators for skill development.

UNIT V **(08 Sessions)**

Single Phase Commutator Motors: Construction, Principle Of Operation, Characteristics Of Universal And Repulsion Motors **; Linear Induction Motors.** Construction, Principle of Operation, Linear Force, and Applications for skill development.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Learn about poly phase AC machines and static slip power recovery control schemes locally for skill development, employability and entrepreneurship development.

CO2: Understand and apply the fundamentals of systematical components for the analysis of AC servo motor leading the design of its equivalent circuit and evaluation of its performance for skill development and employability.

CO3: Learn about construction features and method of operation stepper motor and acquire the knowledge of design procedure of drive amplifier and transistor logic for stepper motor nationally for skill development.

CO4: Acquire the knowledge of fundamentals, construction details and classification of universal motors and synchronous motor like reluctance motors, hysteresis motors for skill development, employability and entrepreneurship development.

CO5: Acquire the knowledge of fundamentals, construction details and classification of linear machines 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	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	2
CO2	1	3	1
CO3	2	1	3
CO4	2	1	2

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

CO5	3	2	2

Suggested Readings:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen " Principles of Electrical Machines and Power Electronics" John willey& Sons, 2001
3. G.K.Dubey "Fundamentals of Electric Drives" Narosa Publishing House, 2001
4. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
5. M.G. Say " Alternating current Machines" Pitman & Sons

Website Sources:

- www.easyengineering.net
- www.nptel.ac.in
- www.lecturenotes.in
- www.scribd.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 Electrical Engineering

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

EEE605(C): DIGITAL COMMUNICATION

Objective: To learn about digital communication and its different types of coding &multiplexing in electronic systems for skill development.

UNIT I **(08 Sessions)**

Elements of Digital Communication and Information Theory: Model of a Digital Communication, System, Probability Theory and Random Variables , Logarithmic Measure of Information, Entropy and Information and Information Rate. Conditional Entropy and Redundancy, Source Coding, Fixed and Variables Length Code Words, Source Coding Theorem. Prefix Doing and Kraft Inequality, Shannon-Fano and Huffman Coding to provide employability & skills.

UNIT II **(08 Sessions)**

Digital Base band Transmission: PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and its Properties and its Properties, NRZ &RZ &RZ Types, Signaling Format For Unipolar, Polar, Bipolar (AMI) & Manchester Coding and Their Power Spectra (No Derivation) Matched Filter Receiver to get knowledge for better employability in industry. Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio. Correlation Detector Decision Threshold and Error Probability For Binary, Unipolar (ON-OFF) Signaling, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum

UNIT III **(08 Sessions)**

Digital Modulation Techniques: Gram-Schmidt Orthgonalization Procedure, Types of Digital Modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent && Non-Coherent Binary ASK, FSK & PSK Differential Phase Shift Keying, Quadrature Modulation Techniques QPSK, Probability of Error and Comparison of Various Digital Modulation Techniques for skill development.

UNIT IV **(08 Sessions)**

Digital Multiplexing: Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of T1, TDM, PCM Hierarchy, T1 toT4 PCM TDM System (DS1 to DS4 Signals) for entrepreneurship & employability.

UNIT V **(08 Sessions)**

Error Control Coding: Error Free Communication Over a Noize Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting Capability, Linear Block Codes, Encoding and Syndrome Decoding. Cyclic Codes for skill development and employability Tree diagram state diagram and Trellis Diagram, Viterbi and Sequential Decoding Comparison of performance.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Apply the knowledge of statistical theory of communication and explain theconventional digital communication system globally for skill development.

CO2: Apply the knowledge of signals and system and evaluate the performance of digitalcommunication system in the presence of noise for skill development.

CO3: Understand the different digital modulation Techniques globally for skill developmentand employability.

CO4: Understand the concept of digital multiplexing for skill development.

CO5: Apply the knowledge of digital electronics and describe the error control codes likeblock code, cyclic code 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	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	1	1
CO3	3	1	3
CO4	1	2	2

School of Engineering & Technology * IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

CO5	2	2	1

Suggested Readings:

1. Haykin, Simon / "Communication System" / John Wiley /4th Ed.
2. Singh, R.P. &Sapre, S.D. /"Communication Systems: Analog &Digital" /Tata McGraw-Hill.
3. Lathi, B.P. / "Modern Digital &Analog Communication System" /Oxford University Press.
4. Simon Haykin/ "Prinicples of Communication Systems"/ Tata McGraw-Hill

Website Sources:

- www.easyengineering.net
- www.nptel.ac.in
- www.lecturenotes.in
- www.scribd.com
- www.ocw.mit.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 Electrical Engineering

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

EEE605(D): ROBOTICS

Objective: To expose students to the history and current developments in the field of robotics; strengthen students' grasp of the mathematics and physics involved in the design, construction and control of robots, with a focus on linear algebra and geometry. programming skills for employability.

UNIT I
INTRODUCTION **(08 Sessions)**
Classifications of robots, Flexible automation vs. Robotic technology for skill development and employability, Robot components and degree of freedom, Robot joints, coordinates and reference frames, characteristics of robots, Robot workspace, role of robots in Industry 4.0; Robot safety and social robotics.

UNIT II
KINEMATICS OF ROBOT **(08 Sessions)**
Matrix representation of robot kinematics, Transformation of matrix, Forward and Inverse Kinematics of robots, D-H Representation of Six Degree of Freedom Robot Arm for employability.

UNIT III
ROBOT ACTUATORS AND POWER TRANSMISSION SYSTEMS **(08 Sessions)**
Characteristics of actuating systems, comparison of hydraulic, pneumatic and electrical actuating system. Mechanical transmission method for entrepreneurship & employability (concept only) - Gear transmission. Belt drives, cables, Roller chains, LinkRod systems, Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws.

UNIT IV
ROBOT GRIPPERS **(08 Sessions)**
Classification of End effectors, Drive system for grippers - Mechanical adhesive vacuum-magnetic-grippers. Hooks & scoops, Active and passive grippers for entrepreneurship & employability

UNIT V
ROBOT SENSORS, CONTROL HARDWARE AND INTERFACING Sensor **(08 Sessions)**
Contact & Proximity, Position, Velocity, Force and Tactile, Introduction to Cameras, Vision applications in robotics for skill development and employability; integration of robot controller with sensors, actuators & other supporting components.

Course Outcomes:
On completion of the course students will be able to
CO1: Learn the basic terminology used in robotics globally for skill development andemployability.
CO2: Conceptualize 3-D translation & orientation of robot arm kinematics for skilldevelopment and employability.
CO3: Understand different robotic actuators and power transmission systems internationally for entrepreneurship & employability.
CO4: Classify the types of robotic grippers used in automation industries for entrepreneurship & employability.
CO5: Realization of robotic sensory system and their interfacing with robot controller for entrepreneurship & 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	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2
CO2	3	3	2
CO3	2	3	3
CO4	2	3	3
CO5	3	3	3

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

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. John J.Craig , "Introduction to Robotics", Pearson, 2009.
2. Saeed B. Niku, "Introduction to Robotics", Wiley & Sons, 2011.
3. Deb S. R. and Deb S., "Robotics Technology and Flexible Automation", Tata McGraw Hill Education Pvt. Ltd. 2010.
4. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE605(E): ELECTRICAL & HYBRID VEHICLES

Objective: To deliver and discuss the about architecture, power electronics based drive control systems, battery management systems and grid integration issues of Electric and Hybrid vehicles for skill development, employability and entrepreneurship development.

UNIT I **(08 Sessions)**

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles.

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis for skill development and employability.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT II **(08 Sessions)**

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency for employability.

UNIT III **(08 Sessions)**

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices for employability and entrepreneurship development.

UNIT IV **(08 Sessions)**

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems for skill development, employability and entrepreneurship development.

UNIT V **(08 Sessions)**

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies for employability and entrepreneurship development.

Course Outcomes:

On completion of the course students will be able to

CO 1: Understand the importance of hybrid and electric vehicles globally for skill development and employability.

CO 2: Conceptualize the Electric Propulsion unit for skill development and employability.

CO 3: Understand the Hybridization of different energy storage devices for skill development and employability.

CO 4: Understand the importance of Sizing the drive system internationally for skill development, employability and entrepreneurship development.

CO 5: Comprehend different energy management strategies 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	2	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	3	1
CO4	3	3	3

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

Registrar
IFTM University
Moradabad.

CO5	3	3	3

Suggested Readings:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE605(F): SENSORS & TRANSDUCERS

Objective: To make students familiar with the constructions and working principle of different types of sensors and transducers. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers for employability.

UNIT I **(08 Sessions)**

Sensors & Transducer: Definition, Classification of transducers, Advantages and Disadvantages of Electrical Transducers: Measurement of displacement using Potentiometer, LVDT & Optical Encoder; Measurement of force using strain gauges & load cells; Measurement of pressure using LVDT based diaphragm for skill development and employability & piezoelectric sensor.

Unit II **(08 Sessions)**

Measurement of temperature using Thermistors, Thermocouples & RTD, Concept of thermal imaging; Measurement of position using Hall effect sensors; Proximity sensor: Inductive, Capacitive & Photoelectric, Use of proximity sensor as accelerometer and vibration sensor; Flow Sensor: Ultrasonic & Laser; Level Sensor: Ultrasonic & Capacitive for skill development and employability.

Unit III **(08 Sessions)**

Machine Vision: Introduction to machine vision, Difference between machine vision and computer vision; Imaging Sensors: CCD and CMOS; sensing & digitizing function in machine vision, image processing and analysis, training the vision system in a pick and place robot for skill development, entrepreneurship and employability.

Unit IV **(08 Sessions)**

Signal Conditioning: Introduction, Functions of signal conditioning equipment, need for amplification of signals, Types of amplifiers. Data Acquisition Systems and Conversion: Introduction, Objectives & configuration of data acquisition system, Analog & Digital IO, Counters, Timers, need of data conversion for skill development, entrepreneurship and employability.

Unit V **(08 Sessions)**

Smart Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Smart city, Industrial robots & electric vehicles for employability

Course Outcomes:

On completion of the course students will be able to

CO 1: Understand the working of commonly used sensors in industry for measurement of displacement, force and pressure nationally for skill development and employability.

CO 2: Recognize the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level for skill development and employability.

CO 3: Identify the application of machine vision for skill development and employability.

CO 4: Conceptualize signal conditioning and data acquisition methods nationally for skill development, entrepreneurship and employability.

CO 5: Comprehend smart sensors and their applications in automation systems 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	2	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	3	1
CO4	2	3	1
CO5	3	3	1

School of Engineering & Technology ★ IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013.
2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE605(G): POWER THEFT AND ENERGY MANAGEMENT

Objective: In developing countries like India, power theft is one of the most prevalent issues which not only cause economic losses but also irregular supply of electricity. It hampers functioning of industries and factories, due to shortage of power supplied to them. Apart from power Theft issues, nowadays management of energy is essential and hence energy management system is required. This course provides knowledge about Power Theft and Energy Management for entrepreneurship & employability.

UNIT I **(08 Sessions)**

Introduction: Energy sources, Energy demand and supply, Energy crisis, Future scenario, Menace of power theft, reasons for power pilferage, electricity loss and theft-National and Global scenario, Security seals and tampering, harmonics and power theft, Control Over power theft for employability.

UNIT II **(08 Sessions)**

Power Theft in Electro-mechanical Meters: Power theft in Voltage circuit, bypassing meters, drilling holes on Electro-mechanical Meters, Insertion of film into meter, partial earth fault tampering, Missing Neutral Method.

Power Theft in Electronic Meters: Power theft by means of Electrostatic Discharge, by tampering printed circuit board, by tampering the frequency circuit, tampering on display circuits of energy meter, Introducing limit switch for entrepreneurship & employability.

UNIT III **(08 Sessions)**

Energy system efficiency, Energy conservation aspects, Instrumentation and measurements. Principles of Energy Management and Energy Audit: General principles, Planning and program, Introduction to energy audit, General methodology, Site surveys, Energy systems survey, Energy audit, Instrumentation, Analysis of data and results for skill development, entrepreneurship & employability.

UNIT IV **(08 Sessions)**

Electrical Load and Lighting Management: General principles, Illumination and human comfort, Lighting systems, Equipment's, Electrical systems, Electrical load analysis, Peak load controls.

UNIT V **(08 Sessions)**

Demand Side Management: Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy, Planning, Implementation and its application for skill development & employability. Customer Acceptance & its implementation issues, National and International Experiences with DSM

Course Outcomes:

On completion of the course students will be able to

CO 1: To develop a strategic direction for organizations involved with energy and power for skill development & employability.

CO 2: Understand the various types of theft in Electro-mechanical & Electronics meters atinternational level for skill development & employability.

CO 3: Understand the role of energy management and energy auditing for skill development & employability.

CO 4: Understand the performance of Electrical System at national level for entrepreneurship & employability.

CO 5: To work on organizations and government departments concerned with promotion,development, and distribution of power for entrepreneurship & 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	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2
CO2	3	3	1
CO3	3	3	2

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

Registrar
IFTM University
Moradabad.

CO4	2	3	3
CO5	2	3	3

Suggested Readings:

1. G.Sreenivasan, "Power Theft", PHI Learning Private Limited
2. Amlan Chakrabarti, "Energy Engineering and Management ", PHI Learning Private Limited
3. W R Murphy, G Mckay, 'Energy Management' B.S. Publications.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.nptel.ac.in

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 Electrical Engineering

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

EEE605(H): CONVENTIONAL & CAD OF ELECTRICAL MACHINES

Objective: To explain the basic concepts of electrical machine design by using different computer optimization techniques for skill development, entrepreneurship & employability.

UNIT I **(08 Sessions)**

Basic Considerations: Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques for skill development, entrepreneurship & employability, Classification of insulating materials. Calculation of total mmf and magnetizing current. Transformer Design: Output equation design of core, yoke and windings. overall dimensions, Computation of no load current to voltage regulation, efficiency and cooling system designs

UNIT II **(08 Sessions)**

Design of rotating machines – I: Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size. Core and armature design of dc and 3-phase ac machines for skill development, entrepreneurship & employability.

UNIT III **(08 Sessions)**

Design of rotating machines – II: Rotor design of three phase induction motors. Design of field system of DC machine and synchronous machines for skill development, entrepreneurship & employability, Estimation of performance from design data.

UNIT IV **(08 Sessions)**

Computer Aided Design Philosophy of computer aided design, advantages and limitations. Computer aided design approaches analysis, synthesis and hybrid methods. Concept of optimization and its general procedure for skill development, entrepreneurship & employability.

UNIT V **(08 Sessions)**

Flow charts and 'c' based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines for skill development, entrepreneurship & employability.

Course Outcomes:

On completion of the course students will be able to

CO 1: Understand the design techniques locally for skill development, entrepreneurship &employability.
CO 2: Understand the design of three phase ac machines for skill development,entrepreneurship & employability.
CO 3: Understand the design of field system of DC machine and synchronous machines for skill development, entrepreneurship & employability.
CO 4: Understand the Philosophy of Computer Aided Design Nationally for skill development, entrepreneurship & employability.
CO 5: Understand the flow charts and 'c' based computer programs for the design of machines for skill development, entrepreneurship & 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	3	3	3	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	3	3	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.

Director

Registrar
IFTM University
Moradabad.

2. K.G. Upadhyay," Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.
3. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
4. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C.Machines" Pitman & Sons.
5. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE605(I): SMART ENERGY DELIVERY SYSTEMS

Objective: To educate the students about the concept of Smart Grid, the rationale for smart grid technology and its characteristics. The concept of smart grid is to add monitoring, analysis, control and communication capabilities to the national electrical delivery system to maximize the throughput of the system while reducing the energy consumption for skill development & employability.

UNIT I **(08 Sessions)**

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid for skill development& employability.

UNIT II

Smart Grid Technologies: **(08 Sessions)**

Part 1: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation for skill development, entrepreneurship & employability, Phase Shifting Transformers.

UNIT III

Smart Grid Technologies: **(08 Sessions)**

Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection to develop employability skills. Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT IV **(08 Sessions)**

Microgrids and Distributed Energy Resources: Concept of microgrid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid for skill development& employability.

UNIT V **(08 Sessions)**

Plastic & Organic solar cells, thin film solar cells, Variable speed wind generators, fuelcells, microturbines, Captive power plants, Integration of renewable energy sources for skill development, entrepreneurship & employability.

Course Outcomes:

On completion of the course students will be able to

CO 1: Understand the evolution of Smart Grid Nationally for skill development &employability.

CO 2: Understand the Smart Meters & Plug in Hybrid Electric Vehicles Globally for skilldevelopment, entrepreneurship & employability.

CO 3: Understand the Smart Substations & Geographic Information System for skilldevelopment & employability.

CO 4: Understand the Microgrids and Distributed Energy Resources for skill development &employability.

CO 5: Understand the Integration of renewable energy sources internationally for skilldevelopment, entrepreneurship & 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	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	3
CO3	3	3	1
CO4	3	3	2
CO5	3	3	3

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

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley
4. Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley Blackwell 19
5. Stuart Borlase, "Smart Grids (Power Engineering)", CRC Press

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE605(J): ANALOG & DIGITAL COMMUNICATION

Objective: To understand and implement the basic analog and digital communication techniques/ circuits with the help of theoretical and practical problem solving for skill development, entrepreneurship & employability.

UNIT I **(08 Sessions)**

Elements of communication system and its limitations for skill development &employability, Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, Superhetrodyne Receiver, IF amplifiers, AGC circuits, Frequency Division multiplexing.

Unit II **(08 Sessions)**

Angle Modulation: Basic definition, Narrow-Band and wideband frequency modulation, transmission bandwidth of FM signals, Generation and detection of frequency modulation, Generation and detection of Phase Modulation. **Noise:** External noise, internal noise, noise calculations, signal to noise ratio for employability.

Unit III **(08 Sessions)**

Pulse Modulation: Introduction, sampling process, Analog Pulse Modulation Systems, Pulse Amplitude Modulation (PAM), Pulse width modulation (PWM) and Pulse Position Modulation (PPM). **Waveform coding Techniques** for skill development & employability: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

Unit IV **(08 Sessions)**

Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, coherent and non-coherent methods for the generation of ASK, FSK and PSK. Comparisons of above digital modulation techniques for skill development & employability.

Unit V **(08 Sessions)**

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques for skill development, entrepreneurship & employability, **Introduction to Information Theory:** Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding

Course Outcomes:

On completion of the course students will be able to

CO 1: Understand the Amplitude Modulation in communication system for employability.
CO 2: Comprehend the Frequency & Phase modulation for employability.
CO 3: Realize the Pulse Modulation Techniques for skill development & employability.
CO 4: Get the Digital Modulation Techniques and their use in communication system for skill development, entrepreneurship & employability.
CO 5: Apply the concept of Information Theory in Communication Engineering for skill development, entrepreneurship & 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	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	3	1
CO2	2	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. B.P. Lathi, "Modern Analog & Digital Communication Systems" Oxford University Press.

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

Registrar
IFTM University
Moradabad.

2. Simon Haykin," Communication Systems" John Wiley & Sons 4th Edition
3. G.Kennedy and B. Davis," Electronic Communication Systems" 4th Edition, Tata McGraw Hill
4. Simon Haykin, "Digital Communications" John Wiley & Sons
5. T.L. Singal, "Analog & Digital Communication", Tata Mc Graw Hill

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE 605(K): TELEMETRY & DATA TRANSMISSION

Objective: To understand the concept of sampling and data handling system for skill development, entrepreneurship & employability.

UNIT I **(08 Sessions)**

Sampling Fundamentals: Introduction to sampling and reconstruction processes, Sampling theorem, Alising Error and its remedies, Minimum sampling rate computation and Convolution. Digital Modulation Techniques: PCM, DPCM, DM code converters for skill development and employability, Methods of binary data transmission: PSK, QPSK, FSK, Data Formats. Receiver probability errors, Phase ambiguity resolution and Differential encoding, Error detection and Error correction codes.

Unit-II **(08 Sessions)**

Data Handling System: Block diagram of data handling systems and its components, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC (SAR type, Dual slope type, Sigma Delta type, Ramp type and Flash type).Range and resolution computation for employability.

Unit-III **(08 Sessions)**

Serial and parallel data transmission protocols: Word Format, Frame format and Frame synchronizer codes. **Serial interfaces:** RS 232C RS 422, RS423, interfaces and node to node switching protocol (X25), Configuration of serial interface devices for skill development and employability, Multiplier & Concentrator, Block diagram of Data Modems and its components. Data Reception Systems: Bit synchronizers, Frame synchronizers, Sub-frame synchronizers and PLL.

Unit-IV **(08 Sessions)**

Remote Control: Communication based processing control systems: Pipelines (Operational security and control components), Power system control and Programmable controllers for factory automation. Command Systems: Tone command system, Tone digital command system and PCM instruction command systems for skill development and employability.

Unit-V **(08 Sessions)**

Aerospace Telemetry: Block Diagram of aerospace telemetry system and its components, Principles of telecontrol systems, Multiplexing techniques in tele-control for employability, Industrial Tele-control installations, Reliability in telecontrol installations

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Differentiate various types of Digital Modulation Techniques and methods of binary data nationally for skill development and employability.

CO2: Interpret the various data handling systems for skill development.

CO3: Understand the various Serial and parallel data transmission protocol for skill development, employability and entrepreneurship development.

CO4: Understand the Communication based processing control systems nationally for skill development and employability.

CO5: Understand the Aerospace Telemetry 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	3	2	2	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	2	1
CO2	2	1	1
CO3	3	1	3
CO4	1	2	2
CO5	2	2	1

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Patranabis," Telemetry Principles: Tata Mcgraw Hill.
2. Schweber," Data Communication " Mcgraw Hill.
3. Berder&Menjewlse," Telemetry Systems".

Website Sources:

- www.easyengineering.net
- www.nptel.ac.in
- www.lecturenotes.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 Electrical Engineering

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

EEE606: ELECTRICAL POWER TRANSMISSION & DISTRIBUTION

Objective: To learn about the layout and components of electrical system & the performance analysis of electrical transmission & distribution system for skill development and employability.

UNIT I **(08 Sessions)**

Introduction: Layout of a power system, Methods of generation of elect. Energy. Different kinds of supply system and their comparison **for skill development**. Choice of transmission voltage, Power situation in India & U.P., Various models of transmission lines & performance index, Representation of short transmission lines, medium transmission lines & long transmission lines, Calculation of A, B, C, D constants of various lines to provide employability & skills. Solved examples

UNIT II **(08 Sessions)**

Construction of receiving & power circle diagram & its application to reactive power compensation & voltage control. Computation of inductance of transmission lines – two conductor system & 3 conductor system including un-symmetrically spaced conductors to get knowledge for better employability in industry, Concepts of GMD/GMR Transposition of lines. Computation of capacitance of transmission lines, 2-conductor system & 3-conductor system, Effect on earth on capacitance . Solved examples

UNIT III **(08 Sessions)**

Use of bundled conductor on E, H, V, Lines to reduce corona loss, Types of overhead line insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential sag-tension calculation in overhead lines for skill development and employability, Sag template stringing of conductors vibration dippers. Solved examples

UNIT IV **(08 Sessions)**

Construction of 1-Core and 3-Core underground cables, Insulation resistance, Electric stress distribution, Grading of cables. Capacitance of 1-Core & 3-Core cables, Introduction to oil filled & gas filled E.H.V. Cables for skill development. Comparison of over-heat lines & underground cables, Basic steps in cable laying. Layout of substation for skill development and employability. Solved examples

UNIT V **(08 Sessions)**

Types of distribution system, Kelvin's Law, Distributor, Calculator of distributors size for D.C. distribution, Introduction to a.c. distribution, Voltage control, Load duration curve, Definition of different economic parameters, Two part tariff for calculating cost of electric energy for skill development, Factor affecting transient stability & enhancement of the same. Solved examples

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Differentiate various types of transmission systems locally for skill development,employability and entrepreneurship development.

CO2: Interpret the various transmission concepts for skill development.

CO3: Use bundled conductors and understand different types of line insulators for skill development,employability and entrepreneurship development.

CO4: Understand single core and three core underground cables nationally for skill development and employability.

CO5: Recognize types of distribution systems 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	3	2	2	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	2	1
CO2	2	1	1
CO3	3	1	3
CO4	1	2	2

Director

Registrar
IFTM University
Moradabad.

CO5	2	2	1

Suggested Readings:

1. Elements of Power System Analysis – W.D. Stevenson , McGraw Hill Book Company. Singapore
2. Electric Energy System Theory – O.I. Elegerd
3. Electrical Power System – C.L. Wadhwa., Wiley Eastern Ltd, New Delhi

Website Sources:

- www.easyengineering.net
- www.nptel.ac.in
- www.lecturenotes.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 Electrical Engineering

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

EEE651: POWER SYSTEM PROTECTION LAB

Objective:

1. To design electrical relay system from powers system network for entrepreneurship & employability.
2. To analyze the different kinds of relays for skill development and employability
3. To understand the protection schemes used in power system equipments.

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

4. To study the construction of an over current relay to provide employability & skills.
5. To study the Time-Current characteristics of an over current relay to provide employability & skills.
6. To study the under voltage relay to develop skill.
7. To study the over voltage relay for better employability in industry.
8. To determine the positive sequence impedance of a three phase synchronous generator for entrepreneurship & employability.
9. To measure negative sequence impedance of a three phase synchronous generator for better employability in industry.
10. To determine the zero sequence impedance of a three phase synchronous generator for entrepreneurship & employability
11. To study the construction of an Earth fault Relay for better employability in industry.
12. To study the Tine –Current characteristics of an Earth fault Relay for better employability in industry
13. To study the working model of a Buchholz Relay to develop skill.
14. To study the formation of Y-bus and Z-bus to develop skill.
15. To perform symmetrical fault analysis in power system for better employability in industry.

Course outcomes:

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

CO1: Understand the protection of power system equipment locally to develop skill.
CO2: Differentiate between the relays operations to provide employability & skills.
CO3: Form the bus matrices (Either admittance or impedance) for better employability in industry.
CO4: Acknowledge the fault analysis in power system nationally to provide employability &skills.
CO5: Determine the sequence impedance of a three phase synchronous generator for better employability in industry.

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	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	2	1
CO2	2	3	2
CO3	3	1	3
CO4	3	1	2
CO5	2	2	1

Suggested Readings:

1. Principles of Power System – V.K. Mehta S. Chand & Co.
2. Power system Analysis – Nagsarkar&Sukhija – Oxford publications
3. Electrical. Power Systems:- Theory & Practice – Bandopadhyay – PHI Learning.

Website Sources:

- www.philadelphia.edu.jo

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

Registrar
IFTM University
Moradabad.

- www.nptel.ac.in
- www.lecturenotes.in
- www.electrical-engineering-portal.com
- www.electrical4u.com

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 Electrical Engineering

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

EEE652: POWER ELECTRONICS LAB

Objective:

1. To design and implement the power electronic circuits in the power transmission system for entrepreneurship & employability.
2. To analyze the working of rectifier and SCR family with their applications in the power control process.

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

1. To study single phase half wave rectifier for better employability in industry.
2. To study single phase full wave rectifier to develop skill.
3. To study forward blocking characteristics of SCR understanding for entrepreneurial skill.
4. To study forward characteristics of SCR with gate signal for entrepreneurship & employability.
5. To study forward conduction state (Latching/Holding) characteristics of SCR to develop skill.
6. To study Reverse Blocking characteristics of SCR to provide employability & skills
7. To study UJT triggering circuit without pulse transformer for better employability in industry.
8. To study UJT triggering circuit with pulse transformer to develop skill.
9. To study semi converter for better employability in industry.
10. To study RC triggering circuit with DIAC and TRIAC to develop skill.

Course outcomes:

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

CO1: Understand the process of AC to DC conversion with waveform locally for skilldevelopment.
CO2: Analyze the behavior of switch during ON & OFF state to provide employability & skills.
CO3: Draw forward and reverse characteristics of SCR nationally for better employability & skills.
CO4: Differentiate triggering circuit without or with pulse transformer for better employability & skills.
CO5: Understand RC triggering circuit with DIAC & TRIAC 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	3	3	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	3	1	1	1	2	1	1	2
CO3	3	2	2	2	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	2	1	2
CO2	3	3	1
CO3	2	3	3
CO4	2	2	2
CO5	3	2	2

Suggested Readings:

1. Power Electronics – P.C. Sen
2. Modern Power Electronics: Evolution, Technology, & Application by B.K. Bose
3. Power Electronics By P. S. Bimbhra, Khanna Publications.
4. Power electronics By M D Singh and K B Khanchandani by TMH publication 2 edition.
5. "Power Electronics - circuits, devices and applications", Prentice Hall of India, 2nd Edition, 2000- Muhammad H. Rashid.
6. Power Electronics by V. R. Moorthi, Oxferd University press.
7. Power Electronics – Devices, Converters and Applications", by VedamSubramanyamRevised 2nd edition, New Age Publications.
8. Introduction to Electric Drives – J.S. Katre

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

Website Sources:

- www.circuitglobe.com
- www.electrical4u.com
- https://ocw.mit.edu
- www.electricalengineeringinfo.com
- www.nptel.ac.in

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 Electrical Engineering

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

EEE653: ELECTRICAL MACHINE DESIGN LAB

Objective:

1. To design the electrical machines (transformer) in the step by step method for the practical purpose for entrepreneurship & employability.
2. To design the theoretical construction parameters for any kind of transformer.

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

1. Design and fabricate a 200VA 230V/24V 1 ph 1ron cored small transformer with an efficiency of 90%.
Assume suitable parameters required for the design of the transformer for skill development and employability.
2. Design a 25kVA , 11000/433 V , 50 Hz, 3 ph delta/star, core type , oil immersed natural cooled distribution transformer. The transformer is provided with tapings on the high voltage winding. The maximum temperature is not tyo be exceed 45^0C with mean temperature rise of oil 35^0C for better employability in industry.
3. Design a 2.2kW, 400V 3ph,50 Hz, 1500 rpm (synchronous speed) squirrel cage induction motor. The motor is to started by a star/delta starter. The efficiency and power factor at full load is to be 0.8 and 0.925 respectively. Assume price of the motor is to be the major consideration for better employability in industry.
4. Design a 370 W,230 V ,50 Hz,4 pole, 1ph capacitor start induction motor. The full load efficiency and power factor should not be less than 0.65 and 0.62 respectively. The starting torque should be about 300% of the full load torque with starting current not more than 21 A. The motor is to be of open type with temperature rise not above 40^0 C for continuous operation for skill development and employability.
5. Design a water wheel generator for skill development and employability, with the following specifications:
   kVA = 3000 Voltage = 6600V
   Phase = 3 Frequency = 50Hz
   RPM = 187.5 Connection = Star
   Power factor = 0.8 lag.
   Assume suitable parameters where ever required.

Course outcomes:
After successfully studying this course, students will be able to:
CO1: Understand the process of construction of different parameters for a given rating ofsingle phase transformer for skill development.
CO2: Design the electrical machines (transformer) locally for skill development andemployability.
CO3: Design the squirrel cage induction motor for skill development and employability.
CO4: Design a water wheel generator nationally for better employability in industry.
CO5: Design the distribution transformer 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	3	3	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	3	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	3	2	1	1	1	2	1	1	2
CO5	3	3	3	3	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	2	3	2
CO2	3	1	3
CO3	2	3	3
CO4	3	2	1
CO5	1	2	2

Suggested Readings:
1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.

School of Engineering & Technology IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

2. P.C. Sen " Principles of Electrical Machines and Power Electronics" John willey& Sons, 2001
3. G.K.Dubey "Fundamentals of Electric Drives" Narosa Publishing House, 2001
4. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
5. M.G. Say " Alternating current Machines" Pitman & Sons

Website Sources:

- www.easyengineering.net
- www.nptel.ac.in
- www.lecturenotes.in

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

School of Engineering & Technology ★ Dept. ★ IFTM University
Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE654: DIGITAL SIGNAL PROCESSING LAB

Objective:

1. To generate the various signals in Matlab/Simulink environment.
2. To design the different kinds of filters in Matlab/Simulink environment for entrepreneurship & employability.

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

1. Generation of various signals using MATLAB for skill development and employability.
2. To study Linear convolution of two sequences using MATLAB understanding for entrepreneurial skill.
3. To study sampling and effect of aliasing using MATLAB to develop skill.
4. To study DFT and IDFT for entrepreneurship & employability.
5. To study filter functions for skill development and employability.
6. To calculate FFT of a signal using MATLAB to provide employability & skills.
7. Design of FIR filters using MATLAB to develop skill.
8. Design of IIR filters using MATLAB to develop skill
9. Verification of various signals , DFT and IDFT using CCS and DSK kit for skill development and employability.
10. Design of FIR filter using CCS and DSK kit to provide employability & skills.

Course outcomes:

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

CO1: Understand the process for the generation of signals and obtain the results in the form of waveform in software environment for skill development.
CO2: Analyze the behavior of filters using CCS & DSK kits for skill development.
CO3: Design of FIR & IIR filters locally for entrepreneurship & employability.
CO4: Verification of various signals to nationally develop skill.
CO5: Understand sampling and convolution to develop skill.

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	3	2	2	1	1	1	2	1	1	2
CO2	3	3	3	2	2	1	1	1	2	1	1	2
CO3	3	3	3	2	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	3	3	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	3	2
CO2	2	2	3
CO3	3	3	3
CO4	3	1	2
CO5	2	2	2

Suggested Readings:

1. Sanjay Sharma,"Digital Signal Processing", S.K.Kataria& Sons.
2. Salivahnan, "Digital Signal Processing", Tata Mcgraw-Hill.
3. Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009
4. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
5. Oppenheim & Schafer, "Digital Signal Processing" PHI Learning

Website Sources:

- https://ocw.mit.edu

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

- www.lecturenotes.in
- www.examupdates.in
- www.nptel.ac.in

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 Electrical Engineering

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

EHU701: INDUSTRIAL MANAGEMENT

Objective: To learn about industrial management & its functions & to learn about environmental issues to get knowledge for better employability in industry.

UNIT I **(08 Sessions)**

Introduction: Concept, Development, Application and scope of Industrial Management, Productivity: definition, measurement, productivity index, types of production system, Industrial ownership for entrepreneurship & employability.

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 for skill development and employability.

UNIT III **(08 Sessions)**

Inventory Control: Inventory, cost, Deterministic models, Introduction to supply chain management to develop skill.

UNIT IV **(08 Sessions)**

Quality Control: Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM to provide employability & skills.

UNIT V **(08 Sessions)**

Environmental Issues for skill development and employability: Environmental pollution –various management techniques to control Environmental pollution-Various control acts for Air, Water, Solid waste and Noise pollution.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Understand the theories and principles of modern management and apply the concepts to the management of organisations in private and public sector globally for skill development and employability.

CO2: Understand how managers can effectively plan in today's dynamic environment, be familiar with the design of organisation structure and describe how environmental uncertainty affects organization design for skill development and employability.

CO3: Understand the different inventory control models internationally for skill development.

CO4: Gain knowledge about quality control and different control charts along with the concept of TQM for skill development and employability.

CO5: Learn about environmental issues 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	3	3	3	2	2	3	2	3	2	3	3	2
CO2	3	3	3	2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	2	2	2	3	2	3	3	2
CO4	3	3	3	3	3	2	2	3	2	3	3	2
CO5	3	2	2	2	2	3	3	3	2	3	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	2	1	2
CO2	3	1	3
CO3	1	3	1
CO4	3	2	1
CO5	2	1	2

Suggested Readings:

1. Khanna O.P.: Industrial Engineering
2. BangaT.R. : Industrial Engineering and Management

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

3. Sharma B.R.: Environmental and Pollution Awareness.
4. Koontz, H, &Weihrich, H (2016). Essentials of Management: An International Perspective (8th ed.), Tata McGraw Hills, New Delhi.
5. Ghuman, K &Aswathapa, K, (2017). Management concepts and cases (10th ed.), Tata McGraw Hills, New Delhi.
6. Telsan, M.T. (2016). Industrial and Business Management, (4th ed.), S. Chand, New Delhi.

Website Sources:

- www.noteshub.co.in
- www.nptel.ac.in
- www.lecturenotes.in
- www.studocu.com

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 Electrical Engineering

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

EEE702: POWER SYSTEM ANALYSIS

Objective: To learn about the power system components and fault analysis &load flow study for skill development and employability.

UNIT I **(08 Sessions)**

Representation of Power System Components: Synchronous machines, Transformers, Transmission lines, one line diagram, Impedance and reactance diagram, per unit System to get knowledge for better employability in industry.
Symmetrical components: Symmetrical Components of unbalanced phasor, power in terms of symmetrical components, sequence impedances and sequence networks for skill development.
Transients: Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions.

UNIT II **(08 Sessions)**

Faults in Power System: Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance, Formation of Z bus using singular transformation and algorithm, computer method for short circuit calculations to provide employability & skills.

UNIT III **(08 Sessions)**

Load Flows: Introduction, bus classifications, nodal admittance matrix (BUS Y), development of load flow equations, load flow solution using Gauss Siedel and Newton-Rap son method, approximation to N-R method, line flow equations and fast decoupled method for entrepreneurship & employability.

UNIT IV **(08 Sessions)**

Power System Stability: Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability, studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement for skill development.

UNIT V **(08 Sessions)**

Traveling Waves: Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings, Bewlay's lattice diagram, protection of equipments and line against traveling waves for skill development.

Course Outcomes:

At the end of the course, a student will be able to:
CO1: Represent the components of power system and use of symmetrical components for skill development.
CO2: Principles of modelling and analysis of power systems subject to symmetrical and unsymmetrical faults locally for skill development and employability.
CO3: Principles and application of regular power flow and optimal power flow methods for skill development.
CO4: Differentiate steady state and transient state stability nationally for skill development and employability.
CO5: Understand the concept of travelling waves 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	3	2	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2	1	2
CO2	3	3	3
CO3	1	1	1
CO4	2	2	2
CO5	3	2	2

School of Engineering & Technology ★ IFTM University, Moradabad

Director

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. T.K Nagsarkar& M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
4. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
5. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.

Website Sources:

- www.smartzworld.com
- www.noteshub.co.in
- www.nptel.ac.in
- www.lecturenotes.in
- www.studocu.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 Electrical Engineering

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

EEE703: ELECTRIC DRIVES

Objective: To learn about electrical driving system and its application &power electronic controllers for electrical systems to get knowledge for better employability in industry.

UNIT I **(08 Session)**

Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives, Classification of electric drives Speed-torque conventions and multi-quadrant operations for skill development and employability, Constant torque and constant power operation, Types of load, Load torque: components, nature and classification.

UNIT II **(08 Sessions)**

Dynamics of Electric Drive: Dynamics of motor-load combination; Steady state stability of Electric Drive; Transient stability of electric Drive for skill development.

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty for skill development. Load equalization

UNIT III **(08 Sessions)**

Electric Braking: Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting, Energy relations during braking, dynamics during braking to provide skills.

UNIT IV **(08 Sessions)**

Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited dc motor drives(continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor, Supply harmonics, power factor and ripples in motor current, Chopper control of separately excited dc motor and dc series motor for entrepreneurship & employability.

UNIT V **(08 Sessions)**

Power Electronic Control of AC Drives: Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converterbased) static rotor resistance and slip power recovery control schemes for skill development and employability.

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications **for skill development**

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Understand the basic concepts of Electric Drive and its classification locally for skill development, employability and entrepreneurship development.

CO2: Classify types of electric drives systems based on nature of loads, control objectives,performance and reliability for skill development.

CO3: Acquire knowledge about the concept of Starting and Braking and their dynamics for skill development and employability.

CO4: Control the DC drives with the help of power electronics locally for skill development and employability.

CO5: Control the AC drives with the help of power electronics 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	2	2	1	1	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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)

School of Engineering & Technology ★ IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

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

Suggested Readings:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.
3. M.Chilkin, "Electric Drives", Mir Publishers, Moscow.
4. N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd..V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

Website Sources:

- www.lecturenotes.in
- www.studentsfocus.com
- www.electrical-engineering-portal.com
- www.nptel.ac.in

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 Electrical Engineering

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

EEE704: UTILIZATION OF ELECTRICAL ENERGY AND TRACTION

Objective: To learn about the electric traction and electrical heating and air conditioning system to get knowledge for better employability in industry.

UNIT I **(08 Sessions)**

Electric Heating: Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating to provide employability & skills.

UNIT II **(08 Sessions)**

Electric Welding: Electric Arc Welding, Electric Resistance welding, Electronic welding control for skill development and employability

Electrolyte Process: Principles of electro deposition, Laws of electrolysis, applications of electrolysis for skill development.

UNIT III **(08 Sessions)**

Illumination: Various definitions, Laws of illumination, requirements of good lighting, Design of indoor lighting and outdoor lighting systems for entrepreneurship & employability.

Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler, Types of air conditioning to provide employability & skills, Window air conditioner.

UNIT IV **(08 Sessions)**

Electric Traction – I : Types of electric traction for skill development and employability, systems of track electrification, Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence.

UNIT V **(08 Sessions)**

Electric Traction – II : Salient features of traction drives, Series – parallel control of dc traction drives (bridge transition) and energy saving, Power Electronic control of dc and ac traction drives for skill development and employability, Diesel electric traction. Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Identify a heating scheme for a given application for skill development andemployability.

CO2: Identify a welding scheme for a given application locally for skill development andemployability.

CO3: Understand various illumination, refrigeration & air conditioning systems for skill development, employability and entrepreneurship development.

CO4: Figure-out the different schemes of traction schemes and its main components for skill development and employability.

CO5: Design a suitable scheme of speed control for the traction systems nationally 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	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2	1	1
CO3	3	1	3

School of Engineering & Technology ★ IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

CO4	1	2	2
CO5	2	2	1

Suggested Readings:

1. G.K.Dubey,"Fundamentals of Electric Drives" Narosa Publishing House
2. H. Partab, " Modern Electric Traction" Dhanpat Rai & Sons.
3. C.L. Wadhwa, " Generation, Distribution and Utilization of Electrical Energy" New Age International Publications.
4. H.Partab,"Art and Science of Electrical Energy" Dhanpat Rai & Sons.

Website Sources:

- www.lecturenotes.in
- www.smartzworld.com
- www.nptel.ac.in
- www.easyengineering.net

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

School of Engineering & Technology
Director
IFTM University, Moradabad

Sanjeev Dorawat
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE 705(A): ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEM

Objective: To learn about neural network architecture and its application & fuzzy logic systems for skill development and employability.

UNIT I **(08 Sessions)**

Neural Networks-1(Introduction & Architecture): Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory to provide employability & skills.

UNIT II **(08 Sessions)**

Neural Networks-II (Back propagation networks): Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods to provide employability & skills, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications.

UNIT III **(08 Sessions)**

Fuzzy Logic-I (Introduction); Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion for skill development.

UNIT IV **(08 Sessions)**

Fuzzy Logic –II (Fuzzy Membership, Rules): Membership functions, I interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller, Industrial applications for entrepreneurship & employability.

UNIT V **(08 Sessions)**

Fuzzy Neural Networks: L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propagation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications for entrepreneurship & employability.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Understand principles and architecture of neural networks and their various learning techniques for skill development, employability and entrepreneurship development.

CO2: Comprehend the concepts of feed forward neural networks and back propagation learning methods locally for skill development and employability.

CO3: Understand the concept of fuzziness involved in various systems and fuzzy set theory for skill development.

CO4: Analyze the application of fuzzy logic control to real time systems. Understand basicknowledge of fuzzy sets and fuzzy logic nationally for skill development and employability.

CO5: Apply basic fuzzy system modeling methods like fuzzy back propagation 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	3	2
CO2	2	1	1
CO3	1	3	3
CO4	3	2	2
CO5	2	2	3

School of Engineering ★ IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Yegnanarayana,B "Artificial Neural Networks," Prentice Hall of India.
2. Kumar Satish, "Neural Networks" Tata Mc Graw Hill
3. SimanHaykin,"Neural Netowrks"Prentice Hall of India

Website Sources:

- www.nptel.ac.in
- www.researchgate.net
- www.edutechlearners.com
- www.lecturenotes.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 Electrical Engineering

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

EEE705(B): GENERALISED THEORY OF ELECTRICAL MACHINES

Objective: To introduce the concepts of poly-phase induction machines and applications which will be utilized in the electrical machines with its performance and theory of operation to provide employability & skills.

Unit I: **(08 Sessions)**
Poly-phase AC Machines: Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power) to provide employability & skills.

UnitII: **(08 Sessions)**
Induction Generator: SEIG, DFIG: Operating Principle, Equivalent Circuit, Characteristics, Application. **Two Phase AC Servomotors:** Construction, torque-speed characteristics, performance and applications to provide employability & skills.

Unit III: **(08 Sessions)**
Stepper Motors: Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications for entrepreneurship & employability, **Switched Reluctance Motors:** Construction; principle of operation; torque production, modes of operation, drive circuits

Unit IV: **(08 Sessions)**
Permanent Magnet Machines: Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM A C motors, brushless dc motors and their important features and applications, PCB motors. Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications to provide employability & skills.

UNIT V: **(08 Sessions)**
Single Phase Commutator Motors: Construction, principle of operation, characteristics of universal and repulsion motors; Linear Induction Motors. Construction, principle of operation, Linear force, and applications to provide employability & skills.

Course Outcomes:
The students completing this course will be able to:
CO1: Explain the theory of poly-phase AC Machines and basic machine relations locally to provide employability & skills.
CO2: Acquire knowledge of Induction Generator & two phase AC Servomotors to provide employability & skills.
CO3: Differentiate between Stepper Motors and Switched Reluctance Motors for entrepreneurship & employability.
CO4: Gain knowledge of permanent Magnet Generators, Brushless dc motors, Single phase synchronous motor, reluctance and hysteresis motors nationally to provide employability & skills.
CO5: Describe the characteristics of universal and repulsion motors and principle of operation Linear Induction Motors to provide employability & 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)

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

School of Engineering & Technology IFTM University, Moradabad
Director
Registrar
IFTM University
Moradabad.

CO5	2	3	1

Suggested Readings:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen "Principles of Electrical Machines and Power Electronics" Johnwilley&Sons, 2001
3. K.R. Varmah, "Fundamentals of Electrical machines & Drives", Cengage.
4. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
5. M.G. Say "Alternating current Machines" Pitman & Sons.

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.

Registrar
IFTM University
Moradabad.

School of Engineering & Technology * IFTM Univ
Director

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE705(C): EMBEDDED SYSTEMS

Objective: To apply knowledge practically in order to design, analyze, & implement embedded systems to provide employability & skills.

Unit I: **(08 Sessions)**
Fundamentals of Embedded System: Embedded Systems Basics: Introduction to Embedded systems, Examples of embedded systems, Typical Hardware, Gates, Timing Diagrams, Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, and Interrupt Basics. Core of the embedded system, Memory, Sensors (resistive, optical, position, thermal) and Actuators (solenoid valves, relay/switch, opto-couplers), Communication Interface, Embedded firmware (RTOS, Drivers, Application programs), Power-supply (Battery technology, Solar), PCB and Passive components, Safety and reliability, environmental issues.Ethical practice. Characteristics and quality attributes (Design Metric) of embedded system to provide employability & skills.

Unit II: **(08 Sessions)**
Real time operating system: POSIX Compliance , Need of RTOS in Embedded system software, Foreground/Background systems, multitasking, context switching, IPC, Scheduler policies, Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management to provide employability & skills, RTOS services in contrast with traditional OS.

Unit III: **(08 Sessions)**
Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory Read Only Data Moves, Push and Pop Opcodes, Data Exchanges, Introduction to ARM-v7-M (Cortex-M3), ARM-v7-R (CortexR4) and comparison in between them to provide employability & skills.

Unit IV: **(08 Sessions)**
Embedded Hardware and Design: Introduction to ARM-v7-M (Cortex-M3), ARM-v7-R (CortexR4) and comparison in between them to provide employability & skills, Embedded Serial Communication: Study of basic communication protocols like SPI, SCI (RS232, RS485), I2C, 10 CAN, Field-bus (Profibus), USB (v2.0), Bluetooth, Zig-Bee, Wireless sensor network

UNIT V: **(08 Sessions)**
Embedded Software, Firmware Concepts and Design: Embedded C-programming concepts (from embedded system point of view): Optimizing for Speed/Memory needs, Interrupt service routines, macros, functions, modifiers, data types, device drivers, Multithreading programming. (Laboratory work on J2ME Java mobile application) for entrepreneurship & employability.

Course Outcomes:
The students completing this course will be able to:
CO1: Acquire knowledge and understand fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware for skill development and employability.
CO2: Analyze a system both as whole and in the included parts, to understand how these parts interact in the functionality and properties of the system nationally for skill development and employability.
CO3: Demonstrate a deeper understanding of the electronics and physical principles used for embedded biomedical measuring systems locally for skill development and employability.
CO4: Apply formal method, testing, verification, validation and simulation techniques and tools in order to engineer reliable and safe embedded systems for entrepreneurship & employability.
CO5: Practically apply gained theoretical knowledge in order to design, analyze and implement embedded systems, e.g. integrating embedded subsystems and applications in building a fully functional autonomous robot for entrepreneurship & 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	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	2

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	2	3	1
CO3	2	3	1
CO4	2	2	2
CO5	2	2	3

Suggested Readings:

1. Introduction to Embedded Systems : Shibu K. V. (TMH)
2. Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)
3. Embedded Systems : Rajkamal (TMH)
4. Embedded Systems : L. B. Das (Pearson)
5. Embedded System design : S. Heath (Elsevier) Embedded microcontroller and processor design: G. Osborn (Pearson)
6. Embedded Systems: Frank Vahid , Wiley India, 2002
7. Embedded Microcomputer Systems – Real Time Interfacing – Jonathan W. Valvano; Cengage Learning; Third or later edition.

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
Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electrical Engineering

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

EEE705(D): ADVANCED DIGITAL SIGNAL PROCESSING

Objective: To understand the designs of different digital filters for skill development and employability.

UNIT I **(08 Sessions)**
DISCRETE TIME SIGNALS
Introduction to Discrete time signals LTI system-stability-properties-sampling frequency domain Representation of discrete time signals and systems for skill development and employability, discrete random signals-transforms, Properties, Inverse Z transforms.

UNIT II **(08 Sessions)**
DIGITAL FIR FILTER DESIGN
Design of FIR filters – structures for entrepreneurship, skill development and employability windowing method, optimal method, Frequency sampling method.

UNIT III **(06 Sessions)**
DIGITAL IIR FILTER DESIGN
Design of IIR filter: Impulse invariant method, Matched z-transform method, bilinear method for entrepreneurship, skill development and employability.

UNIT IV **(08 Sessions)**
ADAPTIVE DIGITAL FILTERS
Adaptive filters, Examples of Adaptive filtering, the minimum mean square error criterion; The Windrow and Hoff LMS Algorithm, Recursive least square Algorithm, Applications for skill development and employability.

UNIT V **(06 Sessions)**
MULTI RATE DIGITAL SIGNAL PROCESSING
The basic sample rate Alteration Devices-Filters with sampling rate Alteration systems, Multistage Design of Decimators and Interpolators, Arbitrating rate sampling rate converter, Polyphase decomposition, digital filter design – Application for skill development and employability.

Course Outcomes:
On completion of the course students will be able to
CO 1: Apply digital signal processing techniques to analyze LTI systems in time andfrequency domain nationally for skill development and employability.
CO 2: Design and Analyze FIR digital filters for entrepreneurship, skill development and employability.
CO 3: Design and Analyze IIR digital filters for entrepreneurship, skill development and employability.
CO 4: Understand and be able to implement adaptive signal processing algorithms nationally for entrepreneurship, skill development and employability.
CO 5: Acquire the basics of multirate digital signal processing 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	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2
CO3	3	3	2
CO4	3	3	1
CO5	3	3	1

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

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Digital signal processing: A Practical Approach, Emmanuel C. Ifeachor, Barrie W. Jervis, Pearson Education.
2. Digital Signal Processing Principal, Algorithms and Applications, John G. Proakis, Dimitris G. Manolakis Pearson
3. Digital signal processing: A Computer Based Approach, Sanjit K. Mitra, Tata McGraw hill Pub, Company Limited New Delhi, 2001.
4. Digital signal processing, Alan Oppenheim, V and Ronals W. Schafer, Prentice Hall of India Private Limited, New Delhi, 1992.
5. Signals and systems, Simon Haylaim and Barry van veen, John wiley and sons India.
6. Digital signal processing, S,Salivahanan, Tata Mc Graw Hill Education Private Limited, New Delhi, 2010.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.nptel.ac.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 Electrical Engineering

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

EEE705(E): DEREGULATED POWER SYSTEM

Objective: To make the aspiring engineers have the overview of deregulation, unbundling of electric utilities and its benefits for skill development and employability.

UNIT I **(06 Sessions)**
Deregulation, Reconfiguring Power systems, unbundling of electric utilities, Background to deregulation and the current situation around the world, benefits from a competitive electricity market after effects of deregulation for skill development and employability.

UNIT II **(08 Sessions)**
Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, ISO in Bilateral markets, Operational planning activities of a GENCO: Genco in Pool and Bilateral markets, market participation issues, competitive bidding for skill development and employability.

UNIT III **(06 Sessions)**
Power wheeling, Transmission open access, pricing of power transactions, security management in deregulated environment, and congestion management in deregulation for employability.

UNIT IV **(06 Sessions)**
General description of some ancillary services, ancillary services management in various countries for employability and reactive power management in some deregulated electricity markets

UNIT V **(08 Sessions)**
RELIABILITY ANALYSIS: Interruption criterion, stochastic components, component models, Calculation methods, Network model: stochastic networks, series and parallel connections, minimum cut sets, reliability cost. Generation, transmission and distribution reliability, Reliability and deregulation: conflict, reliability analysis, effects on the actual reliability, regulation of the market for employability.

Course Outcomes:
On completion of the course students will be able to
CO 1: Describe the deregulation, unbundling of electric utilities and its benefits for skill development and employability.
CO 2: Explain the operational planning activities of independent system operator in pool & bilateral markets and describe competitive bidding locally for skill development and employability.
CO 3: Explain the open access of transmission line and management of security & congestion in deregulation for skill development and employability.
CO 4: Describe the different types of Electric traction, system of track electrification and its related mechanics nationally for skill development and employability.
CO 5: Illustrate the Reliability Analysis of Generation, transmission and distribution and the regulation of the market 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	2	2	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	2	2	2	2	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2	3	1
CO2	2	3	1
CO3	2	3	1
CO4	2	3	1
CO5	2	3	1

School of Engineering & Technology ★ IFTM University Moradabad
Director
Registrar
IFTM University
Moradabad.

Suggested Readings:

1. K. Bhattacharya, MHT Bollen and J.C Doolder, "Operation of Restructured Power Systems", Kluwer Academic Publishers, USA, 2001.
2. Lei Lee Lai, "Power System restructuring and deregulation", John Wiley and Sons, UK. 2001.
3. Fred I Denny and David E. Dismukes, "Power System Operations and Electricity Markets", CRC Press, LLC, 2002.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(F): ENTREPRENEURSHIP DEVELOPMENT

Objective: The purpose of the course is that the students acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities, to develop the ability of analysing and understanding business situations in which entrepreneurs act and to master the knowledge necessary to plan entrepreneurial activities. The objective of the course is, further on, that the students develop the ability of analysing various aspects of entrepreneurship – especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development and, finally, to contribute to their entrepreneurial and managerial potentials.

UNIT I **(08 Sessions)**

Entrepreneurship- Definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry for entrepreneurship, skill development and employability.

UNIT II **(08 Sessions)**

Project identification- assessment of viability for entrepreneurship and employability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT III **(08 Sessions)**

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports for entrepreneurship, skill development and employability, accounts and stores studies.

UNIT IV **(08 Sessions)**

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication for entrepreneurship, skill development and employability.

UNIT V **(08 Sessions)**

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries for entrepreneurship and employability.

Course Outcomes:

On completion of the course students will be able to

CO1: Understand the growth of small scale industries internationally for entrepreneurship and employability.
CO2: Analyze and prepare project report for employability.
CO3: Prepare balance sheets and assessment of economic viability for entrepreneurship and employability.
CO4: Control and prepare a planning methodology of project globally for entrepreneurship and employability.
CO5: Understand the laws concerning entrepreneur 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)

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

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

CO3	2	3	3
CO4	2	3	3
CO5	3	3	3

Suggested Readings:

1. Dr. Gupta and Dr. Srinivasan, Entrepreneurship development in India
2. Vasant Desai, Dynamics of Entrepreneurial Development and Management
3. Sarugadharan and Resia Begum, Women Entrepreneurship; institutional support and problems
4. M.W.Deshpande, Entrepreneurship of small Scale Industries
5. D.L. Saxon and RW Smilor (eds), The Art and Science of Entrepreneurs

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(G): ELECTRICAL ENGINEERING STANDARDS & PRACTICES

Objective: To make the aspiring engineers have the overview of Indian Standards and International Standards for skill development and employability.

Unit I **(08 Sessions)**

Introduction of Standards and Design practices

Different Electrical standards & codes, overview of Indian Standards and International Standards (IS, IEC, IEEE, NEMA and Building codes etc.). General engineering design practices, selection of voltage level, role of electrical studies and design calculations (load flow, fault level calculation, earthing and lightning calculation, voltage drop) in distribution system planning. Feasibility study, thermal and electrical resistivity of soil, Study of electrical drawings/layouts and cost estimation for skill development and employability.

Unit II **(08 Sessions)**

Electrical Standards-I

Overview of IS standards for cables (IS-7098 IS-8130, IS-10810, IS-1554, IS-1255), IS standards for lighting (IS-3646, IS-10322, IS-6665) and IS standards for motors (IS-325, IS-900, IS-2253, IS-4029, IS-15999) - basic terminologies, type test and routine tests. Efficiency class of motors as per IS/IEC standard for employability.

Unit III **(08 Sessions)**

Electrical Standards-II

Transformer types, overview of IS standards for transformer (IS-2026, IS-6600 IS-10028, IS-11171), IS standards for LV & HV switchgears (IS-8623, IS/IEC-60898, IS/IEC-62271, IS-3427, IS-9920, IS-12729) - basic terminologies, type test and routine tests. Instrument transformers (CT & PT), Instrument safety factor, VA burden, knee point voltage and accuracy classes for skill development and employability.

Unit IV **(08 Sessions)**

National Codes and Design practices

Overview of National electrical code, National Building Code of India, Cable types, installation practices, derating factors and bonding methods, Earthing and lightning protection system, touch and step potentials, Hazardous area classification, electrical equipments for different hazardous zones for employability.

Unit V **(08 Sessions)**

Equipment Sizing & Selection, CEA Regulations

Load estimation, sizing and selection of transformers, cables and switchgears, CEA Regulations 2010 and amendments, safety and installation guidelines for entrepreneurship and employability.

Course Outcomes:

On completion of the course students will be able to

CO 1: Interpret different National & International Electrical Standards in practice for employability.
CO 2: Understand Indian standards for cables, lighting and motors for employability.
CO 3: Understand Indian standards of transformers, LV & HV switchgears nationally for entrepreneurship and employability.
CO 4: Demonstrate the basic guidelines for National codes and design practices nationally for entrepreneurship and employability.
CO 5: Select the size and type of transformer, cable & switchgear for electrical applications 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)

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

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

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

Suggested Readings:

1. Robert Alonzo, "Electrical Codes, Standards, Recommended Practices and Regulations 1st Edition", Elsevier Inc.
2. Mohamed A El-Sharkawi, "Electric safety: practice and standards", CRC Press.
3. Central Electricity Authority Regulations and Amendments.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(H): ADVANCED CONTROL SYSTEM

Objective: To provide knowledge on design in state variable form and in phase plane analysis for skill development and employability.

UNIT I
STATE VARIABLE DESIGN **(09 Sessions)**
Introduction to state Model for employability- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle- servo design: -State Feedback with integral control.

UNIT II
PHASE PLANE ANALYSIS **(09 Sessions)**
Features of linear and non-linear systems - Common physical non-linearities – Methods of linearization Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems– Isocline method for skill development and employability.

UNIT III **(09 Sessions)**
DESCRIBING FUNCTION ANALYSIS
Basic concepts, derivation of describing functions for common non-linearities –Describing function analysis of non-linear systems – limit cycles – Stability of oscillations for skill development and employability.

UNIT IV **(09 Sessions)**
OPTIMAL CONTROL
Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti's equation – Application for skill development and employability examples.

UNIT V **(09 Sessions)**
OPTIMAL ESTIMATION
Optimal estimation – Kalman Bucy Filter-Solution by duality principle-Discrete systems Kalman Filter- Application examples for skill development and employability.

Course Outcomes:
On completion of the course students will be able to
CO1: Develop mathematical models for skill development and employability and understand the mathematical relationships between the sensitivity functions and how they govern the fundamentals in control systems.
CO2: Understand the phase plane analysis locally for employability.
CO3: Give basic knowledge in describing function analysis for employability.
CO4: Study the design of optimal controller locally for skill development and employability.
CO5: Design of optimal estimator including Kalman Filter for skill development andemployability.

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	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	2	2	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2	3	1
CO2	2	3	1
CO3	2	3	1
CO4	2	3	1
CO5	2	3	1

School of Engineering ★ IFTM University, Moradabad ★
Director
Registrar
IFTM University
Moradabad.

Suggested Readings:

1. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
2. G. J. Thaler, " Automatic Control Systems", Jaico Publishing House, 1993.
3. M.Gopal, "Modern Control System Theory", New Age International Publishers, 2002.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(I): POWER QUALITY & FACTS

Objective: To monitor the power quality and understand the concept of FACTS, SPS, UPFC, SSSC etc. for skill development and employability.

UNIT I **(08 Sessions)**

Overview: Sources of pollution and regulations, various power quality problems, transmission problems and needs, the emergence of FACTS, FACTS controller & consideration for employability.

UNIT II **(08 Sessions)**

Harmonics: Effects-within the power system, Interference with communication Harmonic measurements, Harmonic elimination, Harmonic distortion due to various sources, Effects of harmonic distortion, THD calculation for employability, Harmonic filter design, Active and Passive Filters.

UNIT III **(08 Sessions)**

Monitoring power quality: Monitoring essentials, reliability indices, Power quality measuring equipment, Current industry trends for skill development and employability, Fourier series, Fourier transform and wavelet transform.

UNIT IV **(08 Sessions)**

Series and shunt compensation: Fundamental of series compensation, principle of operation, TCSC operation in power system, SSSC :principle of operation, Shunt SVC principles, configuration & control, STATCOM, Modeling and applications of series and shunt compensating devices for skill development and employability.

UNIT V **(08 Sessions)**

Phase shifter: Principle of operation, steady state model of static phase shifter, operating characteristics of SPS, power current configuration of SPS applications. Unified power flow controllers: Basic operating principles & characteristics, control UPFC installation applications, UPFC model for power flow studies for skill development and employability.

Course Outcomes:

On completion of the course students will be able to

CO1: Understand the overview of various power quality problems locally for employability.
CO2: Understand the effects of Harmonics for skill development and employability.
CO3: Monitor the power quality for skill development and employability.
CO4: Understand the Modeling and applications of series and shunt compensating devices nationally for employability.
CO5: Understand UPFC model for power flow studies 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	3	3	3	1	1	1	2	1	2	2
CO2	3	3	3	3	3	1	1	1	2	1	2	2
CO3	3	3	3	3	3	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	3	1
CO2	2	3	1
CO3	2	3	1
CO4	2	3	1
CO5	2	3	1

Suggested Readings:

1. Song Y.H. and Johns A.T., "Flexible AC Transmission Systems", IEEE Press.

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

Registrar
IFTM University
Moradabad.

2. Hingorani N.G. and Gyragyi L., "Understanding FACTS (Concepts and Technology of Flexible AC Transmission System)", Standard Publishers & Distributors, Delhi.
3. Ghosh A. and Ledwich G., "Power Quality Enhancement using Custom Power Devices", Kluwer Academic Publishers.
4. Mathur R.M. and Verma R.K., "Thyristor based FACTS controllers for Electrical Transmission Systems", IEEE Press.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(J): DISTRIBUTED GENERATION AND MICROGRID

Objective: To understand the impact of grid integration & micro grids for skill development and employability.

UNIT I
INTRODUCTION **(09 Sessions)**
Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources for entrepreneurship skill development and employability: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNIT II
DISTRIBUTED GENERATIONS (DG) **(09 Sessions)**
Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations for skill development and employability Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants.

UNIT III
IMPACT OF GRID INTEGRATION **(09 Sessions)**
Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration for skill development and employability with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT IV
MICROGRIDS **(10 Sessions)**
Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids, communication infrastructure, modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques for skill development and employability.

UNIT V
POWER QUALITY ISSUES IN MICROGRIDS **(05 Sessions)**
Power quality issues in microgrids- Modelling and Stability analysis of Microgrid for employability, regulatory standards, Microgrid economics, Introduction to smart microgrids

Course Outcomes:
On completion of the course students will be able to
CO1: Understand exploration of renewable energy sources nationally for entrepreneurship,skill development and employability.
CO2: Understand philosophy of distributed generation nationally for skill development andemployability.
CO3: Understand various issues of DG with grid integration for employability.
CO4: Understand the concept of micro grid and various power quality issues foremployability.
CO5: Understand various power quality issues in microgrids 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)

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

Director

Registrar
IFTM University
Moradabad.

CO3	2	3	1
CO4	2	3	1
CO5	2	3	1

Suggested **Readings:**

1. Voltage Source Converters in Power Systems: Modeling, Control and Applications, AmirnaserYezdani, and Reza Iravani, IEEE John Wiley Publications,2009.
2. Power Switching Converters: Medium and High Power, Dorin Neacsu, CRC Press, Taylor & Francis, 2006.
3. Solar Photo Voltaics, Chetan Singh Solanki, PHI learning Pvt. Ltd., New Delhi,2009.
4. Wind Energy Explained, theory design and applications, J.F. Manwell, J.G. McGowan Wiley publication,2002.
5. Biomass Regenerable Energy, D. D. Hall and R. P. Grover, John Wiley, New York, 1987.
6. Renewable Energy Resources, John Twidell and Tony Weir, Tyalor and Francis Publications, 2005.

Website **Sources:**

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(K): ENERGY CONSERVATION & AUDITING

Objective: To identify and describe present state of energy security and its importance for skill development and employability.

UNIT I

BASIC PRINCIPLES OF ENERGY AUDIT (08 Sessions)

Energy audit- definitions, concept, types of audit, energy index, cost index ,pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit Need for energy management – energy basics – designing and starting an energy management program – energy audit process. Need for energy management – energy basics – designing and starting an energy management program – energy accounting – energy monitoring, targeting and reporting for skill development and employability.

UNIT II

ENERGY COST AND LOAD MANAGEMENT (06 Sessions)

Important concepts in an economic analysis – economic models – time value of money –utility rate structures – cost of electricity – loss evaluation. Load management: demand control techniques – utility monitoring and control system-HVAC and energy management – economic justification for skill development and employability.

UNIT III

ENERGY EFFICIENT MOTORS (06 Sessions)

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance - over motoring - motor energy audit applications to Systems for skill development and employability and equipment such as: electric motors – transformers and reactors – capacitors and synchronous machines.

UNIT IV

METERING FOR ENERGY MANAGEMENT (06 Sessions)

Relationships between parameters – Units of measure – typical cost factors – utility meters – timing of meter disc for kilowatt measurement – demand meters – paralleling of current transformers – instrument transformer burdens – multitasking solid-state meters – metering location vs. requirements – metering techniques and practical examples for skill development and employability.

UNIT V

LIGHTING SYSTEMS AND COGENERATION (08 Sessions)

Concept of lighting systems – the task and the working space – light sources – ballasts –luminaries – lighting controls – optimizing lighting energy – power factor and effect of harmonics on power quality – cost analysis techniques – lighting and energy standards for employability, Cogeneration: forms of cogeneration – feasibility of cogeneration – electrical interconnection.

Course Outcomes:

On completion of the course students will be able to

CO1: Identify and describe present state of energy security and its importance for skill development and employability.

CO2: Identify and describe the basic principles and methodologies adopted in energy audit ofutility nationally for skill development and employability.

CO3: Describe the energy performance evaluation of some common electrical and thermal installations and identify the energy saving opportunities for skill development and employability.

CO4: Analyze the data collected during performance evaluation and recommend energy saving measures locally for skill development and employability.

CO5: Discuss the concept of lighting systems 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)

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

School of Engineering & Technology ★ IFTM University Moradabad ★ Director

Registrar
IFTM University
Moradabad.

CO2	3	2	2	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	2	3	2	2	1	1	1	2	1	2	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	2	3	1
CO2	2	3	1
CO3	2	3	1
CO4	2	3	1
CO5	2	3	1

Suggested Readings:

1. Eastop T.D and Croft D.R, "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, 1990.
2. Reay D.A., "Industrial Energy Conservation", first edition, Pergamon Press, 1977.
3. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 1996.
4. Amit K. Tyagi, "Handbook on Energy Audits and Management", TERI, 2003

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(L): BIO-MEDICAL INSTRUMENTATION

Objective: To understand the recent trends in Bio Medical Engineering for entrepreneurship, skill development and employability.

UNIT I **(07 Sessions)**

Characteristics of Transducers and Electrodes for Biological Measurement: Introduction to human body; block diagram, classification, characteristics, Various physiological events and suitable transducer for their recording for entrepreneurship and employability, Bioelectric potentials.

UNIT II **(07 Sessions)**

Cardiac System: Cardiac musculature, Electro cardiography, ECG recording, Phonocardiography, holter recoding ECG lead system, Heart rate meter, vector cardiography, Pacemakers, Defibrillators for entrepreneurship and employability.

UNIT III **(07 Sessions)**

Blood Pressure and Blood Flow Measurement: Invasive and non-invasive methods of Blood ressure, Characteristics of blood flow and heart sound, Cardiac output measurement for employability, Plethysmography.

UNIT IV **(08 Sessions)**

Respiratatory System: Mechanics of breathing, Parameters of respiration, Respiratory system measurements, Respiratory therapy instruments. **Instrumentation for Measuring Nervous Function:** EEG signal, frequency band classification, Lead systems, EEG recording, Clinical applications of EEG signal, X-ray CT scan, MRI, PET for employability.

UNIT V **(09 Sessions)**

Recent Trends in Biomedical Engineering: Patient care and monitoring, Non-invasive diagnostic instrumentation, Biotelemetry, Telemedicine, Prosthetic devices, Lie detector test, Application of lasers and ultrasonic in biomedical field. **Troubleshooting & Electrical Safety of Biomedical Instruments:** Physiological effect of current and safety measurement, Design of biomedical instruments, Simulations on various biomedical applications for entrepreneurship, skill development and employability.

Course **Outcomes:**

On completion of the course students will be able to

CO1: Understand the characteristics of Transducers locally for skill development andemployability.
CO2: Understand the Cardiac System locally for employability.
CO3: Understand the Blood Flow Measurement for entrepreneurship, skill development andemployability.
CO4: Understand the Respiratory System Measurements and instruments for measuringnervous function.
CO5: Troubleshoot and discuss the electrical safety of biomedical instruments.

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	2	1	1	1	2	1	2	2
CO2	3	2	2	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2
CO2	2	3	2
CO3	2	3	1
CO4	1	3	2
CO5	2	3	1

School of Engineering & Technology ★ IFTM University ★ Moradabad
Director

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. Biomedical Engineering Fundamentals by Bronzino, CRC Press
2. A Textbook on Biomedical Engineering by R M Kenedi, Balckie
3. Introduction to Biomedical Engineering by Enderle & Bronzino, Academic Press

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.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 Electrical Engineering

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

EEE705(M): APPLICATION OF POWER ELECTRONICS TO POWER SYSTEM

Objective: To make students aware how power electronics devices can be used to find solution to the problems in long distance power transmission for skill development and employability.

Unit I **(05 SESSIONS)**
Review of semiconductor devices, Steady state and dynamic problems in AC systems for employability, Power flow

Unit II **(06 SESSIONS)**
Flexible AC transmission systems (FACTS): Basic realities & roles, Types of facts controller for entrepreneurship and employability, Principles of series and shunt compensation.

Unit III **(09 SESSIONS)**
Description of static var compensators (SVC), Thyristor Controlled series compensators (TCSC), Static phase shifters (SPS), Static condenser (STATCON), Static synchronous series compensator (SSSC) and Unified power flow controller (UPFC) for skill development and employability.

Unit IV **(08 SESSIONS)**
Modelling and Analysis of FACTS controllers, Control strategies to improve system stability for employability Power Quality problems in distribution systems.

Unit V **(07 SESSIONS)**
Harmonics, harmonics creating loads, modelling, Series and parallel resonances, harmonic power flow, Mitigation of harmonics for employability, filters, passive filters.

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

CO1: Review of semiconductor devices locally for employability.
CO2: Understand the concept of FACTs for entrepreneurship and employability.
CO3: Select and implement proper compensator to solve the problems occurring power transmission for employability.
CO4: Model and analyze the FACT controllers nationally for entrepreneurship and employability.
CO5: Understand and apply the active filtering techniques in mitigation of harmonic distortion 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	2	2	2	2	1	1	1	2	1	2	2
CO2	3	2	2	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2	3	1
CO2	2	3	2
CO3	2	3	1
CO4	1	3	2
CO5	2	3	2

Suggested Readings:

1. Understanding of FACTs., Hingorani, N. G.; IEEE Press 1996.
2. Power Quality.; Heydt G.T.; Stars in a Circle Pblications , Indiana, 1991.
3. Static Reactive Power Compensation.; Miller T.J.E.; John Wiley & Sons, New York, 1982.
4. Flexible AC Transmission System. (FACTs).; Yong Hua Song.; IEE 1999.

School of Engineering & Technology ★ IFTM University Moradabad ★
Director
Registrar
IFTM University
Moradabad.

Website Sources:

- www.easyengineering.net
- www.electrical-engineering.net
- www.lecturenotes.in
- www.academia.edu
- www.nptel.ac.in

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 Electrical Engineering

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

EEE706: INTELLIGENT INSTRUMENTATION

Objective: To learn about the transducers and its applications &use the data acquisition methods for digital instruments for knowledge for better employability in industry.

UNIT I **(08 Sessions)**

Introduction: Historical Perspective, current status, software based instruments to provide employability & skills.

UNIT II **(08 Sessions)**

Digital Transducers for entrepreneurship & employability: Review of various types of analog electrical transducers used for the measurement of strain, pressure, force, flow etc, Digital transducers, Digital Encoders –Classification, Resolution enhancement of digital transducers, application of digital transducers for the measurement of position, velocity, flow, temperature, pressure and liquid level.

UNIT III **(08 Sessions)**

Virtual Instrumentation: Introduction to graphical programming, data flow & graphical programming techniques, advantage ofVI techniques, VIs and sub-VIs loops and charts , arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Code Interface Nodes and DLL links to provide employability & skills.

UNIT IV **(08 Sessions)**

Data Acquisition Methods: Introduction to data acquisition Methods: Analog and Digital IO, Counters, Timers, Timers, basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked Communication and Controls for entrepreneurship & employability

UNIT V **(08 Sessions)**

PC Hardware Review & Instrumentation Buses: Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA buses. IEEE488.1 & 488.2 Serial Interfacing - RS232C, RS422, RS423,RS485; USB, VXI, SCXI, PXI to get knowledge for better employability in industry.

Course Outcomes:

At the end of the course, a student will be able to:

CO1: Explain the concept of intelligent instrumentation and impart knowledge on automation for skill development, employability and entrepreneurship development.

CO2: Develop an ability to analyze digital transducers for skill development, employability and entrepreneurship development.

CO3: Develop an ability to evaluate the performance of a real time system through virtual instrumentation techniques internationally for skill development.

CO4: Determine different data acquisition methods locally for skill development andemployability.

CO5: Discuss the latest technology in automation 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	3	3	3	2	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	3	3	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	2	2
CO2	2	1	1
CO3	3	3	2
CO4	1	2	2

School of Engineering & Technology * IFTM University Moradabad *
Director

Registrar
IFTM University
Moradabad.

CO5	2	2	3

Suggested Readings:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall, 1995:
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall, 1993.
3. S. Gupta , J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED./ Instrument Society of America, 1994.
4. Gary Johnson / Lab VIEW Graphical Programming II Edition / McGraw Hill 1997.

Website Sources:

- www.nptel.ac.in
- www.researchgate.net
- www.edutechlearners.com
- www.lecturenotes.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 Electrical Engineering

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

EEE752: POWER SYSTEM ANALYSIS LAB

Objective:

1. To design a power transmission line and obtain the performance parameters.
2. To use the parameter variation for enhancing the efficiency of power system.
3. To expose the students to the distribution and transmission system to provide employability & skills.

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

1. To study the oil testing set and determine the dielectric strength of transformer oil to provide employability & skills.
2. To study the operating characteristics of miniature circuit breaker B type 6A to develop skill.
3. To study the operating characteristics of bimetallic miniature circuit breaker C type 2A and to draw the Current-Time and Temperature-Time characteristics to develop skill
4. To determine the ABCD, h, z and Image parameters for Short Transmission Line to provide employability & skills.
5. To determine the ABCD, h, z and Image parameters for Medium Transmission Line to develop skill.
6. To determine the ABCD, h, z and Image parameters for long Transmission Line to provide employability & skills.
7. To measure the receiving end voltage of each line under no load or light load condition to observe Ferranti effect to provide employability & skills
8. To analyze and study the Radial Distribution Network to provide employability & skills.
9. To determine Transmission Line performance (Load Flow Analysis) to provide employability & skills
10. To obtain the steady state, transient state and sub-transient short circuit currents of an alternator for better employability in industry.

Course outcomes:

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

CO1: Explain the concept of dielectric strength of transformer oil locally to develop skill.
CO2: Differentiate between short, medium & long transmission line to develop skill.
CO3: Understand the transmission line performance to provide employability & skills.
CO4: Obtain the characteristics of different circuit breakers for better employability in industry nationally.
CO5: Obtain steady state, transient state and sub transient state of an alternator to develop skill.

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	2	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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	2	3	3
CO3	3	2	1
CO4	2	2	3
CO5	3	1	2

Suggested Readings:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.

Director

Registrar
IFTM University
Moradabad.

3. T.K Nagsarkar& M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
4. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
5. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.

Website Sources:

- www.smartzworld.com
- www.noteshub.co.in
- www.nptel.ac.in
- www.lecturenotes.in
- www.studocu.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 Electrical Engineering

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

EEE753: ELECTRIC DRIVES LAB

Objective:

1. To expose the methods of speed control of DC motor for traction and other applications.
2. To use the power electronic controllers for the purpose of position and speed control of DC & AC motors to provide employability & skills.

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

1. To study speed control of separately exited DC motor by varying armature voltage through single phase fully controlled bridge converter for better employability in industry.
2. To study speed control of separately exited DC motor by varying armature voltage through single phase half controlled bridge converter for skill development and employability.
3. To study speed control of separately exited DC motor using single phase dual converter (microcontroller based) for better employability in industry.
4. Speed control of DC motor using chopper motor controller (MOSFET based) for better employability in industry.
5. Chopper control of separately exited dc motor (1 HP) for obtaining speed-torque characteristics to develop skill.
6. To study closed loop control of separately exited dc motor for better employability in industry.
7. To study speed control of three-phase induction motor using three phase AC voltage controller for skill development and employability..
8. To study two position control of three-phase induction motor using three phase AC voltage controller for better employability in industry.
9. To study speed control of three-phase slip-ring induction motor using static resistance control for skill development and employability
10. To study speed control of three-phase slip-ring induction motor using Scherbius slip power recovery control scheme for better employability in industry.

Course outcomes:

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

CO1: Explain the concept of speed control of DC motors nationally to develop skill.
CO2: Explain the concept of speed control of three phase induction motor to develop skill.
CO3: Understand dual converter for skill development and employability
CO4: Differentiate between open loop and close loop control of DC motor nationally for skill development and employability.
CO5: Control separately excited dc motor using chopper 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	3	2	2	1	1	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	2	2	1	1	1	2	1	2	2
CO4	3	3	3	3	3	1	1	1	2	1	2	2
CO5	3	3	3	3	3	1	1	1	2	1	2	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	2	1	2
CO2	3	3	3
CO3	1	1	1
CO4	1	3	3
CO5	3	2	2

School of Engineering & Technology ★ IFTM University, Moradabad
Director

Registrar
IFTM University
Moradabad.

Suggested Readings:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.
3. M.Chilkin, "Electric Drives", Mir Publishers, Moscow.
4. N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd..V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

Website Sources:

- www.lecturenotes.in
- www.studentsfocus.com
- www.electrical-engineering-portal.com
- www.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 Electrical Engineering

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

EEE801: NON- CONVENTIONAL ENERGY RESOURCES

Objective: To learn about non-conventional resources of energy for skill development and employability and its applications & electrochemical effects and fuel cell.

UNIT I **(08 Sessions)**

Energy Resources & their Utilization: Introduction to various sources of energy, Solar, Thermal, Photovoltaic, Water power , Wind energy, Biomass, Ocean thermal ,Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Decentralized and dispersed generation to provide employability & skills. **Solar –radiations:** Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Zenith angle, Solar altitude angle expression, Solar radiation data for India for skill development.

UNIT II **(08 Sessions)**

Solar Energy: Solar thermal power and it's conversion, Solar collectors, Performance analysis of flat plate collectors, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors for skill development and employability. Solar thermal energy storage, Different systems, Solar pond.

Solar Photovoltaic system: Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photo voltaic system and standards, Applications of solar photovoltaic system, PV hybrid system for skill development and employability.

UNIT III **(08 Sessions)**

Biogas: Photosynthesis, Biogas production to provide employability & skills, Transportation of biogas, bio gas plant technology and status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste for entrepreneurship & employability. **Wind Energy:** Availability of wind energy in India, Wind velocity, Types of wind machines and their characteristics for skill development and employability, Elementary design principles, Coefficient of performance of wind mill rotor, Aerodynamic considerations in wind mill design, Wind energy farms, Recent developments.

UNITIV **(08 Sessions)**

Electrochemical effects and fuel cells: Principle of operation of an acidic and alkaline fuel cell , Reusable fuel cell ,Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells to get knowledge for better employability in industry. **Tidal Power:** Tidal and waves as sources of energy, Use of tidal energy, Limitations of tidal energy conversion systems. Hydrogen Energy: Properties of hydrogen in respect of its use as source of renewable energy, Sources and production of hydrogen, Storage and transportation, Problems with hydrogen as fuel. Develop of hydrogen cartridge for skill development.

UNIT-V **(08 Sessions)**

Thermoelectric systems: Kelvin's relations, Power generation, Properties of thermoelectric materials, Fusion plasma generators. **Geothermal Energy:** Geothermal sites, earthquakes, Volcano's, Geothermal resources, Hot springs, Steam ejection, Principle of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants for entrepreneurship & employability. Advanced concepts. **Ocean Energy:** Principle of ocean thermal energy conversion, wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Impact of renewable energy generation on environment, Kyoto protocol, cost of energy production from different energy sources. Energy options for Indian economy for skill development.

Course Outcomes:

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

CO1: Demonstrate the generation of electricity from various Non-Conventional sources of energy and their utilization nationally for skill development, employability and entrepreneurship development.

CO2: Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation for skill development, employability and entrepreneurship development.

CO3: Explore the concepts involved in wind energy conversion system and applications related to Bio-Gas by studying its components, types and performance nationally for skill development and employability.

CO4: Explore the effects of electrochemical energy, Tidal Energy and Hydrogen Energy for skill development, employability and entrepreneurship development.

CO5: Illustrate ocean energy and explain the operational methods of their utilization & acquire the knowledge on Geo thermal energy 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	3	3	2	2	3	3	1	2	1	2	2
CO2	3	3	3	2	2	3	3	1	2	1	2	2
CO3	3	3	3	2	2	3	3	1	2	1	2	2
CO4	3	3	3	2	2	3	3	1	2	1	2	2
CO5	3	3	3	2	2	3	3	1	2	1	2	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	2	1	1
CO3	3	1	3
CO4	1	2	2
CO5	2	2	1

Suggested Readings:

1. Non Conventional Energy Resources – Dubey and Bharagva, Dhanpat Rai Publications
2. Non Conventional Energy Resources - G.D.Rai
3. Solar Energy and Non-Conventional Energy Resources – Domkundwar, Dhanpat Rai Publications
4. Wind and Solar Power Systems – Mukund .R. Patel

Website Sources:

- www.nptel.ac.in
- www.lecturenotes.in
- www.researchgate.net
- www.springer.com

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 Electrical Engineering

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

EEE802: POWER SYSTEM OPERATIONS AND CONTROL

Objective: To understand about the structure and economic operation of power system &control of voltages and power using FACT devices in electrical system for skill development and employability.

UNIT I **(08 Sessions)**

Introduction: Structure of power systems, Power system control center and real time computer control for skill development, SCADA System Level decomposition in power system Power system security, Various operational stages of power system Power system voltage stability.

UNIT II **(08 Sessions)**

Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants, System constraints, Optimal operation of thermal units without and with transmission losses, Penalty factor, , transmission loss formula (without derivation)Hydrothermal scheduling long and short terms understanding for entrepreneurial skill, Concept of optimal power flow

UNIT III **(08 Sessions)**

Load Frequency Control: Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, , P-I control, load frequency control and economic dispatch control, Load frequency control of two area system: Tie line power modeling for skill development and employability, block diagram representation of two area system, static response.

UNIT IV **(08 Sessions)**

Automatic Voltage Control : Schematic diagram and block diagram representation, different types of Excitation systems & their controllers for skill development.

Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation and series compensation for skill development

UNIT V **(08 Sessions)**

State Estimation: Detection and identification, Linear and non-linear models to provide skills.

Flexible AC Transmission Systems: Concept and objectives FACTs controllers for skill development and employability: Structures & Characteristics of following FACTs Controllers. TCR, TSC, SVC, STATCOM, TSSC, SSSC, UPFC.

Course Outcomes:

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

CO1: Develop structure of power system and real time monitoring power systems locally for skill development.

CO2: Understand Economic operation of power system and concept of power flow for skill development and employability.

CO3: Solve problems (numerical problems at present) by posing different problem models related to Economic Load Dispatch, Load Frequency Control and reactive power control and discuss single area load frequency control and two area load frequency control for skill development.

CO4: Differentiate Excitation systems & Voltage and reactive power control methods nationally for skill development, employability and entrepreneurship development.

CO5: Control of voltages and power using FACT devices in electrical system 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	3	3	3	3	3	1	1	1	2	1	2	2
CO2	3	3	3	2	2	1	1	1	2	1	2	2
CO3	3	3	3	3	3	1	1	1	2	1	2	2
CO4	3	3	3	2	2	1	1	1	2	1	2	2
CO5	3	3	3	2	2	1	1	1	2	1	2	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)

Director
IFTM University, Moradabad

Registrar
IFTM University
Moradabad

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

Suggested Readings:

1. D.P. Kothari & I.J. Nagrath, " Modern Power System Analysis" Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani& L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC Transmission Systems"
4. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.
5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill
6. P. Kundur, " Power System Stability and Control Mc Graw Hill.
7. M.H. Rashid, "Power Electronics: Circuits, devices and Applications" Prentice Hall of India,3rd Edition.

Website Sources:

- www.nptel.ac.in
- www.lecturenotes.in
- www.academia.edu
- www.springer.com
- www.studentsfocus.com
- https://notes.specworld.in

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 Electrical Engineering

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

EEE803: POWER STATION PRACTICE

Objective: To learn about the cost of generation & distribution of electrical energy to get knowledge for better employability in industry.

UNITI **(09 Sessions)**

Cost of Power Generation: running cost and fixed cost, Method for providing for depreciation factor affecting cost of generation. Load Factor, Load Curve, Demand Factor, Diversity Factor to get knowledge for better employability in industry. Number and size of generation units: plant capacity factor and plant use factor. Tariff: Flat-rate, Two part, Block rate, Maximum Demand and Power Factor, Tariff Economics of Power Factor improvements.

UNITII **(10 Sessions)**

Selection of site, Thermal Power Plants for entrepreneurship & employability: Types and their relative merits, Boilers accessories, Economizers, Preheater and Super Heater. Fuel, **Combustion Equipment:** Types of Steam Turbines, Condensers, Pumps, Cooling Towers. Layout of Plant, Pollution Control Equipments. Elements of Nuclear Power Plant. Nuclear Reactor- it's components and their functions. Types of Nuclear Reactor, Boiling water, Pressurized water fast breeder reactor and Candu Reactor, their advantages and disadvantages.

UNIT III **(09 Sessions)**

Hydro-Electric Power Plant: Selection of site for skill development and employability. Classification based on: quantity of water available, Nature of load, Available head, Layout, it's main parts and their function: reservoir, Dam, spillways, intake, forebay, Penstock, Search tank, Prime-mover, Draft-tube. Governing of turbines, Types of Turbines and their characteristics, Comparison of various types of plants for entrepreneurship & employability.

UNIT IV **(06 Sessions)**

Advantages of coordinated operation of different types of power plants for skill development and employability, hydro-thermal scheduling – short term and long term.

UNIT V **(07 Sessions)**

Tidal, Wind, Geo-Thermal, Wave, Magneto-Hydro Dynamic (MHD), Photo-voltaic and Solar Power used for generation. Recent advances such as biogas generation, hydrogen, fuel cell for skill development and employability.

Course Outcomes:

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

CO1: Understand the cost of power generation for skill development, employability andentrepreneurship development.

CO2: Layout the Thermal power plant nationally for skill development, employability andentrepreneurship development.

CO3: Select the site for Hydro power plant for skill development.

CO4: Coordinate operate the different types of power plants Nationally for skill developmentand employability.

CO5: Differentiate tidal, wind, geo-thermal, MHD and recent advancements for power generation 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	3	2	2	2	2	3	3	1	2	1	2	2
CO2	3	3	3	2	2	3	3	1	2	1	2	2
CO3	3	2	2	2	2	3	3	1	2	1	2	2
CO4	3	3	3	2	2	3	3	1	2	1	2	2
CO5	3	2	2	2	2	3	3	1	2	1	2	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	2
CO2	2	3	3
CO3	3	1	1

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

Registrar
IFTM University
Moradabad

CO4	1	2	2
CO5	2	1	1

Suggested Readings:

1. M. V. Deshpande, "Elements of Electrical Power Station Design", A. H. Wheeler and Co. Pvt. Ltd. Allahabad.
2. B. G. A. Shrotzki and W. A. Vopal, "Power Plant Engineering and Economics", McGraw Hill Book Co.
3. C. L. Wadhwa," Generation Distribution and Utilization of Electrical Engineering", New Age International, New Delhi.
4. C. L. Wadhwa, "Electrical Power Systems", New Age International, New Delhi.

Website Sources:

- www.nptel.ac.in
- www.academia.edu
- www.researchgate.net
- www.lecturenotes.in
- www.springer.com

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

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

Registrar
IFTM University
Moradabad