Course Structure

&

Syllabus

Of

B.Tech
Electronics & CommunicationEngineering

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

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh
NAAC ACCREDITED

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

Study & Evaluation Scheme of
Bachelor of Technology (B.Tech) Electronics & CommunicationEngineering

Programme:	*Bachelor of Technology in Electronics & CommunicationEngineering*
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:

- Ability to consider the impact of engineering solutions on environment and the need for sustainable development.
- Ability to include social, cultural, ethical issues with Engineering solutions.
- Knowledge and understanding of principles of management and finance in relation to Engineering projects.
- Ability to design and conduct experiments, and to analyze and interpret data.
- Ability to use the techniques, skills, and modern engineering tools necessary for Electronics & Communication Engineering practice.
- Ability to formulate and analyze complex Electronics & Communication Engineering problems.
- Ability to apply knowledge of mathematics, science and engineering for the solution of Electronics & Communication Engineering problems.
- Ability to function effectively on multidisciplinary teams.
- Appreciation of technological change and the need for independent life-long learning.
- Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, and public health.
- Ability to communicate effectively.
- Ability to apply knowledge of engineering, Science and Technology for a successful career in Electronics & Communication Engineering.

Registrar
IFTM University
Moradabad.

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:

- 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.
- Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 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.
- Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- Evaluating the need of lifelong learning and will engage in learning modern techniques and engineering tools like Matlab, 3D printing etc.
- Creating positive attitude for conducting experiments and developing new concepts on emerging fields.
- Impart analytic and thinking skills to develop initiatives and innovative ideas for R&D, Industry and societal requirements.

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 Groupsof 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 asfollows:

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/Dissertation/Seminar/Industrial training/General Proficiency (PDT)

- **Humanities, Management courses, Language and Literature (HML):** These coursesare 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 practiceandexposureinthelanguage,etc.Studentsaremotivatedtolearnthetheories,fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture.These courses are of 4 credits each.

- **Elementary / Fundamental Science courses (FSC):**
  These courses include science courses from the disciplines of Physics Chemistry and Mathematics department, crafted for engineering students. These courses are of 4 credits each.
- **Engineering Core courses (ECC):**
  Core courses of B.Tech. Program will provide a holistic approach to engineering education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined

knowledge can be studied further in depth during the elective phase.

The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the society at large.

A wide range of core courses provides groundwork in the field of electronics, engineering designs, industrial and production engineering etc.

We offer core courses in semester III, IV, V, VI, VII &VIII during the B.Tech.- Electronics & Communication Engineering program. There will be 3 or 4 credits for each core course offered depending upon the course content.

- **Engineering Laboratory Courses (ELC):**
  These courses includes various laboratories of Engineering designed to provide the student solid foundation to the domain of engineering. These courses are of 1 crediteach.

- **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):**
  AValue-AddedCourseisanon-creditcoursewhichisbasicallymeant 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 andrequirements. The student possessing these skills will definitelydevelopand performwellduringtherecruitmentprocessofanypremierorganizationandwillhave 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 studentcompleting a MOOC course through only NPTEL.

- **Project/Dissertation/Seminar/Industrial training/General proficiency (PDT):**
  1. Project with a department faculty.
  2. The students, who take up experiential projects in companies, where senior executiveswithastakeinteachingguidethem,drivethelearning.Allstudentsareencouragedtodo some live project other than their regularclasses.
  3. Industrial visit are essential to give students hand-on exposure and experience of howthingsandprocessesworkinindustries.Ourinstituteorganizessuchvisitstoenhancestudents' exposuretopracticallearningandworkoutforareportofsuchavisitrelatingtotheirspecifictopic, course or evendomain.

	B.Tech. Electronics & Communication 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 11X4)	48
3	Engineering Core courses (ECC)	25 Courses of 4 Credits each (Total Credit 31X4)	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)	1 Course of 4 Credits each (Total Credit1X4) 1 Course of 8 Credits (Total credit 1x8) 2 Course of 0 Credits each (Total Credit 2X0)	08
7	Project/Dissertation/Seminar/Industrial training/General Proficiency (PDT)	10 Courses of 1 Credits each (Total Credit 10X1) 1 Course of 10 Credits (Total credit 1x10)	20
	Total Credits		226

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

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'.

    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:			
Type of Course	**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.
- **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.

Director

Registrar
IFTM University
Moradabad.

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, Compering, 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.

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication Engineering
STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR I, SEMESTER- I

S.N.	Category	Course Code	Course Name	Periods			Evaluation Scheme					Credits
				L	T	P	Mid Term Exam			External Exam	Course Total	
							CT	AS+AT	Total			
THEORY												
1.	FSC	TEMA-101	Engineering Mathematics-I	3	1	0	20	10	30	70	100	4
2.	FSC	TEPH-101	Engineering Physics-I	3	1	0	20	10	30	70	100	4
3.	VAC / FSC	TECE-101 /TECH-101	Environmental Science / Engineering Chemistry	3	1	0	20	10	30	70	100	4
4.	HML/FSC	TPSD-101 /TEME-101	Professional Skill Development-I / Engineering Mechanics	3	1	0	20	10	30	70	100	4
5.	FSC / FSC	TEBE-101 / TEEC-101	Electrical Engineering / Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	FSC / FSC	TEME-102 /TECS-101	Materials & Manufacturing / Computer Fundamentals & Programming	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	ELC	TEPH-151 /TECH-151	Physics Lab / Chemistry Lab	0	0	2	20	10	30	70	100	1
8.	ELC	TEBE-151 / TEEC-151	Electrical Engg. Lab / Electronics Engg. Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEME-152 /T ECS-151	Materials & Manufacturing Lab / Computer Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TEME-153 /TEME-151	Engineering Graphics Lab / Mechanical Engg. Lab	0	0	2	20	10	30	70	100	1
11.	PDT	TGP-101	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	18	06	08	-	-	-	-	1100	29

Sanjeev Aaaaa
Registrar
IFTM University
Moradabad.

Director

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication Engineering

STUDY AND EVALUATION SCHEME (Effective from 2022-23)
YEAR I, SEMESTER- II

S.N.	Category	Course Code	Course Name	Periods L	Periods T	Periods P	Mid Term Exam CT	Mid Term Exam AS+AT	Mid Term Exam Total	External Exam	Course Total	Credits
			THEORY									
1.	FSC	TEMA -201	Engineering Mathematics-II	3	1	0	20	10	30	70	100	4
2.	FSC	TEPH -201	Engineering Physics-II	3	1	0	20	10	30	70	100	4
3.	FSC / VAC	TECH -201 /TECE -201	Engineering Chemistry / Environmental Science	3	1	0	20	10	30	70	100	4
4.	FSC/ HML	TEME -201 /TPSD -201	Engineering Mechanics / Professional Skill Development-I	3	1	0	20	10	30	70	100	4
5.	FSC / FSC	TEEC -201/TEEE -201	Electronics Engineering / Electrical Engineering	3	1	0	20	10	30	70	100	4
6.	FSC / FSC	TECS-201 /TEME -202	Computer Fundamentals & Programming / Materials & Manufacturing	3	1	0	20	10	30	70	100	4
			PRACTICALS / PROJECT									
7.	ELC	TECH-251 / TEPH -251	Chemistry Lab / Physics Lab	0	0	2	20	10	30	70	100	1
8.	ELC	TEEC -251 /TEEE -251	Electronics Engg. Lab / Electrical Engg. Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TECS-251 / TEME -252	Computer Lab / Materials & Manufacturing Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TEME-251 / TEME-253	Mechanical Engg. Lab / Engineering Graphics Lab	0	0	2	20	10	30	70	100	1
11.	PDT	TGP-201	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	18	06	08					1100	29

Registrar
IFTM University
Moradabad.

Director

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication 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	TEMA-301	Engineering Mathematics -III	3	1	0	20	10	30	70	100	4
2.	ECC	TEEC-301	Digital Integrated Circuit	3	1	0	20	10	30	70	100	4
3.	ECC	TEEC-302	Signals and Systems	3	1	0	20	10	30	70	100	4
4.	ECC	TEEC-303	Elementary Electronic Devices	3	1	0	20	10	30	70	100	4
5.	ECC	TEEC-305	Network Analysis and Synthesis	3	1	0	20	10	30	70	100	4
6.	ECC	TECR-301	Professional Skill Development - II	3	1	0	20	10	30	70	100	4
7.	VAC	TEHU-301	Disaster Management (Audit Paper)**	3	0	0	20	10	30	70 *	100 *	3 *
			PRACTICALS / PROJECT									
7.	ELC	TEEC-351	Digital Integrated Circuit Lab	0	0	2	20	10	30	70	100	1
8.	ELC	TEEC-352	Networks and Circuits Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEEC-353	Electronic Devices Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TEEC-354	PCB lab	0	0	2	20	10	30	70	100	1
11.	PDT	TGP-301	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	18	06	08	-	-	-	-	1100	29

* Internal Assessment

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

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication 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	TEMA-401	Computer Based Numerical Analysis and Statistical Techniques	3	1	0	20	10	30	70	100	4
2.	ECC	TEEC-401	Electronic Circuits	3	1	0	20	10	30	70	100	4
3.	ECC	TEEC-402	Control Systems and Applications	3	1	0	20	10	30	70	100	4
4.	ECC	TEEC-403	Microprocessor and Applications	3	1	0	20	10	30	70	100	4
5.	ECC	TEEC-404	Electronics Instrumentation & Measurements	3	1	0	20	10	30	70	100	4
6.	HML	TEEC-405	Engineering Electromagnetic Theory	3	1	0	20	10	30	70	100	4
			PRACTICALS / PROJECT									
8.	ELC	TEEC-451	Electronic Circuits Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEEC-452	Control System Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TEEC-453	Microprocessor Lab - I	0	0	2	20	10	30	70	100	1
11.	ELC	TEEC-454	Measurement Lab	0	0	2	20	10	30	70	100	1
12.	PDT	TGP-401	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	18	06	08					1100	29

Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication 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
				L	T	P	Mid Term Exam			External Exam			
							CT	AS+AT	Total				
				THEORY									
1.	ECC	TEEC-501	Linear Integrated Circuits	3	1	0	20	10	30	70		100	4
2.	ECC	TEEC-502	Analog Communication System	3	1	0	20	10	30	70		100	4
3.	ECC	TEEC-503	Advanced Microprocessor and Microcontroller	3	1	0	20	10	30	70		100	4
4.	ECC	TEEC-505	Power Electronics	3	1	0	20	10	30	70		100	4
5.	HML	TEEC-052	Transducers, Sensors, and Display Systems	3	1	0	20	10	30	70		100	4
6.	EDE	TEHU501	Human Values and Professional Ethics	3	1	0	20	10	30	70		100	4
				PRACTICALS / PROJECT									
7.	ELC	TEEC-551	Linear Integrated Circuits Lab	0	0	2	20	10	30	70		100	1
8.	ELC	TEEC-552	Communication Lab-I	0	0	2	20	10	30	70		100	1
9.	ELC	TEEC-553	Microprocessor Lab-II	0	0	2	20	10	30	70		100	1
10.	ELC	TEEC-554	Power Electronics Lab	0	0	2	20	10	30	70		100	1
11.	PDT	TGP-501	General Proficiency	-	-	-	-	-	100	-		100	1
			TOTAL	**18**	**06**	**08**	-	-	-	-		**1100**	**29**

Departmental Elective – I

1	TEEC050	Introduction to Neural Networks and Fuzzy Logic
2	TEEC051	Operating Systems
3	TEEC052	Transducers, Sensors & Display Systems
4	TEEC053	Advance Semiconductor Devices
5	TEEC054	Introduction to optoelectronics
6	TEEC055	Scientific Computing
7	TEEC056	Mixed Signal Design
8	TEEC057	Smart Antenna

Registrar
IFTM University
Moradabad.

MOOC Course:

| 1 | VAC | MOOC - 01 | MOOC Program -I (Optional) | - | - | - | - | - | - | 100 | 100 | -- |

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication 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
				L	T	P	Mid Term Exam			External Exam			
							CT	AS+AT	Total				
THEORY													
1.	ECC	TEEC-601	Digital Communication	3	1	0	20	10	30	70		100	4
2.	ECC	TEEC-602	Digital Signal Processing	3	1	0	20	10	30	70		100	4
3.	ECC	TEEC-603	Microwave Engineering	3	1	0	20	10	30	70		100	4
4.	ECC	TEEC-604	VLSI Technology	3	1	0	20	10	30	70		100	4
5.	EDE	TEEC-605	Antenna Theory and Wave Propagation	3	1	0	20	10	30	70		100	4
6.	ECC	TEEC-064	Satellite Communications	3	1	0	20	10	30	70		100	4
PRACTICALS / PROJECT													
8.	ELC	TEEC-651	Communication Lab –II	0	0	2	20	10	30	70		100	1
9.	ELC	TEEC-652	DSP Lab	0	0	2	20	10	30	70		100	1
10.	ELC	TEEC-653	Microwave Lab	0	0	2	20	10	30	70		100	1
11.	ELC	TEEC-654	Seminar	0	0	2	-	100	100	-		100	1
12.	PDT	TGP-601	General Proficiency	-	-	-	-	-	100	-		100	1
			TOTAL	18	06	08						**1100**	**29**

Departmental Elective – II

1	TEEC060	Embedded System Design
2	TEEC061	Artificial Intelligence
3	TEEC062	Web Technologies
4	TEEC063	Data Structures and Algorithms
5	TEEC064	Satellite Communications
6	TEEC065	Semiconductor Device Modeling
7	TEEC066	IoT for Communication Engineering
8	TEEC067	Remote Sensing
9	NCC-01	NCC General

Sanjeev Parashar
Registrar
IFTM University
Moradabad.

MOOC Course:

| 1 | VAC | MOOC - 02 | MOOC Program -I (Optional) | - | - | - | - | - | - | 100 | 100 | 100 | - |

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

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication 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	TEEC-701	Wireless Communication	3	1	0	20	10	30	70	100	4
2.	ECC	TEEC-702	Data Communication Networks	3	1	0	20	10	30	70	100	4
3.	ECC	TEEC-703	Optical Fiber Communication	3	1	0	20	10	30	70	100	4
4.	ECC	TEEC-704	VLSI Design	3	1	0	20	10	30	70	100	4
5.	ECC	TEEC-072	Optical Networks	3	1	0	20	10	30	70	100	4
6.	ECC	TEHU701	Industrial Management	3	1	0	20	10	30	70	100	4
			PRACTICALS / PROJECT									
7.	PDT	TEEC-751	CAD of Electronics Lab	-	-	2	-	100	100	-	100	1
8.	ELC	TEEC-752	Optical Fiber Communication Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEEC-753	Communication Network Simulation Lab	0	0	2	20	10	30	70	100	1
10.	PDT	TEEC-754	Industrial Training (Evaluation & Viva)	0	0	2	20	10	30	70	100	1
11.	PDT	TGP-701	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	18	06	08	-	-	-	-	1100	29

Departmental Elective – III

1	TEEC070	Consumer Electronics
2	TEEC071	Digital Image Processing
3	TEEC072	Optical Networks
4	TEEC073	Speech Processing
5	TEEC074	Micro and Smart Systems
6	TEEC 075	Advanced Wireless Broadband Communications
7	TEEC076	Wavelet Transforms
8	TEEC077	Biomedical Electronics

Sanjeev Goswami
Registrar
IFTM University
Moradabad.

SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
IFTM UNIVERSITY, MORADABAD

Bachelor of Technology (B.Tech) Electronics & Communication 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
				L	T	P	Mid Term Exam			External Exam			
							CT	AS+AT	Total				
				THEORY									
1.	VAC	TEEC-801	Introduction to Radar System	3	1	0	20	10	30	70		100	4
2.	ECC	TEEC-802	Electronics Switching	3	1	0	20	10	30	70		100	4
3.	ECC	TEEC-081	Biomedical Instrumentation	3	1	0	20	10	30	70		100	4
				PRACTICALS / PROJECT									
4.	PDT	TEEC –851	Project	0	0	20	-	300	300	400		700	10
5.	PDT	TGP-801	General Proficiency	-	-	-	-	-	100	-		100	1
			TOTAL	09	03	20						1100	23

Departmental Elective – IV

1	TEEC080	Information Theory and Coding
2	TEEC081	Biomedical Instrumentation
3	TEEC082	Non-Conventional Energy Resources
4	TEEC083	Optoelectronics Devices and Circuits
5	TEEC084	Renewable Energy
6	TEEC085	Biomedical Signal Processing
7	TEEC086	Wireless sensor networks
8	TEEC087	FPGA & reconfigurable computing

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

1

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEMA101: ENGINEERING MATHEMATICS –I

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

UNIT I (12 Sessions)
Matrices: Introduction of matrices, Special type of matrices, Elementary row and column transformation, Adjoint & inverse of matrices, Rank of matrix, Consistency of linear system of equations, Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors, Linear dependency and Independency of vector, Diagonalisation of matrices for skill development globally.

UNIT II (10 Sessions)
Differential Calculus–I: Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem, Change of variables, Total differentiation, Jacobian, Expansion of function of several variables for skill development and employability

UNIT III (10 Sessions)
Differential Calculus–II: Asymptotes, Curve tracing, Approximation of errors, Maxima & Minima of functions of several variables, Lagrange's method of multipliers for skill development

UNIT IV (08 Sessions)
Multiple Integrals: Definite integral, Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Dirichlet integral, Liouville's extension formula, Applications to area and volume for skill development and employability.

UNIT V (12 Sessions)
Vector Calculus: Point functions, Gradient, Divergence and Curl of a vector and their properties, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems, international Statements and problems (without proof) for skill development.

Course Outcomes: After completion of this course student will be able to:
CO1: Remember the basics of matrices and apply the concept to frank for solving linear simultaneous equations for skill development globally.
CO2: Apply the concept of limit, continuity and differentiability in the study of Rolle's, Lagrange's, Cauchy mean value theorem and Leibnitz theorem for skill development and employability.
CO3: Apply partial differentiation for evaluating extreme values, expansion of function and Jacobian for skill development .
CO4: Apply the methods of multiple integral for finding area, volume, centre of mass and centre of gravity for skill development and employability at international level.
CO5: Apply the concept of vector for evaluating directional derivatives, tangent and normal planes, line, surface and volume integrals for skill development and employability.

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

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

Director

Sanjeev Borasi
Registrar
IFTM University
Moradabad.

| CO4 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | 3 | 1 | 1 | 2 |
| CO5 | 2 | 2 | 1 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 1 |

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

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

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

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

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

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication 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 (8 sessions)

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

UNIT II (10 sessions)

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

UNIT III (10 sessions)

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

UNIT IV (8 sessions)

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

UNIT V (8 sessions)

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

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

CO1: Understand and learn globally Frame of reference, Lorentz transformation equation for skill development and employability

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

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

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

CO5: Gain knowledge of optical fibre and 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)

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

Sanjeev Kumar

Registrar
IFTM University
Moradabad.

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

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

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

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

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

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

Director

Registrar
IFTM University
Moradabad.

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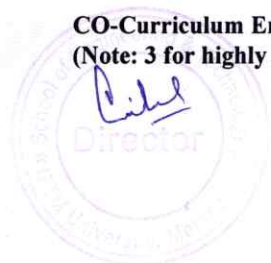
PO-CO Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	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.

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TPSD101: PROFESSIONAL SKILL DEVELOPMENT-I

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

UNIT I (10 Sessions)
Basic Applied Grammar and Usage
The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. Noun: Kinds; Gender; Case; Number; Usage. Pronouns: Definition; Kinds; Usage. Adjectives: Kinds, Degrees of Comparison, Transformation of Degrees. Determiners: Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. Articles: Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. Verbs: Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage for skill development and employability.

UNIT II
Basic Applied Grammar Continued (8 Sessions)
Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. Adverbs: Kinds and Usage. Prepositions: Kinds and Usage. Conjunctions: Kinds; Usage. Interjections: Definition; Usage for skill development and entrepreneurship internationally.

UNIT III (6 Sessions)
Global Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech for skill development.

UNIT IV (8 Sessions)
Précis Writing: Techniques of Précis Writing; examples. Paragraph Writing: Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension for skill development and employability.

UNIT V (8 Sessions)
Writing of Resume, Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment for skill development and employability.

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

CO1: Understand the sentences, its types, its transformations, parts of speech and its types etc. for skill development and employability.

CO2: Understand about the different types of nonfinite verbs, gerund, adverbs and its types, prepositions and its types etc. internationally for skill development and employability.

CO3: Understand about the Clauses and phrases, tenses, voice and speech and its conversion for skill development globally.

CO4: Know about Techniques of Précis Writing, Paragraph Writing, Techniques of Paragraph Writing for skill development and employability

CO5: Writing of Resume, Bio-Data, Writing of Letters and Applications for skill development and employability

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

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

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

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

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication 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: Global 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, International **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 globally. Use of resonance and implications for practical circuits 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 International theoretical and mathematical principles of electrical measuring instruments for skill development, employability and entrepreneurship development.

Sanjeev Agrawal

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

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

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

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

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

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

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

Website Sources:
- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in

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

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 globally.

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

CO1: Understand the importance of materials and manufacturing, various properties of materials, plant layout and production internationally for skill development.

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

Registrar
IFTM University
Moradabad.

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

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

CO5: Able to understand various type of welding process and their global application in specific field 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	1	1	1	1	1	2	3	3	1	1
CO2	3	1	1	3	1	2	3	1	1	1	1	1
CO3	3	2	1	3	1	1	3	1	1	2	1	1
CO4	2	1	1	3	1	1	2	1	1	1	2	3
CO5	2	3	1	2	3	1	1	1	1	1	1	3

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

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

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

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

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

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEPH151: PHYSICS LAB

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

List of Experiments (Any Ten)   **(20 Sessions)**
1. To determine the wavelength of monochromatic light by Newton's ring for skill development and employability.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism for skill development and employability.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points for skill development and employability.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter for skill development and employability.
5. To determine the wavelength of spectral lines using plane transmission grating for skill development and employability.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge for skill development and employability.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil for skill development and employability.
8. To verify Stefan's Law by electrical method for skill development and employability.
9. To calibrate the given ammeter and voltmeter for skill development and employability.
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up internationally and its employability scope for skill development and employability.
11. To determine energy band gap of a given semiconductor material for skill development.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen and for skill development.
14. To determine the ballistic constant of a ballistic galvanometer for skill development.
15. To determine the viscosity of a liquid for skill development.

Course Outcomes:
The students completing this course will be able to:
CO1: Understand principle, concept, working and application of technology internationally and comparison of results with theoretical calculations for skill development and employability.
CO2: Apply the various procedures and techniques for the experiments to create for skill development and employability.
CO3: Understand usage of global instruments and real time applications in engineering studies for skill development and employability.
CO4: Understand the basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results for skill development and employability.
CO5: Understand the some basic law like stefan's law, Hall effect etc. for skill development

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

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

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

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

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

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication 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 national and international 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 local and global 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 national and international manufacturing process e.g. casting, forging, turning, drilling etc. 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 local and global operations on lathe machine for skill development, employability and entrepreneurship.

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

CO5: To acquire thorough knowledge of carrying out various operations on Sheet metals for skill development, employability and entrepreneurship.

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

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

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

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

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

Website Sources:
- www.wikipedia.org

Registrar
IFTM University
Moradabad.

- 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 Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEEE151: ELECTRICAL ENGINEERING LAB

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

LIST OF EXPERIMENTS:
   (20 Sessions)
1. Verification of Kirchhoff's current law for employability.
2. Verification of Kirchhoff's voltage law for employability.
3. Verification of Superposition theorem for skill development and employability.
4. Verification of Thevenin's Theorem for skill development and employability.
5. Verification of Maximum Power Transfer Theorem for skill development and employability.
6. To study a Single phase induction motor and its various methods of starting for employability and entrepreneurship development.
7. To study running and speed reversal of a Three Phase Induction Motor and determine the slip for employability and entrepreneurship development.
8. To determine the transformation ratio and turns ratio and current ratio of a single-phase 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 international circuit laws and network theorems and apply them to laboratory measurements for skill development, employability and entrepreneurship development.

CO2: Systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines for employability and entrepreneurship development.

CO3: Acknowledge the principles of operation and the main features of electric machines and their applications for skill development and employability to compete with local, national and international standards.

CO4: Discuss the starting methods of a single phase induction motor for employability and entrepreneurship development.

CO5: Acquire skills in using electrical measuring devices for skill development and employability

.

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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
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.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEME153: ENGINEERING GRAPHICS LAB

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

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

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

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

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

Course outcome: Students completing this course will be able to:
CO1: Use the international drawing instruments effectively and able to dimension the given figures for skill development and employability.
CO2: Appreciate the usage of engineering curves in tracing the paths of simple machine components for skill development and employability.
CO3: Understand the concept of projection globally and acquire visualization skills, projection of points for skill development and employability.
CO4: Able to draw the basic views related to orthographic projections of Lines, Planes for skill development, employability and entrepreneurship.
CO5: Able to draw the basic views related to isometric projections of Lines, Planes for skill development, employability and entrepreneurship.

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

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

(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
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.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEMA201: ENGINEERING MATHEMATICS-II

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

UNIT I (12 Sessions)

Differential Equations: Ordinary differential equations of first order and first degree, Linear differential equations of nth 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, International Method of variation of parameters, Applications to engineering problems (without derivation) skill development .

UNIT II (10 Sessions)

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

UNIT III (10 Sessions)

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

UNIT IV (10 Sessions)

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

UNIT V (10 Sessions)

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

Course Outcomes:

CO1: Apply differential calculus and higher order problems and necessary and sufficient condition for total differential equations skill development to compete with local, national and international standards.

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

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

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

CO5: Solve partial differential equations with methods & its Applications globally 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)

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

Suggested Readings:

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

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

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEPH201: ENGINEERING PHYSICS-II

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

UNIT I (10 Sessions)

Electromagnetic Theory, Global 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 Skill development and employability.

UNIT II (08 sessions)

Dielectric and Magnetic Properties of Materials

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

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

UNIT III (08 Sessions)

Solid State Physics

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

UNIT IV (08 Sessions)

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

Unit V (08 Sessions)

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

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

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

CO2: Study of Propagation of plane electromagnetic waves in free space for skill development.

CO3: Understand Dielectric and magnetic properties of the materials for employability to compete with local, national and international standards.

CO4: Explain intrinsic and extrinsic semiconductors and the construction, operation and characteristics of diodes for employability.

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

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

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

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

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

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

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TECH201: ENGINEERING CHEMISTRY

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

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

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

UNIT III: Reaction Mechanism and Spectroscopy
Electrophile, Nucleophile (SN^1 and SN^2 reactions)
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, international instrumentation and general application of UV, Visible, IR/FTIR &1HNMR spectroscopy (excluding specific applications) for skill, employability and entrepreneurship.

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

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

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

Registrar
IFTM University
Moradabad.

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

CO2: Understand kinetic and electrochemical methods for various reactions for skill, employability and entrepreneurship.

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

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

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, 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)

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

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

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

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

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

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

Director

Registrar
IFTM University
Moradabad.

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

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

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

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

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

Suggested Readings:

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

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

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

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication 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: International 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: global 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 to compete with local, national and international standards.

UNITV   **(07 Sessions)**
Operational Amplifier (Op-Amp): concept of ideal operational amplifier, parameters. Inverting, non-inverting and unity gain configurations, Op-amp as adder, subtractor, Block diagram of Communication Systems, Introduction to Modulation, Need for modulation, Definition of AM and FM for understanding and skill development in field of communication system for skill development and Employability.

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: To Understand the basics of international semiconductor technology for skill development and Employability.
CO2: P-N junction diode and its global applications for Employability.
CO3: To understand the basics of BJT and MOSFET for Employability.
CO4: To develop understanding of numbers system and basics of Logic Gates for skill development to compete with local, national and international standards.
CO5: To 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)

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

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

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

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

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

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TECS201: COMPUTER FUNDAMENTALS & PROGRAMMING

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

UNIT I   **(Sessions 8)**
Introduction: Introduction to Computer Systems to compete with local, national and international standards. Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems. Number systems: Binary, hexadecimal, octal and their inter conversions. Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler. File Allocation Table, Hardware for skill development and employability.

UNIT II   **(Sessions 8)**
Input, Output and storage units: Introduction to various Input and output Devices. Printers: Various type of Impact and Non- Impact Printers.
Introduction to international algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code. Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs for skill development and employability.

UNIT III   **(Sessions 8)**
Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity for skill development, employability and entrepreneurship.

UNIT IV   **(Sessions 6)**
Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue for skill development, employability and entrepreneurship.

UNIT V   **(Sessions 10)**
Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types. Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler for skill development, employability and entrepreneurship.

COURSE OUTCOMES: On completion of the course students will be able to
CO1: Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming for skill development and employability to compete with local, national and international standards.

CO2: Write, compile and debug programs in C language and use different data types for writing the programs for skill development and employability to compete with local, national and international standards.

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

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

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

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

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

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

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

WEBSITE RESOURCES:
- www.swayam.gov.in
- onlinecourses.nptel.ac.in

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

Sanjeev Aggarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TECS251: COMPUTER LAB

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

List of Experiments   **(Session 20)**
1. Write a program in C to add, subtract, multiplication and division of two numbers for skill development and employability.
2. Write a program in C to compute the compute the average for skill development and employability.
3. Write a program in C to calculate Factorial of a Number for skill development and employability.
4. Write a program in C to print a Table for skill development and employability.
5. Write a program in C to check whether a number is even or odd for skill development and employability.
6. Write a program in C to check whether a number is prime number or not for skill development, employability and entrepreneurship.
7. Write a program in C to find largest of three numbers for skill development, employability and entrepreneurship.
8. Write a program in C to Read n integers, store them in an array and find their sum and average for skill development, employability and entrepreneurship.
9. Write a program in C to find the addition of two matrix for skill development, employability and entrepreneurship.
10. Write a program in C to find the factorial of a given Natural Number n using recursive for skill development, employability and entrepreneurship.

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

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

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

Registrar
IFTM University
Moradabad.

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

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

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

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

WEBSITE RESOURCES:
- www.swayam.gov.in
- onlinecourses.nptel.ac.in

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

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TECH251: CHEMISTRY LAB

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

List of Experiments   **(Sessions 20)**

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

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

CO1: Students are able to estimate the impurities present globally in water for skill development and employability.

CO2: Ability to prepare advanced international polymer materials for skill development and employability.

CO3: Ability to know the strength of an acid present in secondary batteries for skill development and employability.

CO4: Ability to find the Fe^{+2}, Ca^{+2} & Cl^- present in unknown substances using titrimetric and instrumental methods for skill development and employability to compete with local, national, and international standards.

CO5: Ability to find the functional group identification of organic compounds for skill development and employability.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

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

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

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

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

TEEC251: ELECTRONICS ENGINEERING LAB

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

Experiments: **(20 Sessions)**

1. To study of Digital Multimeters (measurement of AC and DC voltage, measurement of current, measurement of resistance, capacitance), passive components (resistor, capacitor) and verify using color code to inculcate knowledge for employability

2. To Study Cathode Ray Oscilloscope (To study of controls of CRO, to measure amplitude, time period and frequency of time varying signals), function generator, power supply & Bread Board for skill development.

3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection for skill development.

4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier knowledge for employability.

5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers knowledge for employability.

6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance knowledge for employability.

   To Plot input / output characteristics for common base transistor for employability to compete with local, national and international standards.

7. To verify the truth table of basic logic gates (AND, OR, NOT) for skill development

8. To build and test the clipper circuit using diode for skill development.

9. To build and test the clamper circuit using diode for skill development.

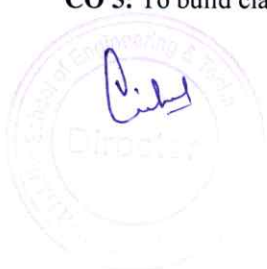**Course Outcome**: Students taking this lab will be able to:
CO 1: Measure voltage, current through multimeter internationally for skill development.
CO 2: Understand the practical working of a diode for employability.
CO 3: Understand the graph transitions of a transistor for skill development.
CO 4: Understand the concept of logic gates for employability to compete with local, national and international standards.
CO 5: To build clamper circuit using diode for skill development and employability.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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 editions of all the suggested readings must be used.

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

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

CO1: Describe the global behavior of materials upon normal external loads for skill development and employability.

CO2: Predict the global behavior of the material under impact conditions for skill development and employability.

CO3: Recognize the mechanical behavior of materials for skill development and employability.

CO4: Recognize parts of IC engines for skill development and employability to compete with local, national, and international standards.

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2022-23)

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

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

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

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

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

Registrar
IFTM University
Moradabad.

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 to inculcate skill, provide employability & entrepreneurial skills.

UNIT – 1
(12 Sessions)

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

UNIT – 2
(08 Sessions)

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

UNIT – 3
(10 Sessions)

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

UNIT – 4
(10 Sessions)

Functions of a Complex Variable – II : Representation of a function by power series ,Taylor's series and Laurent's series, Singularities, concept of Zeroes and poles *for skill development.* 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.

UNIT – 5
(12 Sessions)

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

Course Outcomes:
The student is able to

CO1: Know the use of Laplace transform solving Boundary Value Problems for skill development and employability to compete local, national, and international standards.

CO2: Use Z-transform in development of scientific simulation algorithms for employability.

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

CO4: Apply the Cauchy integral theorem and the Cauchy integral formula in its various versions for skill development and employability.

CO5: Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem for skill development.

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

(**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	2	2	1	1	1	1	2	1	1
CO2	1	2	1	1	1	3	2	1	2	1	1	2
CO3	1	2	1	2	1	1	2	1	2	1	1	1
CO4	2	1	2	1	3	3	1	3	1	2	3	1
CO5	1	1	2	3	1	1	2	1	3	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	2	1	1
CO3	2	2	1
CO4	2	2	1
CO5	2	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: Adhere to the latest editions of the suggested readings.

Director
School of Engineering & Technology, IFTM University, Moradabad

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC301: DIGITAL INTEGRATED CIRCUIT

Objective: The objective of this course is to familiarize the students with digital integrated circuits including fabrication, circuit design, implementation methodologies, testing, design methodologies and future trends in the fields of digital electronics to provide employability & skills.

UNIT – I (08Sessions)

Number Systems and Boolean Algebra: Review of binary, octal and hexadecimal number systems - conversion methods-number representations - signed, unsigned, fixed point, floating point numbers – 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 and Quine-McClusky method – Implementations of logic functions using gates globally, NAND –NOR implementations–Multi level gate implementations- Multi output gate implementations for skill development.

UNIT – II (08Sessions)

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

UNIT – III (08Sessions)

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 - sequence detector for skill development.

UNIT – IV (08Sessions)

Memory and Programmable Logic Devices: Classification of memories, RAM, Memory decoding, Error Detection and correction, Read only Memory, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA), Sequential Programmable Devices for skill development and employability.

UNIT – V (08Sessions)

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

Asynchronous Sequential Logic: Analysis Procedure, Circuits and Latches, Design Procedure, Reduction of state and flow tables, Race free State Assignments, Hazards for skill development and employability and entrepreneurship development.

Course Outcomes:

Students completing this course will be able to:

CO1: To understand binary, octal and hexadecimal number systems and to implement logic functions globally using gates for skill development.

CO2: To implement and design various logic functions such as adder, subtractor, multiplexer etc for skill development and employability.

CO3: To study and develop sequential circuits- flip-flops, counters and registers for skill development.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

CO4: To understand Memory, Programmable Logic Devices and Field Programmable Gate Arrays (FPGA) internationally for skill development and employability.

CO5: To understand the basic logic families such as TTL, IIL, ECL, NMOS, CMOSetc and to study about Asynchronous Sequential Circuits for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

Note: Adhere to the latest editions of the suggested readings.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC302: SIGNALS AND SYSTEMS

Objective: The objective of this course understanding the mathematical and fundamental characteristics of signals and systems in terms of both the time and frequency domains to improve skill and to provide employability skills.

UNIT – I   **(08Sessions)**
Classification of Signals and Systems: Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and periodic, random signals, CT systems and DT systems, Basic properties of systems - Linear Time invariant Systems and properties for skill development.

UNIT – II   **(08Sessions)**
Analysis of Continuous Time Signals: Global Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis.

UNIT – III   **(08Sessions)**
Linear Time Invariant – Continuous Time Systems: Differential equation, Block diagram representation, Impulse response, Convolution integral, frequency response, Fourier and Laplace transforms in analysis, State variable equations and matrix representation of systems to improve skill for employability.

UNIT – IV   **(08Sessions)**
Analysis of Discrete Time Signals: Sampling of CT signals and aliasing, DTFT and properties, Z-transform and properties of Z-transform for better employability in industry.

UNIT – V   **(08Sessions)**
Linear Time Invariant - Discrete Time Systems: Difference equations, Block diagram representation, Impulse response, Convolution sum, Basic definition of causal system, bounded input, bounded output system, time invariant system, LTI systems analysis using DTFT and Z-transforms, State variable equations and matrix representation of systems for better skilling of entrepreneurship.

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

CO1: Understand national and international mathematical and graphical representation/description of continuous and discrete time signals and systems for skill development.

CO2: Develop Global input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system for skill development.

CO3: Analyze and understand the spectral characteristics of signals in frequency domain using Fourier series and Fourier transform for employability and entrepreneurship development.

CO4: Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems for skill development and employability to compete local, national, and international standards.

CO5: Understand the process of sampling and the effects of under sampling for skill development, employability and entrepreneurship development.

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested readings:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson Education, 2007.

2. Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007.

3. H P Hsu, RakeshRanjan"Signals and Systems", Schaum's Outlines, Tata McGraw\ Hill, Indian Reprint, 2007

4. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007.

5. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley &sons, Inc, 2004.

Website sources:

1. https://www.edx.org/course/signals-and-systems-part-1
2. www.onlinecourses.nptel.ac.in
3. www.en.wikipedia.org

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC303: ELEMENTARY ELECTRONIC DEVICES

Objective: The objective of this course is to familiarize the students with the Crystal Properties of Semiconductors Elemental and compound semiconductors, Excess Carriers in Semiconductors and diffusion of carriers, Junction Properties, Metal semiconductor junctions, Fundamentals of BJT operation and characteristics of MOSFET and HEMT to improve skill and knowledge for employability.

UNIT I
(10 Sessions)

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, carrier concentrations, analysis of drift of carriers in electric and magnetic fields for skill development, Hall effect to compete local, national, and international standards..

UNIT II
(8 Sessions)

Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, understanding of diffusion of carriers, diffusion processes for better knowledge and skill, Einstein relation .

UNIT III
(10 Sessions)

Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.

UNIT IV
(12 Sessions)

Transistors: Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs, Ebers-Moll Model, and Metal oxide semiconductor field effect transistor (MOSFET): Construction Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), High Electron Mobility Transistor (HEMT), Operation and characteristics of above devices to improve skill and knowledge for employability.

UNIT V
(10 Sessions)

Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semiconductor lasers, light emitting materials. Operation and characteristics of above devices to improve skill and knowledge for employability, entrepreneurship.

Course Outcomes:

Students completing this course will be able to:

CO1: Analysis of atomic structure for skill development to compete local, national, and international standards.

CO2: Applications of international modern solid state physics results into solid state electronics for skill development and employability.

CO3: Understand operation of Metal-semiconductor and pn junction for skill development and employability.

CO4: Understand fundamentals of BJT operation for skill development.

CO5: Define operation of Photodiode, photo detectors and solar cell for employability and entrepreneurship.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

Suggested Readings:

1. B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.
2. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press.
3. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.
4. Millman Halkias, "Integrated Electronics" TMH India.

Website sources:

- www.nptel.ac.in
- en.wikipedia.org
- www.sanfoundary.co.in
- Grade up online course on transistors (www.gradeup.org)

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

Director

Sanjeev Prasad
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC305: NETWORK ANALYSIS AND SYNTHESIS

Objective: The objective of this course is to develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems for skill and entrepreneurship development.

UNIT I   (11Sessions)

Basic of Circuits and Network: Mesh analysis, node analysis, Y-Δ (Star-delta). Transformation, Source transformation technique, Graph Theory: Definitions (tree, co-tree, link, basic loop, link currents), Incidence Matrix, Tie set matrix, Cut-set matrix for skill development.

UNIT II   (10Sessions)

Network Theorems: Thevenin's and Norton's theorems, maximum power transfer theorem, Superposition theorem, Complex impedance, Steady state and Transient response of RL,RC,RLC circuit (having DC Excitation and Sinusoidal Excitation), Resonance: Series and Parallel Resonance, Bandwidth of RLC circuit, the Q-factor and effect on bandwidth to improve skill for employability.

UNIT III   (10Sessions)

Two Port networks: Characterization of LTI two port networks, Z, Y, ABCD, T and h parameters, Image parameters reciprocity and symmetry, Inter-relationships between the parameters, inter-connections of two port networks, ladder and lattice networks, Transfer function of two port networks, poles and zeros, Necessary condition for international driving point function and transfer function for knowledge of entrepreneurship.

UNIT IV   (07Sessions)

Network synthesis: Positive real functions, Hurwitz polynomials, Properties of real immittance functions, synthesis of LC driving point immittance for better skilling of entrepreneurship, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.

UNIT V   (06Sessions)

Filters: Introduction, Classification of filters, Introduction of windows, Butterworth filter, Equation of Ideal filters, Image parameters, and characteristics impedance, Passive and Active Filters, Low Pass, High pass for better skilling of employability and entrepreneurship, Constant K-type, M derived filters and their design.

Course Outcomes: Students completing this course will be able to

CO1: To understand the various international laws and theorems related to electric networks for skill development.

CO2: Apply Graph theoretic formulation for the solution of network equations for skill development and employability.

CO3: Apply Two-port network formulation for analyzing electric circuits for skill development, employability and entrepreneurship development.

CO4: Familiarize with network synthesis for skill development and employability.

CO5: Identify the characteristics of Filters and determine the parameters for the design of various Filters &Attenuators for entrepreneurship development to compete local, national, and international standards.

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

Suggested Reading:

1. Robert L. Boylsted, "Introductory Circuit Analysis", Pearson Education.
2. A Sudhakar, Shyammohan S P, "Circuits and Network-Analysis and synthesis" 3rd Edition, TMH Education,
3. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
4. BehrouzPeikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.
5. M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
6. Roy Chowdhuary, D., Networks and Systems, New Age International (P) Limited, Publishers (2007).

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.gupshupstudy.com
5. www.tutorialspoint.com

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

TECR 301: PROFESSIONAL SKILL DEVELOPMENT-II

Objectives: The objectives of Professional Skill Development-II are:
- To Develop critical thinking, creativity and effective communication to inculcate skill, provide employability & entrepreneurial skills.
- To provide the essential foundational elements for leadership skill-building and student success.
- To Explore self-awareness that involves identification and articulation of various facets – cultural, social, and familial that contribute to the formation of one's identity.
- To develop mutually beneficial relationships through communication and cooperation with others, collaborate to achieve group goals, practice living and leading with integrity, and learn about issues of local and global significance in order to become active members of their communities.

Unit I: Communicative Skills   (Session-05)
Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words for skill development.

Unit II: Intrapersonal Relationship Skills   (Session-07)
Personality: Characteristics of national and international Healthy & Sick Personality knowledge for better employability in industry
Self-Awareness
Self Esteem
Self Confidence
Assertiveness V/S Aggressiveness
Values: Types & Importance

Unit III: Interpersonal Relationship Skills   (Session-08)
Group: Concepts, Types, Stages
Team: Concepts, Elements, Types, Stages
Presentation Skills& strategies
Interview: Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes knowledge for better employability in industry

Unit IV: Argumentative Skills   (Session-10)
Debate
Role Play
Speeches
Elocution
Group Discussion

Unit V: Campus to Company Skills   (Session-08)
The corporate Fit: Dressing and Grooming
Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email
Dealing with People in Corporate for better employability in industry

Course Outcomes:
Students completing this course will be able to:
CO1: Apply the comprehensive set of skills and knowledge for life success for skill development.

CO2: understand the national and international communication process, its benefits and challenges for skill development.

CO3: Learn to effectively lead others globally on a project or in an organization for employability.

CO4: Develop and articulate respect for the diversity of talents, ways of knowing and learning for skill development.

CO5: Understand the parameters to be corporate fit for employability to compete local, national, and international standards.

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

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEHU301: DISASTER MANAGEMENT

Objective: To provide students an understanding to the concepts and aspects of disaster and its relationship with development to provide employability & skills

UNIT I: Introduction to Disasters (12 Sessions)
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks, Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc., Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters for skill development.

UNIT II: Approaches to Disaster Risk Reduction (10 Sessions)
Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness, Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures, Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders for skill development and 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 cooperations in Disaster Management for skill development, employability and entrepreneurship 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, programs and legislation, Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of local and global Disaster – Disaster Damage Assessment for skill development and employability.

UNIT V: Disaster Management: Applications, Case Studies and Field Works (07 Sessions)
The project /fieldwork is 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. 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. 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. 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 survivors for skill development, employability and entrepreneurship 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 programs, Safety tips before during and after earthquake, cyclone, floods and fire accidents, Mock Drills, Major disasters in India, Disaster Management in , Flood affected areas and damages in India, Heat waves in India, Earth quakes in India, Historical Tsunamis in India, Nuclear emergence, Traffic accidents in India, Train Accidents, Major disease outbreak, Disaster management structure in India, Precaution, mitigation of disaster in India, Warning system in India to prevent disaster, Bhopal gas tragedy, Kutch earth quake, Tsunami (2004), Kosi Calamity 2008, Mayapuri radiation exposure Delhi (2010), Mock exercises.

Any field works related to disaster management.

Course Outcomes:

CO1: The students will be able to identify the nature and causes of local and global disaster and its outcomes for skill development.

CO2: Also the students will be able to apply the disaster risk reduction mechanism for skill development and employability.

CO3: Capacity to manage the Public Health aspects of the disasters for skill development, employability and entrepreneurship development to compete local, national, and international standards.

CO4: Evaluate DM study including data search, analysis and presentation as a case study for skill development and employability.

CO5: To learn efficient emergency skills for providing health care to disaster survivors for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	3	1	1

Director

Sanjeev Agrawal

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

Suggested Readings:

1. SatishModh, Introduction to Disaster Management, Macmillan Publisher India Ltd
2. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
3. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
4. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.

Website Sources:

1. https://publichealthdisasters.eu

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Anand
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC351: DIGITAL INTEGRATED CIRCUITS LAB

Objective: The objective of this course is to familiarize the students with both combinational and sequential digital integrated circuits including circuit design, implementation, testing and future trends in the fields of digital electronics to incorporate skill, provide employability.

List of Experiments

(10Sessions)

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground for skill development.
2. To simplify the given expression and to realize it using Basic gates and Universal gates for skill development
3. Implementation and verification of Half Adder and Full Adder using logic gatesfor skill development
4. Implementation and verification of Decoder and Encoder using logic gatesfor skill development
5. Implementation of global 4x1 multiplexer using logic gates for skill development
6. Implementation of global1x4 de-multiplexer using logic gates for skill development
7. To realize Adder (Half & Full) and Subtractor (Half & Full) Circuits using MUX and DeMUX.
8. Implementation of 4-bit parallel adder using 7483 IC for skill development and employability.
9. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates for skill development and employability.
10. Mini Project to improve skill development, employability and entrepreneurship development.

Course Outcomes:

Students completing this course will be able to:

CO1: To develop a basic knowledge which helps them to better understand combinational and sequential circuits globally for skill development.

CO2: To comprehend the different issues related to designing of digital integrated circuits including circuit design, implementation, testing and design national and international methodologies and tools for future trends for skill development.

CO3: To use tools covering the back-end design stages of digital integrated circuits for skill development

CO4: To understand various types of IC's and there use in digital circuits for skill development and employability.

CO5: To learn and use state table and implement them for minor projects to improve skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (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.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

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:

1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. en.wikipedia.org
4. www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC352: NETWORKS AND CIRCUITS LAB

Objectives

The objectives are to study:

1. Fundamentals of Ohm's law, Kirchhoff's current and voltage laws and its practical implementation to develop skill for employability.

2. Measurement of voltage, current, power and impedance of any circuit for better skilling of entrepreneurship.

3. Analysis of a given circuit depending on types of elements - DC analysis, Transient analysis and Frequency analysis knowledge for better employability in industry.

List of Experiments   **(10Sessions)**

1. Verification of principle of superposition with dc and ac sources for skill development.
2. Verification of global Thevenin& Norton theorem in ac circuits for skill development.
3. Verification of Maximum power transfer theorems in ac circuits for skill development.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
6. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD Parameters for skill development and employability.
7. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values for skill development and employability.
8. To determine attenuation characteristics of a low pass / high pass active filtersfor entrepreneurship development.

Course Outcomes: After studying this course the students would gain enough knowledge on:

CO1: Practical implications of the fundamentals of Ohm's law, Kirchhoff's current and voltage laws globally to develop skill for employability.

CO2: Accurate measurement of voltage, current, power and impedance of any circuit for skill development and employability.

CO3: DC analysis, Transient analysis and Frequency analysis of a given circuit depending on types of elements for better skilling of entrepreneurship to compete local, national, and international standards.

CO4: Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis knowledge for better employability in industry.

CO5: To provide students with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems for 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	1	2	2	1	1	1	3	1	1	1
CO2	1	1	1	2	1	3	1	1	2	1	1	2
CO3	1	2	1	3	1	1	2	1	2	1	2	1
CO4	1	3	1	1	3	1	1	3	1	1	3	1
CO5	1	1	2	1	1	1	1	3	1	1	1	2

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

Director

Registrar
IFTM University
Moradabad.

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

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

Suggested Reading:

1. Robert L. Boylsted, "Introductory Circuit Analysis", Pearson Education.
2. A Sudhakar, Shyammohan S P, "Circuits and Network-Analysis and synthesis" 3rd Edition, TMH Education,
3. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
4. BehrouzPeikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.
5. M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
6. Roy Chowdhuary, D., Networks and Systems, New Age International (P) Limited, Publishers (2007).

Website Sources:

1. www.en.wikipedia.org
2. https://www.vlab.co.in/
3. www.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 Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC353: ELECTRONIC DEVICES LAB

Objective: The objective of this lab is to familiarize the students with the application of PN junction diode characteristics of BJT, operation of single-stage and multi-stage RC–Coupled amplifier, characteristics of JFET and SCR knowledge for better employability in industry.

List of Experiments

(10Sessions)

1. National and international Application of PN Junction Diode:-full wave rectifier-Measurement of Vrms, Vdc, ripple factor-use of filter-ripple reduction for better skilling of entrepreneurship.
2. Characteristics of BJT: BJT in CE configuration-Graphical measurement of h parameters from input and output Characteristics for better skilling.
3. To study the operation of single-stage and multi-stage RC–Coupled Amplifier for better skilling.
4. To calculate A_v, A_I, R_o and R_i of CE RC-Coupled amplifier with potential divider biasing for better skilling.
5. To calculate the current gain and input impedance of Darlington pair and β of a transistor.
6. Study of the characteristics of JFET (Junction Field Effect Transistor) in common source configuration. Graphical measurement of its parameters gm, rd& μ from input and output characteristics for skill development and employability.
7. To study the Characteristics of SCR knowledge for better employability in industry.
8. To study the VI Characteristic of DIAC for better skilling of entrepreneurship.
9. To study the VI Characteristic of TRIAC for different gate values of gate current knowledge for better employability in industry.

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

CO1: Understand the national and international application of PN Junction Diode knowledge for better employability in industry.

CO2: Understand the characteristics of BJT: BJT in CE configuration-Graphical measurement of h parameters from input and output Characteristics knowledge for better employability in industry.

CO3: Able to calculate A_v, A_I, R_o and R_i of CE RC-Coupled amplifier with potential divider biasing for skill development and employability.

CO4: To develop the ability to analyze electronic circuits using discrete components for skill development and employability.

CO5: To recognize basic logic functions and logic gates and can solve problems related to number systems and Boolean algebra for skill development to compete local, national, and international standards.

Director

Sanjeev Aggarwal

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

Suggested Readings:
1. B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.
2. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press.
3. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.
4. MillmanHalkias, "Integrated Electronics" TMH India.

Website sources:
1. www.nptel.ac.in
2. www.en.wikipedia.org
3. www.sanfoundary.co.in
4. Grade up online course on transistors (www.gradeup.org)

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

Director

Sanjeev
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC354: PRINTED CIRCUIT BOARD (PCB) LAB

Objective: The objective of this course is to familiarize the students with printed circuit board for designing various digital and analog circuits. This lab helps them to implement the various circuits clearly on PCB board to incorporate skill, provide employability.

List of Experiments

(13Sessions)

1. Study of chemicals used in international PCB lab for skill development.
2. Study of PCB curing machine and photo contact printer used for developer of negative for skill development.
3. Study of PCB shearing machine for skill development.
4. Study of photo resist dip coating and photo U.V (Double Side) machine used for developing PCB for skill development.
5. Study of etching machine (Proto Etch) used for developing PCB for skill development.
6. Study of roller tinning machine and precision drilling machine for skill development.
7. To study the fabrication of general PCB for skill development.
8. To make negative of bridge rectifier circuit for skill development.
9. To fabricate PCB from the negative of bridge rectifier circuit for skill development.
10. To solder the component on PCB of dc unregulated power supplyfor skill development and employability.

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

CO1: To develop a basic knowledge about various chemicals used for developing Printed Circuit Board globally for better employability in industry.

CO2: To develop knowledge about various international machines and tools related for PCB manufacturing for skill development and employability.

CO3: To have knowledge about soldering and verifying the circuit knowledge for better employability in industry

CO4: To develop PCB with implemented circuits and verifying the circuit with the desired output for skill development and better employability in industry

CO5: To understand the use of PCB in electronics industry by making working model to incorporate skill, provide employability to compete local, national, and international standards..

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

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested Readings:

1. R.S Khandpur, "Printed Circuit Boards: Design – Fabrication", McGraw Hill
2. Mr.Elanjeliyan "PCB Designing and Fabrication Training Book", Chipsystem.
3. Johnson" High speed Digital Design",Pearson Education

Website Sources:

1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. en.wikipedia.org
4. www.vlab.co.in

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEMA 401: 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 incorporate skill, provide employability.

UNIT – 1

(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 for knowledge for employability: Bisection Method, Iteration method, Method of false position, Newton- Raphson method, Methods of finding complex roots, Muller's method, Rate of Convergence, Polynomial equations and their global applications.

UNIT – 2

(10 Sessions)

Solution system of linear equations for skill development: 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.

UNIT – 3

(10 Sessions)

Numerical Integration and Differentiation: Introduction to numerical differentiation, Numerical integration *for skill development*: 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.

UNIT – 4

(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 improve knowledge for employability.

UNIT – 5

(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 for skill development. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, X, R, p, np, and c charts.

Course Outcomes:

The student is able to

CO1: Apply Numerical analysis which has enormous global application in the field of science and Engineering for skill development and employability.

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

CO3: Compare and analyze the methods statistical analysis and the omnipresent role of variability for skill development.

CO4: Predict and evaluate the efficient design of studies and construction of effective sampling plans for employability.

CO5: Exploratory data analysis and formal inference process for skill development to compete local, national, and international standards.

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

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

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

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

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

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

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC 401: ELECTRONIC CIRCUITS

Objective: The objective of this course is to familiarize the students with to the advanced concepts of electronics device structure operation. The primary objective of this course is to understand and implement the advanced electronic circuits such as amplifiers etc with the help of theoretical and practical problem solving to improve skill and provide knowledge for employability.

UNIT-I

(10 Sessions)

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, Hybrid-pi (π) CE transistor model, frequency response of CE amplifier to improve skill.

UNIT – II

(12 Sessions)

MOSFET: Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier. Differential Amplifier: MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair for knowledge for employability.

UNIT – III

(8 Sessions)

Large Signal Amplifiers: Classification of power amplifiers - Class A power amplifier direct and transformer coupled amplifiers; - Class B - Push-pull arrangements and complementary symmetry amplifiers to develop skill, conversion efficiency calculations, cross over distortion – class AB amplifier - amplifier distortion – power transistor heat sinking – Class C and D amplifiers.

UNIT-IV

(10 Sessions)

Feedback Amplifiers: Concept of feedback- topological classification-voltage series, voltage shunt, current series, current shunt - effect of feedback on gain, stability, distortion, band width, input and output impedances – practical feedback amplifier circuits and their analysis to increase knowledge for employability –multistage feedback amplifier.

UNIT – V(10 Session)

Oscillators: Barkhausen criterion for sustained global oscillations - RC oscillators – RC phase shift oscillator and Wein bridge oscillator- resonant circuit oscillators – tuned drain and tuned collector oscillator - LC oscillators- Hartley and Colpitts oscillators – crystal oscillators and frequency stability to improve skill development.

Course Outcomes:

Students completing this course will be able to:

CO1: Determine quiescent point, gain, input and output impedance of common emitter and common collector amplifiers for skill development.

CO2: Understand the concept of feedback amplifiers for skill development and employability.

CO3: Explain performance of basic class-A and class-B power amplifiers for skill development to compete national, and international standards.

CO4: Explain principal of operation of various basic oscillators for skill development.

CO5: Analyze the working of MOSFET and its global application for skill development and employability.

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

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

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

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

Suggested Readings:

1. David A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, Fourth Edition, 2007
2. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Pvt Ltd, Ninth Edition, 2008.
3. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill International Edition, 2002.
4. David A. Bell, "Solid State Pulse circuits", PHI Learning Private Ltd, Fourth Edition, 2007.
5. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.

Website sources:

- www.nptel.ac.in
- en.wikipedia.org
- Grade up online course on transistors (www.gradeup.org)

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

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC402: CONTROL SYSTEMS AND APPLICATIONS

Objective: The objective of this course is to understand concepts of the mathematical modeling, feedback control and stability analysis in Time and Frequency domains for better employability in industry.

UNIT I
(10Sessions)

System Modeling: Introduction to control system, Basic elements in control system, Open and closed loop control systems, Feedback and its effect, types of feedback control systems. Differential equation representation of physical systems, Transfer function, Mathematical modeling of electrical and mechanical systems (Translational and Rotational), Analogous system, Block diagram representation of systems, Block diagram reduction techniques for skill development and employability, Signal flow graph.

UNIT II
(08Sessions)

Time Domain Analysis: Standard test signals- First order system - step, ramp and impulse response analysis-Second order system – step response analysis- steady state error –generalized error co-efficient –Effect of adding a zero to system- knowledge of the Principle of PI, PD and PID for better employability in industry, compensation-stability analysis.

UNIT III
(08Sessions)

Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. international Root locus method (Example problems & solutions) , Lead compensation, and Lag-Lead compensation for skill development and employability.

UNIT IV
(10Sessions)

Frequency Domain Analysis: Frequency response, M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system Frequency domain specifications, Correlation between time domain and frequency domain specifications, Bode plotfor skill development and employability, Stability analysis using Bode plot, gain margin and phase margin, transfer function from bode plot.

UNIT V
(09Sessions)

State Space Analysis: Introduction – Concepts of state, state variables and state model–State model of linear systems– system realization-State space representation using physical, phase and canonical variables –diagonal canonical form-Jordan canonical form diagonalization-Time domain solution of state equation-State transition matrix-Laplace transform solution of state equations- Derivation of transfer function from the state model-Controllability and observability- State space representation of discrete time systems for better skilling of entrepreneurship.

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

CO1: Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system globally into a more simplified form for skill development.

CO2: Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept for skill development and employability.

CO3: Interpret different physical and mechanical systems in terms of electrical system to construct equivalent international electrical models for analysis for skill development and entrepreneurship.

CO4: Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions for better skilling of entrepreneurship.

CO5: Formulate different types of analysis in frequency domain to explain the nature of stability of the system for better skilling of employability in current industry scenario.

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

Suggested Reading:

1. Benjamin C. Kuo, "Automatic Control Systems", Seventh Edition, PHI Learning New Delhi, 1997.
2. Katsuhiko Ogata, "Discrete Time Control Systems", Second Edition, PHI Learning New Delhi, 2006.
3. I. J. Nagrath, M. Gopal, "Control Systems Engineering", Fifth Edition, New Age International, New Delhi, 2007.
4. R. Anandanatarajan, P. Ramesh Babu, "Control Systems Engineering", Second edition, Scitech Publications Pvt. (India) Ltd, 2008.

Website Sources:

1. www.studynama.com
2. www.onlinecourses.nptel.ac.in
3. www.tutorialspoint.com

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC403: MICROPROCESSOR AND APPLICATIONS

Objective: The objective of this course is to understand the basic concepts related to functioning of a microprocessor which yields several applications like adder /subtractor circuits etc for skill development and employability.

UNIT I
(08Sessions)

Introduction: Microprocessor evolution and types, Microprocessor architecture and operation of its components for skill development and employability, Memory, Input & output devices, interrupts, data transfer schemes, data flow, timer and timing diagram Logic devices for interfacing, Architectural advancement of microprocessor, Typical microprocessor schemes.

UNIT II
(08Sessions)

8-Bit Microprocessors: Pin diagram, Signals and internal architecture of 8085 Microprocessor for skill development, registers, ALU, Control & status, 8085 machine cycles: Opcode Fetch, Memory Read, Memory write, I/O read, I/O write, Interrupt Acknowledge, Bus idle. The 8085 Interrupts: Vector and non-vector, Hardware and Software interrupts, Triggering interrupts.

UNITIII
(08Sessions)

Interfacing and 8085 Instructions: Interfacing data converters: D/A converters, R/2R Ladder network. Interfacing input/output devices, Memory mapped input/output with examples. Instruction classificationfor skill development and employability: Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation. Instruction formats: one byte, two byte, three byte. Addressing modes: immediate, register, direct, indirect and implied. Assembler directives.

UNIT – IV
(08Sessions)

Programming: Assembly language programming based on intel 8085for employability. Flow chart symbols, writing assembly language programs, Programming techniques: looping, counting and indexing, time delays, counters, time delays, stacks and subroutines, conditional call and return instructions. Program: BCD Addition, BCD Subtraction, Subtraction with carry, Multiplication, division, square of a given number, square root of a given number, to find largest and smallest number from given array, arrange in ascending and descending order of given array, BCD-to-Binary conversion, Binary-to-BCD conversion to compete local, national, and international standards.

UNIT – V
(08Sessions)

Peripheral Interfacing: Peripheral Devices: 8237 DMA controller, 8255 Programmable peripheral interfacefor skill development and employability, interfacing keyboard and seven segment display, 8253/8254 programmable timer/counter, 8259A programmable interrupt controller, USART and RS232C.

Course Outcomes:

After the successful completion of this course, the student will be able understand:

CO1: Understand the basics of computer architecture to increase skill development to compete local, national, and international standards.

CO2: Understand the basic problems of programming for skill development and employability.

CO3: Understand the internal working of memory for skill development, employability and entrepreneurship development skill development to compete local, national, and international standards.

CO4: Understand the working of computer chips for skill development and employability.

CO5: Understand the Programmable peripheral interface 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)

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

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

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

Suggested Readings:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt.Ltd.
2. Lyla B. Das, "The x86 Microprocessors, Architecture, Programming, and Interfacing (8086 to Pentium), Pearson Education.
3. Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, TMH,2006.

Website Sources:
- en.wikipedia.org
- www.processorseries.in
- www.nptel.ac.in
- www.gradeup.in

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC404: ELECTRONICS INSTRUMENTATION & MEASUREMENTS

Objective: The objective of this course is to familiarize the students with electronic instruments and their measurement providing an in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers with practical knowledge to improve skill, provide employability and entrepreneurial skills.

UNIT I (08Sessions)

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, other unit systems, dimension and standards. to impart skill development analysis of Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, Statistical analysis (Deviation, Average Deviation, Variance, Gaussian Curve of Error). Operation of Permanent Magnet Moving Coil (PMMC) instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter to impart skill development.

UNIT II (08Sessions)

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter System, knowledge to Measurement of temperature by Thermistor, Thermocouple for better employability in industry. and Resistance Temperature Detector.

UNIT III (08Sessions)

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter

UNIT IV (08Sessions)

Cathode Ray Oscilloscope (CRO): Cathode Ray Tube, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, Digital Storage Oscilloscope (DSO), DSO applications understanding for entrepreneurial skill.

UNIT V (08Sessions)

Instrument calibration: Comparison method, digital multimeters as standard instrument, Operation of calibration instrument Recorders: global X-Y recorders, plotters for skill development.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the fundamentals of Electronics Instruments and Measurement providing an in-depth for skill development and employability.

CO2: Understand of international measurement errors, statistical analysis for skill development.

CO3: Describe operation of bridge measurements, Digital Storage Oscilloscope, Function Generator, Analyzer, Display devices for skill development and employability.

CO4: Apply different measurement instrument like voltmeter, AC electronic voltmeter, digital multimeters, digital frequency meter etc globally for skill development and employability and entrepreneurship.

CO5: To address the underlying concepts and methods behind Electronics measurements for skill development and employability.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

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

Suggested Readings:

1. A. K. Sawhney, "Electrical& Electronic Measurement & Instrument", DhanpatRai& Sons.
2. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI, New Delhi 2008.
3. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler& Co. Pvt. Ltd. India.
4. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
5. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (ButerworthHeinmann), 2008.

Website Sources:

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC405: ENGINEERING ELECTROMAGNETIC THEORY

Objective: The objective of this course is to familiarize the students with fundamental antenna engineering parameters and terminology including basic concepts of electromagnetic wave radiation, reception and propagation to provide employability & skills

UNIT-I   (08Sessions)

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 and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar for skill development

UNIT-II   (08Sessions)

Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses'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 for skill development to compete local, national, and international standards..

UNIT-III   (08Sessions)

Magnetostatics: Magneto-static fields, Biot-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.

UNIT-IV   (08Sessions)

Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final 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.

UNIT-V   (08Sessions)

Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power. Characteristic impedance, General wave equation, Loss less propagation, Propagation constant, Voltage standing wave ratio, Introduction to Smith Chart for skill development, employability and entrepreneurship development.

Course Outcomes:

Students completing this course will be able to:

CO1: To understand various Coordinate systems and its transformation for skill development to compete local, national, and international standards.

CO2: To learn the basic concepts of Electrostatics, Maxwell's equation, boundary conditions etc. for skill development.

CO3: To learn the basic concepts of Magnetostatics, Forces, torque etc. for skill development.

Sanjeev Prasad
Registrar
IFTM University
Moradabad.

CO4: To understand waves and its various applications in free space, conductors, dielectrics etc. globally for skill development.

CO5: To learn and understand the concepts of Transmission line and its various parameters for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. M. N. O. Sadiku, "Elements of Electromagnetics", 4th Ed, Oxford University Press.
2. W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH.
3. Joseph A. Edminister, Theory and Problems and Electromagnetics, Schaum's Outline Series, TMH.
4. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", McGraw Hill Book Co.
5. E.C.Jordan, K.G. Balmain: "E.M.Waves & Radiating Systems", Pearson Education, 2006.

Website Sources:

1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. en.wikipedia.org
4. www.tutorialspoint.com

Note: Adhere to latest edition of the suggested readings.

Director

Registrar
IFTM University
Moradabad.

TEEC451: ELECTRONIC CIRCUITS LAB

Objective: The objective of this lab is to familiarize the students with the basic working of Common Collector Amplifier, Class B Amplifier, and differential Amplifier and also help them calculate voltage and currents through simple devices for skill development, employability and entrepreneurship development.

List of Experiments   **(12Sessions)**
1. Study the Common Collector Amplifier and to evaluate –Operating Point, Voltage gain (A_V), input and output impedance, current gain of amplifier for skill development.
2. To study the operation of RC – Coupled amplifier for skill development.
3. To study the Frequency Response of RC – Coupled amplifier.
4. Study of the operation of Class B Amplifier
5. Study of global differential Amplifier for skill development.
6. Study of effect of negative feedback on gain of RC–Coupled Amplifier
7. Study of Phase Shift Oscillator with and without buffer between RC sections.
8. Study of the Wien Bridge Oscillator and effect on output frequency with variation in RC combination for skill development and employability.

Course Outcomes:
Students completing this course will be able to:
CO1: Evaluate the Operating Point, Voltage gain (A_V), input and output impedance, current gain of Common Collector Amplifier globally for skill development.
CO2: Operation of RC – Coupled amplifier for skill development.
CO3: Operation of Class B Amplifier for skill development to compete local, national, and international standards.
CO4: Study of the Wien Bridge Oscillator and effect on output frequency with variation in RC combination for skill development and employability to compete local, national, and international standards.
CO5: To understand the use of various circuits in electronics industry by making working model 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	1	2	1	1	3	1	1	2	1	1	1	3
CO2	3	1	1	1	3	1	1	3	1	1	1	3
CO3	1	2	1	3	1	1	2	1	2	1	3	1
CO4	3	1	1	1	3	1	1	3	1	1	1	3
CO5	1	1	2	1	1	2	1	1	3	2	1	1

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested Readings:

1. B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.
2. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press.
3. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.
4. MillmanHalkias, "Integrated Electronics" TMH India.

Website sources:

1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in
4. Grade up online course on transistors (www.gradeup.org)

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

TEEC452: CONTROL SYSTEM LAB

Objectives

- Will have a strong knowledge on MATLAB software.
- To study the concept of time response and frequency response of the system
- Students get the basic knowledge on practical control system applications on machines & electronic devices.
- This course aims to familiarize with the modeling of dynamical systems, to simulate and analyze the stability of the system using MATLAB.

This lab will help students for their skill development, employability and entrepreneurship development.

List of Experiments   **(15Sessions)**

PART – I (for skill development and employability)

1. To study of effect of loading on the speed of the Motor globally in the open loop (Eddy Current Brake)
2. To study effect of loading on the speed of the Motor in the closed loop.
3. To study the speed control of a DC Motor
4. Study of stepper motor in full step, single phase, step and free running mode.
5. Study of stepper motor in full step, two phase, step and free running mode.
6. Study of stepper motor in half step, step and free running mode.
7. PID CONTROLLER: To observe open loop performance of building block and calibration of PID controls
a) To study P, PI and PID controller with type 0 system with delay
b) To study P, PI and PID controller with type 1 system.
8. LEAD LAG COMPENSATOR:
(a) Study of Lead compensator
(b) Study of Lag Compensator.
(c) Study of Lead Lag Compensator.

PART - II (for skill development, employability and entrepreneurship development)
Introduction to MATLAB (Control System Toolbox), Implement at least any four experiment in MATLAB.
1. Program for finding the transfer function of the system using Matlab.
2. Program for finding the transfer function of the system when poles, zeros and gain are given using Matlab.
3. Program for finding the root locus of the transfer function using Matlab.
4. Program to determine the poles of a transfer function in order to determine stability of the system using Matlab.
5. Plot unit step response and to find rise time and delay time.
6. Plot bode plot of given transfer function and find gain and phase margins.

Course Outcomes:

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

CO1: Discuss the need of software tools globally (MATLAB, PSPICE) to illustrate modeling and simulation of any system for skill development.

CO2: Classify and evaluate the performance parameters of a system and then with simulation prepare an advance tool to modify the values of the parameter of the system in order to meet the desired need for skill development.

CO3: Prepare international professionals in laboratory to compute or to predict the characteristics of a system by visualizing experimental data and its graphical representation for skill development.

CO4: To understand the basic of MATLAB simulation tool for doing the various experiments with help of MATLAB for skill development and employability.

CO5: To understand the use of control systems in electronics industry by making working model forskill 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	1	2	1	1	3	1	1	2	1	1	1	3
CO2	3	1	1	1	3	1	1	3	1	1	1	3
CO3	1	2	1	3	1	1	2	1	2	1	3	1
CO4	3	1	1	1	3	1	1	3	1	1	1	3
CO5	1	1	2	1	1	2	1	1	3	2	1	1

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

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

Suggested Readings:

1. Benjamin C. Kuo, "Automatic Control Systems", Seventh Edition, PHI Learning New Delhi, 1997.
2. Katsuhiko Ogata, "Discrete Time Control Systems", Second Edition, PHI Learning New Delhi, 2006.
3. R. Anandanatarajan, P. Ramesh Babu, "Control Systems Engineering", Second edition, Scitech Publications Pvt. (India) Ltd, 2008
4. I. J. Nagrath, M. Gopal, "Control Systems Engineering", Fifth Edition, New Age International, New Delhi, 2007.

Website Sources:
1. en.wikipedia.org
2. https://www.vlab.co.in/
3. onlinecourses.nptel.ac.in

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

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC453: MICROPROCESSOR LAB - I

Objective: The objective of this lab is to provide hands-on experience to students of working on a microprocessor kit and develop basic programs of calculation for skill development and employability.

Introductory: Familiarization of 8085 kits for skill development.   **(13Sessions)**

1. To study the 8085-microprocessor training kit.
   (a) Add two given 8-bit numbers with carry by using 8085 instructions set.
   (b) Subtract two 8-bit numbers with borrow using 8085 instructions set.

2. (a) To find the largest number in an array of data using 8085 instructions set.
   (b) To find the smallest number in an array of data using 8085 instructions set.

3. (a) To write a program to arrange an array of data in ascending order.
   (b) To write a program to sort the numbers in descending order.

4. To prepare a global assembly language program to multiply two 8- bit numbers for 8085 microprocessors for skill development.

5. To prepare an assembly language program to divide 8- bit numbers for 8085 microprocessors for skill development

6. To prepare an assembly language program to find the square root of an 8 bit number for 8085 microprocessor for skill development

7. To prepare an assembly language program to find the square of an 8 bit number for 8085 microprocessor for skill development.

8. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set for skill development and employability.

9. To convert given Binary number into its hexadecimal number and vice versa using 8085 instruction set for skill development and employability.

Course Outcomes:
Students taking this lab will be able to:
CO1:Understand the basics of microprocessor operation for skill development to compete local, national, and international standards.
CO2:Analyze through output how the circuit functions for skill development
CO3:Understand the conversion of decimal to hexadecimal system for skill development
CO4: To understand the basic of global programming in 8085 for doing the various programs for skill development and employability.
CO5: To understand the use of microprocessors in electronics industry by making working model for skill development, employability and entrepreneurship development.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	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. "Microprocessor Architecture, Programming and Applications with 8085" by R S Gaonkar
2. "Computer Architecture: A Quantitative Approach" by J H Hennessy and D A Patterson
3. "The 8051 Micro controller, Architecture, Programming and Applications" by Kenneth J Ayala'
4. "Fundamentals of microprocessor and micro controller by B Ram"

Website Sources:
1. www.microprocessorlib.in
2. www.nptel.ac.in
3. www.gradeup.in

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

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

TEEC454: MEASUREMENT LAB

Objective: The objective of this course is to familiarize the students with electronic instruments and their measurement providing an in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, RTD, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers with lab practical to improve skill and provide knowledge for employability and entrepreneurship.

List of Experiments   **(09Sessions)**

1. Study of semiconductor diode voltmeter and its use as DC average responding ac voltmeter.
2. Study of global radio receiver measurements to inculcate skill.
3. Study of Resistance Temperature Detector (RTD) and calculating various parameters.
4. Study of Thermocouple and calculating its various parameters.
5. Study of Thermistor and calculating its various parameters.
6. Study of low resistance by using Kelvin's double bridge to improve skill.
7. Study of different dc and ac bridges and determine the value of given components.
8. Study of unknown inductance by using Hay's bridge.
9. Measurement of phase difference and frequency using CRO (lissajous figure) to provide better knowledge for employability and entrepreneurship.

Course Outcomes:
Students completing this course will be able to:
CO1: Understand the fundamentals of international Electronics Instruments and Measurement for skill development.
CO2: Understand Measurement errors, Bridge measurements and various parameters for employability.
CO3: Analyze operation of Digital Storage Oscilloscope, CRO, Function Generator for entrepreneurship to compete local, national, and international standards.
CO4: Define display devices, data acquisition systems, RTD and transducers for skill development.
CO5: Determine the underlying concepts and methods behind electronic measurements 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	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)

Director

Sanjeev Prasad
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

(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. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", DhanpatRai& Sons.
2. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI, New Delhi 2008.
3. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler& Co. Pvt. Ltd. India.
4. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
5. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (ButerworthHeinmann), 2008.

Website Sources:

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

EEC501: LINEAR INTEGRATED CIRCUITS

Objective: The objective of this course is to familiarize the students with linear integrated circuits practically and to perform mathematical operations in many linear, non-linear and frequency-dependent circuits by designing circuits for summing, subtraction, integrator, differential etc. to provide employability & skills

UNIT I   (08Sessions)
Introduction to Operational Amplifiers: Introduction, block diagram representation of a Typical Op-amp, Pin diagram 741, Analysis of Typical Op-amp Equivalent Circuit, Integrated circuit, Types of integrated circuit, development of integrated circuit. Ideal op-amp, ideal voltage transfer curve, open loop op-amp configuration, Op-amp with negative feedback, Virtual ground.
The Op-amp With Negative Feedback: Block diagram representation of feedback configurations, Voltage series feedback amplifiers, Voltage shunt feedback amplifier, Differential Amplifier for skill development.

UNIT II   (08Sessions)
Practical Op-amp and Frequency Response of an Op-amp: Basic global Op-amp parameters, introduction of frequency response, compensating networks, frequency response of internally compensated op-amps, non-compensated op-amps, High frequency op-amp equivalent circuit, closed loop frequency response, slew rate, CMRR for skill development and employability

UNIT III   (08Sessions)
Linear Applications of Op-amps: An Overview of ideal Op-Amp (Inverting/Non-inverting), Op-Amp based circuits i.e. Voltage Follower, Adder, Subtractor, Integrator (both ideal & practical), Differentiator (both ideal & practical), V-I & I-V Converter & its applications, Instrumentation amplifier. Generalized Impedance Converter, Simulation of Inductors and Capacitors.
Active Filters: First and Second Order LP, HP, BP BS and All Pass Filters and State Variable filter, Sinusoidal oscillators:-Wien bridge, Phase shift oscillator for skill development, employability and entrepreneurship development.

UNIT IV   (08Sessions)
Non-Linear Applications of Op-amps: Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Sample and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger circuit, Astable multivibrator, Monostable multivibrator. Generation of Triangular Waveforms. Voltage controlled Oscillator. Voltage regulators using Op-amp for skill development and employability

UNIT V   (08Sessions)
Specialized IC Applications: The 555 pin diagram, Equivalent circuit of 555 timers. Implementing a Monostable Multivibrator Using the 555 IC, Astable Multivibrator Using the 555 IC.
Phase locked loops (PLL): Block Diagram of IC PLL, Working Principle of PLL and Applications of PLL for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To learn basic concepts of Operational Amplifiers and use of Op-amp with negative feedback for skill development.

CO2: To learn the basic concepts Practical Op-amp and its Frequency Response for skill development and employability.

CO3: To understand various global applications of Op-amp such as integrator, differentiator, instrumentation amplifier etc. for skill development, employability and entrepreneurship development.

CO4: To study various Non-Linear Applications of Op-amps for skill development and employability to compete local, national, and international standards.

CO5: To understand the concepts of various specialized IC's such as 555 timer and PLL for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. Sedra and Smith, "Microelectronic Circuits", 4th Edition, Oxford University Press.
2. Michael Jacob, `Applications and Design with Analog Integrated Circuits', PHI, 2nd Edition, 2006
3. Jacob Milliman and Arvin Grabel, "Microelectronics", 2nd Edition, TMH, 2008.
4. OP-Amps and Linear Integrated Circuits- Ramakant A. Gayakwad (PHI Publication). (Selected portion from Chapter 7, 8 and 9)
5. Pulse & Digital Circuits by K.Venkata Rao, K Rama Sudha& G Manmadha Rao, Pearson Education, 2010. (Selected portions).

Website Sources:

1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. www.tutorialspoint.com
4. www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Borawd
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC502: ANALOG COMMUNICATION SYSTEMS

Objective: To develop a fundamental understanding on Communication Systems with emphasis on analog, frequency, phase modulation techniques and noise performance to inculcate the skill development and entrepreneurship among students.

Unit – I (08Sessions)

Transmission of Signals: Introduction to signals: Real & Complex signals, Communication system Model, Need for modulation, Mode of Communication for skill development: Sky wave , Ground Wave, Baseband and Pass band signals, Base band representation of Band Pass signals: Pre-envelope, Post envelope & Complex envelope, , Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Hilbert Transform, Single Side Band Modulation, DSB-SC, DSB-C, SSB Modulators and Demodulators, Vestigial Side Band (VSB), Super-heterodyne Receiver for the skill development.

Unit – II (08Sessions)

Angle Modulation: Global FM & PM signal, Relationship between FM & PM signal, Single Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting for the purpose of employability in the field of communication system for employability.

Unit – III (08Sessions)

Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Digital Representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Introduction to digital issues: Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Power spectral density with the aim of employability in the field of communication system introduce the skill development and entrepreneurship.

Unit – IV (08Sessions)

Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation (CVSDM), DPCM, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises ,Mathematical Representation of Noise for skill development.

Unit – V (08Sessions)

Noise in Amplitude Modulation & Frequency Modulation, Signal to Noise Ratio, Figure of Merit, Noise in Frequency Modulation: Pre emphasis, De Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital for R& D in communication system for employability.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand and identify the fundamental concepts and various global components of analog communication systems for skill development.

CO2: Describe analog pulse modulation, frequency modulation techniques and digital modulation techniques for employability.

CO3: Apply the basic knowledge of electronic circuits and understand the effect of Noise in communication system and noise performance of AM system for employability to compete national, and international standards.

CO4: Understand the effect of noise performance of FM system for skill development.
CO5: Understand TDM and Pulse Modulation techniques for employability.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested readings:
1. H. Taub, D L Schilling, GoutomSaha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
2. B.P. Lathi, "Modern Digital and Analog communication Systems", 3rd Edition, Oxford University Press, 2009.
3. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
4. H. P. HSU & D. Mitra, "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

Website sources:

- www.nptel.ac.in

- https://en.wikipedia.org/wiki/Communications_system

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

EEC503: ADVANCED MICROPROCESSOR AND MICROCONTROLLER

Objective: The objective of this course is to understand the basic concepts related to functioning of a 8086 microprocessor, Microcontroller 8051 architecture and programming model to inculcate skill, provide employability & entrepreneurial skills.

UNIT – I   **(10 Sessions)**

Advanced Micro Processors Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes, Instruction sets, instruction format, Types of instructions for skill development. Interrupts: hardware and software interrupts. Hardware of 186, 286, 386, 486 & Pentium processors.

UNIT – II   **(12 Sessions)**

Microprocessor Instructions & Communication Instruction Set for skill development and knowledge for employability, Mnemonics, 8086 Addressing modes, Microprocessor I/O connecting I/O put to Microprocessor, Polling and Interrupts, Interrupt and OM. Controllers. Motorola 68 XXX family of microprocessor, 68 XXX addressing modes, instruction set, hardware. Program (Based on 8086µp): Addition, Subtraction with carry, Multiplication, division, square of a given number, square root of a given number, Convert F0 to C0, BCD-to-Binary conversion, Binary-to-BCD conversion.

UNIT–III   **(12 Sessions)**

Microcontroller Introduction 8051 architecture and programming model for skill development and knowledge for employability. Internal RAM and registers, I/O ports, Interrupt system &Instruction set. Program (Based on 8051): Addition, Subtraction with carry, Multiplication, Data Transfer between two PCs using RS.232 C Serial Port, Programs on Data Transfer Instructions using 8051 Microcontroller, Programs on Arithmetic and Logical Instructions using 8051 Microcontroller.

UNIT – IV   **(8 Sessions)**

Microprocessor & Microcontroller Interfacing Data Communication for knowledge for employability, parallel I/O serial communication, Serial interface and UART, modems, I/O devices, D/A, A/D interface, special I/O devices.

UNIT – V   **(8 Sessions)**

Introductuon16-bit microcontrollers INTEL 8096 for skill development: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Course Outcomes:
After the successful completion of this course, the student will be able understand:
CO1: Demonstrate the detail architecture of 8086 microprocessor for skill development.
CO2: Demonstrate the internal architecture of different microprocessor for skill development and employability.
CO3: 8086 and compute assembly language programs for skill development, employability and entrepreneurship development to compete local, national, and international standards.
CO4: Describe the architecture of 8051 microcontroller and apply the knowledge of microcontroller globally later in the real-life problems for skill development and employability.

CO5: Understand the basic problems of programming 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	1	2	1	1	3	1	1	2	1	1	1	3
CO2	3	1	1	1	3	1	1	3	1	1	1	3
CO3	1	2	1	3	1	1	2	1	2	1	3	1
CO4	3	1	1	1	3	1	1	3	1	1	1	3
CO5	1	1	2	1	1	2	1	1	3	2	1	1

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

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

Suggested readings:
1. C.M. Gilmore, "Microprocessors Principals and Application", MGH
2. Rajkamal, "Embedded System, Architecture & Programming "TMH
3. Berry B. Berry, "Inter Series of microprocessors", PHI
4. D. V. Hall, "Microprocessor &Interfacing", TMH
5. Liu and Gibson GA, "Microcomputer System: The 8086/8088 family", PHI.

Website sources:
1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in
4. Grade up online course on transistors (www.gradeup.org)

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

EEC505: POWER ELECTRONICS

Objective: The Objective of this course is to nurturing and developing students with the engineering concepts and practices and develop their knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide in the aforesaid field for skill development, employability and entrepreneurship development.

Unit – I (7Sessions)
Characteristics of Selected device: Fast recovery diode, global Schottky diode, SCR gate trigger and communication circuit, heat sinks, protection circuit, series & parallel connection of SCR, Diac, Triac, UJT, Operation of Power Mosfet for skill development, employability.

.**Unit – II** (11Sessions)
Controlled Rectifier
Half wave & Full wave with resistive & R-L-E and resistive inductive loads for skill development. Free-wheeling diode, three phase rectifier, Bridge rectifier-half controlled and fully controlled.

Unit – III (8 Sessions)
Inverter, Chopper and Cyclo-converter: Single phase & three phase inverters, introduction to series & parallel inverters. Mc-Murray Bedford inverters, principle of chopper operation, control strategies, types of chopper, Jones & Morgan chopper, Cyclo converter and its advantages & disadvantage for skill development, employability.

Unit – IV (8 Sessions)
Motor control: D.C and A.C motor control, reversible drives, closed loop control, commutator less d.c motor control.

Unit – V (7 Sessions)
A.C voltage controllers: Types of ac voltage controller for knowledge for employability, Integral cycle control, single phase voltage controller, Sequence control of Ac voltage (Transformer tap changer)

Course Outcomes:
After the successful completion of this course, the student will be able understand:
CO1: To understand the global basics of Power Electronics for skill development.
CO2: To learn the details of power semiconductor switches (Construction, Characteristics and operation) for skill development and employability.
CO3: Describe the working of various types of converters for skill development, employability and entrepreneurship development.
CO4: Ability design AC voltage controller and Cyclo- Converter for skill development and employability to compete national, and international standards.
CO5: Express the design and control of rectifiers, inverters 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	1	2	1	1	3	1	1	2	1	1	1	3
CO2	3	1	1	1	3	1	1	3	1	1	1	3

Director

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

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

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

Suggested Readings:

1 P.C Sen," Power Electronics", Tata McGraw-Hill Publication Co., Ltd

2. S.K. Dutta, "Power Electronics" & Control' Prentice Hall of India Pvt. Ltd

3. P.S Bimbra, "Power Electronics" Khanna publishers

4. Mohammed h Rashid,""Power electronics" circuit device & application", PHI, New Delhi

5. S. B. Dewan, "Power electronics"thyristor-based convertersWiley India Pvt. Ltd

Website Sources:

1. http://www.smpstech.com/websites.htm. ...
2. http://www.electronics-tutorials.ws/ ...
3. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-334-power-electronics-spring-2007/ ...
4. http://www.cpes.vt.edu/areas/ ...
5. http://www.ni.com/white-paper/14677/en/ ...
6. https://www.coursera.org/course/powerelectronics

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC050: INTRODUCTIONS TO NEURAL NETWORKS AND FUZZY LOGIC

Objective: The objective of this course is to understand the fundamental characteristics of neural networks, fuzzy logic and its application to improve skill and to provide employability skills.

Unit-I: Neural Networks-1(Introduction & Architecture)   Neuron, Nerve structure and synapse, Artificial international Neuron and its model, activation functions, Neural network architecture to improve skill: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

Unit-II: Neural Networks-II (Back propogation networks)   Architecture to improve skill and knowledge: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III: Fuzzy Logic-I (Introduction) Basic concepts of fuzzy logic which improves knowledge for employability, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV: Fuzzy Logic –II (Fuzzy Membership, Rules) Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzy fications & Defuzzificataions, Fuzzy Controller, Industrial applications to improve skill.

Unit-V Genetic Algorithm (GA)   Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications to improve knowledge for employability.

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

CO1: Comprehend the international concepts of feed forward neural networks for skill development.
CO2: Analyze the various feedback networks for skill development and employability.
CO3: Understand the concept of fuzziness involved in various systems and fuzzy set theory for skill employability.
CO4: Comprehend the global fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm for skill development and employability.
CO5: Analyze the application of fuzzy logic control to real time 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	1	1	2	2	1	1	1	1	3	1	1
CO2	1	3	1	1	1	3	1	1	2	1	1	2
CO3	1	2	1	3	1	1	2	1	2	1	1	2

Director

Sanjeev Borawf
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested readings:

1. S. Rajsekaran& G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.

2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.

3. SimanHaykin,"Neural Netowrks"Prentice Hall of India

4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

5. Kumar Satish, "Neural Networks" Tata Mc Graw Hill.

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC051: OPERATING SYSTEMS

Objective: The objective of this course is to understand structure of modern computers purpose, structure and functions of operating systems, illustration of key OS aspects by example to improve knowledge for better employability in industry.

Unit – I: Basic Functions and Concepts of Operating Systems: Concept of an operating systems to improve skill, batch system, international Multi-programmed, Time sharing, Personal Computer System, Parallel system, Real time system, General system Architecture.

Unit – II: Features and Objectives of Operating Systems: System components, operating system services, System calls, System Programs, System Structure, System design and implementation to improve skill. Concept of process, process states, process state transition, process control block, operations of processes, concurrent processes, deadlocks, scheduling algorithms, scheduling criteria, Process Synchronization.

Unit - III: Memory Management: Logical and physical address space, storage allocation and management techniques to improve knowledge for employability, swapping, concepts of multi programming, paging, segmentation, virtual storage management strategies, Demand Paging, Page Replacement Algorithms, Thrashing.

Unit - IV: Information Management: File concept, Access method, Directory structure, Protection File system structure, Allocation methods, Free space management, Directory implementation, Disk structure, Disk Scheduling, Disk management, Swap space management.
Distributed-System Structures: Network operating system, Distributed operating systems which improves knowledge for employability, Remote services, Robustness, Design Issues.

Unit – V: Skills to analysis **Distributed file systems and Distributed Coordination:** Naming and Transparency, Remote file Access, Stateful versus stateless service, File replication, Event ordering, Mutual Exclusion, Atomicity, Concurrency control, Deadlock Handling, Election Algorithms, Reaching Agreement.

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: Understand international fundamental operating system abstractions such as processes, threads, files, semaphores for skill development and employability.
CO2: Analyze important algorithms eg. Process scheduling and memory management algorithms for skill development and employability to compete local, national, and international standards.
CO3: Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques for employability.
CO4: Describe, contrast and compare differing structures for operating systems for skill development.
CO5: Analyze IPC abstractions, shared memory regions for skill development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested readings:

1. Operating Systems by Galvin &Silberschatz Addison Wesley Publishing Ltd. Edi 5th .

2. An Introduction to Operating System by Harvey M. Deitel ,Narosa Publishing House, Latest Edition.

3. Operating Systems: Design and implementation by Andrew S. Tanenbaum, PHI, Edi 2nd.

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

EEC052: TRANSDUCERS, SENSORS AND DISPLAY SYSTEMS

Objective: The objective of this course is to make students familiar with the constructions and working principle of different types of sensors and transducers as well as different type of display systems for better skilling of employability in current industry scenario.

UNIT I   (08Sessions)
Introduction of Transducers: Active & Passive Transducers, Electric Transducers, Advantages of Electric Transducers, Classification of Transducers, Primary & Secondary Transducers, Analog & Digital Transducers, Inverse Transducers, Input, Output and Transfer Characteristics of Transducers for better skilling of entrepreneurship.

UNIT II   (07Sessions)
Resistive Transducers, Potentiometers, Helipots, Materials used for potentiometers, Advantages and Disadvantages of resistance potentiometers, Strain Gauges, Types of Strain Gauges, Resistance Thermometers, Thermistors, Applications of Thermistors, Thermocouples, Advantages & Disadvantages of Thermocouples for skill development and employability.

UNIT III   (07Sessions)
LVDT, Advantages, Disadvantages and Uses of LVDT, RVDT, international Capacitive Transducers, Advantages of Capacitive Transducers, Piezo-electric Transducers for skill development and employability, Hall effect Transducers, Applications of Hall Effect Transducers, Optoelectronic Transducers.

UNIT IV   (07Sessions)
Sensor Characteristics: Span, Full Scale output, Accuracy, Calibration, Non linearity, Saturation, Repeatability, Dead Zone, Resolution, Dynamic Characteristics, Environmental Factors, Reliability, application characteristics. Sensor Materials and Technologies: Silicon as Sensing Material, Plastics, Metals, Ceramics, Glasses, Surface Processing: Deposition of Thin and Thick Films, Spin Casting, Vacuum Deposition, Sputtering, Chemical Vapor Deposition, Photolithography for better employability in industry.

UNIT V   (07Sessions)
Display Device & Systems: Classification of displays, CRT, LED, LCD, Gas Discharge Display, Incandescent Display, Electrophoretic Image Display (EPID), Liquid Vapor Display (LVD)for skilling of entrepreneurship.

Course Outcomes: Upon completion of this course, the students will be able to:
CO1: Use concepts in common methods for converting a physical parameter into an electrical quantity globally for skill development.
CO2: Design and develop appropriate signal conditioning circuits for different types of sensors for better employability.
CO3: Outline the international basics of smart sensors in different applications for skill development and employability.
CO4: Familiarize with different type of display systems for employability.
CO5: Recognize and define electrical & electromechanical sensors according to applications for 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)

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

Suggested Reading:

1. Instrument Engineers Hand Book (process measurement), LIPTAK .

2. Electronic Instrumentation – by H S Kalsi TMH 2ndEd 2004

3. Handbook of Modern Sensors Physics, Designs and Applications by Jacob Fraden, Springer, AIP Press, III Edn.

4. Measurement systems application and design, ERNEST DOEBELIN, IV Edn.

5. A Course in Electrical and Electronic Instrumentation and Measurement by A.K Sawhney and PuneetSawhney, DhanpatRai Publications.

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

EEC053: ADVANCE SEMICONDUCTOR DEVICES

Objective: The course is designed to teach the physical principles and operational characteristics of advanced semiconductor electronic devices with emphasis on modern field effect transistors, memory devices and semiconductor sensors to improve skill and provide knowledge for employability.

Unit – I   (08Sessions)
Review of Fundamentals of Semiconductors: Semiconductor Materials and their properties to improve skill, Carrier Transport in Semiconductors, Excess Carriers in Semiconductor.

Unit – II   (08Sessions)
Junctions and Interfaces: Description of p-n junction, Action, The Abrupt Junction, Example of an Abrupt Junction, The linearly graded Junction. The Ideal Diode Model, Real Diodes, Temperature Dependence of I-V Characteristics, High Level Injection Effects, Example of Diodes. Description of Breakdown Mechanism to improve skill and knowledge, Zener and Avalanche Breakdown in p-n Junction.

Unit – III   (08Sessions)
Majority Carrier Diodes: The Tunnel Diode, The Backward Diode, The Schottkey Barrier Diode, Ohmic Contacts Hetero junctions to improve knowledge for employability.

Unit – IV   (08Sessions)
Microwave Diodes: The Varactor Diode, The p-i-n Diode, The IMPATT Diode, TRAPATT Diode, The BARITT Diode, Transferred Electron Devices
Optoelectronic Devices: The global Solar Cell which improves knowledge for employability, Photo detectors, Light Emitting Diodes, Semiconductor Lasers.

Unit – V   (08Sessions)
Metal Semiconductor Field Effect Transistors: Basic Types of MESFETs, Models for I-V Characteristics of Short – Channel MESFETs to improve skill, High Frequency Performance, MESFETs Structures.
MOS Transistors and Charge Coupled Devices: Basic Structures and the Operating Principle, I-V Characteristics, Short- Channel Effects, MOSFET Structures, Charge Coupled Devices.

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: Describe various global properties of semiconductor materials using mathematical equations for skill development.
CO2: Aanalyse the characteristics and theories in semiconductor materials in terms of crystal structures, charge carriers and energy bands for skill development and employability.
CO3: Describe crystalline structures of semiconductors for employability to compete national, and international standards.
CO4: Describe the physical characteristics such as electronic structure and optical and transport properties, and current-voltage characteristics of semiconductors for skill development.
CO5: Explain operation and application of MOSFET for skill development and employability to compete local, national, and international standards.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested readings:

1. M.S. Tyagi, "Introduction to Semiconductor Materials and Devices", John Willy-India Pvt. Ltd.
2. S. M. Sze, "Physics of Semiconductor Devices", 2nd Edition, John Willy-India Pvt. Ltd.
3. B. G. Streetman and S. Banerjee, "Solid state electronics devices", 5th Edition, PHI.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

EEC054: INTRODUCTION TO OPTOELECTRONICS

Objective:
• To know the basics of solid state physics and understand the nature and characteristics of light.
• To understand different methods of luminescence, display devices and laser types and their applications.
• To learn the principle of optical detection mechanism in different detection devices.
• To understand different light modulation techniques and the concepts and applications of optical switching.
• To study the integration process and application of optoelectronic integrated circuits in transmitters and receivers.
This will help students to inculcate skill, provide employability knowledge.

UNIT I   (08Sessions)
ELEMENTS OF LIGHT AND SOLID-STATE PHYSICS
Global Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid-State Physics, Review of Semiconductor Physics and semiconductor Junction Device for skill development.

UNIT II   (08Sessions)
DISPLAY DEVICES AND LASERS
Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications for skill development.

UNIT III   (08Sessions)
OPTICAL DETECTION DEVICES
Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance for skill development.

UNIT IV   (08Sessions)
OPTOELECTRONIC MODULATOR
Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices for skill development.

UNIT V   (08Sessions)
OPTOELECTRONIC INTEGRATED CIRCUITS
Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices for skill development and employability.

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

CO1: Understand the global Concept of elements of light and solid-state physics for skill development.
CO2: Understand and explore the various display devices and LASERS for employability to compete local, national, and international standards.
CO3: Explore and apply the basic building blocks of optical detection devices for skill development and employability.
CO4: Analyze the optoelectronic modulators for skill development.

CO5: Design, Analyze and apply optoelectronic integrated circuits for skill development and employability.

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

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

Suggested Readings:

1. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
2. Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., New Delhi, 1995.
3. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill International Edition, 1998.

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC055: SCIENTIFIC COMPUTING

Objective: The objective of this course is to provide an introduction to basic computer programming concepts and techniques useful for Scientists, Mathematicians and Engineers to improve skill, provide employability and entrepreneurial skills.

Unit-I: (08Sessions)

Introduction: Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Skills to analysis Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy. Computer Arithmetic.

System of liner equations: Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems

Unit-II: (08Sessions)

Eigenvalues and singular values: Eigenvalues and Eigenvectors, Methods for Computing All Eigenvalues to improve skill, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD. Nonlinear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares. Interpolation

Unit-III: (08Sessions)

Numerical Integration And globally Differentiation method which improves knowledge for employability: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation

Initial Value Problems for ODES, Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods, Boundary Value Problems For ODES, Finite Difference Methods, Finite Element Method, Eigenvalue Problems

Unit-IV: (08Sessions)

Partial Differential Equations to improve knowledge for employability, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods

Unit-V: (08Sessions)

Fast Fourier Transform to improve skill, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets, Random Numbers and Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences

Course Outcome:

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

CO1: Understand the significance of computing methods, their strengths and application areas for skill development and employability.

CO2: Perform the computations on various data using appropriate computation tools for skill development and employability.

CO3: Apply Monte-Carlo techniques globally to obtain approximate solutions for skill development.

CO4: Apply differential equations to solve international numerical problems for skill development.

CO5: Find optimum solutions to numerical problems for skill development and employability.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested readings:
1. Heath Michael T., "Scientific Computing: An Introductory Survey", McGraw-Hill, 2nd Ed., 2002
2. Press William H., Saul A. Teukolsky, Vetterling William T and Brian P. Flannery, Numerical Recipes: The Art of Scientific Computing", Cambridge University Press, 3rd Ed., 2007
3. Xin-she Yang (Ed.)., "Introduction To Computational Mathematics", World Scientific Publishing Co., 2nd Ed., 2008
4. Kiryanov D. and Kiryanova E., "Computational Science", Infinity Science Press, 1st Ed., 2006
5. Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, "Scientific Computing With MATLAB And Octave", Springer, 3rd Ed., 2010

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

EEC056: MIXED SIGNAL DESIGN

Course Objective: The objective of the course is to familiarize the students with the concepts of Switched-capacitor filters, data converters along with their applications in real life for skill development and employability.

Unit-I (08Sessions)

Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous time filters: passive and active filters knowledge for better employability; Basics of global analog discrete-time filters and Z-transform.

Unit-II (08Sessions)

Switched-capacitor filters knowledge for better employability and improve skill - Nonidealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications.

Unit-III (08Sessions)

Basics of data converters to improve skill; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

Unit-IV (08Sessions)

Mixed-signal layout, improve skills to analyse interconnects and data transmission; Voltage-mode signalling and data transmission; Current-mode signalling and data transmission.

Unit-V (08Sessions)

Introduction to frequency synthesizers and synchronization to improve skill; Basics of PLL, Analog PLLs; Digital PLLs; DLLs.

Course Outcome:

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

CO1: Understand the global practical situations where mixed signal analysis is required for skill development.

CO2: Analyse and handle the inter-conversions between signals for employability.

CO3: Design systems involving mixed signals for skill development and employability.

CO4: Understand operation of different types of international ADC and DAC for skill development.

CO5: Design PLL and its application to create different circuits 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	1	2	2	1	1	1	1	3	1	1
CO2	1	3	1	1	1	3	1	1	2	1	1	2
CO3	1	2	1	3	1	1	2	1	2	1	1	2
CO4	1	1	2	1	3	1	1	3	1	1	3	1
CO5	1	1	2	1	1	1	1	1	3	1	1	2

Director

Sanjeev Agarwal
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	1	1	1
CO3	1	3	2
CO4	2	3	1
CO5	1	2	3

Suggested readings:

1. R. Jacob Baker, CMOS mixed-signal circuit design, Wiley India, IEEE press, reprint 2008.

2. Behzad Razavi , Design of analog CMOS integrated circuits, McGraw-Hill, 2003.

3. R. Jacob Baker, CMOS circuit design, layout and simulation, Revised second edition, IEEE press, 2008.

4. Rudy V. dePlassche, CMOS Integrated ADCs and DACs, Springer, Indian edition, 2005.

5. M. Burns et al., An introduction to mixed-signal IC test and measurement by, Oxford university press, first Indian edition, 2008.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

EEC057: SMART ANTENNA

Objective: The objective of this course is to understand the fundamental characteristics of different wireless system, CDMA to improve skill and to provide employability skills.

Unit-I   (08Sessions)
Spatial processing for wireless systems. Skills to analyse adaptive antennas. Beam forming networks. Digital radio receiver techniques and software radios.

Unit-II   (08Sessions)
Coherent and non-coherent CDMA spatial processors knowledge for better employability. Dynamic re-sectoring. Range and capacity extension– multi-cell systems.

Unit-III   (08Sessions)
Global Spatio – temporal channel models. Environment and signal parameters. Geometrically based single bounce elliptical mode to improve skill.

Unit-IV   (08Sessions)
Optimal spatial filtering, knowledge of adaptive algorithms for CDMA for better employability. Multitarget decision – directed algorithm.

Unit-V   (08Sessions)
DOA estimation – conventional and subspace methods. ML estimation techniques. Estimation of sources using eigen decomposition for skill development. Direction finding and true ranging PL systems. Elliptic and hyperbolic PL systems. TDOA estimation techniques.

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: compare the performances of digital radio receivers and software radios for skill development.
CO2: study the CDMA spatial processors to analyze the multi-cell systems for skill development and employability.
CO3: analyze the channel models for smart global antenna systems for skill development.
CO4: study the environmental parameters for signal processing of smart antenna systems for employability.
CO5: evaluate the requirements for the design and implementation of smart antenna systems for skill development to compete local, national, and international standards.

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

Suggested readings:

1. T.S.Rappaport& J.C.Liberti, Smart Antennas for Wireless Communication, Prentice Hall (PTR) ,1999.

2. R.Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless Communication, Kluwer,2001.

3. M.J. Bronzel, Smart Antennas, John Wiley, 2004.

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

EHU501: HUMAN VALUES AND PROFESSIONAL ETHICS

Objective: The objective of this course is to familiarize the students with awareness on Engineering Ethics and Human Values and also to become social responsible as an engineer to provide employability & skills

UNIT I   (08Sessions)

Human Values: National and international 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   (08Sessions)

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   (08Sessions)

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, employability and entrepreneurship development

UNIT IV   (08Sessions)

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.Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination for skill development, employability and entrepreneurship development

UNIT V   (08Sessions)

Global Issues: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc for skill development, employability and entrepreneurship development

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

CO1: To create an awareness on national and international Engineering Ethics and Human Values for skill development.

CO2: To understand Senses of 'Engineering Ethics' and various moral issues for skill development and employability.

CO3: To study Engineering as Social Experimentation for skill development, employability and entrepreneurship development to compete local, national, and international standards.

CO4: To learn about various parameters like Safety, Responsibilities, and Rights of an engineer for skill development and employability.

CO5: To understand about the various Global Issues and to understand the sample code of Ethics for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes   (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Website Sources:

1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. en.wikipedia.org
4. www.tutorialspoint.com

Note: Adhere to latest edition of the suggested readings.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC551: LINEAR INTEGRATED CIRCUITS LAB

Objective: The objective of this course is to familiarize the students to explore and learn various concepts regarding analog electrical signals, networks and measurement of various electrical components. Each experiments are designed in such a way that, the student first get to learn the theories well and then perform the experiment to enhance their knowledge to improve skill and provide knowledge for employability and entrepreneurship.

List of Experiments   **(15Sessions)**

1. To study global Simulation software (Matlab) for skill development.
2. To design an inverting amplifier using Op-Amp IC 741 Kit / Simulation software.
3. To design non-inverting amplifier using Op-Amp IC 741 Kit / Simulation software.
4. To demonstrate the use of op-amp as Summing Kit / Simulation software.
5. To design a Subtractor on Kit / Simulation software
6. To study Op-amp as a differentiator using Op-Amp IC 741 Kit / Simulation software.
7. To study Op-amp as an integrator using Op-Amp IC 741 Kit / Simulation software.
8. To study half wave and full wave rectifier circuit using Op-amp IC 741 and simulate using Simulation software for skill development.
9. To design and simulate a wein-bridge oscillator using kit/Simulation software.
10. To design and simulate a phase shift oscillator using Kit /Simulation software.
11. To design mono stable multivibrator using IC555 on Kit /Simulation software.
12. To design astable multivibrator using IC555 on Kit /Simulation software.
13. To study and design 1 st order Low Pass, High pass and Band pass Filter and obtain the desired frequency response using Kit /Simulation softwarefor skill development.
14. Design of Clippers and Clampers Circuits using Op-Amp Kit /simulate using Simulation software

Course Outcomes:
Students completing this course will be able to:
CO1: To understand about different global Integrated Circuit working practically for skill development and employability.
CO2: To analyze and design linear circuits and verify their circuits for skill development.
CO3: To understand various mathematical operations internationally in many linear, non-linear and frequency-dependent circuits by designing circuits for summing, subtraction, integrator, differential etc for skill development.
CO4: To understand IC 555 and its uses in different circuits for skill development and employability.
CO5: To understand the use of analog circuits in electronics industry by making working model 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	1	1	1	2	1	1	3	1	1	1	2	1

Director

Registrar
IFTM University
Moradabad.

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. Sedra and Smith, "Microelectronic Circuits", 4th Edition, Oxford University Press.
2. Michael Jacob, `Applications and Design with Analog Integrated Circuits', PHI, 2nd Edition, 2006
3. Jacob Milliman and Arvin Grabel, "Microelectronics", 2nd Edition, TMH, 2008.
4. OP-Amps and Linear Integrated Circuits- Ramakant A. Gayakwad (PHI Publication). (Selected portion from Chapter 7, 8 and 9)
5. Pulse & Digital Circuits by K.Venkata Rao, K Rama Sudha& G Manmadha Rao, Pearson Education, 2010. (Selected portions).

Website Sources:
1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. en.wikipedia.org
4. www.vlab.co.in

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC552: COMMUNICATION LAB- I

Objective: Familiarize the students with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course, e.g., amplitude and frequency modulation, pulse modulation to improve skill and provide knowledge for employability and entrepreneurship.

List of Experiments   (14Sessions)

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands knowledge for employability.
2. To study amplitude demodulation by linear diode detector knowledge for skill development.
3. To study the working of AM radio receiver and the effect of Image Frequency.
4. To study the tuning of actual AM radio receiver.
5. To study frequency modulation/demodulation and determine its modulation factor.
6. To study the working of FM radio receiver and tuning of actual FM radio receiver
7. To study global sampling and multiplexing techniques and reconstruction
8. To study Pulse Amplitude Modulation, Pulse Width Modulation and Pulse Position Modulation.
9. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
10. To demodulate the obtained PAM signal by 2nd order LPF.
11. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component (To Study of Square Waveform Synthesis)
12. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component (To Study of Triangular Waveform Synthesis)
13. To Study Synthesis of Saw-Tooth Waveform.
14. To Study the Synthesis of Amplitude Modulated Signal

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

CO1: Design analog modulation circuits as amplitude and frequency modulation for skill development.
CO2: Design various global pulse modulation techniques as PAM, PPM, PWM for employability.
CO3: Design the circuit to sample an analog signal for skill development.
CO4: Understand the fundamental frequency and its harmonic component for employability to compete national, and international standards.
CO5: To understand the Synthesis of Amplitude Modulated Signal 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)

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

(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. H. Taub, D L Schilling, GoutomSaha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.

2. B.P. Lathi, "Modern Digital and Analog communication Systems", 3rd Edition, Oxford University Press, 2009.

3. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.

4. H. P. HSU & D. Mitra, "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing
Company Ltd.

Website sources:

- https://www.vlab.co.in/broad-area-electronics-and-communications

- www.nptel.ac.in

- https://en.wikipedia.org/wiki/Communications-system

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC553: MICROPROCESSOR LAB - II

Objective: The objective of this lab is to provide hands-on experience to students of working on advance microprocessor kit and develop complex programs of calculation for skill development, employability and entrepreneurship development.

Introductory: Familiarization of 8086/8051 kits.　　　　　　　　**(12Sessions)**

1. Study of microprocessor 8086 training kit for skill development.
2. Add and subtract two given 16-bit numbers by using 8086 instruction set for skill development.
3. Write a program to multiply two 16- bit numbers for 8086 microprocessor for skill development.
4. Write a Program for comparing two strings by using 8086 instruction sets for skill development.
5. Write a program for division of two 32- bit numbers for 8086 microprocessor for skill development and employability.
6. To find the smallest number in an array of data using 8086 instruction set to compete national, and international standards..
7. To find LCM and HCF of Two Numbers using 8051 Micro controller or skill development and employability.
8. To calculate Factorial of 0-5 decimal number using 8051 Micro controllerfor skill development and employability.
9. To perform logical operation (AND, OR, EX-OR and NOT operation) using 8051 Micro controller for skill development and employability.
10. Write a program to Split bytes into two nibbles and display on LCD using 8051 Micro controller for skill development and employability.

Course Outcomes:
Students taking this lab will be able to:
CO1: Understand the basics of microprocessor operation for skill development.
CO2: Analyze through output how the circuit functions for skill development to compete local, national, and international standards.
CO3: Understand the conversion of decimal to hexadecimal system for skill development.
CO4: Understand the difference between microprocessor and micro controller for skill development to compete national, and international standards.
CO5: To understand the use of microprocessors in electronics industry by making working model for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes(Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

CO s/PO s	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1	1	1	1	1	3	1	1	1	1
CO 2	1	1	1	1	1	1	1	2	1	1	1	1
CO 3	1	2	1	1	1	1	1	1	1	1	1	1
CO 4	1	1	1	1	3	1	1	1	1	2	1	1

Director

Sanjeev Goswami
Registrar
IFTM University
Moradabad.

CO 5	1	1	1	1	1	1	1	1	1	1	1	3

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

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

Suggested Readings:

1. "Microprocessor Architecture, Programming and Applications with 8085" by R S Gaonkar
2. "Computer Architecture: A Quantitative Approach" by J H Hennessy and D A Patterson
3. "The 8051 Micro controller, Architecture, Programming and Applications" by Kenneth J Ayala'
4. "Fundamentals of microprocessor and micro controller by B Ram"

Website Sources:

1. www.microprocessorlib.in
2. www.nptel.ac.in
3. www.gradeup.in
4. en.wikipedia.org

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Agarwal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC554: POWER ELECTRONICS LAB

Course Objective:

1) To expose students to operation and characteristics of power semiconductor devices and passive components, their practical application in power electronics.

2) To provide a practical exposure to operating principles, design and synthesis of different power electronic converters.

3) To introduce students to industrial control of power electronic circuits as well as safe electrical connection and measurement practices.

This powers electronics lab helps student for skill development, employability and entrepreneurship development.

List of Experiments   **(12Sessions)**

1. Measurement of the following basic diode characteristics of SCR
(a) Forward blocking current V/S Voltage.
(b) Reverse blocking current V/S Voltage.
(c) Reverse gate current V/S Voltage.
2. To determine the following Turn on characteristics of SCR
(a) Gate trigger current (Firing current).
(b) Gate trigger voltage.
(c) Latching current.
(d) Holding current.
3. Study of SCR triggering circuits and to check the performance of one type of triggering circuits for skill development
4. Study of SCR commutation circuits and to check the performance of one type of commutation circuits for skill development
5. Harmonic analysis of a complex voltage Wave form by harmonic analysis for skill development
6. Study of chopper circuits to check performance of one type of chopper circuits for skill development
7. Study of inverter circuits and to check the performance of one type of inverter circuits for skill development
8. Speed control of international DC motor by solid state devices for skill development and employability.
9. Speed control of induction motor using thyristors for skill development and employability.
10. Basic triac characteristics for skill development
11. Study of excitation system of a synchronous generator using thyristors and to find excitation response for skill development and employability.

Course Outcomes:

The expected outcomes of the Course/Subject are:

CO1: Articulate the global basics of power electronic devices for skill development

CO2: Express the design and control of rectifiers, inverters for skill development

CO3: Design of international power electronic converters in power control applications for skill development

CO4: Ability to express characteristics of SCR, BJT, MOSFET and IGBT for skill development

Director

Sanjiv Agrawal
Registrar
IFTM University
Moradabad.

CO5: To understand the use of power electronic circuits in electronics industry by making working model for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes(Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

CO s/PO s	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1	1	1	1	1	3	1	1	1	1
CO 2	1	1	1	1	1	1	1	2	1	1	1	1
CO 3	1	2	1	1	1	1	1	1	1	1	1	1
CO 4	1	1	1	1	3	1	1	1	1	2	1	1
CO 5	1	1	1	1	1	1	1	1	1	1	1	3

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

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

Suggested Readings:

1 P.C Sen," Power Electronics", Tata McGraw-Hill Publication Co., Ltd

2. S.K. Dutta, "Power Electronics" & Control' Prentice Hall of India Pvt. Ltd

3. P.S Bimbra, "Power Electronics" Khanna publishers

4. Mohammed h Rashid,""Power electronics" circuit device & application", PHI, New Delhi

5.S. B. Dewan, "Power electronics"thyristor-based convertersWiley India Pvt. Ltd

Website Sources:

1. en.wikipedia.org

2. https://www.vlab.co.in/

3. onlinecourses.nptel.ac.in

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

Director

Sanjeev Kumar
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC601: DIGITAL COMMUNICATION

Objective: To understand the key modules of digital communication systems with emphasis on digital modulation techniques and to get introduced to the basics of source and channel coding/decoding and Spread Spectrum Modulation in order to achieve employability in the field of communication and skill development for R&D activities in communication systems.

Unit – I   (08Sessions)
Digital Transmission: Introduction, Advantages of Digital Transmission for employability in the field of communication. Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK, QAM and MSK), M-ary Digital carrier Modulation for employability.

Unit – II   (08Sessions)
Digital representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 digital System, TDM Hierarchy in order to inculcate the employability.

Unit – III   (08Sessions)
Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers for the skill development of the students who want to pursue the career in the field of R&D in communication system.

Unit – IV   (08Sessions)
Spread spectrum Communications: Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications in order to get employability in the field of communication to compete local, national, and international standards.

Unit – V   (08Sessions)
Measure of Information, Self-information, Entropy, Conditional Entropy, Mutual information, Divergence, Channel capacity, Shanon's theorem, Channel capacity, FEC coding: Linear block codes, Convolutional codes to ensure the skill development of the students.

Course Outcomes
Students completing this course will be able to:
CO1: To understand digital transmission, eye diagram, digital carrier system and modulation techniques for employability.
CO2: To study digital representation of analog signals, issues in digital transmission for skill development.
CO3: To study performance analysis of digital communication system in order to get employability in the field of communication.
CO4: To understand spread spectrum communications and OFDM communications to get employability to compete local, national, and international standards.
CO5: To understand the measure of information, channel capacity and convolutional codes for skill development to compete national, and international standards.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

Mapping Course Outcomes leading to the achievement of Programme Outcomes(Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

CO s/PO s	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1	1	1	1	1	3	1	1	1	1
CO 2	1	1	1	1	1	1	1	2	1	1	1	1
CO 3	1	2	1	1	1	1	1	1	1	1	1	1
CO 4	1	1	1	1	3	1	1	1	1	2	1	1
CO 5	1	1	1	1	1	1	1	1	1	1	1	3

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

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

Suggested readings:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 4th Edition, Oxford University Press, 2010.
2. H. Taub, D L Schilling, GoutomSaha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
3. John G. Proakis, "Digital Communications", 4th Edition, McGraw-Hill International.
4. Simon Haykin, "Communication Systems",4th Edition, Wiley India.
5. H P HSU & D Mitra, "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd

Website Sources:
1. en.wikipedia.org
2. onlinecourses.nptel.ac.in
3. www.scribd.com
4. www.tutorialspoint.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC602: DIGITAL SIGNAL PROCESSING

Objective: The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems for skill development and employability.

UNIT I   (10Sessions)
The Discrete Fourier Transform: Its Properties and Applications: Definitions, Relationship of the DFT to other Transforms; Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution for better employability in industry, Additional DFT Properties; Linear Filtering Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences.

UNIT II   (08Sessions)
Efficient Computation of the DFT: Fast Fourier Transform Algorithm: Efficient Computation of the DFT: FFT Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms: Decimation-In-Time (DIT), Decimation-In-Time (DIF); IDFT using DIT and DIF Algorithms. Applications of FFT Algorithms for skilling of entrepreneurship.

UNIT III   (08Sessions)
Implementation of Discrete-Time Systems: Structure for the Realization of Discrete-Time Systems, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization for skill development and employability.

UNIT IV   (06Sessions)
Design of FIR Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters internationally for better employability in industry.

UNIT V   (08Sessions)
General Considerations: Causality and Its Implications, Design of FIR Filters: Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windowing techniques, the Rectangular Window, Other Commonly Used Windows for skill development and entrepreneurship, Examples of Filter Designs Using Windows, The Kaiser Window, Finite word length effect, Limit cycle, Data representation format.

Course Outcomes:
Upon successful completion of this course the students will have developed following skills/abilities:
CO1: Interpret, represent and process discrete/digital signals and systems for skill development.
CO2: Thorough understanding of frequency domain analysis of discrete time signals for skill development and employability.
CO3: Ability to design & analyze global DSP systems like FIR and IIR Filter for better employability in industry.
CO4: Understanding of spectral analysis of the signals internationally for skill development.
CO5: Understand the applications of DSP in speech processing and spectrum analysis for skill development, employability and entrepreneurship development.

Director

Sanjeev Asawf

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

Suggested Reading:

1. Digital Signal Processing – S. Salivahan, A. Vallavraj and C. Gnanapriya, TMH.
2. Digital Signal Processing: a Computer-Based Approach – Sanjit K. Mitra, TMH.
3. Digital Signal Processing – Manson H. Hayes (Schaum's Outlines) Adapted by Subrata Bhattacharya, TMH.
4. Digital Signal Processing: A Modern Introduction – Ashok Ambardar, Cengage Learning.
5. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling and Sandra L.
6. Digital Signal Processing – A practical approach - Ifeacher, Jervis, Pearson Education Asia, 2003.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.gupshupstudy.com
5. www.tutorialspoint.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC603: MICROWAVE ENGINEERING

Objective: The objective of this course is to familiarize the students with the basics of waveguide technology that plays a significant part in communication systems to inculcate skill, provide employability and entrepreneurial skills.

Unit – I   (08Sessions)
Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Knowledge of Micro strip Transmission line (TL) to improve skills, global Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities.

Unit – II   (08Sessions)
Scattering Matrix: Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrite, Faraday Rotation, Isolators, Circulators.S parameter analysis of all components to improve Knowledge for employability.

Unit – III   (08Sessions)
Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications for better skill development.

Unit – IV   (08Sessions)
Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field- effect Transistor, Transferred electron devices, Analysis of Avalanche Transit –time devices: IMPATT Diode, TRAPPAT Diode for entrepreneurship & employability.

Unit – V   (08Sessions)
Microwave Measurements: General set up of a microwave test bench for better skilling of entrepreneurship, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.

Course Outcomes:
The students completing this course will be able to:
CO1: Explain the concept of global waveguides in different modes for skill development.
CO2: Understand the concept of high frequency operation of waves internationally for skill development and employability.
CO3: Understand the concept of fields and cross fields for employability.
CO4: Analyze operation of different microwave transistor, diodes for skill development and employability to compete national, and international standards.
CO5: Understand different components and working of Microwave test bench for skill development.

Director

Sanjeev Borawf
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)

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

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

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

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

Suggested reading:

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3rd Ed, PearsonEducation.
2. A. Das and S. K. Das, "Microwave Engineering",TMH.
3. R.E Collin, "Foundation for Microwave Engineering ", 2nd Ed., John WileyIndia.
4. David M. Pozar, "Microwave Engineering" 3rd Ed, John Wiley & Sons,2009.
5. J. Ryder "Network Lines and Fields" 2nd Ed, Prentice-Hall IndiaLtd.

Website sources:

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

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC604: VLSI TECHNOLOGY

Objective: The objective of this course is to familiarize the students with the VLSI Technology processes and industrial manufacturing of Integrated circuits to inculcate skill, provide employability & entrepreneurial skills. This course also helps them to understand the basic concepts of diffusion, Ion-implantation, packaging design and various technologies involved in fabrication.

UNIT I   (08Sessions)
Introduction to IC Technology: Global SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and introduction to Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth for knowledge for employability, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.

UNIT II   (08Sessions)
Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching knowledge to upgrade skill. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.

UNIT III   (08Sessions)
Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment to improve knowledge for employability.

UNIT IV   (08Sessions)
Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies to improve knowledge and skill.

UNIT V   (08Sessions)
VLSI Process Integration: Fundamental Considerations for IC Processing as per industry, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication.

Course Outcomes:
Students completing this course will be able to:
CO1: To understand the global basic of IC Technology such as SSI, MSI, LSI, VLSI etc for employability.
CO2: To understand photolithography, etching process for skill development and employability.
CO3: To understand Oxidation and Diffusion techniques for skill development and employability.
CO4: To learn various national and international types and design of packaging for employability.
CO5: To learn basic NMOS, PMOS, CMOS Technology and Fabrication 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)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	1	3	1	1	1	1	1
CO2	1	1	1	3	1	1	3	1	1	1	1	1

Director

Registrar
IFTM University
Moradabad.

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

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

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

Suggested Readings:
1. S. M. Sze, "VLSI Technology", 2nd Edition, McGraw –Hill Publication.
2. S.K. Ghandhi, "VLSI Fabrication Principles", 2nd Edition,. Willy-India Pvt. Ltd.
3. J. D. Plummer, M. D. Deal and Peter B. Griffin, "Silicon VLSI Technology: Fundamentals, practice and modelling", Pearson Education.
4. Stephen A. Campbell, "Fabrication Engineering at the micro and nano scale", Oxford Univ Press.

Website Sources:
- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

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

Director

Registrar
IFTM University
Moradabad.

EEC605: ANTENNA THEORY AND WAVE PROPAGATION

Objective: The objective of this course is to familiarize the students with fundamental antenna engineering parameters and terminology. This course also helps to understand wide variety of practical antennas and antenna arrays. It also helps to understand the propagation of waves on various surfaces to provide employability & skills

UNIT I   (08Sessions)
Antennas Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle), Radiation Intensity, Beam Efficiency, Directivity and Gain, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio, Antenna Temperature, Antenna Impedance, Retarded Potential, Far Field due to an alternating current element, Power radiated by a current element, Field variation due to sinusoidal current distribution for skill development.

UNIT II   (08Sessions)
Point Sources and Their Arrays: Introduction, Point Source, Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Nonisotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non uniform Amplitude Distributions. General Considerations.

Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of $\lambda/2$ Antenna, Array of Two Driven $\lambda/2$ Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded global Dipole Antennas for skill development.

UNIT III   (08Sessions)
The Loop Antenna. Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Microstrip Antennas for skill development.

UNIT IV   (08Sessions)
Reflector Antennas   Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination,

Reflector Types (summarized), Feed Methods for Parabolic Reflectors, Antenna Measurements Introduction, Antenna Measurement ranges, Radiation pattern Measurements, Gain and Directivity Measurements, Spectrum Analyzer for skill development and employability.

UNIT V   (08Sessions)
Ground Wave Propagation Plane Earth Reflection, Space Wave and Surface Wave, Space Wave Propagation

Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth, Sky wave Propagation Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics for skill development, employability and entrepreneurship development.

Director

Sanjeev Anand

Registrar
IFTM University
Moradabad.

Course Outcomes:

After the successful completion of this course, the student will be able understand:

CO1: Basic global Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle), Radiation Intensity, Beam Efficiency, Directivity etc for skill development.

CO2: To understand important and fundamental antenna engineering parameters and terminology for skill development.

CO3: To learn the basic concepts of electromagnetic wave radiation and reception for skill development.

CO4: To develop the basic international skills necessary for designing a wide variety of practical antennas and antenna arrays for skill development and employability.

CO5: To Learn the Importance of Propagation Mechanism of antenna for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan,"Antennas and Wave Propagation", Fourth Edition, Tata McGraw Hill, 2010 Special Indian Edition.
2. A .R. Harish, M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press, 2009.
3. Jordan Edwards C. and Balmain, Keith G."Electromagnetic Waves and Radiating Systems", PHI.
4. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill.

Director

Registrar
IFTM University
Moradabad.

Website Sources:

1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. www.tutorialspoint.com
4. www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

EEC060: EMBEDDED SYSTEM DESIGN

Objective: The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions for skill development and employability.

Unit – I   (08Sessions)
Introduction Review of Embedded Hardware: Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Built-Ins on the Microprocessor, Conventions used on Schematic, Microprocessor Architecture knowledge for better employability and improve skill, Interrupt Basic, Shared Data Problems, Interrupt Latency.

Unit – II   (08Sessions)
PIC Micro controller & Interfacing: Introduction, CPU Architecture knowledge to improve skill, Register file structure, Instruction Set, Programs, Timers and Interrupts – Interrupt Service Routine – features of Interrupts – Interrupt vector & Priority, Timing Generation & Measurements, Compare mode, Capture mode, Event counter, PWM, Frequency Measurement – Interfacing Methods, I/O Interface, SPI, LCD interfacing, Seven segment interfacing, I2 C Bus, DAC, Serial EEPROM, ADC, UART.

Unit – III   (08Sessions)
Software Development & Tools: improve skills to analyses Software architectures, Round – Robin, Round-Robin with Interrupts, Function Queue Scheduling architecture, Introduction to assembler – Compiler –n Cross compilers and Integrated Development Environment IDE, Linker/ Locators, Simulators, Getting Embedded software into target System Debugging Strategies

Unit – IV   (08Sessions)
Introduction to Real Time Operating Systems: Task and Task States, Tasks and Data, Semaphores and shared data to compete local, national, and international standards.

Unit – V   (08Sessions)
Operating System Services: Message queues, Mailboxes and Pipes, Timer Function, Events, Memory Management, Interrupt Routines in an RTOS Environment to improve skill, Basic Design Using RTOS.

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

CO1: Understand the concept of global embedded system, microcontroller, different components of microcontroller and their interactions for skill development.
CO2: Get familiarized with programming environment to develop embedded solutions for employability.
CO3: Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices for skill development and employability.
CO4: Learn the method of designing and program an Embedded Systems for real time applications. for skill development to compete local, national, and international standards.
CO5: Develop familiarity with 8051 Microcontrollers and their applications in an embedded environment for skill development and employability.

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

Director

Sanjeev Bansf

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

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

Suggested readings:

1. An Embedded Software Primer, by David E. Simon, Pearson Education, Latest Edition.

2. PIC Microcontroller by John B. Peatman, Pearson Education, Latest Edition.

3. D. D. Gajski, F. Vahid, S. Narayan, J. Gong, Specification and Design of Embedded Systems, Prentice Hall.

4. Steve Heath, Embedded systems design, Newnes, 1997.

5. Hardware Software Co-design of Embedded Systems, F. Balarin, Chiodo, et al., Kluwer Academic Publishers, May 1997

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC061: ARTIFICIAL INTELLIGENCE

Objective: The objective is to enable the students to understand the basic principles of Artificial Intelligence in various applications to improve skill and to provide employability skills.

Unit – I   (08Sessions)
Introduction: Artificial Intelligence - Definition - Components - Scope - Application Areas -The importance of AI, Early work in AI, Skills to analyses AI and related fields, introducing intelligence in the methods of attack, criteria for success.

Unit – II   (08Sessions)
Problem Solving: Control strategies, heuristic search, problem characteristics, forward versus backward reasoning, problem tree versus problem graphs, matching, heuristic functions, weak methods, problem reduction and constraint satisfaction knowledge for better employability.

Unit – III   (08Sessions)
Knowledge Representation: Definition and importance of knowledge, representing single facts in logic, resolution non-monotonic reasoning, Dealing within inconsistencies and uncertainties, Fuzzy logic, Bayesian probabilistic interference, dempster shafrer theory, Ad-Hoc methods, Heuristic reasoning methods, structural representation of knowledge graphs for better employability, frames and related structures to compete local, national, and international standards..

Unit – IV   (08Sessions)
Natural Language Processing: Overview of Linguistics, Grammars and Languages, Basic Paying Techniques, Semantic Analysis and Representation Structures to improve skill, Natural language generation, natural system.

Unit – V   (08Sessions)
Pattern Recognition: Recognition and classification process, learning classification patterns, recognizing and understanding speech.
Expert System: Rule based system architectures, model based system, constraint satisfaction dealing with uncertainties, knowledge acquisition and validation expert system building tools. Introduction to neural networks to improve skill, learning algorithms and models.

Course Outcome:
After the successful completion of this course, the students will be able to:
CO1: Solve basic international AI based problems for skill development.
CO2: Define the concept of Artificial Intelligence for skill development.
CO3: Apply AI techniques to real-world problems to develop intelligent systems for skill development and employability to compete local, national, and international standards.
CO4: Select appropriately from a range of techniques when implementing intelligent systems for skill development.
CO5: Understanding of the main abstractions and reasoning for intelligent 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	1	1	2	2	1	1	1	1	3	1	1
CO2	1	3	1	1	1	3	1	1	2	1	1	2

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

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

Suggested readings:

1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, PHI.
2. Elaine Rich, Artificial Intelligence, Mc-Graw Hill.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC062: WEB TECHNOLOGIES

Objective: The objective is too familiar with client server architecture and able to develop a web application using java technologies to improve knowledge for better employability in industry.

Unit – I   (08Sessions)
Internet and World Wide Web: - Introduction, Internet Addressing, ISP, types of Internet Connections for skill development and employability, Introduction to WWW, WEB Browsers, WEB Servers, URLS, http, WEB applications, Tools for WEB site creation.

Unit – II   (08Sessions)
HTML:-Introduction to global HTML, Lists, adding graphics to HTML page, creating tables, linking documents, frames, DHTML and Style sheets

Unit – III   (08Sessions)
Java Script: - Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, creating forms, introduction to Cookies.

Unit – IV   (08Sessions)
Java: - Introduction to java objects and classes for knowledge for employability, control statements, arrays, inheritance, polymorphism, Exception handling, Multithreading, Building the Java Applets, Boxes, Radio Button, Managing Multiple controls, Scrollbars, Choice controls, Scrolling lists, Windows, Menu and Dialog Boxes, Popup Windows, Graphics in Java, Mouse events, Drawing Objects, Fonts, Canvases, Images, Image maps, Graphics, Animation.

Unit – V   (08Sessions)
XML: - Why XML, XML syntax rules, XML elements, XML attributes, XML DTD displaying XML with CSS.

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

CO1: Develop a dynamic global webpage by the use of java script and DHTML for skill development.
CO2: Write a well-formed / valid XML document for employability.
CO3: Write java program to a DBMS and perform insert, update and delete operations on DBMS table for skill development and employability.
CO4: Write a server-side java application called Servlet to catch form data sent from client, process it and store it on database for skill development.
CO5: Understand Java application called JSP to catch form data sent from client and store it on database for skill development and employability to compete local, national, and international standards.

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

Director

Sanjeev Agrawal

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

Suggested readings:

1. Java, How to Program, 6th edition, H.M. Deitel, P,J.Deitel
2. Java 2: The Complete Reference, Fifth Edition, TMH
3. Web Enabled Commercial Application Development, by Ivan Bayross, BPB.
4. Learning XML by Eric T. Ray, Second edition.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC063: DATA STRUCTURES AND ALGORITHMS

Objective: The objective is to devise novel solutions to small scale programming challenges involving data structures and recursion to improve skill and provide knowledge for employability.

Unit – I (08Sessions)

Introduction: Introduction to data structures for skill development; Introduction to Algorithms Complexity.

Arrays, Stacks & Queues: Concepts; Basic operations & their algorithms: Transverse, Insert, Delete, Sorting of data in these data structures; Prefix, Infix, Postfix Notations.

Unit – II (08Sessions)

Lists: Concepts of Link List and their representation for better employability in industry; Two way lists; Circular link list; Basic operations & their algorithms: Transverse, Insert, Delete, Searching and Sorting of data in List; Storage Allocation & Garbage Collection; Linked stack and queues; Generalized List; sparse matrix representation using generalized list structure.

Unit – III (08Sessions)

Trees: Binary Trees and their representation using arrays and linked lists for skill development; Trees and their applications; Binary tree transversal; Inserting, deleting and searching in binary trees; Heap & Heap Sort; General Trees; Thread binary tree; Height balance Tree (AVL); B-Tree.

Unit – IV (08Sessions)

Graphs and their applications: Graphs; Skills to analysis of Linked Representation of Graphs; Graph Traversal and spanning forests; Depth first search; Breadth first search.

Unit – V (08Sessions)

Sorting & Searching: Knowledge of global Insertion sort for better employability; Selection sort; Merging; Merge sort; Radix sort; Sequential & Binary Search; Indexed Search; Hashing schemes; Binary search Tree.

Course Outcome:

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

CO1: Understand the concept of Dynamic memory management, data types, algorithms, Big O notation for skill development to compete local, national, and international standards.

CO2: Understand basic data structures such as arrays, linked lists, stacks and queues for employability.

CO3: Describe the hash function and concepts of collision and its resolution methods for skill development and employability.

CO4: Solve problem involving graphs, trees and heaps for skill development.

CO5: Apply Algorithm for solving global problems like sorting, searching, insertion and deletion of data 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	1	2	2	1	1	1	1	3	1	1
CO2	1	3	1	1	1	3	1	1	2	1	1	2
CO3	1	2	1	3	1	1	2	1	2	1	1	2

Director

Sanjeev Anand

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

Suggested readings:

1. Data Structure Using C and C++ by A. Tenenbaum, Y. Langsam, M. J. Augenstein (PHI),Edition 2nd

2. Theory and problems of Data Structures Seymour Lipschutz (McGraw Hill), Edition 1st

3. Data Structures & Program Design Robert L. Kruse (PHI) , Edition 3rd

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

EEC064: SATELLITE COMMUNICATION

Objective: The objective of this course is to familiarize students with concept of wireless and remote communication which is a part of day to day life communication systems to inculcate skill, provide employability.

Unit – I   (08Sessions)
Elements of Satellite Communication: Global Orbital mechanics look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit *to improve skill.*

Unit – II   (08Sessions)
Satellite subsystems: attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna, Satellite link design to improve skill and knowledge to employability: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

Unit – III   (08Sessions)
Propagation effects and their impact on satellite-earth links *to improve skill*: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and non geostationary.

Unit – IV   (08Sessions)
Direct broadcast satellite television and radio: satellite navigation and the global positioning systems, GPS position location principle to improve skill and knowledge to employability, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing accuracy, GPS Receiver Operation.

Unit – V   (08Sessions)
Global Mobile Satellite Systems: Antenna System for mobile satellite applications to improve knowledge for employability, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna(MSA), Low gain omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.

Course Outcomes:
Students completing this course will be able to:
CO1: Understand the global concept of connecting remote assets for skill development
CO2: Understand how communication works independent of location for skill development and employability.
CO3: Understand installation and maintenance of national and international ground station for skill development, employability and entrepreneurship development.
CO4: Understand how it brings about weather forecasting and other important services for skill development and employability.
CO5: Analyze Communication systems 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)

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

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

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

Suggested Readings:
1.B. Pratt, A. Bostian, "Satellite Communications", Wiley India.
2. D. Roddy, "Satellite Communications", TMH, 4thEd.
3. S. D. Ilcev, "Global Mobile Satellite Communication",Springer
4. R. Pandya, "Mobile and Personal Communication Systems and Services",PHI.

Website Sources:
1.www.nptel.ac.in
2.en.wikipedia.org
3.www.satcom.in
4.www.gradeup.in
5.www.ies_satcom.in

Note: Adhere to latest edition of the suggested readings.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC065: SEMICONDUCTOR DEVICE MODELING

Objective: This course provides a solid foundation in the physics of semiconductors so that students will be able to not only understand current devices and exploit them in novel applications to improve skill, provide employability and entrepreneurial skills.

Unit-I   (08Sessions)
Basic Device Physics which improves knowledge for employability: Electrons and holes in silicon, p-n junction, MOS capacitor, High field effects, Semi-classical Bulk Transport – Qualitative Model.

Unit-II   (08Sessions)
Drift-Diffusion Transport Model – Equations, Boundary Conditions, Mobility and Generation / Recombination, Energy band diagrams

Unit-III   (08Sessions)
MOSFET Devices for skill development: Structure and Characteristics, Qualitative Model, Long-channel MOSFETs, Short-channel MOSFETs. Equations, Boundary Conditions and Approximations employability to compete local, national, and international standards.

Unit-IV   (08Sessions)
Skills to understand CMOS Device Design: MOSFET Scaling, Threshold voltage, MOSFET channel length. CMOS Performance Factors: Basic CMOS circuit elements, Parasitic elements, Sensitivity of CMOS delay to device parameters, Performance factors of advanced CMOS devices.

Unit-V   (08Sessions)
Bipolar Devices which improves knowledge for employability: n-p-n Transistors, Ideal current-voltage characteristics, Characteristics of a typical n-p-n transistor, Bipolar device models for circuit and time-dependent analyses, Breakdown voltages. Bipolar Device Design : Design of the emitter design, Design of the base region, Design of the collector design, Modern bipolar transistor structures.

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

CO1: Explain the equations, approximations and techniques available for deriving a model with specified properties for skill development.

CO2: Apply suitable international approximations and techniques to derive the model referred to above starting from drift-diffusion transport equations for employability.

CO3: Simulate characteristics of a simple device using MATLAB, SPICE for skill development and employability to compete local, national, and international standards.

CO4: Explain how the equations get lengthy and parameters increase in number while developing a compact model for skill development.

CO5: Understanding of the physics of a new device and conversion of this understanding into equations 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	1	2	2	1	1	1	1	3	1	1
CO2	1	3	1	1	1	3	1	1	2	1	1	2

Director

Sanjeev Anand
Registrar
IFTM University
Moradabad.

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

Suggested readings:

1. Yuan Taur, Tak.H.Ning, Fundamentals of Modern VLSI Devices, Cambridge University Press,
2. Donald Neamen, Semiconductors Physics and Devices, Tata Mc Graw Hill, 2003
3. Tyagi, Introduction to Semiconductor Materials and Devices, Wiley Publications, 2002.
4. Semiconductor Devices, Basic Principles Jasprit Singh, Wiley Publications, 2001
5. S.M. Sze (Ed), Physics of Semiconductor Devices, 2nd Edition, Wiley Publications, 1998
6. Analysis and Design of Analog Integrated Circuits 4/e, Paul R. Gray, Paul J. Hurst, Robert G Meyer, 2001, Wiley Publications
7. Physics of Semiconductor Devices 3/e S. M. Sze, Wiley Publications, 2007.

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

EEC066: IOT FOR COMMUNICATIONS

Objective: The objective of this course is to familiarize the students with to the advanced concepts of internet of things (IOT's) for communications. The primary objective of this course is to understand the concept of internet of things (IOT's) for communications and to be able to know details about advanced internet of things (IOT's) for communications. This will help students to know more about theoretical and practical problem solving techniques to improve skill and provide employability.

Unit-I (08Sessions)
Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability for skill development.

Unit-II (08Sessions)
Hardware for IoT: Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, Net Arduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex for skill development.

Unit-III (08Sessions)
Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination for skill development.

Unit-IV (08Sessions)
Programming the Ardunio: Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoTfor skill development employability to compete local, national, and international standards..

Unit-V (08Sessions)
Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges IoT Applications : Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city for skill development and employability.

Course Outcomes:
Students completing this course will be able to:
CO1: To understand the basic global concept of internet of things for skill development.
CO2: To understand the concept of hardware for IOT's Conventional Cryptographic Techniques for skill development.
CO3: To understand the concept of network and communication for skill development.
CO4: To study Programs related to Arduinos for skill development to compete local, national, and international standards..
CO5: To understand the challenges in IOT's for skill development and employability.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

Suggested Readings:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", willey
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti" Internet of Things(A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,HakinCassimally "Designing the Internet of Things" Wiley India.

Website sources:
1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC067: REMOTE SENSING

Objective: The objective is to familiarize the students with Satellites and their characteristics, Aerial photography, different types of sensors and the application to improve knowledge for better employability in industry.

Unit-I (08Sessions)

Remote sensing – history & development, definition, concept and principles for better skilling, Energy resources, radiation principles, international EM Radiation and EM Spectrum, Black body radiation, laws of radiation, Interaction of EMR with atmosphere and earth's surface

Unit-II (08Sessions)

Platforms – types and their characteristics, Satellites and their characteristics for skill development and employability, geo-stationary and sun-synchronous, Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS satellite series, Meteorological satellites – INSAT, NOAA, GOES

Unit-III (08Sessions)

Sensors – types and their characteristics for skill development and employability, across track (whiskbroom) and along track (pushbroom) scanning, Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN, Concept of resolution – spatial, spectral, temporal, radiometric, Basic concept and principles of thermal, microwave and hyperspectral sensing

Unit-IV (08Sessions)

Aerial photography – basic information and specifications of aerial photographs for knowledge for employability, Planning and execution of photographic flights, Aerial cameras, types and their characteristics, Aerial film negative and its processing- completion of photographic task

Unit-V (08Sessions)

Definition and terms in photogrammetry, Types of aerial photographs, Geometry of aerial photographs, Introduction to digital photogrammetry to improve skill, orthophotos and digital orthophotography

Course Outcome:

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

CO1: Understand the international concepts of Photogrammetry and compute the heights of objects for skill development.

CO2: Understand the basic concept of Remote Sensing and know about different types of satellite and sensors for employability.

CO3: Understand the global principles of aerial and satellite remote sensing for skill development and employability.

CO4: Illustrate Energy interactions with atmosphere and with earth surface features for skill development.

CO5: Illustrate spatial and non spatial data features 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	1	2	2	1	1	1	3	1	1	1
CO2	1	3	1	1	3	1	1	3	1	1	3	1
CO3	1	2	1	3	1	1	2	1	2	1	2	1

Director

Sanjeev Braw
Registrar
IFTM University
Moradabad.

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

Suggested readings:

1. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications

2. Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag Jensen,

3. J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall.

4. Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press

Website Sources:

1. www.en.wikipedia.org

2. www.studynama.com

3. www.onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

5. www.gupshupstudy.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC651: COMMUNICATION LAB- II

Objective: To understand the steps involved in the analysis of digital communication systems and to synthesize a digital communication module with the given specifications for skill development and better employability in industry.

List of Experiments   **(12Sessions)**

1. Study of international Pulse code modulation (PCM) and its demodulation using Bread Board for skill development
2. Study of delta modulation and demodulation and observe effect of slope overload for skill development
3. To Study data conditioning and reconditioning techniques for non-return to zero format (NRZ-L, NRZ-M, NRZ-S, unipolar to bipolar, bipolar to unipolar)for skill development
4. To study data conditioning and reconditioning techniques for phase encoded format [Biphase - Level (Manchester Coding), Biphase – Mark, Biphase – Space]for skill development
5. To study data conditioning and reconditioning techniques for return to zero format and multilevel binary format (URZ, RZ-AMI) for skill development
6. Study of Amplitude shift keying modulator and demodulatorfor skill development and employability.
7. Study of Frequency shift keying modulator and demodulator for skill development and employability.
8. Study of Phase shift keying modulator and demodulator for skill development and employability.
9. Study of error control coding techniques (Odd Parity Coding, Even Parity Coding, Hamming Coding) for skill development.
10. Study of convolution encoding and hard decision Viterbi decoding for K= 7 and rate =1/2. for skill development.
11. Study of convolution encoding using puncturing for K = 7 and rate = ¾. for skill development.
12. Study of convolution encoding using puncturing and soft decision Viterbi decoding using depuncturing for K= 7 and rate = ¾ for skill development.

Course Outcomes:

Students completing this course will be able to:

CO1: The ability of visualization and practical implementation of international baseband modulation techniques for skill development.

CO2: The skill to analyze and implement analogue to digital converters like PCM, DM for skill development

CO3: The ability to design pass band digital modulation systems and techniques with desired specifications for skill development

CO4: Generate digital modulation signals for ASK, PSK and FSK and perform their detection for skill development and employability.

CO5: Simulate MSK, DPSK, QPSK and DEPSK schemes and estimate their BER for skill development, employability and entrepreneurship development to compete local, national, and international standards.

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

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

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

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

Suggested readings:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 4th Edition, Oxford University Press, 2010.

2. H. Taub, D L Schilling, GoutomSaha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.

3. John G. Proakis, "Digital Communications", 4th Edition, McGraw-Hill International.

4. Simon Haykin, "Communication Systems",4th Edition, Wiley India.

5. H P HSU & D Mitra, "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

Website sources:

1. https://www.vlab.co.in/broad-area-electronics-and-communications
2. www.nptel.ac.in
3. https://www.guru99.com/
4. https://en.wikipedia.org/wiki/Communications-system

Note: Adhere to latest edition of the suggested readings.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC652: DIGITAL SIGNAL PROCESSING LAB

Objective: The objective of this course is to make students familiar with the most important methods in DSP, including various waveforms, DFT, IDFT, digital filter design, transform-domain processing and importance of Signal Processors. To make students aware about the meaning and implications of the properties of systems and signals for better employability in industry.

The following experiments have to be performed using DSP kits and also verify any five experiments using MATLAB.

List of Experiments   **(10Sessions)**

1. Familiarization with the architecture of a standard DSP kit (Preferably TMS 320C6XXX DSP kit of Texas Instruments) for skill development and entrepreneurship.

2. Generation of various types of waveforms (sine, cosine, square, triangular etc.) for skill development.

3. To study and verify linear convolution of two sequences (without using the inbuilt conv. function in MATLAB)for better employability in industry.

4. Finding the DFT and IDFT of a periodic sequence in international DSP kit.

5. To study Circular convolution of two sequences and comparison of the result with the result obtained from linear convolutionfor skill development.

6. With the help of Fourier series, make a square wave from sine wave and cosine waves. Find out coefficient valuesfor skill development.

7. Design and implementation of IIR (low pass and high pass) Filters (Butterworth)for skill development and employability.

8. Design and implementation of FIR (low pass and high pass) Filters using windowing techniques (rectangular window, triangular window and Kaiser Window)for skill development.

9. Generate an Amplitude Modulation having side low frequencies 1200 Hz and 800 Hz. Observe and verify the theoretical FFT characteristics with the observed ones for skill development and employability.

10.Generate Frequency Modulation having carrier frequencies 1 KHz and modulating frequency 200 Hz with the modulation index of 0.7. Observe and verify the theoretical FFT characteristics with the observed ones for better employability in industry.

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

CO1: To understand about different waveforms and architecture of international DSP kit ones for skill development and employability.

CO2: To analyze and design DFT, IDFT, digital filter, transform-domain processes etc for better employability in industry.

CO3: To understand various global modulation techniques such as Amplitude and Frequency modulation ones for skill development and employability.

CO4: To understand about the basic signal generation for better employability.

CO5: Demonstrate their abilities towards DSP processor based implementation of DSP systems ones for skill development.

Director

Sanjeev Prasad
Registrar
IFTM University
Moradabad.

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

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

Suggested Readings:
1. Digital Signal Processing – S. Salivahan, A. Vallavraj and C. Gnanapriya, TMH.
2. Digital Signal Processing: a Computer-Based Approach – Sanjit K. Mitra, TMH
3. Digital Signal Processing – Introduction to Digital Signal Processing - J. G. Proakis and D. G. Manolakis, 4th Edition, Pearson.
4. Digital Signal Processing – Manson H. Hayes (Schaum's Outlines) Adapted by Subrata Bhattacharya, TMH.
5. Digital Signal Processing: A Modern Introduction – Ashok Ambardar, Cengage Learning.
6. Modern Digital Signal Processing – Roberto Cristi, Cengage Learning.
7. Digital Signal Processing: Fundamentals and Applications – Li Tan, Academic Press, Elsevier.
8. Digital Signal Processing: A MATLAB-Based Approach – Vinay K. Ingle and John G. Proakis, Cengage Learning.
9. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling and Sandra L.
10. Digital Signal Processing – A practical approach - Ifeacher, Jervis, Pearson Education Asia, 2003.

Website Sources:
1. ndl.iitkgp.ac.in
2. online courses.nptel.ac.in
3. en.wikipedia.org
4. www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

EEC653: MICROWAVE LAB

Objective: The objective of this lab is to familiarize the students with the concept of guided communication technology and help them analyze the working of microwaves through experiment for skill development and better employability in industry.

List of Experiments   **(10Sessions)**
1. To study the microwave test bench for skill development.
2. To study the characteristics of the reflex Klystron tube and to determine its electronic tuning rangefor skill development.
3. To measure the polar pattern and the gain of a waveguide horn antenna for skill development.
4. To determine the standing-wave-ration and reflection coefficient for skill development.
5. To study the magic teefor skill development and employability.
6. Study of transmission of Analog Modulated wave using microwave test bench for skill development.
7. To determine the frequency & wavelength in a rectangular wave-guide working on TE10 mode for skill development.
8. To Study of Attenuation loss for transmission through a wave guide for skill development.
Study of different types of Antenna for skill development to compete local, national, and international standards.

Course Outcomes:
Students taking this lab will be able to:
CO1: Understand the global concept of wavelength based propagation for skill development.
CO2: Learn to measure polar pattern of horn antenna.for skill development.
CO3: Get a practical view on working of klystron for skill development.
CO4: Understand the concept of attenuation loss during transmission for skill development.
CO4: Understand the concept of travelling of microwaves in practical environment for skill development, employability and entrepreneurship development to compete local, national, and international standards.

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

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

Director

Sanjew Dorawf
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	2	3	1
CO3	3	1	2
CO4	1	3	1
CO5	3	1	2

Suggested Readings:
1. Microwave and RF design by Michael steel
2. Microwave engineering by Roger Kaul
3. RF Electronics Design and Simulation by Kikkert
4. Reflection-less filters by Matt Morgan.

Website Sources:
1. www.intechopen.com
2. www.nptel.ac.in
3. en.wikipedia.org
4. www.gradeup.in
5. www.rftechnology.in

Note: Adhere to latest edition of the suggested readings.

Director

Registrar
IFTM University
Moradabad.

EEC701: WIRELESS COMMUNICATION

Objective: To get an understanding of mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards for skill development and employability.

Unit I (08Sessions)

Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels. Small scale Multipath Measurements, Parameters of Mobile Multipath. Channels types of small scale fading for skill development.

Unit II (08Sessions)

International Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.

Unit III: (08Sessions)

Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantisation techniques, vocoder, linear predictive coders, Multiple Access techniques for Wireless Communications for skill development

Unit IV: (08Sessions)

GSM system for mobile: Services and features, System Architecture, Radio Sub system Channel types, Frame Structure. CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel, Introduction to advanced wireless communication standards (LTE, WiMax)

Unit V: (08Sessions)

Introduction to Mobile Adhoc Networks, Mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN for skill development, employability and entrepreneurship development.

Course Outcomes:

After the successful completion of this course, the student will be able understand:

CO1: Apply the knowledge of basic communication systems and its principles for skill development.

CO2: Describe the international cellular concept and analyze capacity improvement Techniques for skill development and employability.

CO3: Mathematically analyze mobile radio propagation mechanisms and diversity reception techniques for skill development.

CO4: Design global Base Station (BS) parameters and analyze the fundamentals of equalization for skill development and employability.

CO5: Analyze and examine the multiple access techniques and its application for skill development, employability and entrepreneurship development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

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

Suggested readings:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal ,"Wireless Communications ",McGraw Hill Publications.
3. R. Pandya, "Mobile and personal communication system", PHI.
4. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
5. Andreas F. Molisch, "Wireless Communications", Wiley Student Edition.
6. S. Haykin& M. Moher, "Modern wireless communication", Pearson, 2005.
7. A. F. Moliseh, "Wireless Communication", John Wiley and Sons, 2010.
8. David Tse Lee, "Wireless Communication Systems," TMH, 2013

Website sources:

1. https://en.wikipedia.org/wiki/Wireless
2. www.nptel.ac.in
3. https://www.electronicshub.org/wireless-communication/

Note: Adhere to latest edition of the suggested readings.

Director

Registrar
IFTM University
Moradabad.

EEC702: DATA COMMUNICATION NETWORKS

Objective: To get an understanding on the fundamentals of networks and issues involved and to acquire an understanding on the set of rules and procedures that mediates the exchange of information between communicating devices for skill development, employability and entrepreneurship development.

Unit-I (08Sessions)
Introduction to international Networks & Data Communications the Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Reviewfor skill development.

Unit-II (08Sessions)
Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch, Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol for skill development and employability.

Unit-III (08Sessions)
Multiple Access: RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, and Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16

Unit-IV (08Sessions)
Network Layer: Design Issues. Routing Algorithms. Congestion control Algorithms.IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram

Unit-V (08Sessions)
Transport Layer Protocol: UDP and TCP, ATM ATM, Cryptography, Network Security for skill development and employability.

Course Outcomes:
After the successful completion of this course, the student will be able understand:
CO1: Compare and examine, OSI and TCP/IP international protocol stacks for skill development
CO2: Categorize services offered by all layers in TCP/IP protocol stack for skill development and employability.
CO3: Analyze a network globally under congestion and propose solutions for reliable data transfer for skill development, employability and entrepreneurship development.
CO4: Examine the protocols operating at different layers of TCP/IP model for skill development and employability.
CO5: Assess the cryptographic techniques 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)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	1	2	2	1	1	1	1	1
CO2	1	1	1	3	1	2	2	1	1	1	1	1
CO3	1	1	1	3	1	2	2	1	1	1	1	1

Director

Registrar
IFTM University
Moradabad.

| CO4 | 1 | 1 | 1 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| CO5 | 1 | 1 | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 |

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

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

Suggested readings:

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007.

2. A. S. Tanenbaum, "Computer Networks", PHI, 5th ed., 2013

3. W. Stallings, "Data and Computer Communication", PHI, 10th ed., 2014.

Website sources:

1.   https://en.wikipedia.org/wiki/Computer_network

2.   https://www.guru99.com/data-communication-computer-network-tutorial.html

3.   www.nptel.ac.in

Note: Adhere to latest edition of the suggested readings.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC703: OPTICAL FIBER COMMUNICATION

Objective: The objective of this course is to expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design to incorporate skill, provide knowledge for employability.

UNIT I (8Sessions)

Overview of Optical Fiber Communication: Global Optical fiber communication system, advantages and disadvantages of optical fiber communications, applications of optical fiber communication system to improve knowledge for employability. Optical fiber wave guides- introduction, Ray theory transmission, Optical fiber Modes and configuration: single mode and multimode fiber, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers: Numerical Aperture Cut off wavelength, Mode Field Diameter and spot size, Effective Refractive Index.

UNIT II (10Sessions)

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques to inculcate skill. Dispersion: Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion and intramodal dispersion. Pulse broadening. Nonlinear effects. Birefringence, Normalized frequency parameter.

UNIT III (8Sessions)

Fiber Material and its Fabrication Techniques to improve skill and knowledge, Optical fiber Connectors: Joints, Couplers and Isolators. Optical sources: LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Laser Diodes: Basic concepts, Classifications, Semiconductor injection Laser: Modes, Threshold conditions, Laser diode rate equations, resonant frequencies, reliability of LED.

UNIT IV (7Sessions)

Source to fiber power launching: Output patterns, Power coupling, Power launching, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD to gain knowledge for better employability, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.

Optical receiver operation: Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers.

UNIT V (5Sessions)

Link Design: Point to Point Links for better skilling of entrepreneurship, Power Penalities, Error control, Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter, Measurement techniques of Numerical aperture, attenuation and dispersion.

Course Outcomes:

After completion of this course Students are able to

CO1: Recognize and classify the structures of global Optical fiber and types for skill development.

CO2: Classify the Optical sources and detectors and to discuss their principle for employability.

CO3: Familiar with Design considerations of fiber optic systems for employability and entrepreneurship.

CO4: Explain operation of different optical devices like LED, Laser diode for employability to compete local, national, and international standards.

Registrar
IFTM University
Moradabad.

CO5: Describe link design and measurement techniques for skill development 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)

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

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

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

Suggested Reading:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.
3. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
4. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.
5. "Fiber Optics and Optoelectronics", Oxford University Press, 2004.

Website Sources:

1. en.wikipedia.org
2. www.studynama.com
3. onlinecourses.nptel.ac.in
4. www.tutorialspoint.com

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

EEC704: VLSI Design

Objective: The objective of this course is to familiarize the students with the advanced VLSI Design processes and industrial manufacturing of Integrated circuits. This course also helps them to understand the advanced concepts of CMOS, BiMOS implantation, packaging design and various technologies involved in fabrication to improve skill and knowledge for employability. This course helps student to learn software language like HDL and VHDL for research in the field of VLSI.

Unit-I   (8Sessions)
Introduction: Overview of international VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design for better knowledge for employability. MOS Transistor: MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances

Unit-II   (8Sessions)
MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints which meets knowledge for employability.

Unit-III   (8Sessions)
Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits to improve skill, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behavior bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.

Unit-IV   (8Sessions)
Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory which improves knowledge for employability.

Unit-V   (8Sessions)
Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Knowledge of Design for Testability for better employability in industry: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques

Course Outcomes:
Students completing this course will be able to:
CO1: To identify the various international IC fabrication methods for skill development and employability.
CO2: To express the Layout of advance MOS circuit using Lambda based design rules for employability.
CO3: To differentiate various latest global FPGA architectures for skill development and employability.
CO4: To Design an application using softwares for skill development and employability.

CO5: To develop concepts of modeling a digital system using Hardware Description Language 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)

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

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

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

Suggested Readings:

1. Basic VLSI design, Dougles A. Pucknel, K. Eshriaghian, PHI.
2. Principles of CMOS VLSI Design- A system Perpective, by Niel H.E Weste, K. Eshriaghian, Pearson Education.
3. CMOS Digital Integrated Circuit Analysis and Design, Sung.mo Kang and Yusuf Leblebici, Tata McGraw-Hill

Website Sources:
- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC070: CONSUMER ELECTRONICS

Objective: The objective of this course is to familiarize the students with to the basic concepts of consumer electronics. The primary objective of this course is to understand the concept of consumer electronics and to be able to measure various parameters in consumer electronics, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit-I   (08Sessions)
Audio System Microphones: construction, working principles and applications of microphones, their types viz: a) Carbon b) moving coil, c) velocity, d) crystal, e) condenser, e) cordless etc. Loud Speaker, Sound recording on magnetic tape, Digital sound recording on tape and disc, CD system Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifiers for skill development.

Unit-II   (08Sessions)
Television Monochrome TV Communication, Elements of international TV communication system, Scanning, Need for synchronizing and blanking pulses, Progressive scanning, Gross structure filters, interlaced scanning, resolution and band width requirement, tonal gradation, Composite Video signal (CVS) at the end of even and odd fields, Monochrome picture tube, camera tube, TV receiver for skill development and employability.

Unit-III   (08Sessions)
Colour TV, Primary colours, tristimulus values, trichromatic coefficients, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, non-spectral colour, visibility curve, Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera, Basic colour TV system-NTSC, SECAM, Construction and working principles of trinitron and PIL types of colour picture tubes. Block diagram of PAL TV receiver, explanation and working for skill development.

Unit-IV   (08Sessions)
Cable Television Block diagram and principles of working of cable TV and DTH, cable TV using internet for skill development.

Unit-V: VCR, VCD and DVD Principle of video recording on magnetic tapes, block diagram of VCR, VHS tape transport mechanism. Video Camera Study of VCD and DVD for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To study basic *global* concepts of audio system microphones for skill development.
CO2: To understand the concept of various TV communications methods internationally for skill development.
CO3: To understand the concept of Basic colour TV system-NTSC, SECAM, Construction and working principles for skill development.
CO4: To study various concepts cable TV and DTH for skill development.
CO5: To understand the concept of VCR, VCD and DVD and camera for skill development, employability and entrepreneurship development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested readings:

1. Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi
2. Complete Satellite & cable Television R.R Gulati New age International Publisher
3. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
4. Colour Television & Video Technology by A.K. Maini CSB Publishers
5. VCR-principles, maintenance & repair by S.P. Sharma, Tata Mc Graw Hill, New Delhi
6. Colour TV by A.Dhake

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Registrar
IFTM University
Moradabad.

EEC071: DIGITAL IMAGE PROCESSING

Objective: The objective of this course is to familiarize the students with to the basic concepts of digital image processing. The primary objective of this course is to understand the concept of digital image processing and to be able to measure various parameters in biomedical signal processing, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit-I (08Sessions)
Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, Color image fundamentals, RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT for skill development.

Unit-II (08Sessions)
Spatial Domain: Gray level transformations, Histogram processing, Basics of global Spatial Filtering, Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement for skill development.

Unit-III (08Sessions)
Image Restoration, degradation model, Properties, Noise models, Mean Filters, Order Statistics, Adaptive filters, Band reject Filters, Band pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener filtering for skill development and employability.

Unit-IV (08Sessions)
Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and Tmerging, Morphological processing- erosion and dilation, Segmentation by morphological watersheds, basic concepts, Dam construction, Watershed segmentation algorithm for skill development.

Unit-V (08Sessions)
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors, Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To study basic global concepts of digital image processing for skill development.
CO2: To understand the concept of spatial domain for skill development.
CO3: To understand the concept of different parameters of image restoration for skill development to compete local, national, and international standards.
CO4: To study various techniques such as edge detection, edge linking in digital image processing for skill development.
CO5: To understand the concept of data compression and other parameters for skill development, employability and entrepreneurship development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested readings:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Sanjeev Agarwal

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC072: OPTICAL NETWORKS

Objectives: The objective of this course is to gain an understanding of various issues in designing an optical network. This course gives you in-depth knowledge on the elements of optical networks and how they work together to support high capacity data transfer to improve skill and knowledge for employability.

UNIT-I (10 Sessions)

Introduction to Optical Networks: Principles and Challenges and its Generation, Characteristics of Optical Fibre in non-linear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters for skill development

UNIT-II (8 Sessions)

Optical Amplifiers: Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing, Spectral efficiency, Crosstalk, Introduction of Soliton systems.

UNIT-III (10 Sessions)

SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH

Infrastructure, Ethernet. Optical Transport Network for national, and international standards Generic framing Procedure, IP routing and forwarding and QOS. WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connectsfor skill development and employability.

UNIT-IV (12 Sessions)

WDM Network Design: Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution

UNIT-V (10 Sessions)

Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching Deployment Considerations- SONET/SDH core Network for skill development and employability.

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

CO1: Formulate international optical communication networks for skill development

CO2: Solve optical communication networks related problems using efficient technical approaches for skill development and employability.

CO3: Applications of modern solid state physics results into solid state electronics for skill development, employability and entrepreneurship development to compete local, national, and international standards

CO4: Design optical networks as well as to interpret statistical and physical data for skill development and employability.

CO5: Familiar with Design considerations of fiber optic systems for skill development, employability and entrepreneurship development.

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

Director

Sanjee Anawf

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

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

Suggested Readings:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations
3. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

Website sources:

1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in
4. Grade up online course on transistors (www.gradeup.org)

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

Director

Sanjeev Braw
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC073: SPEECH PROCESSING

Objective: The objective of this course is to familiarize the students with to the basic concepts of speech processing. The primary objective of this course is to understand the concept of speech processing and to be able to measure various parameters in speech processing, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit-I (08Sessions)
Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals for skill development.

Unit-II (08Sessions)
Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech & silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function for skill development.

Unit-III (08Sessions)
Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder for skill development.

Unit-IV (08Sessions)
Homomorphic speech processing: Global Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder for skill development and employability.

Unit-V (08Sessions)
Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To study basic international concepts of speech processing for skill development.
CO2: To understand the concept of time domain methods of speech sampling for skill development.
CO3: To understand the concept of FFT,DFT etc for skill development.
CO4: To study various global concepts of homomorphic speech processing for skill development.
CO5: To understand the concept of linear predictive coding for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

Director

Sanjeev Draj

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

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

Suggested Readings:

1. R. L. Rabiner& R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC074: MICRO AND SMART SYSTEMS

Objective: The objective of this course is to familiarize the students with to the basic concepts of micro and smart systems. The primary objective of this course is to understand the concept of micro and smart systems and to be able measure various parameters in micro and smart systems, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit-I (08Sessions)

Introduction, requirement of miniaturization, International Microsystems versus MEMS, micro fabrication, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems for skill development.

Unit-II (08Sessions)

Micro sensors, actuators, systems and smart materials: Silicon capacitive accelerometer, piezoresistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic micro relay, portable blood analyzer, piezoelectric inkjet print head, micromirror array for video projection, smart materials and systems for skill development.

Unit-III (08Sessions)

Micromachining technologies: silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication for skill development.

Unit-IV (08Sessions)

Modeling of solids in Microsystems: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses. Modelling of coupled electromechanical systems: electrostatics, Coupled Electro-mechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electromechanics for skill development and employability.

Unit-V (08Sessions)

Integration of micro and smart systems: integration of Microsystems and microelectronics, microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control. Scaling effects in Microsystems: scaling in: mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, bio chemical phenomena for skill development, employability and entrepreneurship development.

Course Outcomes:

Students completing this course will be able to:

CO1: To study basic concepts of different types of international micro and smart systems for skill development.

CO2: To understand the concept of micro sensors, actuators and smart materials for skill development.

CO3: To understand the concept of micromachining technologies for skill development.

CO4: To study various modelling techniques of solids in microsystems for skill development to compete national, and international standards.

CO5: To understand the concept of integration of micro and smart systems for skill development, employability and entrepreneurship development.

Director

Registrar
IFTM University
Moradabad.

Mapping Course Outcomes leading to the achievement of Programme Outcomes   (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:
1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, "Micro and smart systems", Wiley India, 2010.
2. Vijay K. Varadan, K. J. Vinoy, S. Gopalakrishnan "Smart Material Systems and MEMS: Design and Development Methodologies", John Wiley & Sons, 2006.
3. Mohamed Gad-El-Hak, "MEMS: Applications", CRC Press, 2006.

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Registrar
IFTM University
Moradabad.

TEEC075: ADVANCED WIRELESS BROADBAND COMMUNICATION

Objective:
The student should be made:
- Discuss and analyze the latest technologies in broadband communications including wireless components
- Analyze different techniques and technologies required for the development of broadband communications
- Discuss the recent development of fiber-optic communication and next generation Internet protocols in current and emerging broadband communications

This course will help students for skill development, employability and entrepreneurship development.

UNIT I (08Sessions)

Wireless local area networks

Personal communication systems –Wireless local area networks – Global Wireless broadband access systems - Wireless wide area networks – Cellular systems and design fundamentals for skill development.

UNIT II (08Sessions)

B-Isdn Services and Protocol

B-ISDN protocols -User plane, management plane, control plane, signaling plane, Other aspects of B-ISDN: Broadcast service aspects, Network aspects and user network interface aspects, SONET- An overview for skill development.

UNIT III (08Sessions)

Tqm Tools and Techniques

Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols. ATM switching building blocks, Input, Output buffering, Central buffering, Performance aspects of buffering switching networks for skill development and employability.

UNIT IV (08Sessions)

Architecture and channels

HSPA and LTE – Architecture – Radio interface and channels – Resource mapping – Session, mobility and security procedures – LTE Advanced – Heterogeneous Networks – Internetworking – IP based coupling Architecture - Multimode terminals and intersystem handover.

UNIT V (08Sessions)

Quality System.

Introduction to Broadband Wireless, Evolution of Broadband Wireless; Fixed and Mobile Broadband Wireless; WiMAX and Other Broadband Wireless Technologies: overview for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To understand the basic global concept of wireless local area network for skill development.
CO2: To understand the concept of B-Isdn Services and Protocol for skill development.
CO3: To understand the concept of Tqm Tools and Techniques and communication for skill development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

CO4: To study Programs related to international Architecture and channels for skill development.

CO5: To understand the challenges in Quality Systems for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:
1. William Stallings, ISDN and Broadband ISDN with Frame and ATM, Pearson 4th edition, 2009.(For Unit 1 and 2)
2. Robert C Newman Broadband Communications, Prentice Hall, 2002. (For Unit 3,4 and 5)
3. J Jeffrey G. Andrews, Arunabha Ghosh & Rias Muhamed, Fundamentals of WiMAX: Understanding Broadband Wireless Networking, Prentice Hall, 2007
4. John R Vacca, Wireless Broadband Networks Handbook, Tata McGrawHill
5. Janakiraman. B and Gopal .R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

Website sources:
1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in

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

EEC076: WAVELET TRANSFORMS

Objective: To expose the students to the basics of wavelet theory and to illustrate the use of wavelet processing for data compression and noise suppression to improve skill and provide knowledge for employability.

Unit-I (08Sessions)

Stationary and non-stationary signals, Signal representation using basis and frames, Brief introduction to Fourier transform and short time Fourier transform for better employability in industry and skill development, Time frequency analysis, Bases of time frequency: orthogonal, Filter banks, Multi resolution formulation: Wavelets from filters, Classes of wavelets for national, and international standards Haar, Daubechies, bi-orthogonal.

Unit-II (08Sessions)

Continuous wavelet transforms (CWT), Time and frequency resolution of the continuous wavelet transform for better employability in industry, Construction of continuous wavelets: Spline, orthonormal, bi-orthonormal, Inverse continuous wavelet transform, Redundancy of CWT, Zoom property of the continuous wavelet transform, Filtering in continuous wavelet transform domain.

Unit-III (08Sessions)

Orthogonal and biorthogonal two-channel filter banks, Design of two-channel filter banks for skill development, Tree-structured filter banks, Discrete wavelet transform, Non-linear approximation in the Wavelet domain, multi resolution analysis, Construction and Computation of the discrete wavelet transform, the redundant discrete wavelet transform.

Unit-IV (08Sessions)

Multirate discrete time systems for skill development, Parameterization of discrete wavelets, Bi-orthogonal wavelet bases, Two dimensional, wavelet transforms and Extensions to higher dimensions, wave packets

Unit-V (08Sessions)

Signal and Image compression, Detection of signal changes, analysis and classification of audio signals using CWT, Wavelet based signal de-noising and energy compaction, Wavelets in adaptive filtering, Adaptive wavelet techniques in signal acquisition for better employability in industry, coding and lossy transmission, Digital Communication and Multicarrier Modulation, Trans multiplexers, Image fusion, Edge Detection and object isolation.

Course Outcome:

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

CO1: Understand about windowed Fourier transform and difference between windowed Fourier transform and wavelet transform for skill development and employability to compete national, and international standards.

CO2: Understand wavelet basis and characterize continuous and discrete wavelet transforms for skill development.

CO3: Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties for skill development.

CO4: Implement discrete wavelet transforms with multirate digital filters for skill development and employability.

CO5: Design certain classes of wavelets to specification and justify the basis of the application of

wavelet transforms to different fields for employability to compete national, and international standards.

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

Suggested readings:
1. A Wavelet Tour of Signal Processing, 2nd edition, S. Mallat, Academic Press, 1999.
2. Wavelets and Sub band Coding, M. Vetterli and J. Kovacevic, Prentice Hall, 1995.
3. Wavelet transforms: Introduction, Theory and applications, Raghuveer rao and AjitS.Bopardikar, Pearson Education Asia, 2000.

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

EEC077: BIOMEDICAL ELECTRONICS

Objective: To apply knowledge of engineering and science to understand the principle of biomedical electronic circuits. Understand how to apply, measure circuit performance, and solve problems in the areas of biomedical signals to improve skill, provide employability and entrepreneurial skills.

Unit I   (08Sessions)

Introduction to the physiology of cardiac, nervous & muscular and respiratory systems. Transducers and Electrodes: Different types of international transducers & their selection for biomedical applications for better knowledge for employability. Electrode theory, selection criteria of electrodes & different types of electrodes such as, Ag – Ag Cl, pH, etc

Unit II   (08Sessions)

Skills to Cardiovascular measurement: The heart & the other cardiovascular systems. Measurement of Blood pressure-direct and indirect method, Cardiac output and cardiac rate. Electrocardiography-waveform-standard lead systems typical ECG amplifier, phonocardiography, Ballisto cardiography, Cardiac pacemaker, defibrillator, different types and its selection.

Unit III   (08Sessions)

EEG Instrumentation requirements which improves knowledge for employability, EEG electrode, frequency bands, recording systems EMG basic principle-block diagram of a recorder pre amplifier. Bed side monitor, block diagram- measuring parameters-cardiac tachometer-Alarms-Lead fault indicator-central monitoring. Telemetry, modulation systems, choice of carrier frequency, single channel telemetry systems.

Unit IV   (08Sessions)

Instrumentation for clinical laboratory which improves knowledge for employability: Bio electric amplifiers-instrumentation amplifiers isolation amplifiers-chopper stabilized amplifiers, input guarding, Measurement of pH value of Blood-blood cell counting, blood flow, Respiratory transducers and instruments.

Course Outcome:

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

CO1: Understand the international electronic devices and theory of operation in the medical area for skill development and employability.

CO2: Analyze electronic circuits using oscilloscopes and other electronics test equipment globally for employability.

CO3: Apply knowledge of engineering and science to interpret data for skill development and employability.

CO4: Apply knowledge of engineering and science to understand the principle of biomedical electronic circuits. 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)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	1	2	2	1	1	1	1	1
CO2	1	1	1	3	1	2	2	1	1	1	1	1
CO3	1	1	1	3	1	2	2	1	1	1	1	1

Director

Registrar
IFTM University
Moradabad.

CO4	1	1	1	3	1	2	2	1	1	1	1	1

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

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

Suggested readings:

1. J JCarr, "Introduction to Biomedical Equipment Technology": Pearson Education 4th e/d
2. K S Kandpur, "Hand book of Biomedical instrumentation", Tata McGraw Hill 2nd e/d.
3. John G Webster, "Medical Instrumentation application and design", John Wiley 3rd e/d.
4. Richard Aston, "Principle of Biomedical Instrumentation and Measurement

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Registrar
IFTM University
Moradabad.

EHU701: INDUSTRIAL MANAGEMENT

Objective: The objective of this course is to familiarize the students with working concept of management that are applied in the industry for larger gain to improve skill and knowledge for employability.

UNIT I (8 Sessions)
Introduction: Concept, Objectives, scope and application of Industrial Management, Development of Industrial Management, Production System and Types of national and international Production system, Productivity : Definition, measurement, Productivity index ,Industrial Ownership for skill development.

UNIT II (8 Sessions)
Management: Definition, Principle and Functions, Management tools: Work Study, Process charts and diagrams Motion study, Time Study, Production planning Specification of production requirement.

UNIT III (8 Sessions)
Inventory: Types of Inventory, functions of inventories, advantage of inventory control Inventory cost, Deterministic model, numerical problems, Inventory control, Introduction to supply Chain Management for skill development

UNIT IV (8 Sessions)
Introduction of Quality: quality control, statistical quality control Control charts: introduction, types, Numerical problems on control charts, Single, double and sequential sampling, numerical problems, Introduction to Total Quality Management(TQM)

UNIT V (8 Sessions)
Environmental Pollution: Introduction, Sources, Effects, Types of Pollution, sources, effect, measurement technique to control pollution, Various acts for Air, Water, Solid waste and noise pollutionfor skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To develop, design, implement, and improve national and international integrated systems that include people, materials, information, equipment, and environment for skill development.
CO2: Develop an ability to contribute to the success of companies through effective problem solving for skill development and employability.
CO3: Continue to develop the personal, professional and ethical responsibility and skills necessary to adapt to our changing societal, technological, and global environments for skill development, employability and entrepreneurship development.
CO4: Understand the global concepts related to Business for skill development and employability.
CO5: Demonstrate the roles, skills and functions of management 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)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	2	1	1	3	1	1	1	1	1

Director

Sanjeev Arawf
Registrar
IFTM University
Moradabad.

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

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

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

Suggested Readings:

1. Industrial Engineering -O.P.Khanna
2. Industrial Engineering & Management- T.R. Banga
3. Environmental an Pollution Awareness- SharmaB.R
4. Industrial Management –R.K.Singhal
5. Industrial Management- Onkar N.Pandey

Website Sources:

1. www.gradeup.in
2. Onlinecourses.nptel.ac.in
3. en.wikipedia.org

Note: Adhere to the latest editions of suggested readings.

EEC751: CAD OF ELECTRONICS LAB

Objective: To understand the steps involved hardware preparation, measuring of various parameter, simulation of circuits using software tools, synthesis and interpretation of data to inculcate skill, provide employability knowledge.

List of Experiments   **(12Sessions)**

1. Transient Analysis of BJT inverter using step input.
2. DC Analysis (VTC) of BJT inverter with and without parameters to improve skill and knowledge.
3. Transient Analysis of NMOS inverter using step input.
4. Transient Analysis of NMOS inverter using pulse input.
5. DC Analysis (VTC) of NMOS inverter with and without parameters to improve knowledge for better employability.
6. Analysis of global CMOS inverter using step input.
7. Transient Analysis of CMOS inverter using step input with parameters.
8. Transient Analysis of CMOS inverter using pulse input.
9. Transient Analysis of CMOS inverter using pulse input with parameters.
10. DC Analysis (VTC) of CMOS inverter with and without parameters to improve knowledge for better employability.
11. Transient & DC Analysis of NOR Gate inverter.
12. Transient & DC Analysis of NAND Gate.

Course Outcomes:

Students completing this course will be able to:

CO1: Familiarize with global CAD tool capabilities and limitations for skill development.

CO2: Use automatic synthesis, placement and routing tools to implement a design for skill development.

CO3: Analyze the circuit design process and simulate the BJT transient analysis for employability.

CO4: Know the origin of failure of a circuit when it is in an application for skill development and employability to compete local, national, and international standards.

CO5: Acquaint with the design and simulate the NMOS, CMOS circuits 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)

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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	1
CO5	2	3	1

Suggested readings:

1. 1. J. Millman and Halkias, Integrated Electronics, TMH, 2nd Edition, 2010.
2. J. Millman and A. Grabel, Micro Electronics, TMH, 2nd Edition, 2009.
3. A. S. Sedra and K. C. Smith, Micro Electronic Circuits, Oxford press, 4th Edition, 1998.
4. Neil H.E. Weste, David Money Harris, CMOS VLSI Design – A Circuits and SystemsPerspective, Addision – Wesley, 2011.
5. Michael John, Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley Publishing Company, 1997

Website sources:

- https://www.vlab.co.in/broad-area-electronics-and-communications

- www.nptel.ac.in

Note: Adhere to latest edition of the suggested readings.

EEC752: OPTICAL FIBER COMMUNICATION LAB

OBJECTIVES
This lab covers fiber optic communication design, measurements and simulations to improve skill, provide employability and entrepreneurial skills. This includes numerical aperture, fiber attenuation, and power distribution in single mode fibers, mode distribution in multimode fibers, fiber coupling efficiency and Connectors / splices losses.

List of Experiments   **(10Sessions)**

1. The study of setting up international Fiber Optic Analog Link to for skill development.
2. To study setting up Fiber Optic Digital Link for skill development.
3. Study of Propagation Loss in Optical Fiber to improve knowledgefor better employability.
4. To Measurement of Optical Power using Optical Power Meter.
5. To measure propagation loss in optical fiber using optical power meter.
6. Study and measurement of Numerical Aperture of optical fiber.
7. Study the characteristics of fiber optic LED's and photo detector for skill development.
8. Study of Intensity Modulation Technique using digital Input signal.
9. Study of framing in time division multiplexing.
10. Study of Manchester coding and decoding.

Course Outcomes
When a student completes this course, he/she should be able to:
CO1: Understand the international functionality of each of the components that comprise a fiber-optic communication system: transmitter, fiber, amplifier, and receiver for skill development and employability.
CO2: Understand the properties of global optical fiber that affect the performance of a communication link for skill development.
CO3: Understand to differentiate between direct modulation and external electro-optic modulation for employability.
CO4: Understand basic optical amplifier operation and its effect on signal power and noise in the system for employability.
CO5: Apply concepts listed above to the design of a basic communication link 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)

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

Director

Sanjeev
Registrar
IFTM University
Moradabad.

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

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

Suggested Reading:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.

2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

3. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.

4. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

5. "Fiber Optics and Optoelectronics", Oxford University Press, 2004.

Website Sources:

1. en.wikipedia.org

2. https://www.vlab.co.in/

3. onlinecourses.nptel.ac.in

4. www.tutorialspoint.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC753: COMMUNICATION NETWORK SIMULATION LAB

Objective: The objective of this course is to make students familiar with the advanced simulation software such as NETSIM and HFSS (High Frequency Structural Software) to inculcate skill, provide employability knowledge. This will help students to prepare themselves for advanced studies and research in the field of electronics.

List of Experiments   **(10Sessions)**

Experiments based on NetSim simulation software:
1. Introduce students to network simulation through the international NetSim simulation package for skill development.
2. Simulate a three nodes point – to – point network with duplex links between them.
3. Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2– n3.
4. Simulate the different types of Internet traffic such as FTP and TELNET over a network and analyze the throughput.
   Experiments based on HFSS simulation software to improve skill and knowledge for employability, research.
5. Analysis of Rectangular patch antenna.
6. Analysis of Circular Monopole antenna.
7. Analysis of Microstrip patch antenna with changes in ground plane.
8. Analysis of Horn Antenna.

Course Outcomes:
Students completing this course will be able to:
CO1: Understand about different international software's such as NETSIM and HFSS for skill development.
CO2: Design and simulate various network points, Internet traffic such as FTP and TELNET over NETSIM for employability.
CO3: Design and simulate various microstrip patch antennas over HFSS for skill development to compete local, national, and international standards.
CO4: Analyze operation of Different antennas using HFSS for employability.
CO5: Apply knowledge of designing antenna to improve communication system 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)

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

Director

Sanjeev Boraw
Registrar
IFTM University
Moradabad

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

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

Suggested Readings:

1. Lambert M. Surhone, Mariam T. Tennoe, Susan F. Henssonow, "OMNeT++: Network Simulation, Network Simulator, NetSim", VDM Publishing
2. C.A Balanis, "Antenna Theory: Analysis and Design", Willey
3. I.J Bahl and P.Bharatia, "Microstrip Antennas", Artech House Publishers.

Website Sources:

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.ansys.com

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

EEC754: INDUSTRIAL TRAINING (EVALUATION AND VIVA)

Objective: The fundamental objective of Industrial Training is to prepare students for future employment in their chosen engineering discipline having interaction with industry to understand the practical implementation of the theoretical aspects and can enhance their employ ability skills and become job ready along with real corporate exposure.

Each student has to undergo industrial training for a minimum period of 4 weeks. This may be taken in a phased manner during the vacation starting from the end of third semester.

Student has to submit a training report to the Department in the prescribed format and also make a presentation of the same. The report should include the certificates issued by the industry.

This Industrial Training help students to improve skill, employability and entrepreneurship development to compete local, national, and international standards.

Course Outcomes:

Students completing this course will be able to:

CO1: Get the opportunity to test their interest in a particular career before permanent commitments are made to improve skill and knowledge for employability

CO2: Develop skills in the application of theory to practical work situations to improve skill and knowledge for employability to compete local, national, and international standards.

CO3: Develop skills and techniques directly applicable to their careers to improve skill and knowledge for employability to compete local, national, and international standards.

CO4: Internships will increase a student's sense of responsibility and good work habits to improve skill and knowledge for employability

CO5: Build a good communication skill with group of workers and learn to learn proper behavior of corporate life in industrial sector to improve skill, 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)

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

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

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

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

Director

Sanjeev Anand
Registrar
IFTM University
Moradabad.

Suggested readings:
1. Albert George Beverstock, Industrial Training Practices, Classic, 1969.
2. LokeshChoudhary, Industrial Training And Education, Mittal Publications, 2007

Website sources:
1. https://www.srishtirobotics.com
2. https://www.sofcontraining.com

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev Agrawal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC801: INTRODUCTION TO RADAR SYSTEMS

Objective: The objective of this course is to provide an understanding of the basic concepts, operation, and applications of modern radar systems. It is designed to develop the knowledge and techniques necessary to analyze the performance of radar systems to provide employability & skills.

UNIT I   (07Sessions)
Introduction to Radar: Basic Radar, Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, national and international applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross- Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses for skill development.

UNIT II   (08Sessions)
MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancellers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance for skill development.

UNIT III   (07Sessions)
Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobbing, Limitations to tracking Accuracy, Low- Angle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers and Automatic Tracking with Surveillance Radars (ADT) for skill development, employability and entrepreneurship development.

UNIT IV   (06Sessions)
Detection of Signals in Noise: Introduction, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers for skill development and employability.

UNIT V   (08Sessions)
Information from Radar Signals: Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter for skill development, employability and entrepreneurship development.

Course Outcomes:
CO1: Compare working of different types of national and international radars for skill development.
CO2: Analyse the statistical parameters of Noise and Radar cross section of targets for skill development and employability.
CO3: Distinguish the fixed and moving targets using different types of radar systemsfor skill development, employability and entrepreneurship development.
CO4: Explain various techniques employed in radar receivers globally for detection of signals in noise for skill development and employability.
CO5: Identify the different types of display devices & duplexersfor skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Reading:

1. Merrill I. Skolnik "Introduction to Radar Systems" Third Edition.
2. J.C. Toomay, Paul J. Hannen "Principles of Radar" Third Edition.
3. Eugene F. Knott, John F. Shaeffer, Michael T. Tuley, "Radar Cross Section", SciTech Publishing.

Website Sources:

1. en.wikipedia.org
2. www.studynama.com
3. onlinecourses.nptel.ac.in
4. www.gupshupstudy.com
5. www.tutorialspoint.com

Note: Adhere to latest edition of the suggested readings.

Director

Sanjeev
Registrar
IFTM University
Moradabad.

EEC802: ELECTRONICS SWITCHING

Objective: To understand the working principles of switching systems from manual and electromechanical systems to stored program control systems to provide skills and employability.

Unit I (08Sessions)

Evolution of global switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems for skill development.

Unit II (08Sessions)

Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.

Unit III (08Sessions)

Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.

Unit IV (08Sessions)

Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling for skill development and employability

Unit V (08Sessions)

Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch for skill development, employability and entrepreneurship development.

Course Outcomes:

Students completing this course will be able to:

CO1: Explain the global working principle of switching systems involved in telecommunication switching for skill development.

CO2: Assess the need for voice digitization and T Carrier systems for skill development and employability.

CO3: Compare and analyze international Line coding techniques and examine its error performance for skill development, employability and entrepreneurship development.

CO4: Design multi stage switching structures involving time and space switching stages for skill development and employability.

CO5: Analyze basic telecommunication traffic theory for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

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

Suggested readings:

1. Thiagarajan Viswanathan & Manav Bhatnagar, "Telecommunication switching System and networks", @2nd Ed, PHI.

2. J.E. Flood, "Telecommunication switching, Traffic and Networks", Pearson education.

3. J.C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed

Website sources:

1. https://en.wikipedia.org/wiki/Communications_system

2. https://www.guru99.com/

3. www.nptel.ac.in

Note: Adhere to latest edition of the suggested readings.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC080: INFORMATION THEORY AND CODING

Objective: The objective of this course is to familiarize the students with to the basic concepts of information theory and coding. The primary objective of this course is to understand the concept of information theory and coding and to be able measure various parameters in information theory and coding, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit I (08Sessions)

Information Theory: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. International Markov statistical model for stochastic process, Entropy and information rate of Markov source for skill development.

Unit II (08Sessions)

Source Coding: Encoding of the source output, Shannon's encoding algorithm, Communication Channels, Discrete communication channels, Continuous channels. Fundamental Limits on Performance: Source coding theorem, Huffman coding, mutual information, Channel Capacity for skill development.

Unit III (08Sessions)

Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem for skill development.

Unit IV (08Sessions)

Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding for skill development.

Unit – V (08Sessions)

Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes for skill development and employability.

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

CO1: To study basic concepts of international information theory and coding for skill development.

CO2: To understand the concept of source coding for skill development.

CO3: To understand the concept of channel coding, differential entropy for skill development to compete local, national, and international standards.

CO4: To study various error control coding parameters for skill development.

CO5: To understand the concept of binary cycle codes and computational techniques for skill development, employability and entrepreneurship development.

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. Ranjan Bose, ITC and Cryptography, TMH, II edition, 2007
2. Glover and Grant, Digital Communications; Pearson Ed. 2nd Ed 2008
3. K. Sam Shanmugam, Digital and analog communication systems, John Wiley, 2006.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Sanjeev Borand
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC081: BIOMEDICAL INSTRUMENTATION

Objective: The objective of the course is to familiarize the students with the biomedical engineering & develop their skills anticipate change, communicate and work with others effectively in a globally connected society.

Unit I (07Sessions)

Introduction: Specifications of bio-medical instrumentation system, Man-Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body. Bioelectric potentials: Resting and action potentials, propagation of action potential, The Physiological potentials – ECG, EEG, EMG, ERG, EOG and Evoked responses. Electrodes and Transducers: Electrode theory, International Biopotential Electrodes – Surface electrodes, Needle electrodes, Microelectrodes, Biomedical Transducer for skill development.

Unit II (08Sessions)

Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes and Leads, ECG – Single channel, three channel, Vector Cardiographs, ECG System for Stresses testing, Holter recording, Blood pressure measurement, Heart sound measurement. Pacemakers and Defibrillators. Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment for skill development and employability.

Unit III (06Sessions)

Respiratory system Measurements: Physiology of Respiratory system. Measurement of breathing mechanism –Spirometer. Respiratory Therapy equipment's: Inhalators, Ventilators & Respirators, Humidifiers, and Nebulizers & Aspirators. Nervous System Measurements: Physiology of nervous system, Neuronal communication, Neuronal firing measurements.

Unit IV (08Sessions)

Ophthalmology Instruments: Electroretinogram, Electro-oculogram, Ophthalmoscope, Tonometer for eye pressure measurement. Diagnostic techniques: Ultrasonic diagnosis, Eco - cardiography, Eco-encephalography, ophthalmic scans, X-ray & Radio-isotope diagnosis and therapy, CAT-Scan, Emission computerized tomography, MRI for skill development and employability.

Unit V (09Sessions)

Bio-telemetry: The components of a Bio-telemetry system, Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Prosthetic Devices and Therapies: Hearing Aides, Myoelectric Arm, Diathermy, Laser applications in medicine for skill development, employability and entrepreneurship development.

Course Outcomes:

After the successful completion of this course, the student will be able understand:

CO1: Define Biomedical engineering and its concept internationally for skill development.

CO2: Define continuous improvement in the field of global biomedical engineering for skill development and employability.

CO3: Apply to solve critical design skills to identify and solve problems in biomedical engineering for skill development, employability and entrepreneurship development.

CO4: Lead and manage biomedical engineering projects in industry, government, or academia that involve multidisciplinary team members for skill development and employability.

Director

Registrar
IFTM University
Moradabad

CO5: To enhance the knowledge use of medical instruments in the Industries for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Reading:
1. R. S. Khandpur, "Biomedical Instrumentation", Tata McGraw Hill
2. S. K. Venkata Ram, "Bio-Medical Electronics &Instrumentation (Revised)", Galgotia.
3. J. G. Webster (editor), "Medical Instrumentation Application & Design", 3rd Ed WILEY, India
4. Cromwell, "Biomedical Instrumentation and Measurements" PHI
5. J. G. Webster, "Bio- Instrumentation", Wiley
6. S. Ananthi, "A Text Book of Medical Instruments", New Age International

Website Sources:
1. https://biomedical-engineering-online.biomedcentral.com/
2. https://wne.libguides.com/bme/websites
3. https://www.uml.edu/catalog/undergraduate/engineering

Note: Adhere to latest edition of the suggested readings.

EEC082: NON-CONVENTIONAL ENERGY RESOURCES

Objective: The objective of this course is to familiarize the students with to the basic concepts of non-conventional energy resources. The primary objective of this course is to understand the concept of non-conventional energy resources and to be able measure various parameters in non-conventional energy resources, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit I (08Sessions)
Introduction Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells: Theory of solar cells. international solar cell materials, solar cell array, solar cell power plant, limitations for skill development.

Unit II (08Sessions)
Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

Unit III (08Sessions)
Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.
Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations for skill development.

Unit IV (08Sessions)
Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.
Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems for skill development and employability.

Unit V (08Sessions)
Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To study basic concepts of different types of international non-conventional energy resources for skill development.
CO2: To understand the concept of global solar thermal energy for skill development.
CO3: To understand the concept of geothermal, fuel cells etc. for skill development.
CO4: To study various thermo-electrical and thermionic conversions for skill development.
CO5: To understand the concept of bio-mass, ocean thermal energy and wave energy techniques for skill development, employability and entrepreneurship development.

Director

Sanjeev Bansal
Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

Mapping Course Outcomes leading to the achievement of Programme Outcomes   (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications, 1st ed., 2015.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2nd ed., 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International, 2006.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning, 2008.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

EEC083: OPTOELECTRONICS DEVICES AND CIRCUITS

Objectives:
1. To know the physics of absorption, recombination and photoemission from semiconductors.
2. To analyse different types of photo detectors based on their performance parameters.
3. To discuss different LED structures with material properties and reliability aspects.
4. To explain optical modulators and optical components
5. To illustrate different types of lasers with distinct properties.

This course will help students for skill development, employability and entrepreneurship development.

UNIT I   (08Sessions)
Global Optical processes in semiconductors – electron hole recombination, absorption, Franz-Keldysh effect, Stark effect, quantum confined Stark effect, deep level transitions, Auger recombination heat generation and dissipation, heat sources.

UNIT II   (08Sessions)
Lasers – threshold condition for lasing, line broadening mechanisms, axial and transverse laser modes, heterojunction lasers, distributed feedback lasers, DBR lasers, quantum well lasers, tunneling based lasers, modulation of lasers.

UNIT III   (08Sessions)
Nitride light emitters, nitride material properties, InGaN/GaN LED, structure and working, performance parameters, InGaN/GaN Laser Diode, structure and working, performance parameters. White-light LEDs, generation of white light with LEDs, generation of white light by dichromatic sources, ,generation of white light by trichromatic sources, temperature dependence of trichromatic, 7generation of white light by tetrachromatic and pentachromatic sources, white-light sources based on wavelength converters.

UNIT IV   (08Sessions)
Optical modulators using pn junction, electro-optical modulators, acousto-optical modulators, Raman-Nath modulators, Franz- Keldysh and Stark effect modulators, quantum well electro-absorption modulators, optical switching and logic devices, optical memory.

UNIT V   (08Sessions)
Optical detection – PIN, APD, modulated barrier photodiode, Schottky barrier photodiode, wavelength selective detection, micro cavity photodiodes. Optoelectronic ICs, advantages, integrated transmitters and receivers, guided wave devices. Working of LDR, liquid crystal display, structure, TFT display, structure, polymer LED, organic LED.

Course Outcomes:
Students completing this course will be able to:
CO1: To understand the basic global optical process in semiconductors for skill development.
CO2: To understand the concept of different types of international LASERS for skill development.
CO3: To understand the concept of different materials used in light emitters for skill development.
CO4: To study programs related to optical modulators and other modulators for skill development.
CO5: To understand the challenges in optical detections for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. Alastair Buckley, Organic Light-Emitting Diodes, Woodhead, 2013.

2. B E Saleh and M C Teich, Fundamentals of Photonics:, Wiley-Interscience, 1991

3. Bandyopadhay, Optical communicatoion and networks, PHI, 2014.

4. Mynbaev, Scheiner, Fiberoptic Communication Technology, Pearson, 2001.

5. Piprek, Semiconductor Optoelectronic Devices, Elsevier, 2008.

6. Xun Li, Optoelectronic Devices Design Modelling and Simulation, Cambridge University Press, 2009

Website sources:

1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC084: RENEWABLE ENERGY

Objective: The objective of this course is to familiarize the students with to the basic concepts of renewable energy. The primary objective of this course is to understand the concept of energy conversion, solar thermal energy etc.

UNIT I   (08Sessions)
Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations for skill development.

UNIT II   (08Sessions)
Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, global thermal energy storage for solar heating and cooling, limitations for skill development.

UNIT III   (08Sessions)
Geothermal Energy: Resources of geothermal energy, thermodynamics of geothermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations for skill development.

UNIT IV   (08Sessions)
Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics, performance and limitations of energy conversion systems for skill development and employability.

UNIT V   (08Sessions)
Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To understand the basics of various non-conventional energy resources for skill development.
CO2: To understand the concept of global solar thermal energy for skill development.
CO3: To understand the concept of geothermal energy for skill development.
CO4: To study Thermo-electrical and thermionic Conversions for skill development to compete local, national, and international standards.
CO5: To understand the challenges in various renewable resources such as bio mass for skill development, employability and entrepreneurship development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

Mapping Course Outcomes leading to the achievement of Programme Outcomes (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

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

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

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

Suggested Readings:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications, 2006.
4. D.S. Chauhan, "Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle," Renewable Energy Power For A Sustainable Future", Oxford University Press.

Website sources:
1. www.nptel.ac.in
2. en.wikipedia.org
3. www.sanfoundary.co.in

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

Director

Registrar
IFTM University
Moradabad.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC085: BIOMEDICAL SIGNAL PROCESSING

Objective: The objective of this course is to familiarize the students with to the basic concepts of biomedical signal processing. The primary objective of this course is to understand the concept of biomedical signal processing and to be able measure various parameters in biomedical signal processing, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit I   **(08Sessions)**
Global Signal processing: Review of Discrete time signals and systems, LTI systems, Response of LTI systems, Convolution, Difference equation representation of discrete systems for skill development.

Unit II   **(08Sessions)**
Z transform – Transform analysis of LTI system, DFT. STFT, Introduction to wavelets, CWT and DWT with Haar wavelet for skill development.

Unit III   **(08Sessions)**
Introduction to bio signals: Computers in medicine. Human anatomy and physiology – Cell structure, Origin of bioelectric potentials, biomedical signals, The Brain and its potentials. Electrophysiological origin of brain waves. EEG signal and its characteristic- ECG signal origin and characteristics for skill development.

Unit IV   **(08Sessions)**
Neurological signal processing: EEG analysis, Parametric modelling, Linear prediction theory; Autoregressive (AR) method; Recursive estimation of AR parameters. Cardiological signal processing: ECG parameters and their estimation, Arrhythmia analysis monitoring, ECG data reduction techniques for skill development.

Unit V   **(08Sessions)**
Adaptive interference / Noise cancellation: Types of noise in bio signals; Digital filters, IIR and FIR, Notch filters, Optimal and adaptive filters. Weiner filters, steepest descent algorithm, LMS adaptive algorithm, Adaptive noise canceller, cancellation of 50 Hz signal in ECG, Cancellation of maternal ECG in foetal electrocardiography for skill development, employability and entrepreneurship development.

Course Outcomes:
Students completing this course will be able to:
CO1: To study basic global concepts of different types of biomedical signal processing for skill development.
CO2: To understand the concept of various transforms such as Z-transform, DFT etc.for skill development.
CO3: To understand the concept of bio signals in human autonomy for skill development to compete local, national, and international standards.
CO4: To study various neurological signal processing for skill development.
CO5: To understand the concept of adaptive interface/noise cancellation techniques for skill development, employability and entrepreneurship development.

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

Suggested readings:

1. D. C Reddy, "Biomedical Signal Processing, Principles and Techniques", Tata McGraw Hill Publishing Company Limited, First Edition, 2005.

2. Willis J Tompkins, "Biomedical Digital Signal Processing", Prentice Hall India Private Limited, First Edition, 2006.

3. Rangaraj M Rangayyan "Biomedical Signal Analysis – A case study approach" IEEE press series in biomedical engineering, First Edition, 2002.

4. John G Proakis, Dimitris and G. Manolakis, "Digital Signal Processing Principles algorithms, applications" PHI Third Edition. 2006.

Website Sources:

1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

EEC086: WIRELESS SENSOR NETWORKS

Objective: The objective of this course is to familiarize the students with to the basic concepts of wireless sensor networks. The primary objective of this course is to understand the concept of wireless sensor networks and to be able measure various parameters in wireless sensor networks, this will help students to know more about theoretical and practical problem solving to improve skill and provide employability.

Unit I   **(08Sessions)**

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet for skill development.

Unit II   **(08Sessions)**

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering for skill development.

Unit III   **(08Sessions)**

MAC Protocols: Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4 national, and international standards for skill development and employability.

Unit IV   **(08Sessions)**

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

Unit V   **(08Sessions)**

QoS and Energy Management: Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes for skill development, employability and entrepreneurship development.

Course Outcomes:

Students completing this course will be able to:

CO1: To study basic concepts of different types of global biomedical signal processingfor skill development.

CO2: To understand the concept of various transforms such as Z-transform, DFT etc.for skill development.

CO3: To understand the concept of bio signals in human autonomy for skill development to compete local, national, and international standards.

CO4: To study various neurological signal processing for skill development.

CO5: To understand the concept of adaptive interface/noise cancellation techniques for skill development, employability and entrepreneurship development.

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

Suggested readings:

1. Kazem Sohraby, Daniel Minoli and TaiebZnati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.
2. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.
3. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.
4. Feng Zhao and LeonidesGuibas, "Wireless sensor networks ", Elsevier publication - 2004.
5. William Stallings, "Wireless Communications and Networks ", Pearson Education - 2004

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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

Director

Registrar
IFTM University
Moradabad.

EEC087: FPGA & RECONFIGURABLE COMPUTING

Objective: To understand the steps involved hardware preparation, FPGA architecture, simulation of circuits using software tools, synthesis and interpretation of data to inculcate skill, provide employability knowledge

Unit I   (08Sessions)
Reconfigurable Computing to improve knowledge for better employability: Reconfigurable global Computing Systems, Evolution and Characteristics, Advantages and Issues, Fundamental Concepts and Design Steps, Domain Specific Processors and Application Specific Processors.

Unit II   (08Sessions)
Reconfigurable Architectures: Classification of Reconfigurable Architectures, FPGA Technology and Architectures to improve skill, LUT devices and Mapping, Placement and Partitioning. Implementation of IP Cores in FPGA.

Unit III   (08Sessions)
Interconnections in Reconfigurable Architectures to improve skill and knowledge for employability: Routing and Switching concepts. Signal Generation and AD-DA Interfaces. Interfacing GPIOs and PMODs with FPGA.

Unit IV   (08Sessions)
Programming Technology to improve skill: HDL Based Programming and High level Synthesis using C, Partial Reconfiguration. VLSI Subsystems in FPGAs. Finite State Machine using Verilog HDL

Unit V   (08Sessions)
Intellectual Property Based Design: Soft core, Firm core and Hard Core, Software tools. Design and Implementation of an Embedded System in FPGA to improve skill and knowledge for employability. Implementation of Micro blaze processor.

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

CO1: Understand the Concept of global Reconfigurable Computing and FPGA Architectures for skill development.

CO2: Understand and explore the various FPGA computing platforms in terms of design tools for employability.

CO3: Explore and apply the basic building blocks of FPGA designing in terms of Programming (HDLs) for skill development and employability to compete local, national, and international standards.

CO4: Analyze the Coarse-grained and Fine Grain configurability for performance enhancement using multi-FPGA systems for skill development.

CO5: Design, Analyze and apply reconfigurable computing in various applications for optimization for skill development and employability.

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

IFTM University, Moradabad
Department of Electronics & Communication Engineering
Bachelor of Technology (B.Tech) Programme
(Effective from Session 2021-22)

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

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

Suggested readings:

1. S. Hauck ,"Reconfigurable Computing: Theory and practice of FPGA based Computation", Morgan Kaufmann, 2008.
2. Simon, "Programming FPGA's: Getting started with Verilog:, Mc Graw – Hill Education,2016.
3. Wayne Wolf, "FPGA-Based System Design", Pearson Education, 1e, 2005.
4. S. Palnitkar,"VerilogHDL",Pearson Education, 1e, 2003.

Website Sources:
1. www.en.wikipedia.org
2. www.studynama.com
3. www.onlinecourses.nptel.ac.in
4. www.tutorialspoint.com
5. www.gupshupstudy.com

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