आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

IFTM UNIVERSITY
N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102
www.iftmuniversity.ac.in

Study & Evaluation Scheme of
Bachelor of Technology
[Session 2020-21]

Programme:	**Electrical Engineering**
Course Level:	**UG Degree**
Duration:	**Four 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 apply the knowledge of mathematics, science and engineering principles for Modeling, analyzing and solving Electrical Engineering problems.
- Ability to identify, formulate and analyze real-life Electrical Engineering problems.
- Ability to design and develop solutions for real-life Electrical Engineering problems.
- Ability to design and develop sophisticated equipment and Experimental systems for carrying out detailed
- Investigation to multifaceted Electrical Engineering problems.
- Dedication to work as an Electrical engineer who is capable of identifying solutions to various local and global problems faced by the society.
- Ability to design and develop modern systems for the upkeep of pollution free environment.
- Willingness and ability to upkeep professional ethics and social values.
- Willingness and ability to think independently, take initiative, lead a team of engineers or researchers and inculcate team spirit.
- Ability to express ideas clearly and communicate orally as well as in writing with others. Willingness and ability to maintain lifelong learning process by way of participating in various professional activities.

IFTM University, Moradabad
Bachelor of Technology (B.Tech) Electrical Engineering
STUDY AND EVALUATION SCHEME (Effective from 2020-21)
YEAR I, SEMESTER- I

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -101	**Engineering Mathematics-I**	3	1	0	20	10	30	70	100	4
2.	EPH -102	**Engineering Physics-I**	3	1	0	20	10	30	70	100	4
3.	ECH -103/ **ECE -101**	Engineering Chemistry –I/ **Environmental Science**	3	1	0	20	10	30	70	100	4
4.	PSD -101/PSD-201	**Professional Skill Development-I**	3	1	0	20	10	30	70	100	4
5.	EEE -101/ EEC-101	**Electrical Engineering**/ Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	EME -101 / ECS -101	**Materials & Manufacturing** / Computer Fundamentals & Programming	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EPH -152 / ECH -153	**Physics Lab** / Chemistry Lab	0	0	2	30	20	50	50	100	1
8.	EEE -151	**Electrical Engg. Lab** / Electronics Engg. Lab	0	0	2	30	20	50	50	100	1
9.	EME-151 / ECS -151	**Materials & Manufacturing Lab** / Computer Lab	0	0	2	30	20	50	50	100	1
10.	EME-152	**Engineering Graphics Lab**	0	0	2	30	20	50	50	100	1
11.	GP-101	**General Proficiency**	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR I, SEMESTER- II

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA -201	**Engineering Mathematics-II**	3	1	0	20	10	30	70	100	4
2.	EPH -202	**Engineering Physics-II**	3	1	0	20	10	30	70	100	4
3.	ECH -203	**Engineering Chemistry-II**	3	1	0	20	10	30	70	100	4
4.	EEC -201/ EEE201	**Electronics Engineering**/Electrical Engineering	3	1	0	20	10	30	70	100	4
5.	EME -202	**Engineering Mechanics**	3	1	0	20	10	30	70	100	4
6.	ECS -201 / EME -201	**Computer Fundamentals & Programming** / Materials & Manufacturing	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECH -253 / EPH -252	**Chemistry Lab** / Physics Lab	0	0	2	30	20	50	50	100	1
8.	ECS -251 / EME -251	**Computer Lab** / Materials & Manufacturing Lab	0	0	2	30	20	50	50	100	1
9.	EEE -251 /	Electrical Engg. Lab/ **Electronics Engg. Lab**	0	0	2	30	20	50	50	100	1
10.	EME-252	**Mechanical Engineering Lab**	0	0	2	30	20	50	50	100	1
11.	GP-201	**General Proficiency**	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I Year (I Semester)

EMA – 101: 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.

UNIT – 1 **(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.

UNIT – 2 **(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.

UNIT – 3 **(10 Sessions)**

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

UNIT – 4 **(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.

UNIT – 5 **(12 Sessions)**

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

Course Outcomes:

The student is able to

- Remember terminologies and formulae in matrices, differential, integral and vector calculus.
- Understand and interpret the concepts of matrices, differential, integral and vector calculus.
- Compare and analyze the methods in matrices, differential, integral and vector calculus.
- Predict and evaluate the problems in matrices, differential, integral and vector calculus.

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR(I Semester)

EPH-101 ENGINEERING PHYSICS-I

Objective: The aim of this course is to impart knowledge of statistical mechanics, quantum mechanics, Laser system and their applications. The broad education is necessary to understand special theory of Relativity.

UNIT- I **(8 sessions)**

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

UNIT- II **(10 sessions)**

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

UNIT- III **(10 sessions)**

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

UNIT- IV **(8 sessions)**

Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

UNIT- V **(8 sessions)**

Fibre Optics: Fundamental ideas of optical Fiber, Propagation Mechanism, Numerical aperture, Acceptance angle and Acceptance cone, Single and multi modefibers, Applications of optical fibers.

Course Outcomes:

The students completing this course will be able to:

- Learn Frame of reference, Lorentz transformation equation
- Understand Statistical Mechanics, Maxwell- Boltzmann statistics and its applications.
- Study Bose -Einstein statistics and Fermi –Dirac statistics
- Understand De-Broglie Hypothesis, Davisson -Germer Experiment
- Study Time Dependent & Time Independent Schrodinger Equation and applications of these equations.
- Attain basic knowledge on different types of LASERs and their applications.
- Gain knowledge of optical fibre.

Suggested Readings:

1. A. Beiser, "Concepts of Modern Physics
2. C. 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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I Semester)

ECE-101: Environmental Science

Course 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, including interactions across local to global scales.

Unit I: **(12 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: **(10 Sessions)**

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

Unit III: **(10 Sessions)**

Water quality: Physical. Chemical & biological parameters. Water quality standard, BOD.COD and BOD COD calculations. :

Environmental Analysis: 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 management's .pollution and public health aspect Environmental Protection- Role of government, initiatives by non-governmental organizations (NGO).

Course outcomes:

After completion of this course student,

- Understand the issues and challenges related to environmental and ecosystem due to some human activities.
- Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I Year (I/II Semester)

PROFESSIONAL SKILL DEVELOPMENT-I

(EEG –101/EEG-201/MCA-101/BSB-103)

Course Objectives: The objectives of Professional Skill Development-I are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

Unit I **(Session-08)**
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

Unit II
Basic Applied Grammar Continued **(Session-06)**
Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. **Adverbs:** Kinds and Usage. **Prepositions:** Kinds and Usage. **Conjunctions:** Kinds; Usage. **Interjections:** Definition; Usage.

Unit III **(Session-10)**
Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech

Unit IV **(Session-06)**
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.**

Unit V **(Session-08)**
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.

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

- Write paragraph, gist or abstract/précis of the passage in own words/ language and resume, bio-data, letters and applications of different kinds.
- Use targeted grammatical structures meaningfully and appropriately in oral and written production.
- Enhance competence in the four modes of literacy: writing, speaking, reading & listening.
- Understand and recall of what is read and listen including facts and main idea.

Suggested Readings:

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

Website Sources

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I/II Semester)

(EEE-101/EEE-201)ELECTRICAL ENGINEERING

Objective:

1. To provide comprehensive idea about AC and DC circuits and its analysis
2. To provide 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.

UNIT-II **(08 Sessions)**

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

UNIT-III **(08 Sessions)**

Three Phase AC Circuits: Three Phase System, Advantages, Phase Sequence, Star and Delta Connections, Balanced Supply and Balanced Load, Three-phase Power and its Measurement,

Measuring Instruments: Types of Instruments, PMMC and Moving Iron Instrument, Single-Phase Dynamometer Wattmeter, Induction Type Energy Meter

UNIT-IV **(08 Sessions)**

Magnetic Circuits: Magnetic Circuit Concepts, Analogy between Electric & Magnetic Circuits, Magnetic Circuits with DC and AC Excitations, B-H Curve, 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, **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

- Predict the behavior of any electrical and magnetic circuits.
- Formulate and solve complex AC, DC circuits.
- Identify the type of electrical machine used for that particular application.
- Realize the requirement of transformers in transmission and distribution of electric power and other applications.
- Function on multi-disciplinary teams.

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I Year (I/II Semester)

EME-102/202: 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.

UNIT I **(9 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.

UNIT II **(9 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.

UNIT III **(9 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.

UNIT IV **(7 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.

UNIT V **(6 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.

Course Outcomes:

Students completing this course will be able:

- To understand how and why the properties of materials are controlled.
- To understand how and why the structure and composition of a material may be controlled by processing.
- To identify the positive and negative impacts of manufacturing on society.
- To apply the knowledge in industries and organizations.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I/II Semester)

EPH-151 / 251: 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.

List of Experiments: (Minimum 10 experiments are required to be performed) (20 Sessions)

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy bank gap of a given semiconductor material.
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.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

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

- Understand principle, concept, working and application of technology and comparison of results with theoretical calculations.
- Apply the various procedures and techniques for the experiments.
- Understand usage of instruments and real time applications in engineering studies.
- Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I/II Semester)

(EEE-151/ EEE-251)ELECTRICAL ENGINEERING LAB

Objective:

1. To design electrical circuits on bread board. **(20 Sessions)**
2. To analyze a given network by applying various network theorems.
3. To expose the students to the operation of dc generator
4. To expose the students to the operation of dc motor and transformer.
5. To examine the self -excitation in dc generators.

LIST OF EXPERIMENTS:

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

Course Outcomes:

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

- Explain the concept of circuit laws and network theorems and apply them to laboratory measurements.
- Be able to systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines
- Acknowledge the principles of operation and the main features of electric machines and their applications.
- Acquire skills in using electrical measuring devices.

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
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I Year (I/II Semester)

EME-152/252: 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.

List of Experiments (Say minimum 10 experiments out of the following) (20 Sessions)

1. **Carpentry Shop:**
   a. Study of tools & operations and carpentry joints.
   b. Simple exercise using jack plane.
   c. To prepare half-lap corner joint, mortise & tenon joints.
   d. Simple exercise on woodworking lathe.
2. **Fitting Bench Working Shop:**
   a. Study of tools & operations
   b. Simple exercises involving fitting work.
   c. Making perfect male-female joint.
   d. Simple exercises involving drilling/tapping/dieing.
3. **Black Smithy Shop:**
   a. Study of tools & operations
   b. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.
4. **Welding Shop:**
   a. Study of tools & operations of Gas welding & Arc welding
   b. Making simple Butt and Lap arc welded joints.
   c. Simple exercises involving Oxy-acetylene Gas welding.
5. **Sheet-metal Shop:**
   a. Study of tools & operations.
   b. Making Funnel complete with 'soldering'.
   c. Fabrication of tool-box, tray, electric panel box etc.
6. **Machine Shop:**
   a. Study of machine tools and operations.
   b. Simple exercises involving Plane turning.
   c. Simple exercises involving Step turning
   d. Simple exercises involving Taper turning.
7. **Foundary Shop:**
   a. Study of tools and operations.
   b. Preparation of sand for moulding.
   c. Mould making using core.

Course Outcomes:
Students completing this course will be able:

- To define and use different manufacturing process e.g. casting, forging, turning, drilling etc.
- To define and use different welding processes e.g. gas welding and electric arc welding.
- To acquire thorough knowledge of carrying out various operations in this lab.
- To acquire skills for creating different objects from raw materials.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I Year (I/II Semester)

EME 153 / 253: Engineering Graphics Lab

Objective: **(18 Sessions)**

- The course is aimed at developing Basic Graphic skills.
- Develop Skills In Preparation Of Basic Drawings.
- Skills in Reading and Interpretation of Engineering Drawings.

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

2. Orthographic Projections **(05 Sessions)**
Introduction, Definitions- Planes of projection, reference line and conventions employed. Principle of Orthographic projections, First and Third Angle projections.
Projection of Points, Pictorial view.
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)**

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.

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.

Course Outcomes:
Students completing this course will be able to:
- Use the drawing instruments effectively and able to dimension the given figures
- Appreciate the usage of engineering curves in tracing the paths of simple machine components
- Understand the concept of projection and acquire visualization skills, projection of points
- Able to draw the basic views related to projections of Lines, Planes

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 Mc Graw 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
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I Year (I Semester)

EMA – 201: 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.

UNIT – 1 **(12 Sessions)**

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

UNIT – 2 **(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**.**

UNIT – 3 **(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.

UNIT – 4 **(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.

UNIT – 5 **(10 Sessions)**

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

Course Outcomes:

The student is able to

- Classify differential equations according to certain features.
- Solve first order linear differential equations and nonlinear differential equations of certain types and interpret the solutions.
- Solve second and higher order linear differential equations with constant coefficients and construct all solutions from the linearly independent solutions.
- Find series solutions about ordinary and regular singular points for second order linear differential equations.
- Apply Fourier series to analyze the engineering problem.
- Solve partial differential equations with methods & its Applications.

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
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (II Semester)

EPH-201 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.

UNIT- I **(10 sessions)**

Electromagnetic Theory

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

UNIT- II **(8 sessions)**

Dielectric and Magnetic Properties of Materials Dielectric Properties: Dielectric constants, Polarization of dielectric materials, Polarizability, Claussius- Mossotti Equation, Application of dielectric. Magnetic Properties: Magnetization, Magnetic moment, Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve.

UNIT - III **(8 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.

UNIT- IV **(8 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.

Unit- V **(8 sessions)**

X-Rays: Diffraction of X-rays, Production and properties, Bragg's Law, Bragg's spectrometer, Applications of X-rays.

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

Course outcomes:

The students completing this course will be able to:

- Understand Gauss law, Ampere's Law, Maxwell's equations and their applications.
- Study of Propagation of plane electromagnetic waves in free space.
- Understand Dielectric and magnetic properties of the materials.
- Explain Intrinsic and extrinsic semiconductors.
- Construction, Operation and characteristics of diodes.
- Understand concepts of superconductors, Properties of superconductors & applications of superconductors.
- Gain basic knowledge on the properties, production and applications of X-rays.
- Basic principle of nano science and technology and applications of nanotechnology.

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. A. 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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech-I Year (I/II Semester)

ECH-101/ ECH-201: ENGINEERING CHEMISTRY

Objectives:

1. To emphasize the relevance of fundamentals and applications of chemistry in the field of engineering.
2. To take into account appropriate combinations of old and new emerging concepts for the potential uses in engineering.
3. To address the principles of general chemistry and specific topics relevant to various engineering disciplines.
4. To bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT-I **(08 SESSIONS)**

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

UNIT-II **(08 SESSIONS)**

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

UNIT-III **(08 SESSIONS)**

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

UNIT-IV **(08 SESSIONS)**

POLYMERS:Polymers, classification and applications, polymerization (addition and condensation), Thermoplastic and Thermosetting polymers, preparation, properties and uses of PVC, Dacron, nylon66 and Bakelite. Elastomers (Natural rubber, buna-N, buna-S) vulcanization, conducting polymers (Intrinsic & Extrinsic), doping, ion exchange resins, biodegradable polymers.

UNIT-V **(08 SESSIONS)**

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

Course Outcomes:

- Demonstrate knowledge of science behind common impurities in water and methods to treat them and also different methods to remove hardness of water .
- Students will also be able to understand and relate electrochemistry and corrosion.
- to analyze the basic knowledge of various types of Fuels, their properties and Industrial Applications ALONG WITH THE determination OF the calorific value of fuels .
- Apply the science for understanding corrosion and its prevention.
- Demonstrate knowledge of superconducting and organic electronic materials.

Suggested Readings:

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

Website sources:

- http://www.commonchemistry.org/
- https://www.technicalsymposium.com/

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I/II Semester)

(EEC-101/EEC-201) ELECTRONICS ENGINEERING

Objective: The objective of the course is to familiarize the students with concepts of semiconductor and its working along with their applications in real life.

UNIT – I **(08Sessions)**

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

UNIT – II **(08Sessions)**

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

UNIT– III **(08Sessions)**

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.

UNIT – IV **(08Sessions)**

Number system: conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gates. Canonical forms, minimization using K-map (Upto four variable, don't care conditions also)

UNIT – V **(08Sessions)**

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.

Course Outcome:

- Understand the basic of semiconductor technology
- Define the purpose of different diodes used in several applications
- Develop understanding and impact of resistance regions
- Discuss how basic communication occurs over wireless medium
- Discuss the benefits of transistors over conventional vacuum tubes

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:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I/II Semester)

EME – 101 / EME – 201: 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.

Unit-1 **(Sessions 10)**

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

Unit-2 **(Sessions 08)**

Trusses: Introduction, Simple Truss and solution of simple truss, Method of Joints and Method of Sections.
Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application.

Unit-3 **(Sessions 08)**

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.

Unit-4 **(Sessions 06)**

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

Unit-5 **(Sessions 08)**

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion. Relative Velocity.
Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium.

Course outcomes: Students completing this course will be able to

- Recognize different force systems, moments and couple.
- To draw Free Body Diagram and label the reactions on it.
- Apply equilibrium equations in statics.
- Understand Newton's law in motion, and recognize different kinds of particle motions.

Reference Books:

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.

Suggested Readings:

- 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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech-I Year (I/II Semester)

ECS-101 / 201: Computer Fundamentals and Programming

Objective:

- This course introduces the concepts of computer basics & programming with particular attention to Engineering examples.
- The C programming language is used but the course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.
- C is the easiest language to understand so basic constructs of C will be cleared.

Unit-I **(08 Sessions)**

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

Unit –II **(08 Sessions)**

Input, Output and storage Units: Introduction to various Input and output Devices
Printers: Various type of Impact and Non- Impact Printers.
Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code.
Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs.

Unit-III **(08 Sessions)**

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

Unit-IV **(08 Sessions)**

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

Unit-V **(08 Sessions)**

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

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

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.
- Understand the dynamic behavior of memory by the use of pointers.
- Use different data structures and create or manipulate basic data files and developing applications for real world problems.

Suggested Readings:

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

Website Sources:

- www.nptel.ac.in
- www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
- www.learn-c.org

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (II Semester)

ECH 151 / 251: CHEMISTRY LAB

OBJECTIVE:

- 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 practicals.
- 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

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

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

COURSE OUTCOME:

- Students are able to estimate the impurities present in water.
- Ability to prepare advanced polymer materials.
- Ability to know the strength of an acid present in secondary batteries.
- Ability to find the Fe^{+2}, Ca^{+2} & Cl^{-} present in unknown substances using titrimetric and instrumental methods.

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
- https://play.google.com/store/apps/details?id=com.softwareindiavinod.chemistrypracticals&hl=en&gl=US

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (II Semester)

ECS-151 / 251: Computer Lab

Objective: The following student learning outcomes, goals, assessment methods and core competencies have been identified for the Learning Center computer lab:

- To provide students with an open access computer lab using up-to-date technology to complete their studies.
- To increase retention in reading, study skills, English, foreign language, nursing, psychology and other academic classes by providing a lab where students can make use of software products to supplement instruction.

List of Experiments: (Minimum 10 experiments are required to be performed) (20 Sessions)

1. Object: Apply basic operations in windows on a folder.
2. Object: Design front page of your practical file
3. Object: Prepare a PERSONAL LETTER.
4. Object: Create your resume using given Templates.
5. Object: Create a report containing the pay details of the employee.
6. Object: Create a student result sheet
7. Object: create a pie chart for a sample data and give legends.
8. Object: Prepare a Time Table in MS-Excel.
9. Object: Prepare a presentation in MS-Power point about "Fundamentals of Computer".
10. Object: Create your E-Mail ID on Gmail
11. Object: Search any topic related to your syllabi using any search.
12. Object: Write a program in C to print "I am a student of IFTM University".
13. Object: Write a program in C to take input from user using scanf.
14. Object: Write a program to add, subtract, multiplication and division of two numbers.
15. Object: Write a program in C to calculate Factorial of a Number
16. Object: Write a program in C to print a Table.
17. Object: Program to compute the compute the average.
18. Object: Write a program to check whether a number is even or odd.
19. Object: Write a program to check whether a number is prime number or not.
20. Object: Write a program to check whether a year is leap year or not.
21. Object: Write a program to find largest of three numbers. 28
22. Object: Program to compute the factorial of a given number.

Course Outcome: The end of this course:

- Students will be able to identify the Learning Center as a place for utilizing computers with specialized software as a resource for supplemental study.
- Students will find the Learning Center equipment, software, and facility adequate to meet their educational needs.
- The Learning Center will support or facilitate a positive learning or service environment for students.
- Each student should be able to choose appropriate data structures to represent data items in real world problems.
- Each student should be able to analyze the time and space complexities of algorithms .
- Each student should be able to design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
- Each student should be able to analyze and implement various kinds of searching and sorting techniques.

Suggested Readings:

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

Website Sources:

- www.nptel.ac.in
- www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
- www.learn-c.org

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR ((I/II Semester)

EEC 151/251 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.

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 colour code.
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.
3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance.
7. To Plot input / output characteristics for common base transistor.
8. To verify the truth table of basic logic gates (AND, OR, NOT)
9. To build and test the clipper circuit using diode.
10. To build and test the clamper circuit using diode

Course Outcome:

Students taking this lab will be able to:

- Measure voltage, current through multimeter.
- Understand the practical working of a diode
- Understand the graph transitions of a transistor
- Understand the concept of logic gates.

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
Bachelor of Technology (Electrical Engineering) Programme
B.Tech I YEAR (I/II Semester)

EME – 151 / EME - 251: 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.

(Any 08 experiments of the following or such experiments suitably designed) (20 Sessions)

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

Course outcomes: Students completing this course will be able to

- Describe the behavior of materials upon normal external loads.
- Predict the behavior of the material under impact conditions.
- Recognize the mechanical behavior of materials.
- Recognize parts of IC engines.
- Recognize components of boilers.

Suggested Readings:

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

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

IFTM University, Moradabad
Bachelor of Technology (B.Tech) Electrical Engineering
STUDY AND EVALUATION SCHEME (Effective from 2020-21)
YEAR II, SEMESTER-III

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA-301	Engineering Mathematics –III	3	1	0	20	10	30	70	100	4
2.	EEE-301	Electrical Machine-I	3	1	0	20	10	30	70	100	4
3.	EEE-302	Electrical Measurements & Measuring Instruments-I	3	1	0	20	10	30	70	100	4
4.	EEE-303	Analog Electronic Devices	3	1	0	20	10	30	70	100	4
5.	EEE-304	Electromagnetic Field Theory	3	1	0	20	10	30	70	100	4
6.	EEE-305	Networks and Systems	3	1	0	20	10	30	70	100	4
7.	EHU-301	Disaster Management (Audit Paper)	3	0	0	20	10	30	70*	100	3*
PRACTICALS / PROJECT											
8.	EEE-351	Electrical Machine -I Lab	0	0	2	30	20	50	50	100	1
9.	EEE-352	Network Lab	0	0	2	30	20	50	50	100	1
10	EEE-353	Electronic Devices Lab	0	0	2	30	20	50	50	100	1
11.	EEE-354	Electrical Measurements -I Lab	0	0	2	30	20	50	50	100	1
12.	GP-301	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

#The Subject (EHU-301), Disaster Management will be offered as a compulsory audit course and each student has to pass the subject at the minimum by getting 35 marks out of 100.

YEAR II, SEMESTER-IVS.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA-401	Computer based Numerical &Statistical Techniques	3	1	0	20	10	30	70	100	4
2.	EEE-401	Electrical Measurements & Measuring Instrument-II	3	1	0	20	10	30	70	100	4
3.	EEE-402	Electrical Machine –II	3	1	0	20	10	30	70	100	4
4.	EEE-403	Digital Electronics	3	1	0	20	10	30	70	100	4
5.	EEE-404	Signal and Systems	3	1	0	20	10	30	70	100	4
6.	PSD-401	Professional Skill Development – II	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EEE-451	MATLAB and SIMULINK Lab	0	0	2	30	20	50	50	100	1
8.	EEE-452	Digital Electronics Lab	0	0	2	30	20	50	50	100	1
9.	EEE-453	Electrical Measurements -II Lab	0	0	2	30	20	50	50	100	1
10.	EEE-454	Electrical Machine -II Lab	0	0	2	30	20	50	50	100	1
11.	GP-401	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EMA-301 ENGINEERING MATHEMATICS -III

Objective:

1. To demonstrate their understanding of mathematical ideas from multiple perspectives.

UNIT –I **(08 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.

UNIT-II **(08 Sessions)**

Integral Transforms: Fourier Integral, Fourier Complex Transform, Fourier Sine and Cosine Transforms and Applications to Simple Heat Transfer Equations. Z- Transforms and its applications to solve difference equations.

UNIT-III **(08 Sessions)**

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

UNIT-IV **(09 Sessions)**

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

UNIT – V **(07 Sessions)**

Method of least squares and curve fitting of straight lines, polynomials, exponential curves etc. solution of cubic and bi-quadratic equations.

Course Outcomes:

On completion of the course, student will be able to

- Demonstrate basic knowledge of L, D, E, P, D, and E Vector & F.T.
- Show the understanding of impact of engineering mathematics on Mech.
- Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by

a) Using the internal connections between geometry, algebra, and numerical computation,
b) Apply the connections between theory and applications, or
c) Distinguish between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

- Fourier series and application in simple PDE.
- Functions of Complex variable and their properties.
- Acquire knowledge about important probability distributions and their properties.
- Acquire knowledge about statistical parameter estimation.

Suggested Readings:

1. "Engineering Mathematics", Vol-II, Gangadharan, PHI Learning, India
2. "Engineering Mathematic", Vol-II, Srivastava & Srivastava, PHI Learning, India

Website Sources:

- www.lecturenotes.in
- www.technicalsymposium.com
- www.math.wisc.edu

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-301 ELECTRICAL MACHINES-I

Objective:

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

UNIT –I **(09 Sessions)**

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

UNIT –II **(08 Sessions)**

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

UNIT –III **(05 Sessions)**

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

UNIT –IV **(09 Sessions)**

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

UNIT –V **(09 Sessions)**

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

Course Outcomes:

On completion of the course, student will be able to

- Acquire knowledge about the fundamental principles and classification of electromagnetic machines.
- Acquire knowledge about the constructional details and principle of operation of dc machines.
- Acquire knowledge about the working of dc machines as generators and motors.
- Acquire knowledge about testing and applications of dc machines.
- Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers.
- Develop the equivalent circuit and phasor diagram of different machines and analyze their performance using the equivalent circuit.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-302 ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS- I

Objective:

The educational objectives of this course is to provide in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers.

UNIT I **(08 Sessions)**

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

UNIT II **(05 Sessions)**

Measuring Instruments: Classification – Absolute & secondary instruments – control, damping & balancing – constructional details, Recording & Integrating Instruments

UNIT III **(09 Sessions)**

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

UNIT IV **(09 Sessions)**

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

UNIT V **(09 Sessions)**

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

Course Outcome:

On completion of the course, student will be able to

- To use the techniques and skills for electrical projects.
- Measurement of R,L,C ,Voltage, Current, Power factor , Power, Energy
- Ability to balance Bridges to find unknown values.
- Ability to measure frequency, phase with Oscilloscope
- Ability to use Digital voltmeters

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE- 303 ANALOG ELECTRONIC DEVICES

Objective:

To expose the students to the semiconductor device, performance characteristics and their application.

UNIT I **(08 Sessions)**

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

UNIT II **(08 Sessions)**

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

UNIT III **(09 Sessions)**

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

UNIT IV **(08 Sessions)**

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

UNIT V **(07 Sessions)**

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

Course Outcomes:

On completion of the course, student will be able to

- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Regulators and Amplifiers
- To implement mini projects based on concept of electronics circuit concepts.
- Evaluate frequency response to understand behavior of Electronics circuits.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-304 ELECTROMAGNETIC FIELD THEORY

Objective:

1. Electromagnetic is a branch of physics or electrical engineering which is used to study the electric and magnetic phenomena.
2. Electromagnetic Field (EMF) Theory is one of the most important and fundamental courses of electrical engineering and electronics and communication engineering curriculum which deals with comprehensive study of characteristics of electric field, magnetic field and combined field called electromagnetic field.

UNIT I: (09 Sessions)

Vector Analysis: Scalar and vectors, Addition and subtraction of vectors, multiplication and division of a vector by a scalar Multiplication of two vectors, The unit vector.

Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector, The divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.

UNIT II: (08 Sessions)

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

UNIT III: (08 Sessions)

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

UNIT IV: (08 Sessions)

Electromagnetic Waves and Maxwell's equations: Faraday's Law, Transformer and motional electromotive forces, displacement current, Maxwell's equation in differential and integral form.

Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

UNIT V: (07 Sessions)

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

Course Outcomes:

On completion of the course, student will be able to

- Define and recognize different co- ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time. Apply different techniques of vector calculus to understand different concepts of electromagnetic field theory.
- Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media using the fundamental laws.
- Determine the electromagnetic force exerted on charged particles, current elements, working principle of various electric and electromagnetic energy conversion devices are based on this force.
- Design electromagnetic energy storage devices like capacitor, inductor which are frequently used in electrical systems and choose suitable materials required to assemble such electromagnetic energy storage devices.
- Deduce and justify the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves, TV signals, radar beams and light rays.
- Generalize the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-305 NETWORKS AND SYSTEMS

Objective:

1. To learn about the network and circuit solving theorems.
2. To learn & design the circuits (both AC & DC) also to minimize the circuit with the help of various theories.

UNIT-I **(08 Sessions)**

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

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

UNIT-II **(08 Sessions)**

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

UNIT-III **(08 Sessions)**

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

UNIT-IV **(08 Sessions)**

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

UNIT-V **(08 Sessions)**

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

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

Course Outcomes:

On completion of the course, student will be able to

- To analyze the Circuits in time and frequency domain
- To study network Topology, network Functions, two port network
- To synthesize passive network by various methods
- Apply their knowledge in analyzing Circuits by using network theorems.
- Apply the time and frequency method of analysis.
- Find the various parameters of two port network.
- Apply network topology for analyzing the circuit
- Synthesize the network using passive elements.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-351 ELECTRICAL MACHINES-I LAB

Objective:

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

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

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

Course Outcomes:

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

- Acknowledge the principles of operation and the main features of transformers and their applications.
- Explain the circuit parameters and its performance analysis.
- Acknowledge the principles of operation and the performance analysis of three phase induction motor.
- Perform the speed control techniques on induction motors.
- Acquire skills in using electrical machines like transformer and induction motors.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-352 NETWORKS LAB

Objective:

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

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

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

Course Outcomes:

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

- Understand the DC network theorems for solving DC circuits.
- Obtain the circuit parameters.
- Design and explain the filters and resonance circuits.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-353 ANALOG ELECTRONIC DEVICES LAB

Objective:

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

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

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

Course Outcomes:

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

- Understand the different experimental input and output equipment's.
- To draw and explain the performance of different kinds of electronic devices.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (III Semester)

EEE-354 ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS-I LAB

Objective:

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

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

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

Course Outcomes:

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

- Understand the different resistance measuring devices and circuits.
- Study and calibrate the different electrical equipment.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EMA-401 COMPUTER BASED NUMERICAL &STATISTICAL TECHNIQUES

Objective:

1. To The concept of different functions and define the recursive functions.
2. The concept of laplace transform and other transformations, solutions of different sets of equations and statistical computation.

UNIT –I **(08 Sessions)**

Solution of Algebraic and Transcendental Equation and Eigen Value Problem: Solution of algebraic and transcendental equation by the method of bisection, method of false position, Newton-Raphson's method and Graeffe's Root squaring method, Eigen value problem by power method and Jacobi method.

UNIT –II **(08 Sessions)**

Solution of System of Equations and Matrix Inversion: Solution of linear algebraic equation: Gauss and Gauss-Jordan elimination methods-Method of Triangularization and Crout's Method, Iterative methods: Gauss-Jacobi, Gauss-Seidel and Relaxation methods.

UNIT –III **(08 Sessions)**

Interpolation: Finite Differences, Relation between operators - Interpolation by Newton's forward and backward difference formulae for equal intervals. Newton's divided difference method and Lagrange's method for unequal intervals, Numerical differentiation in one variable, Numerical Integration by Trapezoidal and Simpson's rules.

UNIT –IV **(08 Sessions)**

Solution of Ordinary Differential Equation: Single step methods: Taylor series method, Picard's method of successive approximation, Euler and Improved Euler methods, Runge- Kutta method of fourth order only.

UNIT –V **(08 Sessions)**

Statistical Computation: Probability Theory, Binomial, Poisson, and normal distribution, Sampling theory (small and large), Test of significance chi-square test, t-test, F-test, Analysis of Variance (ANOVA), Application to medicine agriculture and Engineering.
Time series and forecasting (moving and semi-averages), Statistical quality control methods, control charts, X, R, p, np, and c charts.

Course Outcomes:

On completion of the course, student will be able to

1. Solve system of linear equations.
2. Understand various methods of modeling.
3. Apply Mathematical Modeling and for Engineering Problem Solving.
4. Solve Mathematical Equations by various methods.
5. Understand Statistical Methods for Data Analysis and sampling techniques.
6. Write programs for various numerical and statistical methods

Suggested Readings:

1. M. K. Venkataraman - "Numerical methods in Science and Engineering", National Publishing Company, Madras
2. B.S. Grewal -"Numerical methods in Engineering & Science", Khanna Publishers, New Delhi
3. P. Kandasamy, K. Gunavathy and K. Thilagavathy - "Numerical Methods", S. Chand & Company Ltd, New Delhi.
4. Gupta and Malik - "Calculus of finite Differential and Numerical Analysis", Krishna Prakasan Media (P) Ltd. Meerut
5. M. Ray - "Mathematical Statistics", Ram Prasad & Sons, Agra.

Website Sources:

1. www.lecturenotes.in
2. www.nptel.ac.in
3. https://1234mathematics.files.wordpress.com/

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-401 ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS-II

Objective:

1. To learn about connections of different measuring instruments in electrical systems.
2. To understand correct function of electrical parameters.

UNIT –I **(08 Sessions)**

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

UNIT –II **(08 Sessions)**

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

UNIT –III **(08 Sessions)**

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

UNIT –IV **(08 Sessions)**

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

UNIT –V **(08 Sessions)**

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

Course Outcomes:

On completion of the course, student will be able to

- Analyze the performance characteristics of each instrument
- Illustrate basic meters such as voltmeters and ammeters.
- It explains about different types of signal analyzers.
- It explains the basic features of oscilloscope and different types of oscilloscopes
- Apply the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-402 ELECTRICAL MACHINES-II

Objective:

1. To learn about the working of synchronous machine & its applications.
2. To understand the working of special motors used in electrical systems.

UNIT –I **(08 Sessions)**

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

UNIT –II **(08 Sessions)**

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

UNIT –III **(08 Sessions)**

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

UNIT –IV **(08 Sessions)**

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

UNIT –V **(08 Sessions)**

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

Course Outcomes:

- On completion of the course, student will be able to
- To give the students a fair knowledge on the working of various Ac machines and the characteristics.
- To impart knowledge on Construction and performance of salient and non – salient type synchronous generators.
- To impart knowledge on Principle of operation and performance of synchronous motor
- To impart knowledge on Construction, principle of operation and performance of induction machines.
- To impart knowledge on Starting and speed control of three phase induction motors
- To impart knowledge on Construction, principle of operation and performance of single phase induction motors and special machines.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-403 DIGITAL ELECTRONICS

Objective:

1. To learn about different number systems and their applications in electrical circuits.
2. To design and solve different logic circuits using digital theorems.

UNIT – I **(08 Sessions)**

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

UNIT – II **(08 Sessions)**

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

UNIT – III **(08 Sessions)**

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

UNIT – IV **(08 Sessions)**

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

UNIT – V **(08 Sessions)**

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

Course Outcomes:

On completion of the course, student will be able to

- Demonstrate different applications of diode- clipper, clamper, full wave rectifier.
- Demonstrate voltage regulation by Zener diode. Demonstrate Switched Mode Power Supply & Design linear voltage regulator using regulator IC chip.
- Demonstrate voltage regulation by Zener diode. Demonstrate Switched Mode Power Supply & Design linear voltage regulator using regulator IC chip.
- Design V to I & I to V using Op-Amp. Demonstrate NE 555 timer IC and design monostable, astable, bistable multivibrator.
- Design RS-JK & D filpflop using logic gates. Design Synchronous Up/Down counter
- Design of Combinational circuit for BCD to decimal conversion to drive 7- segment display using Multiplexer.
- Design decoder, multiplexer and adder circuit.

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:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-404 SIGNAL AND SYSTEMS

Objective:

1. To understand the different signals as input source and their impact on electrical circuits.
2. To deal with laplace, fourier & Z-transformation.

UNIT –I **(09 Sessions)**

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

UNIT –II **(08 Sessions)**

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

UNIT –III **(07 Sessions)**

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

UNIT –IV **(08 Sessions)**

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

UNIT –V **(08 Sessions)**

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

Course Outcomes:

On completion of the course, student will be able to

- Understand mathematical description and representation of continuous and discrete time signals and systems.
- Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
- Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
- Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s-domain.
- Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-451 MATLAB AND SIMULINK LAB

Objective:

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

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

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

Course outcomes:

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

- Write the program for obtaining the performance results for electrical circuits in software environment.
- Visualize the experimental results in software environment.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-452 DIGITAL ELECTRONICS LAB

Objective:

1. To expose the students to electrical world of digital languages.
2. To analyze the different controllers used in electrical systems.

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

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

Course outcomes:

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

- Explain different digital languages like binary, grey, decimal etc.
- Implement logic analysis to the digital circuits.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-453 ELECTRICAL MEASUREMENT-II LAB

Objective:

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

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

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

Course outcomes:

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

- Explain the concept of energy meters and calibration methods of measuring devices.
- Understand the working of CRO and oscilloscope.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech II Year (IV Semester)

EEE-454 ELECTRICAL MACHINE-II LAB

Objective:

1. To expose the students to the working principle and performance of synchronous machine.
2. To analyze the load characteristics of synchroscope.

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

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

Course outcomes:

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

- Explain the concept of synchronous machine
- Familiar with the load analysis of three phase alternator.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (B. Tech) Electrical Engineering
STUDY AND EVALUATION SCHEME (Effective from 2020-21)
YEAR III, SEMESTER-V

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EEE-501	Microprocessor Engineering	3	1	0	20	10	30	70	100	4
2.	EEE-502	Electrical Engineering Material Science	3	1	0	20	10	30	70	100	4
3.	EEE-503	Commutating Machines	3	1	0	20	10	30	70	100	4
4.	EEE-504	Control System	3	1	0	20	10	30	70	100	4
5.	EHU-501	Human Values & Professional Ethics	3	1	0	20	10	30	70	100	4
6	EEE-505	Instrumentation Engineering	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EEE-551	Microprocessor Lab	0	0	2	30	20	50	50	100	1
8.	EEE-552	Electrical Machine-III Lab	0	0	2	30	20	50	50	100	1
9.	EEE-553	Control System Lab	0	0	2	30	20	50	50	100	1
10.	EEE-554	Instrumentation Engineering Lab	0	0	2	30	20	50	50	100	1
11.	GP-501	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

YEAR III, SEMESTER-VI

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EEE-601	Power System Protection	3	1	0	20	10	30	70	100	4
2.	EEE-602	Power Electronics	3	1	0	20	10	30	70	100	4
3.	EEE-603	Principles of Electrical Machine Design	3	1	0	20	10	30	70	100	4
4.	EEE-604	Digital Signal Processing	3	1	0	20	10	30	70	100	4
5.	EEE-605(A)	Elective I	3	1	0	20	10	30	70	100	4
6.	EEE-606	Electrical Power Transmission & Distribution	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EEE-651	Power System Protection Lab	0	0	2	30	20	50	50	100	1
8.	EEE-652	Power Electronics Lab	0	0	2	30	20	50	50	100	1
9.	EEE-653	Electrical Machine Design Lab	0	0	2	30	20	50	50	100	1
10.	EEE-654	Digital Signal Processing Lab	0	0	2	30	20	50	50	100	1
11.	GP-601	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

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

List of Electives

Elective I:

S. NO.	COURSE CODE	NAME OF THE COURSE
1.	EEE-605 (A)	High Voltage Engineering
2.	EEE-605 (B)	Special Electrical Machines

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-501 MICROPROCESSOR ENGINEERING

Objective:

1. To learn about microprocessor 8085 & 8086 with its applications.
2. To learn about the assembly language programs.

UNIT I **(09 Sessions)**

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

UNIT II **(06 Sessions)**

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

UNIT III **(08 Sessions)**

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

UNIT IV **(09 Sessions)**

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

UNIT V **(08 Sessions)**

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

Course Outcomes:

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

- Explain the internal organization and operation of microprocessors/microcontrollers.
- Program 8086 Microprocessor, 8051 and PIC Microcontrollers for application specific solution
- Design microprocessors/microcontrollers-based systems
- Implement and develop new experiments on microprocessor/microcontroller based systems.
- gain an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques with peripheral devices
- learn the concept of designing computer organization and architecture
- gain an understanding of applications of microprocessors in designing processor-based automated electronics system.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-502 ELECTRICAL ENGINEERING MATERIAL SCIENCE

Objective:

1. To learn about different kinds of engineering materials used for the fabrication of electrical system components.
2. To understand the electrical & magnetic properties of materials used in electrical system.

UNIT -I **(07 Sessions)**

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

UNIT-II **(09 Sessions)**

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

Behaviour of Dielectrics in Alternating Fields

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

UNIT-III **(08 Sessions)**

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

UNIT –IV **(07 Sessions)**

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

UNIT-V **(09 Sessions)**

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

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

Course Outcomes:

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

- Given a type of material, be able to qualitatively describe the bonding scheme and its general physical properties, as well as possible applications.
- Given a type of bond, be able to describe its physical origin, as well as strength.
- Be able to qualitatively derive a material's Young's modulus from a potential energy curve.
- Given the structure of a metal, be able to describe resultant elastic properties in terms of its 1D and 2D defects.
- Given a simple set of diffraction data, be able to index the peaks and infer the structure.
- Be able to describe a polymer's elastic behavior above and below the glass transition.
- Be able to do simple diffusion problems.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE – 503 COMMUTATING MACHINES

Objective:

1. To learn about Dc machines and their applications.
2. To understand the output characteristics of DC machine and commutation methods.

UNIT-I **(06 Sessions)**

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

UNIT-II **(07 Sessions)**

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

UNIT-III **(09 Sessions)**

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

UNIT-IV **(09 Sessions)**

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

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

Speed Control: Characterizing Parameters, Basic Methods Of Speed Control, Field Flux Control, Armature Resistance, Control, Voltage Control, Ward Leonard System.

UNIT-V **(08 Sessions)**

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

Course Outcomes:

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

- Provide the basic concept of DC machines and Transformers.
- Diagnose the condition of DC machines and Transformers. Understand the principle of electromagnetic energy conversion.
- Explain the performance characteristics of various DC Generators. Describe the performance characteristics of various DC Motors.
- Describe the equivalent circuit of transformers and determine its regulation.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-504 CONTROL SYSTEM

Objective:

1. To understand the signals for controlling the electrical system.
2. To understand the stability analysis and transient response of various systems.

UNIT I **(08 Sessions)**

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

UNIT-II **(09 Sessions)**

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

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

UNIT-III **(07 Sessions)**

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

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

UNIT-IV **(09 Sessions)**

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

Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, Solved examples

UNIT-V **(07 Sessions)**

state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and Observability and their testing. Solved examples

Course Outcomes:

- On completion of this course, the students will be able to
- Develop the mathematical model of the physical systems.
- Analyze the response of the closed and open loop systems.
- Analyze the stability of the closed and open loop systems.
- Design the various kinds of compensator.
- develop and analyze state space models
- Will have a strong knowledge of MATLAB software
- Will be able to do various engineering projects.
- Ability to formulate transfer function for given control system problems.
- Ability to find time response of given control system model.
- Plot Root Locus and Bode plots for given control system model
- Ability to design Lead, Lag, Lead-Lag systems in control systems
- Ability to design PID controllers for given control system model

Suggested Readings:

1. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley IndiaLtd, 2008.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India

Website Sources:

- www.tutorialspoint.com
- www.electrical4u.com
- www.nptel.ac.in
- www.javatpoint.com
- www.electronicscoach.com
- www.easyengineering.net

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme

B.Tech III Year (V Semester)

EEE-505 INSTRUMENTATION ENGINEERING

Objective:

1. To study the transducers and its applications in electrical systems.
2. To study about the output recorders and waveform generators.

UNIT I **(07 Sessions)**

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

UNIT – II **(08 Sessions)**

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

UNIT III **(09 Sessions)**

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

UNIT IV **(07 Sessions)**

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

UNIT V **(09 Sessions)**

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

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

Course Outcomes:

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

- Recognize the evolution and history of units and standards in Measurements.
- Identify the various parameters that are measurable in electronic instrumentation.
- Employ appropriate instruments to measure given sets of parameters.
- Practice the construction of testing and measuring set up for electronic systems.
- To have a deep understanding about instrumentation concepts which can be applied to Control systems.
- Relate the usage of various instrumentation standards.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-551 MICROPROCESSOR LABORATORY

Objective:

1. To expose the students for the microprocessor kits of 8085 & 8086 .
2. To analyze a given program for the output in 8085 and 8086 module microprocessor kits.
3. **LIST OF EXPERIMENTS:** **(16 Sessions)**

- To study 8085 based microprocessor system
- To study 8086 and 8086A based microprocessor system
- To add two 8 bit binary numbers using 8085 microprocessor.
- To subtract two 8 bit binary numbers using 8085 microprocessor
- To develop the program to find out the smallest number from a given set of numbers.
- To develop the program to find out the largest number from a given set of numbers.
- To develop and run the program for the multiplication of two 8 bit numbers.
- To develop and run the program to transfer a block of data.
- To develop and run the program for masking the higher nibble of an 8 bit number.
- To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa.

Course Outcomes:

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

- Explain the concepts of 8085 & 8086 microprocessor kit.
- Write the program in the form of microprocessor assembly language.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-552 ELECTRICAL MACHINE-III LAB

Objective:

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

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

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

Course Outcomes:

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

- Explain and differentiate between the working principles of different kinds of DC machines.
- Understand the different speed control methods of DC machines.
- Obtain the performance analysis of DC machines,
- Expose themselves for the practical world applications of DC machines.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-553 CONTROL SYSTEM-I LAB

Objective:

1. To design the Matlab /Simulation software based model of DC machines.
2. To expose towards the experimental setup of DC machines for the purpose of obtaining the performance indices.
3. Exposer towards the stability analysis and transient repose of different kinds of control systems.

LIST OF EXPERIMENTS **(20 Sessions)**

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

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

- Explain the methods of speed control of DC motor.
- Work under the Matlab/Simulation environment
- Know about the concept of stability and transient response.
- Able to understand the concept of compensation techniques used for the performance enhancement.

Suggested Readings:

1. Nagrath & Gopal, “Control System Engineering”, 4th Edition, New age International.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall of India
3. B.C. Kuo & Farid Golnaraghi, “Automatic Control System” Wiley IndiaLtd, 2008.
4. D.Roy Choudhary, “Modern Control Engineering”, Prentice Hall of India

Website Sources:

- www.tutorialspoint.com
- www.electrical4u.com
- www.nptel.ac.in
- www.javatpoint.com
- www.electronicscoach.com
- www.easyengineering.net

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (V Semester)

EEE-554 INSTRUMENTATION ENGINEERING LAB

Objective:

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

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

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

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

- Explain the concept of strain gauge for measuring the strain.
- Understand the working principle of thermocouple & thermistors.
- Generate square-waves in timer.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE-601 POWER SYSTEM PROTECTION

Objective:

1. To study about the fault analysis in power system transmission and distribution system.
2. To learn about the different kinds of relays for the purpose of protecting the power system equipments.

UNIT-I **(07 Sessions)**

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

UNIT-II **(07 Sessions)**

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

UNIT-III **(09 Sessions)**

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

UNIT-IV **(09 Sessions)**

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

UNIT-V **(08 Sessions)**

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

Course Outcomes:

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

- Calculation of both symmetrical and un-symmetrical fault currents
- Understanding the fundamentals of electromechanical relays and digital protective relaying
- The basic methods of calculating the magnitude and angle of voltage and current for the digital relaying
- The methods to choose suitable current transformer, voltage transformer and circuit breakers etc for fulfilling power system protection
- Design of overcurrent protection and its coordination

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE – 602 POWER ELECTRONICS

Objective:

1. To learn about the different power electronic devices used for the controlling purpose in electrical system.
2. To learn about the different kinds of power supplies and their methods to control the power flow.

UNIT I **(08 Sessions)**

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

UNIT II **(08 Sessions)**

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

UNIT III **(08 Sessions)**

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

UNIT IV **(08 Sessions)**

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

UNIT V **(08 Sessions)**

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

Course Outcomes:

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

- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non- linear devices.
- Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits
- Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.
- Formulate and analyze a power electronic design at the system level and assess the performance.
- Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus.
- Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE- 603 PRINCIPLES OF ELECTRICAL MACHINE DESIGN

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

UNIT I **(06 Sessions)**

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

UNIT II **(08 Sessions)**

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

UNIT III **(09 Sessions)**

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

UNIT IV **(08Sessions)**

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

UNIT V **(09 Sessions)**

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

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

- Acquire knowledge to carry out a detailed design of a dc machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.
- Acquire knowledge to carry out a detailed design of a transformer and provide the information required for the fabrication of the same along with an estimate of various performance indices
- Acquire knowledge to carry out a detailed design of an alternator and provide the information required for the fabrication of the same along with an estimate of various performance indices.
- Acquire knowledge to carry out a detailed design of an induction machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.
- Exhibit the study of mmf calculation and thermal rating of various types of electrical machines.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE--604 DIGITAL SIGNAL PROCESSING

Objective:

1. To study about the different kinds of signals (analog, digital, continues and discrete).
2. To study about the convolution technique and fourier analysis for discrete systems.

UNIT-I **(08 Sessions)**

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

UNIT-II **(09 Sessions)**

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

UNIT-III **(09 Sessions)**

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

UNIT IV **(07 Sessions)**

Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly used Windows, Examples of Filter Design Using Windows.

UNIT-V **(07 Sessions)**

Design of Infinite Impulse Response Digital Filters:, Impulse Invariant Transformation, Bi-Linear Transformation, All Pole analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth filter.

Course Outcomes:

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

- Use concepts of trigonometry, complex algebra, Fourier transform, z-transform to analyze the operations on signals and acquire knowledge about Systems
- Select proper tools for analog-to-digital and digital-to-analog conversion. Also select proper tools for time domain and frequency domain implementation.
- Design, implementation, analysis and comparison of digital filters for processing of discrete time signals
- Integrate computer-based tools for engineering applications
- Employ signal processing strategies at multidisciplinary team activities.
- Assess the techniques, skills, and modern engineering tools necessary for analysis of different electrical signals and filtering out noise signals in engineering practice. Also develop creative and innovative designs that achieve desired performance criteria within specified objectives and constraints, understand the need for lifelong learning and continuing professional education
- Thorough understanding of frequency domain analysis of discrete time signals.
- Ability to design & analyze DSP systems like FIR and IIR Filter etc.
- Understanding of spectral analysis of the signals.

Suggested Readings:

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

Website Sources:

- https://ocw.mit.edu
- www.lecturenotes.in
- www.examupdates.in
- www.nptel.ac.in

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE – 605(A) HIGH VOLTAGE ENGINEERING

Objective:

1. To learn about the breakdown mechanisms of different media.
2. To learn about the lightning phenomenon during clouding and the different theories behind it.
3. To study about the generation and measurement of high voltage practically (both AC & DC).

UNIT I **(08 Sessions)**

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

UNIT II **(06 Sessions)**

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

UNIT III **(07 Sessions)**

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

UNIT IV **(10 Sessions)**

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

UNIT V **(09 Sessions)**

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

Course Outcomes:

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

- Acquire the knowledge of necessity and methods of testing various apparatus in power system
- Knowledge of various circuits for generating high voltages for testing various apparatus and their measurement method.
- Knowledge of the various reasons of overvoltage in power system and protection methods against them
- Knowledge of insulation coordination and design of insulation levels of various parts of power system.
- To provide students importance of high voltage engineering.
- To familiarize students with different dielectric materials and their break down mechanisms.
- To give awareness of generation & measurement of high voltage and currents.
- To impart the knowledge of insulation co-ordination.
- To provide information on testing of electrical apparatus.

Suggested Readings:

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

Website Sources:

1. www.easyengineering.net
2. www.electrical-engineering.net
3. www.lecturenotes.in
4. www.academia.edu
5. www.nptel.ac.in

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE – 605(B) SPECIAL ELECTRICAL MACHINES

Objective:

1. To learn about the poly phase induction machine and its applications.
2. To study about different kinds of machines used in electrical systems.

UNIT-I **(08 Sessions)**

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

UNIT-II **(08 Sessions)**

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

UNIT-III **(08 Sessions)**

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

UNIT-IV **(08 Sessions)**

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

UNIT-V **(08 Sessions)**

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

Course Outcomes:

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

- To gain knowledge about the basic principles and classification of servo motors.
- To understand and apply the fundamentals of systematical components for the analysis of AC servo motor leading the design of its equivalent circuit and evaluation of its performance.
- To learn about construction features and method of operation stepper motor and acquire the knowledge of design procedure of drive amplifier and transistor logic for stepper motor.
- To learn about characteristics and application of stepper motor
- Acquire the knowledge of fundamentals, construction details and classification of universal motors and synchronous motor like reluctance motors, hysteresis motors.
- Acquire the knowledge of fundamentals, construction details and classification of linear machines.

Suggested Readings:

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

Website Sources:

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

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE – 605(C) DIGITAL COMMUNICATIONS

Objective:

1. To learn about digital communication and its different types of coding.
2. To learn about multiplexing in electronic systems.

UNIT-I **(08 Sessions)**

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

UNIT-II **(08 Sessions)**

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

UNIT-III **(08 Sessions)**

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

UNIT-IV **(08 Sessions)**

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

UNIT-V **(08 Sessions)**

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

Course Outcomes:

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

- Apply the knowledge of statistical theory of communication and explain the conventional digital communication system.
- Apply the knowledge of signals and system and evaluate the performance of digital communication system in the presence of noise.
- Apply the knowledge of digital electronics and describe the error control codes like block code, cyclic code.
- Describe and analyze the digital communication system with spread spectrum modulation.
- Design as well as conduct experiments, analyze and interpret the results to provide valid conclusions for digital modulators and demodulator using hardware components and communication systems using CAD tool.

Suggested Readings:

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

Website Sources:

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

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE- 606 ELECTRICAL POWER TRANSMISSION & DISTRIBUTION

Objective:

1. To learn about the layout and components of electrical system.
2. The performance analysis of electrical transmission & distribution system.

UNIT-I **(08 Sessions)**

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

UNIT-II **(08 Sessions)**

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

UNIT-III **(08 Sessions)**

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

UNIT-IV **(08 Sessions)**

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

UNIT-V **(08 Sessions)**

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

Course Outcomes:

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

1. Differentiate various types of transmission and distribution systems.
2. Interpret the various transmission concepts
3. Maintain voltage regulation and efficiency of transmission system.
4. Minimize the voltage drop of distribution systems.

Suggested Readings:

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

Website Sources:

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

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EHU – 601 Human Values and Professional Ethics

Objective:

1. To learn about the morals and ethics of human.
2. To learn about social responsibility and right of human.

UNIT 1: **(08 Sessions)**

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethic – Service – Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing - Honesty – Courage –Valuing Time – Co-operation – Commitment - Empathy – Self-Confidence – Character - Spirituality.

UNIT 2: **(08 Sessions)**

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - custom and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment.

UNIT 3: **(08 Sessions)**

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT 4: **(08 Sessions)**

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies. Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination.

UNIT 5: **(08 Sessions)**

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc.

Course Outcomes:

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

- Appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- Facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.
- Helps students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
- Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

Suggested Readings:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
3. Jayshree Suresh and B.S.Raghavan, “Human values and Professional Ethics”, S.Chand & Company Ltd., New Delhi.
4. Charles E Harris, Michael S. Protchard and Michael J Rabins, ‘Engineering Ethics - Concept and Case’, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
5. ‘Concepts and Cases’, Thompson Learning (2000)
6. John R Boatright, ‘Ethics and Conduct of Business’, Pearson Education, New Delhi, 2003.
7. Edmund G Seebauer and Robert L Barry, ‘Fundamentals of Ethics for Scientists and Engineers’, Oxford University of Press, Oxford, 2001.

Website Sources:

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

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

University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE-651 POWER SYSTEM PROTECTION LAB

Objective:

1. To design electrical relay system from powers system network.
2. To analyze the different kinds of relays.
3. To understand the protection schemes used in power system equipments.

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

1. To study the construction of an over current relay.
2. To study the Time-Current characteristics of an over current relay
3. To study the under voltage relay
4. To study the over voltage relay
5. To determine the positive sequence impedance of a three phase synchronous generator
6. To measure negative sequence impedance of a three phase synchronous generator
7. To determine the zero sequence impedance of a three phase synchronous generator.
8. To study the construction of an Earth fault Relay..
9. To study the Tine –Current characteristics of an Earth fault Relay
10. To study the working model of a Buchholz Relay.
11. To study the formation of Y-bus and Z-bus.
12. To perform symmetrical fault analysis in power system.

Course outcomes:

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

- Understand the protection of power system equipment.
- Differentiate between the relays operations.
- Form the bus matrices? (Either admittance or impedance).
- Acknowledge the fault analysis in power system.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE-652 POWER ELECTRONICS LAB

Objective:

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

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

1. To study single phase half wave rectifier.
2. To study single phase full wave rectifier.
3. To study forward blocking characteristics of SCR
4. To study forward characteristics of SCR with gate signal
5. To study forward conduction state(Latching/Holding) characteristics of SCR
6. To study Reverse Blocking characteristics of SCR
7. To study UJT triggering circuit without pulse transformer
8. To study UJT triggering circuit with pulse transformer
9. To study semi converter
10. To study RC triggering circuit with DIAC and TRIAC

Course outcomes:

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

- Understand the process of AC to DC conversion with waveform.
- Analyze the behavior of switch during ON & OFF state.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech III Year (VI Semester)

EEE-654 DIGITAL SIGNAL PROCESSING LAB

Objective:

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

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

1. Generation of various signals using MATLAB.
2. To study Linear convolution of two sequences using MATLAB.
3. To study sampling and effect of aliasing using MATLAB.
4. To study DFT and IDFT.
5. To study filter functions.
6. To calculate FFT of a signal using MATLAB.
7. Design of FIR filters using MATLAB.
8. Design of IIR filters using MATLAB.
9. Verification of various signals , DFT and IDFT using CCS and DSK kit.
10. Design of FIR filter using CCS and DSK kit.

Course outcomes:

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

- Understand the process for the generation of signals and obtain the results in the form of waveform in software environment.
- Analyze the behavior of filters using CCS & DSK kits.

Suggested Readings:

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

Website Sources:

- https://ocw.mit.edu
- www.lecturenotes.in
- www.examupdates.in
- www.nptel.ac.in

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme

B.Tech III Year (VI Semester)

EEE-653 ELECTRICAL MACHINE DESIGN LAB

Objective:

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

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

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

Course outcomes:

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

- Understand the process of construction of different parameters for a given rating of single phase transformer.

Suggested Readings:

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

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (B.Tech) Electrical Engineering
STUDY AND EVALUATION SCHEME (Effective from 2020-21)

YEAR IV, SEMESTER-VII

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EHU-701	Industrial Management	3	1	0	20	10	30	70	100	4
2.	EEE-702	Power System Analysis	3	1	0	20	10	30	70	100	4
3.	EEE-703	Electrical Drives	3	1	0	20	10	30	70	100	4
4.	EEE-704	Utilization of Electrical Energy and Traction	3	1	0	20	10	30	70	100	4
5.	EEE-705	Artificial Neural Network & Fuzzy System	3	1	0	20	10	30	70	100	4
6	EEE-706	Intelligent Instrumentation	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EEE-751	Seminar*	0	0	2	50	50	100	-	100	1
8.	EEE-752	Power System Analysis Lab	0	0	2	30	20	50	50	100	1
9.	EEE-753	Electrical Drives Lab	0	0	2	30	20	50	50	100	1
10.	EEE754	Industrial Training (Evaluation & Viva)	0	0	2	50	50	100	-	100	1
11.	EGP-701	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

*****Based on the review of literature to decide the final year project.

YEAR IV, SEMESTER-VIII

S.N.	Module Code	Module Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EEE-801	Non Conventional Energy Resources	3	1	0	20	10	30	70	100	4
2.	EEE-802	Power System Operation and Control	3	1	0	20	10	30	70	100	4
3.	EEE-803	Power Station Practice	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
3.	EEE-851	Project	0	0	18	-	300	300	400	700	10
4.	EGP-801	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**09**	**03**	**18**	**-**	**-**	**-**	**-**	**1100**	**23**

List of Electives

Elective II:

S. NO.	COURSE CODE	NAME OF THE COURSE
3.	EEE-705 (A)	Artificial Neural Network & Fuzzy System
4.	EEE-705 (B)	Generalised Theory of Elect. Machines

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IVYear (VII Semester)

EHU-701 INDUSTRIAL MANAGEMENT

Objective:

1. To learn about industrial management & its functions.
2. To learn about environmental issues.

UNIT-I **(08 Sessions)**

Introduction: Concept, Development, Application and scope of Industrial Management, Productivity: definition, measurement, productivity index, types of production system, Industrial ownership.

UNIT-II **(08 Sessions)**

Management Function: Principles of management-Management tools-time and motion study, work simplification- process charts and flow diagrams, Production planning, Specification of production requirements.

UNIT-III **(08 Sessions)**

Inventory Control: Inventory, cost, Deterministic models, Introduction to supply chain management

UNIT-IV **(08 Sessions)**

Quality Control: Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM.

UNIT-V **(08 Sessions)**

Environmental Issues: Environmental pollution –various management techniques to control Environmental pollution-Various control acts for Air, Water, Solid waste and Noise pollution.

Course Outcomes:

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

- Understand the theories and principles of modern management and apply the concepts to the management of organisations in private and public sector.
- Understand how managers can effectively plan in today's dynamic environment, be familiar with the design of organisation structure and describe how environmental uncertainty affects organisation design.
- Identify what strategies organisations might use to become more customer oriented and be more innovative. Identify the characteristics of effective teams and understand why teams have become so popular in organisations.
- Describe contemporary theories of motivation and discuss the challenges managers face in motivating unique group of workers.
- To help the students gain understanding of the functions and responsibilities of managers.

Suggested Readings:

1. Khanna O.P.: Industrial Engineering
2. Banga T.R. : Industrial Engineering and Management
3. .Sharma B.R.: Environmental and Pollution Awareness.
4. Koontz, H, & Weihrich, H (2016). Essentials of Management: An International Perspective (8th ed.), Tata McGraw Hills, New Delhi.
5. Ghuman, K & Aswathapa, K, (2017). Management concepts and cases (10th ed.), Tata McGraw Hills, New Delhi.
6. Telsan, M.T. (2016). Industrial and Business Management, (4th ed.), S. Chand, New Delhi.

Website Sources:

- www.noteshub.co.in
- www.nptel.ac.in
- www.lecturenotes.in
- www.studocu.com

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IVYear (VII Semester)

EEE-702 POWER SYSTEM ANALYSIS

Objective:

1. To learn about the power system components and fault analysis.
2. To learn about the load flow study.

UNIT-I **(08 Sessions)**

Representation of Power System Components: Synchronous machines, Transformers, Transmission lines, one line diagram, Impedance and reactance diagram, per unit System.

Symmetrical components: Symmetrical Components of unbalanced phasor, power in terms of symmetrical components, sequence impedances and sequence networks.

Transients:Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions.

UNIT-II **(08 Sessions)**

Faults in Power System : Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance, Formation of Z bus using singular transformation and algorithm, computer method for short circuit calculations

UNIT-III **(08 Sessions)**

Load Flows: Introduction, bus classifications, nodal admittance matrix (*BUS Y*), development of load flow equations, load flow solution using Gauss Siedel and Newton-Rap son method, approximation to N-R method, line flow equations and fast decoupled method

UNIT-IV **(08 Sessions)**

Power System Stability: Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability, studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

UNIT-V **(08 Sessions)**

Traveling Waves: Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings, Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Course Outcomes:

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

- methods for power system analysis in steady state operation
- principles of modelling and analysis of power systems subject to symmetrical and unsymmetrical faults
- the mathematical description and use of symmetrical component theory
- modelling of generators, transformers, lines and cables in the positive, negative and zero sequence systems
- the significance of different earthing/grounding methods
- the principles and application of regular power flow and optimal power flow methods

Suggested Readings:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
4. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
5. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.

Website Sources:

- www.smartzworld.com
- www.noteshub.co.in
- www.nptel.ac.in
- www.lecturenotes.in
- www.studocu.com

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IVYear (VII Semester)

EEE- 703 ELECTRIC DRIVES

Objective:

1. To learn about electrical driving system and its application.
2. To learn about power electronic controllers for electrical systems.

UNIT-I **(08 Session)**

Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives, Classification of electric drives Speed-torque conventions and multi-quadrant operations, Constant torque and constant power operation, Types of load, Load torque: components, nature and classification.

UNIT-II **(08 Sessions)**

Dynamics of Electric Drive: Dynamics of motor-load combination; Steady state stability of Electric Drive; Transient stability of electric Drive

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III **(08 Sessions)**

Electric Braking: Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting, Energy relations during braking, dynamics during braking.

UNIT-IV **(08 Sessions)**

Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor, Supply harmonics, power factor and ripples in motor current, Chopper control of separately excited dc motor and dc series motor.

UNIT-V **(08 Sessions)**

Power Electronic Control of AC Drives: Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Course Outcomes:

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

- Examine various applications in industrial and domestic areas where use of electric drives are essential.
- Classify types of electric drives systems based on nature of loads, control objectives, performance and reliability.
- Combine concepts of previously learnt courses such as, electrical machines, Control and power electronics to cater to the need of automations in industries.
- Select most suitable type and specification of motor drive combination for efficient conversion and control of electric power.

Suggested Readings:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K.Pillai, “A First Course on Electric Drives”, New Age International.
3. M.Chilkin, “Electric Drives”, Mir Publishers, Moscow.
4. N.K. De and Prashant K.Sen, “Electric Drives”, Prentice Hall of India Ltd.. V.Subrahmanyam, “Electric Drives: Concepts and Applications”, Tata McGraw Hill.

Website Sources:

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

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IV Year (VII Semester)

EEE –704 UTILIZATION OF ELECTRICAL ENERGY AND TRACTION

Objective:

1. To learn about the electric traction.
2. To learn about electrical heating and air conditioning system.

UNIT-I **(08 Sessions)**

Electric Heating: Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating

UNIT-II **(08 Sessions)**

Electric Welding: Electric Arc Welding, Electric Resistance welding, Electronic welding control

Electrolyte Process: Principles of electro deposition, Laws of electrolysis, applications of electrolysis

UNIT-III **(08 Sessions)**

Illumination: Various definitions, Laws of illumination, requirements of good lighting, Design of indoor lighting and outdoor lighting systems.

Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler, Types of air conditioning, Window air conditioner

UNIT-IV **(08 Sessions)**

Electric Traction – I : Types of electric traction, systems of track electrification, Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence.

UNIT-V **(08 Sessions)**

Electric Traction – II : Salient features of traction drives, Series – parallel control of dc traction drives (bridge transition) and energy saving, Power Electronic control of dc and ac traction drives, Diesel electric traction. Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Course Outcomes:

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

- Able to maintain electric drives used in an industries
- Able to identify a heating/ welding scheme for a given application
- Able to maintain/ Trouble shoot various lamps and fittings in use
- Able to figure-out the different schemes of traction schemes and its main components
- Able to design a suitable scheme of speed control for the traction systems
- Able to identify the job/higher education / research opportunities in Electric Utilization industry.

Suggested Readings:

1. G.K.Dubey,"Fundamentals of Electric Drives" Narosa Publishing House
2. H. Partab, " Modern Electric Traction" Dhanpat Rai & Sons.
3. C.L. Wadhwa, " Generation, Distribution and Utilization of Electrical Energy" New Age International Publications.
4. H.Partab,"Art and Science of Electrical Energy" Dhanpat Rai & Sons.

Website Sources:

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

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IV Year (VII Semester)

EEE 705(A) ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEM

Objective:

1. To learn about neural network architecture and its application.
2. To learn about fuzzy logic system.

UNIT-I **(08 Sessions)**

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

UNIT-II **(08 Sessions)**

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

UNIT-III **(08 Sessions)**

Fuzzy Logic-I (Introduction); Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT-IV **(08 Sessions)**

Fuzzy Logic –II (Fuzzy Membership, Rules): Membership functions, I interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller, Industrial applications.

UNIT-V **(08 Sessions)**

Fuzzy Neural Networks: L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propagation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Course Outcomes:

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

1. Comprehend the concepts of feed forward neural networks
2. Analyze the various feedback networks.
3. Understand the concept of fuzziness involved in various systems and fuzzy set theory.
4. Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
5. Analyze the application of fuzzy logic control to real time systems. Understand basic knowledge of fuzzy sets and fuzzy logic.
6. Apply basic fuzzy inference and approximate reasoning.
7. Understand principles of neural networks.
8. Apply basic fuzzy system modelling methods.

Suggested Readings:

1. Yegnanarayana,B "Artificial Neural Networks," Prentice Hall of India.
2. Kumar Satish, "Neural Networks" Tata Mc Graw Hill
3. Siman Haykin,"Neural Netowrks"Prentice Hall of India

Website Sources:

- www.nptel.ac.in
- www.researchgate.net
- www.edutechlearners.com
- www.lecturenotes.in

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IV Year (VII Semester)

EEE 706 INTELLIGENT INSTRUMENTATION

Objective:

1. To learn about the transducers and its applications.
2. To use the data acquisition methods for digital instruments.

UNIT – I **(08 Sessions)**

Introduction: Historical Perspective, current status, software based instruments.

UNIT-II **(08 Sessions)**

Digital Transducers: Review of various types of analog electrical transducers used for the measurement of strain, pressure, force, flow etc, Digital transducers, Digital Encoders –Classification, Resolution enhancement of digital transducers, application of digital transducers for the measurement of position, velocity, flow, temperature, pressure and liquid level.

UNIT-III **(08 Sessions)**

Virtual Instrumentation: Introduction to graphical programming, data flow & graphical programming techniques, advantage of VI techniques, VIs and sub-VIs loops and charts , arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Code Interface Nodes and DLL links.

UNIT-IV **(08 Sessions)**

Data Acquisition Methods: Introduction to data acquisition Methods: Analog and Digital IO, Counters, Timers, Timers, basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked Communication and Controls

UNIT-V **(08 Sessions)**

PC Hardware Review & Instrumentation Buses: Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA buses. IEEE488.1 & 488.2 Serial Interfacing - RS232C, RS422, RS423,RS485; USB, VXI, SCXI, PXI.

Course Outcomes:

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

- To explain the concept of intelligent instrumentation and impart knowledge on automation.
- To develop an ability to model and analyze a real time system.
- To develop an ability to evaluate the performance of a real time system.
- To develop an ability to design an intelligent system for industrial automation.
- To discuss the latest technology in automation

Suggested Readings:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall, 1995:
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall, 1993.
3. S. Gupta , J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED./ Instrument Society of America, 1994.
4. Gary Johnson / Lab VIEW Graphical Programming II Edition / McGraw Hill 1997.

Website Sources:

- www.nptel.ac.in
- www.researchgate.net
- www.edutechlearners.com
- www.lecturenotes.in

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IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IV Year (VII Semester)

EEE-752 POWER SYSTEM ANALYSIS LAB

Objective:

1. To design a power transmission line and obtain the performance parameters.
2. To use the parameter variation for enhancing the efficiency of power system.
3. To expose the students to the distribution and transmission system.

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

1. To study the oil testing set and determine the dielectric strength of transformer oil
2. To study the operating characteristics of miniature circuit breaker B type 6A.
3. To study the operating characteristics of bimetallic miniature circuit breaker C type 2A and to draw the Current-Time and Temperature-Time characteristics
4. To determine the ABCD, h, z and Image parameters for Short Transmission Line
5. To determine the ABCD, h, z and Image parameters for Medium Transmission Line
6. To determine the ABCD, h, z and Image parameters for long Transmission Line
7. To measure the receiving end voltage of each line under no load or light load condition to observe Ferranti effect.
8. To analyze and study the Radial Distribution Network.
9. To determine Transmission Line performance (Load Flow Analysis)
10. To obtain the steady state , transient state and sub-transient short circuit currents of an alternator.

Course outcomes:

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

- Explain the concept of dielectric strength of transformer oil.
- Differentiate between short, medium & long transmission line.
- Understand the transmission line performance.

Suggested Readings:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
4. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
5. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.

Website Sources:

- www.smartzworld.com
- www.noteshub.co.in
- www.nptel.ac.in
- www.lecturenotes.in
- www.studocu.com

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Bachelor of Technology (Electrical Engineering) Programme
B.Tech IV Year (VII Semester)

EEE-753 ELECTRIC DRIVES LAB

Objective:

1. To expose the methods of speed control of DC motor for traction and other applications.
2. To use the power electronic controllers for the purpose of position and speed control of DC & AC motors.

LIST OF EXPERIMENTS: (20 Sessions)

- To study speed control of separately exited DC motor by varying armature voltage through single phase fully controlled bridge converter.
- To study speed control of separately exited DC motor by varying armature voltage through single phase half controlled bridge converter.
- To study speed control of separately exited DC motor using single phase dual converter (microcontroller based).
- Speed control of DC motor using chopper motor controller (MOSFET based).
- Chopper control of separately exited dc motor (1 HP) for obtaining speed-torque characteristics.
- To study closed loop control of separately exited dc motor.
- To study speed control of three-phase induction motor using three phase AC voltage controller.
- To study two position control of three-phase induction motor using three phase AC voltage controller.
- To study speed control of three-phase slip-ring induction motor using static resistance control.
- To study speed control of three-phase slip-ring induction motor using Scherbius slip power recovery control scheme.

Course outcomes:

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

- Explain the concept of speed control of DC motors & three phase induction motor.
- Differentiate between open loop and close loop control of DC motor

Suggested Readings:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K.Pillai, “A First Course on Electric Drives”, New Age International.
3. M.Chilkin, “Electric Drives”, Mir Publishers, Moscow.
4. N.K. De and Prashant K.Sen, “Electric Drives”, Prentice Hall of India Ltd.. V.Subrahmanyam, “Electric Drives: Concepts and Applications”, Tata McGraw Hill.

Website Sources:

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

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B.Tech IV Year (VIII Semester)

EEE-801 NON- CONVENTIONAL ENERGY RESOURCES

Objective:

i. To learn about non-conventional resources of energy and its applications.
ii. To learn about electrochemical effects and fuel cells.

UNIT-I **(08 Sessions)**

Energy Resources & their Utilization: Introduction to various sources of energy, Solar, Thermal, Photovoltaic, Water power , Wind energy, Biomass, Ocean thermal ,Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Decentralized and dispersed generation.**Solar – radiations:** Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Zenith angle, Solar altitude angle expression, Solar radiation data for India.

UNIT-II **(08 Sessions)**

Solar Energy: Solar thermal power and it's conversion, Solar collectors, Performance analysis of flat plate collectors, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors. Solar thermal energy storage, Different systems, Solar pond.**Solar Photovoltaic system:** Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photo voltaic system and standards, Applications of solar photovoltaic system, PV hybrid system.

UNIT –III **(08 Sessions)**

Biogas: Photosynthesis, Biogas production, Transportation of biogas, bio gas plant technology and status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste. **Wind Energy:** Availability of wind energy in India, Wind velocity, Types of wind machines and their characteristics, Elementary design principles, Coefficient of performance of wind mill rotor, Aerodynamic considerations in wind mill design, Wind energy farms, Recent developments.

UNIT-IV **(08 Sessions)**

Electrochemical effects and fuel cells: Principle of operation of an acidic and alkaline fuel cell , Reusable fuel cell ,Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells.**Tidal Power:** Tidal and waves as sources of energy, Use of tidal energy, Limitations of tidal energy conversion systems. Hydrogen Energy: Properties of hydrogen in respect of its use as source of renewable energy, Sources and production of hydrogen, Storage and transportation, Problems with hydrogen as fuel. Develop of hydrogen cartridge.

UNIT-V **(08 Sessions)**

Thermoelectric systems: Kelvin's relations, Power generation, Properties of thermoelectric materials, Fusion plasma generators. **Geothermal Energy:** Geothermal sites, earthquakes, Volcano's, Geothermal resources**,** Hot springs, Steam ejection, Principle of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants. Advanced concepts.**Ocean Energy:** Principle of ocean thermal energy conversion, wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Impact of renewable energy generation on environment, Kyoto protocol, cost of energy production from different energy sources. Energy options for Indian economy.

Course Outcomes:

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

- Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells.
- Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.
- Explore the concepts involved in wind energy conversion system by studying its components, types and performance.
- Illustrate ocean energy and explain the operational methods of their utilization.
- Acquire the knowledge on Geo thermal energy.

Suggested Readings:

1. Non Conventional Energy Resources – Dubey and Bharagva, Dhanpat Rai Publications
2. Non Conventional Energy Resources - G.D.Rai
3. Solar Energy and Non-Conventional Energy Resources – Domkundwar, Dhanpat Rai Publications
4. Wind and Solar Power Systems – Mukund .R. Patel

Website Sources:

- www.nptel.ac.in
- www.lecturenotes.in
- www.academia.edu
- www.researchgate.net
- www.springer.com
- www.worldwidescience.org

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IFTM University, Moradabad
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B.Tech IV Year (VIII Semester)

EEE –802 POWER SYSTEM OPERATION AND CONTROL

Objective:

1. To understand about the structure and economic operation of power system.
2. To learn about the control of voltages and power using FACT devices in electrical system.

UNIT-I **(08 Sessions)**

Introduction: Structure of power systems, Power system control center and real time computer control, SCADA System Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability.

UNIT-II **(08 Sessions)**

Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants, System constraints, Optimal operation of thermal units without and with transmission losses, Penalty factor, , transmission loss formula (without derivation) Hydrothermal scheduling long and short terms, Concept of optimal power flow

UNIT-III **(08 Sessions)**

Load Frequency Control: Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, , P-I control, load frequency control and economic dispatch control, Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static response.

UNIT-IV **(08 Sessions)**

Automatic Voltage Control : Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.**Voltage and Reactive Power control :** Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation,

UNIT-V **(08 Sessions)**

State Estimation: Detection and identification, Linear and non-linear models.

Flexible AC Transmission Systems: Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR, , TSC, SVC, STATCOM, TSSC, SSSC, UPFC

Course Outcomes:

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

- Develop mathematical models of power system for dynamic studies
- Analyze the performance of single and multi-machine systems under transient, steady state and dynamic conditions.
- Design stabilizers, dynamic resistors and SMES for the power system.
- To make students understand Economic operation of power system and importance of LFC control.
- To allow students discuss about thermal and hydro power plants operation in meeting the load demand optimally. (State and central wide installation).Also expressing importance of reactive power control through seminars.
- To improve student's ability in solving problems (numerical problems at present) by posing different problem models related to Economic Load Dispatch, Load Frequency Control and reactive power control.
- Apply their knowledge in PSOC for competitive exams like GATE, IES, and Public sector etc.
- Ability to discuss single area load frequency control and two area load frequency control.
- Ability to model and design turbine and Automatic controller.
- Ability to express variation of frequency in the power system with varying load.

Suggested Readings:

1. D.P. Kothari & I.J. Nagrath, " Modern Power System Analysis" Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC Transmission Systems"
4. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.
5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill
6. P. Kundur, " Power System Stability and Control Mc Graw Hill.
7. M.H. Rashid, "Power Electronics: Circuits, devices and Applications" Prentice Hall of India,3rd Edition.

Website Sources:

- www.nptel.ac.in
- www.lecturenotes.in
- www.academia.edu
- www.researchgate.net
- www.springer.com
- www.studentsfocus.com
- https://notes.specworld.in

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

IFTM University, Moradabad
Bachelor of Technology (Electrical Engineering) Programme
B.Tech IV Year (VIIISemester

EEE –803 Power Station Practice

Objective:

1. To learn about the cost of generation & distribution of electrical energy.
2. To learn about the power generation plants.

UNIT-I **(09 Sessions)**

Cost of Power Generation: running cost and fixed cost, Method for providing for depreciation factor affecting cost of generation. Load Factor, Load Curve, Demand Factor, Diversity Factor. Number and size of generation units: plant capacity factor and plant use factor. Tariff: Flat-rate, Two part, Block rate, Maximum Demand and Power Factor, Tariff Economics of Power Factor improvements.

UNIT-II **(10 Sessions)**

Selection of site, Thermal Power Plants: Types and their relative merits, Boilers accessories, Economizers, Preheater and Super Heater. Fuel, Combustion Equipment: Types of Steam Turbines, Condensers, Pumps, Cooling Towers. Layout of Plant, Pollution Control Equipments. Elements of Nuclear Power Plant. Nuclear Reactor- it's components and their functions. Types of Nuclear Reactor, Boiling water, Pressurized water fast breeder reactor and Candu Reactor, their advantages and disadvantages.

UNIT-III **(09 Sessions)**

Hydro-Electric Power Plant: Selection of site. Classification based on: quantity of water available, Nature of load, Available head, Layout, it's main parts and their function: reservoir, Dam, spillways, intake,forebay, Penstock, Search tank, Prime-mover, Draft-tube. Governing of turbines, Types of Turbines and their characteristics, Comparison of various types of plants.

UNIT-IV **(06 Sessions)**

Advantages of coordinated operation of different types of power plants, hydro-thermal scheduling – short term and long term.

UNIT-V **(07 Sessions)**

Tidal, Wind, Geo-Thermal, Wave, Magneto-Hydro Dynamic (MHD), Photo-voltaic and Solar Power used for generation. Recent advances such as biogas generation, hydrogen, fuel cell.

Course Outcomes:

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

- Develop mathematical models of power system for dynamic studies
- Analyze the performance of single and multi-machine systems under transient, steady state and dynamic conditions.
- Design stabilizers, dynamic resistors and SMES for the power system.
- To make students understand Economic operation of power system and importance of LFC control.
- To allow students discuss about thermal and hydro power plants operation in meeting the load demand optimally. (State and central wide installation).Also expressing importance of reactive power control through seminars.
- To improve student's ability in solving problems (numerical problems at present) by posing different problem models related to Economic Load Dispatch, Load Frequency Control and reactive power control.
- An understanding of basic abstractions of electrical power generations from conventional and nonconventional sources of energy.
- The capability to use abstractions to comprehend and analyze the impact of various system on environments and economics aspects of energy generation.
- Knowledge for learning advanced topics in electrical power system.
- The capability to incorporate the knowledge of electrical power generation in other field of science, engineering and economics.

Suggested Readings:

1. M. V. Deshpande, "Elements of Electrical Power Station Design", A. H. Wheeler and Co. Pvt. Ltd. Allahabad.
2. B. G. A. Shrotzki and W. A. Vopal, "Power Plant Engineering and Economics", McGraw Hill Book Co.
3. C. L. Wadhwa," Generation Distribution and Utilization of Electrical Engineering", New Age International, New Delhi.
4. C. L. Wadhwa, "Electrical Power Systems", New Age International, New Delhi.

Website Sources:

- www.nptel.ac.in
- www.academia.edu
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