KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

S.P.G.Chidambara Nadar - C.Nagammal Campus

S.P.G.C.Nagar, K.Vellakulam - 625 701, (Near Virudhunagar), Madurai District.

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(III & IV)

VISION:

To make the Department of Electrical and Electronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of the world.

MISSION:

Department of Electrical and Electronics Engineering is committed to

1. Inculcate technical knowledge by providing well-balanced curriculum to the urban and unreachable rural student community through “Total Quality Education”
2. Induce leadership and entrepreneurial skills with high standard of ethics and moral values to the student community.
3. Impart innovative skills to the student community by effectively involving them in research activities.
4. Create a wholesome environment to promote effective interaction of students with the industry experts

PROGRAM EDUCAITON OBJECTIVES:

Graduates of the programme will be able to

1. **Technical Knowledge:**
   Apply Technical knowledge acquired in the field of Electrical and Electronics Engineering and allied areas for practical or industrial problems for a successful professional career
2. **Problem Solving:**
   Develop and envisage appropriate solutions for real time technological problems faced by the industries and society.

3. **Personality Development**

   Demonstrate interpersonal skills, soft skills and leadership quality blended with ethical and social responsibility for a prospective career

4. **Life Long Learning:**

   Habituate life-long learning so as to adapt to the emerging needs of the profession.

PROGRAM OUTCOMES:

After going through the four years of study, the Electrical and Electronics Engineering graduates will have the ability to

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 :

Ability to design and solve engineering problems by applying the fundamental knowledge of Engineering Mathematics, Basic Sciences, Electrical and Electronics Engineering

PSO2:

Ability to understand the recent technological developments in Electrical & Electronics Engineering and develop products / software to cater the Societal & Industrial needs

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(III & IV)

SEMESTER III

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	MA1372	Transforms and Linear Algebra	BS	3	1	0	4	4
2	EE1301	DC Machines and Transformers	PC	3	1	0	4	4
3	EE1302	Transmission and Distribution	PC	3	0	0	3	3
4	EE1306	Power Plant Engineering	ES	3	0	0	3	3
5	EE1371	Electronic Devices and Circuits	ES	3	0	0	3	3
PRACTICAL								
6	EE1311	DC Machines and Transformers Laboratory	PC	0	0	4	4	2
7	EE1316	Electronic Devices and Circuits Laboratory	ES	0	0	4	4	2
8	HS1321	Interpersonal Skills - Listening and Speaking	EEC	0	0	2	2	1
			TOTAL	**15**	**2**	**10**	**27**	**22**

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	MA1472	Numerical Methods and Probability	BS	3	1	0	4	4
2	IT1471	Object Oriented Programming using JAVA (Theory cum laboratory)	ES	3	0	2	5	4
3	EE1401	AC Machines	PC	3	1	0	4	4
4	EE1402	Linear and Digital Integrated Circuits	PC	3	1	0	4	4
5	EE1403	Measurements and Instrumentation	PC	3	0	0	3	3
PRACTICAL								
6	EE1411	AC Machines Laboratory	PC	0	0	4	4	2
7	EE1481	Linear and Digital Integrated Circuits Laboratory	PC	0	0	4	4	2
8	HS1421	An Introduction to Advanced Reading and Writing	EEC	0	0	2	2	1
			TOTAL	**15**	**3**	**12**	**30**	**24**

MA1372 **TRANSFORMS AND LINEAR ALGEBRA**

L	T	P	C
3	1	0	4

OBJECTIVES:

- To acquaint the students with Fourier transform and Z-transform techniques.
- To introduce Fourier series which plays a vital role in solving boundary value problems.
- To make them understand the concepts of vector space, linear transformations and diagonalization
- To introduce the concept of inner product spaces in orthogonalization.

UNIT I FOURIER TRANSFORM **12**

Fourier integral theorem – Fourier transform pair - Sine and cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT II Z – TRANSFORM AND DIFFERENCE EQUATIONS **12**

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and final value theorems – Formation of difference equation – Solution of difference equation using Z - transform.

UNIT III VECTOR SPACES **12**

Vector spaces – Subspaces – Linear combinations of vectors-Linear Span – Linear independence and linear dependence – Bases and dimensions.

UNIT IV LINEAR TRANSFORMATION AND DIAGONALIZATION **12**

Linear transformation – Null space and range space – Dimension theorem – Matrix representation of a linear transformation – Eigen values and eigenvectors – Diagonalization of linear transformation – Application of diagonalization in linear system of differential equations.

UNIT V INNER PRODUCT SPACES **12**

Inner products spaces – Orthogonal vectors- Gram Schmidt orthogonalization process - Orthogonal complement – Least square approximation - Minimal solution to system of linear equations

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO.1 Compute the Fourier transforms of standard functions and learn the properties.

CO.2 Apply the techniques of Z- transform to get the solutions of difference equations.

CO.3 Test the given system of equation is linearly dependent or independent.

CO.4 Apply the concept of eigen values and eigenvectors for diagonalization of a matrix.

CO.5 Calculate the orthonormal vector and minimal solution to the system of linear equation using inner product techniques.

TEXT BOOKS:

1. Kreyszig, E., 2008. Advanced Engineering Mathematics. JohnWileyand sons. *Inc., New York*.
2. Grewal, B.S. and Grewal, J.S., 1996. Higher engineering mathematics. *2002, Khanna Publishers, New Delhi*.

REFERENCES:

1. Bali, N.P., Goyal, M. and Watkins, C., 2007. *Advanced Engineering Mathematics: A Complete Approach.* Laxmi Publications, Ltd..
2. James, G., 2011. *Solutions Manual to Advanced Modern Engineering Mathematics*.
3. O'neil, P.V., 2017. *Advanced engineering mathematics*. Cengage learning.
4. Ramana, B.V., 2006. *Higher Engineering Mathematics.* Tata McGraw-Hill Education.
5. Kumaresan, S., 2000. *Linear algebra: a geometric approach*. PHI Learning Pvt. Ltd..

WEB REFERENCES

1 http://soaneemrana.org/onewebmedia/ADVANCED%20ENGINEERING%20MAT EMATICS%20BY%20ERWIN%20ERESZIG1.pdf

2 http://sv.20file.org/up1/692_0.pdf

3 https://fdocuments.in/document/introductory-linear-algebra-kolman-8e.html

EE1301 DC MACHINES AND TRANSFORMERS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To introduce the concept of Magneto statics and the various laws governing it.
- To analyze the Magnetic-circuit and the working principle of electrical machines using the concepts of electromechanical energy conversion principles.
- To understand the principle of operation and Testing of transformers
- To understand the working principle of DC machine as Generator and Motor.

UNIT I MAGNETOSTATICS 12

Introduction Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law - Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic force, Torque Equation, Inductance, Energy density, Applications- Magnetic circuits Hysteresis and Eddy Current losses

UNIT II CONCEPTS IN ROTATING MACHINES AND INTRODUCTION TO TRANSFORMERS 12

Electromechanical energy conversion principles; Singly and multiply excited magnetic field systems-- rotating mmf waves. TRANSFORMERS - Construction – Principle of Operation – Equivalent Circuit Parameters- Losses

UNIT III TESTING OF TRANSFORMERS AND THREE PHASE TRANSFORMERS 12

Testing of Transformers – Efficiency and Voltage Regulation- All Day Efficiency-Sumpner's Test. Auto Transformer –Three Phase Transformers-Connections – Scott Connection– Vector Groups– Parallel Operation.

UNIT IV DC GENERATORS 12

Construction of DC Machine – Principle of Operation - Lap and Wave Windings-EMF Equations– Equivalent Circuit Model – Armature Reaction –-Commutation - Methods of Excitation- Interpoles and Compensating Winding-Characteristics of DC Generators-Applications

UNIT V DC MOTORS 12

Principle and Operations - Types–Characteristics of DC Motors -Starting and Speed Control of DC Motors –Plugging, Dynamic and Regenerative Braking -Testing and Efficiency – Retardation Test- Swinburne's Test and Hopkinson's Test –Applications of DC Motor

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO.1: Acquaint with the techniques of magnetic-circuit analysis and magnetic materials

CO.2: Describe the working of the electrical machines based on the principle of electromechanical energy conversion

CO.3: Discuss on the construction, working, performance analysis methods, testing of transformer and three phase transformer connections

CO.4: Elucidate about the construction, types, working and characteristics of DC generator

CO.5: Describe the working principle, types, characteristics, starting, speed control and testing of DC motors

TEXT BOOKS:

1. Nagrath, I.J. and Kothari.D.P., *Electric Machines'*, McGraw-Hill Education, 2000
2. Gupta, J.B., 2009. *Theory & Performance of Electrical Machines*. SK Kataria and Sons.
3. Theraja, B.L. and Theraja, A.K., 2005. *A text Book of Electrical Technology* vol 2 AC and DC machines.

REFERENCES:

1. Stephen J. Chapman, '*Electric Machinery Fundamentals*'4th edition, McGraw Hill Education Pvt. Ltd, 2010
2. B.R. Gupta ,*'Fundamental of Electric Machines*' New age International Publishers,3rd Edition ,Reprint 2015
3. S.K. Bhattacharya, '*Electrical Machines*' McGraw - Hill Education, New Delhi, 3rd Edition,2009
4. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, '*Electric Machinery'*, Sixth edition, McGraw Hill Books Company, 2003

EE1302 TRANSMISSION AND DISTRIBUTION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of Power System - Parameters of single and three-phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines – Case study - Commissioned Transmission lines in India.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABLES 9

Underground cables - Types of cables – Construction of single core and 3 core cables - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cables - Grading of cables - Power factor and heating of cables.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin's Law – AC distributions: Power factors referred to receiving end voltage - Power factors referred to respective load voltages - DC distributions: Distributor fed at one end - Distributor fed at both ends - Distributor fed at the centre - Ring distributor. - Techniques of Voltage Control: Excitation control - tap changing transformers - Power factor improvement: Static capacitors - Phase advancers. –Types of Substations – Case study – Commissioned substations of various voltage levels in Tamil Nadu.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Explain structure of electric power system & determine the transmission line parameters for various conductor configurations.

CO2 Analyze the performance of different types of transmission lines using suitable model.

CO3 Describe mechanical design of overhead transmission lines and insulators.

CO4 Explain construction of UG cables and determine the capacitance of difficult types of cables.

CO5 Outline AC / DC distribution systems, types of substations and various method of voltage control.

TEXT BOOKS:

1. Mehta, V.K. and Mehta, R., 2011. *Principles of power systems*, S. *Chand, New Delhi, India*.
2. Wadhwa, C.L., 2006. *Electrical power systems*. New Age International.

REFERENCES:

1. Singh, S.N., 2008. *Electric power generation: transmission and distribution*. PHI Learning Pvt. Ltd..
2. Faulkenberry, L.M., 1996. *Electrical power distribution and transmission*. Pearson Education India.
3. Ingole, A., 2017. *Power transmission and distribution*. Pearson Education India.
4. Bayliss, C.R., Bayliss, C. and Hardy, B., 2012. *Transmission and distribution electrical engineering*. Elsevier.
5. Ramamurthy, G., 2004. *Handbook of electrical power distribution*. Universities Press.
6. Gupta, B.R. and Chand, S., 2008. Power system analysis and design. *New Delhi*.

EE1306 **POWER PLANT ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce students to different aspects of power plant engineering with real time scenario.
- To familiarize the students to the working of different conventional and non-conventional power plants based on different fuels.
- To illustrate the economics of power generation and energy based on tariff structures.

UNIT I INTRODUCTION 7

Energy and Power – Sources of Energy. Energy Scenario – National and Global. Types of Power plants. Selection and location of power plants. Introduction to Distributed generation – Energy self-sufficient home - Case studies. Energy self-sufficient villages – Odanthurai (TN), Dharnai (Bihar)

UNIT II THERMAL POWER PLANTS 10

Steam power plant – Rankine cycle, Layout of modern coal power plant, Components and working, Super Critical Boilers, FBC Boilers. Diesel power plant and Gas turbine power plant – Layout, components and working. Case Study - Tuticorin Thermal Power Station

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants. Case Study - Koodankulam Nuclear Power Station

UNIT IV RENEWABLE ENERGY POWER PLANTS 10

Solar power plants – Photovoltaic and Thermal, Design of l kW and 1 MW solar plant. Wind power plants – Vertical and Horizontal axes Wind Turbines. Hydro Electric Power Plants – Classification, layout and selection of turbines. Pumped storage plants. Biomass power plants. Tidal and Ocean Thermal Energy plants. Geothermal plants. Fuel cell – Types. Hybrid power plants. Case Studies: Kamudi Solar Power Unit, Kayathar Wind Farm.

UNIT V ECONOMICS OF POWER GENERATION 9

Load and load duration curves. Types of consumers - Residential, Commercial and Industrial. Electricity billing – costing of electrical energy – Tariff structures – Peer to peer energy trading. Economics of power plant – Fixed and variable cost. Payback period. Net Present Value, Internal Rate of Return. Emission calculation and carbon credit.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Prepare checklist to find the suitability of a power plant in a particular location

CO2 Explain the layout, construction and working of the components of Steam, diesel and gas turbine power plants

CO3 Explain the layout, construction and working of the components inside nuclear power plants.

CO4 Demonstrate the working of various Renewable energy based power plants.

CO5 Calculate the cost of power generation, electricity billing and rate of return on power plant investments

TEXT BOOKS

1. Nag, P.K., 2014. *Power plant Engineering*, 4th Edition, McGraw Hill.
2. Rai, G.D., 2017. *Non-conventional energy sources,* 6th Edition, Khanna Publishers

REFERENCES:

1. Rai, G.D., 2015. *An Introduction to Power plant Technology*, 3rd Edition, Khanna Publishers
2. Paul Breeze, 2019. *Power Generation Technologies*, 3rd Edition, Elsevier.
3. Godfrey Boyle, 2009. *Renewable energy*, 2nd Edition, Oxford University Press.
4. Rajput, R.K., 2016. *A text book of Power Plant Engineering,* 5th Edition, Laxmi Publications.

EE1371 ELECTRONIC DEVICES AND CIRCUITS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To apply the characteristics of diodes in wave shaping circuits.
- To sketch the various characteristics of BJT, FET and thyristor.
- To compute the various parameters of CE,CB, CC amplifiers.
- To understand the various concepts involved in multistage and feedback amplifier
- To comprehend the operation of power amplifiers and oscillators circuits

UNIT I SEMICONDUCTOR DIODES AND ITS APPLICATIONS 9

PN junction diode –Structure, operation and V-I characteristics, diffusion and transition capacitance –Applications of PN diode –Switch, clipper, clamper & Rectifier– Zener Diode-Characteristics – as a voltage regulator-Introduction to special diodes: Schottky diode, Varactor diode, Tunnel diode.

UNIT II BJT AND POWER ELECTRONIC DEVICES 9

Different currents and their relations in BJT- CE, CB and CC configuration- Biasing- Fixed bias- Collector to Base bias and Voltage divider Bias- JFET & MOSFET Characteristics-Thyristors: Characteristics and applications of SCR, DIAC and TRIAC. UJT characteristics and application as relaxation oscillator.

UNIT III AMPLIFIERS 9

Equivalent hybrid model for BJT-BJT small signal model (exact and approximate) –Mid-band Analysis of CE, CB, CC amplifiers- Gain and frequency response – Design of single stage RC coupled amplifier using BJT –Small signal analysis CS and CD configuration of FET amplifier.

UNIT IV MULTISTAGE AND FEEDBACK AMPLIFIER 9

Multistage amplifier: Coupling schemes for cascading amplifier, General analysis of N-stage cascaded amplifier, Darlington pair, Cascade and Bootstrap amplifiers. Feedback amplifier: Advantages of negative feedback, Mixing and Sampling networks – Types and effects, Voltage-Series, Voltage-Shunt, Current-Series and Current-Shunt amplifier circuits. Introduction to Tuned Amplifiers

UNIT V OSCILLATORS AND POWER AMPLIFIERS 9

Oscillators: Classification, Condition for oscillation - RC oscillators: RC phase shift and Wien Bridge oscillators - Resonant frequency oscillators: Hartley, Colpitts and crystal oscillators. Power amplifiers: Class A, Class B and Class AB amplifiers, Efficiency - Distortion in power amplifiers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Explain the Structure, operation, characteristics and applications of PN junction diode and special diodes.

CO2 Describe the structure and characteristics of various types of transistors and thyristors.

CO3 Analyze the operation of simple amplifier circuits in CB, CC, CE, CS and CD configurations.

CO4 Elucidate the operation of various configurations of multistage and feedback amplifiers.

CO5 Comprehend the operation of various power amplifiers and oscillators circuits.

TEXT BOOKS:

1. Millman, J., 1979. *Microelectronics McGraw-Hill*. New York, p.5.

2. Bell, D.A., 2008. *Fundamentals of Electronic Devices and Circuits: Lab Manual*. Oxford university press.

REFERENCES:

1.Sedra, A.S. and Smith, K.C., 2015. *Microelectronic circuits* seventh edition..

2.Kumar, B. and Jain, S.B., 2007. *Electronic devices and circuits.* PHI Learning Pvt. Ltd...

3.Floyd, T.L. and Buchla, D.M., 2004. *Electric circuits fundamentals*. Pearson/Prentice Hall.

4.Neamen, D.A., 2001. *Electronic circuit analysis and design (Vol. 2).* New York, NY.: McGraw-Hill.

5.Boylestad, R.L., 2009. *Electronic devices and circuit theory*. Pearson Education India.

6.Northrop, R.B., 2003. *Analysis and application of analog electronic circuits to biomedical instrumentation*. CRC press.

EE1311 DC MACHINES AND TRANSFORMERS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To study the load characteristics of DC machines and transformers
- To determine the performance characteristics of DC machines and transformers using direct and indirect tests.
- To study the different speed control methods of DC shunt motor To study the need for starters in DC motors
- To study the various connections in three Phase transformers

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.

12 Study of starters and 3-phase transformers connections.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to correlate the theory and practice and to

CO1 Obtain the steady state characteristics of various types of DC Machines and transformers by performing the load test.

CO2 Conduct various tests on DC machines and Transformers and Analyze its performance

characteristics.

CO3 Apply the various speed control of DC shunt motor

CO4 Analyze various starters used in DC motors.

CO5 Analyze various types of connections in three phase transformers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled with Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos

EE1316 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To understand the behavior of various semiconductor devices based on experimentation.

LIST OF EXPERIMENTS

1. Characteristics of PN junction diode.
2. Characteristics of a NPN Transistor under common emitter configuration
3. Characteristics of JFET.
4. Characteristics of UJT and generation of saw tooth waveforms.
5. Frequency response characteristics of a Common Emitter amplifier.
6. Characteristics of photo diode & photo transistor.
7. Design and testing of RC phase shift oscillator.
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters.
9. Differential amplifiers using FET.
10. Study of CRO for frequency and phase measurements.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to

CO1 To obtain the characteristics of various semiconductor devices such as PN junction diode, BJT,JFET & UJT.

CO2 To design rectifiers and voltage regulators for simple applications.

CO3 To demonstrate working of differential amplifier and oscillator.

REFERENCES:

1. Kumar, B. and Jain, S.B., 2007. *Electronic devices and circuits*. PHI Learning Pvt. Ltd...

2. Floyd, T.L. and Buchla, D.M., 2004. *Electric circuits fundamentals*. Pearson/Prentice Hall.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
1	Semiconducter devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor	-
2	Resistors, Capacitors and inductors	-
3	Necessary digital IC 8	-
4	Function Generators	10
5	Regulated 3 output Power Supply 5, ± 15V	10
6	Storage Oscilloscope	1
7	CRO	10
8	Bread boards	10

HS1321 INTERPERSONAL SKILLS - LISTENING AND SPEAKING

L	T	P	C
0	0	2	1

OBJECTIVES:

The course will enable learners to

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills
- Make effective presentations

UNIT I LISTENING AS A KEY SKILL 6

Listening as a key skill- its importance- speaking – give personal information – ask for personal

information – express ability – enquire about ability – ask for clarification - Improving pronunciation– pronunciation basics –– stressing syllables and speaking clearly – intonation patterns – conversation starters: small talk.

UNIT II LISTEN TO A PROCESS INFORMATION 6

Listen to a process information- give information, as part of a simple explanation –– taking lecture notes – preparing to listen to a lecture – articulate a complete idea as opposed to producing fragmented utterances - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics

UNIT III LEXICAL CHUNKING 6

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk – greet – respond to greetings – describe health and symptoms – invite and offer –accept – decline – take leave – listen for and follow the gist- listen for detail

UNIT IV GROUP DISCUSSION 6

Being an active listener: giving verbal and non-verbal feedback – participating in a group discussion – summarizing academic readings and lectures conversational speech listening to and participating in conversations – persuade- negotiate disagreement in group work**.**

UNIT V GROUP & PAIR PRESENTATIONS 6

Formal and informal talk – listen to follow and respond to explanations, directions and instructions in academic and business contexts – strategies for presentations and interactive communication – group/pair presentations

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1 Develop their communicative competence in English with specific reference to listening

CO2 Prepare conversation with reasonable accuracy

CO3 Apply lexical Chunking for accuracy in speaking

CO4 Demonstrate their ability to communicate effectively in GDs.

CO5 Explain directions and instructions in academic and business contexts

TEXT BOOKS:

1. Brooks, M, 2011, *Skills for Success. Listening and Speaking. Level 4,* Oxford, UK.: Oxford University Press.
2. Richards, C, Jack& David Bholke, 2010, *Speak Now. Level 3,* Oxford, UK.: Oxford University Press.

REFERENCES:

1. Bhatnagar, Nitin & Mamta Bhatnagar, 2010, *Communicative English for Engineers and Professionals,* Pearson, New Delhi.
2. Hughes, Glyn & Josephine Moate, 2014, *Practical English Classroom,* Oxford, UK.: Oxford University Press.
3. Vargo, Mari, 2013, *Speak Now Level 4*, Oxford, UK.: Oxford University Press.
4. Richards, C, Jack, 2006, *Person to Person (Starter)*, Oxford, UK.: Oxford University Press.
5. Ladousse, Gillian Porter, 2014, *Role Play*. Oxford, UK.: Oxford University Press.

WEB RESOURCES:

1. https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf
2. https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html
3. https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/
4. https://www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness/unit3presentations/1opening.shtml

SEMESTER IV

MA1472 NUMERICAL METHODS AND PROBABILITY

L	T	P	C
3	1	0	4

OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To make the students to understand the knowledge of various techniques of differentiation and integration.
- To evaluate the solution of differential equation with initial and boundary conditions.
- To introduce the basic concepts of probability and random variables.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations: Fixed point iteration method – Newton Raphson method – Solution of linear system of equations: Gauss elimination method – Pivoting – Gauss Jordan method – Inverse of a matrix by Jordan Method – Iterative methods of Gauss Jacobi and Gauss Seidel – Dominant Eigen value of a matrix by Power method

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UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals: Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines – Difference operators and relations –Interpolation with equal intervals: Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials – Numerical integration : Trapezoidal rule– Simpson's 1/3 rule – Simpson's 3/8 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL AND BOUNDARY VALUE PROBLEMS FOR DIFFERENTIAL EQUATIONS 12

Initial value problem: Taylors, Euler, Modified Euler and Fourth order Runge - Kutta method

for solving first order equation. Boundary value problem: Finite difference method for linear differential equations – Laplace equations – One dimensional heat flow equation by implicit and explicit method – One dimensional wave equation by explicit method

UNIT V PROBABILITY AND RANDOM VARIABLE 12

Probability - The axioms of probability - Conditional probability - Baye's theorem - Discrete and continuous random variables - Moments - Moment generating functions – Distributions; Binomial, Poisson, Uniform, Exponential and Normal.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO.1 Compute numerical solutions to system of linear equations, algebraic, transcendental equations and Eigen value problems.

CO.2 Construct approximate polynomial to represent the data and find the intermediate values of unknown function using interpolation.

CO.3 Apply numerical methods to find the values of differentiation and integration.

CO.4 Solve the initial and boundary value problem numerically.

CO.5 Apply the concepts of probability distributions to solve engineering problems.

TEXT BOOKS:

1. Grewal, B.S. and Grewal. JS, 1996. *Numerical methods in Engineering and Science*. Khanna Publishers.
2. Milton, J.S. and Arnold, J.C., 1990. *Introduction to probability and statistics (Vol. 4).* New York: McGraw-Hill.

REFERENCES:

1. Rao, K.S., 2017. *Numerical methods for scientists and engineers*. PHI Learning Pvt. Ltd..
2. GUNAVATHI, K., 2008. *Numerical Methods Vol-IV (Tamil Nadu).* S. Chand Publishing.
3. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., 2007. *Probability and Statistics for Engineers and Scientists:* Pearson Prentice Hall. Upper Saddle River, USA.
4. Lipschutz, S. and Schiller, J., 1998*. Introduction to Probability and Statistics*, Schaum's Outline Series.
5. Gupta, S.C. and Kapoor, V.K., 2020. *Fundamentals of mathematical statistics*. Sultan Chand & Sons.

WEB REFERENCES:

1 https://fac.ksu.edu.sa/sites/default/files/numerical_analysis_9th.pdf

2 http://www.elcom-hu.com/Mshtrk/Statstics/9th%20txt%20book.pdf

3 https://cds.cern.ch/record/644736/files/3764367156_TOC.pdf

IT1471 OBJECT ORIENTED PROGRAMMING USING JAVA

(Theory cum Laboratory)

L	T	P	C
3	0	2	4

PRE-REQUISITE:

1. Fundamentals of Computing and Programming

OBJECTIVES:

- Build software development skills using JAVA programming for real world applications
- Understand and apply the OOPs features like Arrays, Strings and Packages
- Use of inheritance and inner class to develop JAVA applications
- Develop JAVA applications using Exceptions, Generic Programming and Multithreading
- Apply the concepts of I/O streams and Event driven Programming

UNIT 1 FUNDAMENTALS OF JAVA AND OBJECT ORIENTED PROGRAMMING

11 + 4 = 15

THEORY COMPONENT:

JAVA as a Programming Platform – JAVA Buzzwords – History of JAVA–Introduction to Object Oriented Programming – Using Predefined Classes – Defining Your Own Classes - Static Fields and Methods – Method Parameters - A Simple JAVA Program – Comments – Data Types – Variables and Constants – Operators- Input and Output

LAB COMPONENT:

Implementation of the following problems using JAVA

1. **Using Predefined Classes of JAVA**
   a. Write a JAVA Program to add two big integer numbers using BigInteger class
   b. Write a JAVA Program to display the calendar of the given month using LocalDate class

2. Defining Your Own Classes for Simple JAVA Programs

a. Implement a JAVA program to find the area of rectangle and circle

Implement a JAVA Program to find the sum and average of three numbers

UNIT 2 BASIC CHARACTERISTICS OF OBJECT ORIENTED PROGRAMMING

THEORY COMPONENT: 8 + 12 = 20

Control Flow - Object Construction- Packages-Documentation Comments- Arrays-Strings

LAB COMPONENT:

Implementation of the following problems using JAVA

1. Control Flow - Conditional Statements and Multiple Selection Statements

a. Prepare Electricity bill using JAVA. Create a class with the following member: Consumer number, Consumer name, previous month reading, current month reading and type of EB connection.

Calculate the domestic connection bill amount using the following tariff:

First 100 units – Rs. 1.50

per unit 101-200 units –

Rs. 3 per unit 201- 500

units – Rs. 4.50 per unit

>501 units – Rs. 7 per unit

Calculate the commercial connection bill amount using the following tariff:

First 100 units – Rs. 2.50

per unit 101-200 units –

Rs. 5 per unit 201- 500

units – Rs. 6.50 per unit

>501 units – Rs. 9 per unit

Control Flow – Looping Statements

a. Write a JAVA program to check whether the given number is Armstrong or not

b. Write a JAVA program to find the factorial of a given number

2. Object Construction

a. Develop a JAVA program to define a class called Account which contains two private data elements, an integer account number and a floating point account

balance, and three methods:

A constructor that allows the user to set initial values for account number and account balance and a default constructor that prompts for the input of the values for the above data members.

A method which reads a character value for transaction type (D for deposit and W for withdrawal), and a floating point value for transaction amount, and updates account balance.

A method, which prints on the screen the account number and account balance.

3. Packages

a. Develop a JAVA application using packages to implement the following currency converter Dollar to Indian Rupees, Euro to Indian Rupees

4. Arrays

a. Develop a JAVA program to find the largest and smallest number in an array

b. Develop a JAVA program to perform matrix multiplication

5. Strings

a. Write a JAVA program to check whether the given string is a palindrome or not.

Control Flow – Looping Statements

a. Write a JAVA program to check whether the given number is Armstrong or not

b. Write a JAVA program to find the factorial of a given number

6. Object Construction

a. Develop a JAVA program to define a class called Account which contains two private data elements, an integer account number and a floating point account balance, and three methods:

A constructor that allows the user to set initial values for account number and account balance and a default constructor that prompts for the input of the values for the above data members.

A method which reads a character value for transaction type (D for deposit and W for withdrawal), and a floating point value for transaction amount, and updates account balance.

A method, which prints on the screen the account number and account balance.

7. Packages

a. Develop a JAVA application using packages to implement the following currency converter Dollar to Indian Rupees, Euro to Indian Rupees

8. Arrays

a. Develop a JAVA program to find the largest and smallest number in an array

b. Develop a JAVA program to perform matrix multiplication

9. Strings

a. Write a JAVA program to check whether the given string is a palindrome or not.

UNIT 3 INHERITANCE AND INTERFACES 9 + 6 = 15

THEORY COMPONENT:

Classes, Super classes and Sub classes – The Cosmic Super class – Generic Array

Lists – Object Wrappers and Autoboxing – Interfaces - Inner classes

LAB COMPONENT:

Implementation of the following problems using JAVA

10. Inheritance

a. Use the abstract class Shape that include two integers and an empty method named printArea(). Construct the classes Rectangle, Triangle and Circle inherited from the class Shape. The Derived classes should include only the method printArea() that print the area of the given shape.

11. Generic Array Lists

a. Write a JAVA program to perform string operations using ArrayList. Write functions for the following

i) Append – add at end

ii) Insert – add at particular index

iii) List all string starts with given letter

12. Interfaces and Inner Classes

a. Write a JAVA program with a class named as “circle” that implements an interface named as “circleinterface” and define the methods named as “area” and “circum” in the class to find the area and

circumference of the circle.

b. Write a JAVA program to perform subtraction of two numbers using inner class

UNIT 4 EXCEPTION AND MULTITHREADING 8 + 4 = 12

THEORY COMPONENT:

Dealing with Errors – Catching Exceptions – Using Exceptions – Why Generic Programming? – Defining a Simple Generic Class – Generic Methods – Bounds for Type Variables – What are Threads? – Thread States – Thread Properties – Synchronization

LAB COMPONENT:

Implementation of the following problems using JAVA

13. Exception and Generic Programming

a. Implement the exception handling for dividing two numbers

b. Create a JAVA program that finds the maximum value based on the given type of elements using generic functions in java.

14. Multithreading

a. Write a JAVA program that implements a multi-threaded application that has three threads.
First thread generates a random integer every 1 second.
If the value is even, second thread computes the square of the number.
If the value is odd, the third thread will print the value of cube of the number.

UNIT 5 STREAMS AND EVENT DRIVEN PROGRAMMING 9 + 4 = 13

THEORY COMPONENT:

Byte Stream – Character Stream – Reading and Writing from console and files – Swing and the MVC design pattern - **Components:** Text field, Input, Choice, Text Area, Buttons, **Layout Management:** Border layout – **Listener:** ActionListener.

LAB COMPONENT:

Implementation of the following problems using JAVA

15. Streams

a. Create a JAVA program to write a student profile into a file and read the

contents from the file and display it on the screen.

16. User Interface Components with Swing

a. Create a JAVA GUI application to convert miles to kilometres when pressing the “Convert!” button. Note that you need to implement the ActionListener interface and override the actionPerformed() method. Note that 1 mile is equal to 1.609 kilometres.

TOTAL: **45 + 30 = 75 PERIODS**

COURSE OUTCOMES:

Upon successful completion of the course the students should be able to

CO1 Develop JAVA applications using Sequence statements

CO2 Apply the basic features of Object Oriented Programming to give solutions to simple JAVA applications

CO3 Build a JAVA application using Inheritance and Interface

CO4 Utilize the concept of Exception, Generic Programming and Multithreaded Programming of JAVA for developing console basedapplications

CO5 Design graphics-based JAVA applications using files and Event driven Programming

TEXT BOOK:

1. Cay, S., 2016. *Core Java-Volume I: Fundamentals*. Prentice Hall.

REFERENCES:

1. Schildt, H. and Coward, D., 2014. *Java: the complete reference* (p. 1312). New York: McGraw-Hill Education.
2. Deitel, P.J. and Deitel, H.M., 2014. *Java SE 8 for programmers*. Pearson Education.
3. Deitel, P.J., 2002. *Java how to program*. Pearson Education India.

SOFTWARE SPECIFICATIONS:

1. JDK8
2. Eclipse / Netbeans

EE1401 **AC MACHINES**

L	T	P	C
3	1	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single-phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR **12**

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and ASA methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR **12**

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR **12**

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR **12**

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star-delta starters – Speed control – Voltage control, Frequency control and V/f control – Slip power recovery scheme-Braking of three-phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES **12**

Constructional details of single-phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Construction and working principle of: Shaded pole induction motor - Linear induction motor – AC series motor - Stepper motors.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Describe the construction, working principle and performance characteristics of Synchronous Machines.

CO2 Explain principle of operation, characteristics and starting methods of Synchronous motor.

CO3 Illustrate the construction, working, characteristics and various testing methods of three phase Induction motor.

CO4 Differentiate between different types of starting and speed control methods in three-phase Induction motor

CO5 Discuss on the construction and working principle of Single-phase Induction motor and Special Machines.

TEXT BOOK:

1. D.P. Kothari and I.J. Nagrath, 2018. *'Electric Machines'*, 5th Edition, McGraw Hill.

REFERENCES:

1. P.S. Bhimbhra, 2003. *'Electrical Machinery'*, Khanna Publishers.
2. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 2003. *'Electric Machinery'*,

Mc Graw Hill.

3. Vincent Del Toro, 2016. *'Basic Electric Machines'* Pearson India Education.
4. Stephen J. Chapman, 2010. *'Electric Machinery Fundamentals',* 4th Edition, McGraw Hill.

EE1402 LINEAR AND DIGITAL INTEGRATED CIRCUITS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To describe the IC fabrication procedure.
- To analyze circuit characteristics with signal analysis using OP-AMP ICs.
- To design and construct application circuits with ICs such as OP-AMP, 555,565 etc.
- To introduce the fundamentals of digital circuits for the design of combinational logic circuits (Number systems, Boolean algebra).
- To analyze and design synchronous and asynchronous sequential circuits

UNIT I IC FABRICATION 9

IC classification, fundamentals of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging Fabrication of diodes, capacitance and resistance

UNIT II INTRODUCTION OF OP-AMP & ITS CHARACTERISTICS 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of OP-AMP – summer, differentiator and integrator

UNIT III APPLICATIONS OF OPAMP& SPECIAL IC'S 9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit-555 Timer circuit – Functional block, characteristics & applications; 566-voltage

controlled oscillator circuit; 565-phase locked loop circuit functioning and applications.

UNIT IV NUMBER SYSTEMS , BOOLEAN ALGEBRA & DESIGN OF COMBINATIONAL LOGIC CIRCUITS USING GATES 9

Number system, error detection, corrections & codes conversions, Boolean algebra: De-Morgan's theorem, switching functions and minimization using K-maps & Quine McCluskey method Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers.

UNIT V DESIGN AND ANALYSIS OF SYNCHRONOUS & A SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops - SR, D, JK and T, shift registers, counters, state assignments analysis and design of synchronous sequential circuits, state diagram; state reduction Latches - SR - D , Asynchronous sequential logic circuits-Transition table, flow table – race conditions – circuits with latches, analysis of asynchronous sequential logic circuits – introduction to design – implication table

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1 To describe and examine the various IC fabrication procedure

CO2 To discuss the DC& AC characteristics and basic applications of OP-AMP

CO3 To discuss the various applications of OP-AMP and special IC's such as 555, 565 and 566

CO4 To examine the structure of various number systems, Boolean algebra and design of combinational logic circuits

CO5 To design and analyze synchronous and asynchronous sequential circuits

TEXT BOOKS:

1. D. Roy Choudhery, Sheil B. Jain, *Linear Integrated Circuits*, second edition, New Age publishers, 2010.
2. Morris Mano.M, *'Digital Logic and Computer Design*', Prentice Hall of India, 3rd Edition, 2005.

EE1403 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on

- Basic functional elements of Measurement & Instrumentation
- Fundamentals of electrical instruments used for measuring Electrical Quantities
- Fundamentals of Electronic Instruments & Measurement of Magnetic Parameters
- Comparative methods for measurement of Resistance, Inductance & Capacitance
- Various transducers and the data acquisition systems.

UNIT I INTRODUCTION 9

Functional elements of a generalized instrument – Static and dynamic characteristics – Errors in measurement – Statistical estimation of measurements data: Arithmetic mean, Average deviation, Standard deviation, Variance and Probable error of mean – Standards and calibration

UNIT II ELECTRICAL MEASURING INSTRUMENTS 9

Principle and types of analog and digital voltmeters – Moving Iron & Moving Coil Instruments – Torque Equation, Range Extension of Ammeters and Voltmeters, Principle of multi meters, Electro Dynamometer Meters – Single and three phase watt meters and energy meters, Construction, working principle of Instrument transformers

UNIT III MAGNETIC MEASUREMENT & ELECTRONIC INSTRUMENTS 9

Magnetic measurements – Determination of B-H curve and measurements of iron loss. Magnetic disk – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT IV COMPARATIVE METHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Calibrate the parameter of a measuring instruments and interpret the measurement data

CO2 Measure the Electrical Parameters using appropriate Electrical measuring Instruments

CO3 Choose a specific Electronic Instrument based on needs and Measure Magnetic parameters

CO4 Apply comparative methods for measurement of resistance, inductance and capacitance

CO5 Select a transducer for measuring electrical and non-electrical quantities.

TEXT BOOKS

1. Sawhney, A.K. and Sawhney, P., 2016. *A course in Electrical and Electronic Measurements and Instrumentation*. Dhanpat Rai & Company.
2. Doebelin, E.O. and Manik, D.N., 2007. *Measurement systems: application and design*

REFERENCES:

1. Gupta, B.J., 2008. *A Course In Electronics & Electrical Measurements And Instrumentation.* SK Kataria and Sons.
2. Purkait, P., 2013. *Electrical and electronics measurements and instrumentation*. McGraw- Hill Education.

EE1411 **AC MACHINES LABORATORY**

L	T	P	C
0	0	4	2

OBJECTIVES:

To impart knowledge on

- determining regulation of synchronous machines
- analyzing performance characteristics of synchronous & induction machines
- predetermination of the performance characteristics of induction machines

PRACTICAL EXPERIMENTS:

1. Regulation of three-phase alternator by EMF and MMF methods.
2. Regulation of three-phase alternator by ZPF and ASA methods
3. Regulation of three-phase salient pole alternator by Slip test
4. Load test on three-phase alternator (with resistive, inductive and capacitive loads)
5. V and Inverted V curves of three-phase Synchronous Motor
6. Load test on three-phase squirrel cage induction motor
7. Load test on three-phase slip ring induction motor
8. Predetermination of performance characteristics of three-phase induction motor by circle diagram and equivalent circuit.
9. Separation of No-load losses of three-phase induction motor
10. Load test on single-phase induction motor
11. Equivalent circuit of single-phase induction motor.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Obtain performance characteristics on AC generators and motors by performing load test.

CO2 Demonstrate methods/techniques used for the determination of regulation of alternators

CO3 Predetermine the performance characteristics of induction machines

REFERENCES:

1. D.P. Kothari and I.J. Nagrath, 2018. *'Electric Machines'*, 5th Edition, McGraw Hill.
2. P.S. Bhimbhra, 2003. *'Electrical Machinery'*, Khanna Publishers.
3. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 2003. *'Electric Machinery'*, Mc Graw Hill.
4. Vincent Del Toro, 2016. *'Basic Electric Machines'* Pearson India Education.
5. Stephen J. Chapman, 2010. *'Electric Machinery Fundamentals',* 4th Edition, McGraw Hill.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Name of the Equipment	Quantity Required
1.	Synchronous Induction motor 3HP	1
2.	DC Shunt Motor Coupled with Three-phase Alternator	4
3.	DC Shunt Motor Coupled with Three-phase Slip ring Induction motor	1
4.	Three Phase Induction Motor with Loading Arrangement	2
5.	Single-Phase Induction Motor with Loading Arrangement	2
6.	Tachometer -Digital/Analog	8
7.	BLDC Motor	1
8	Single Phase Auto Transformer	2
9	Three Phase Auto Transformer	3
10	Single-Phase Resistive Loading Bank	2
11	Three-Phase Resistive Loading Bank	2
12	Capacitor Bank	1
13	SPST switch	2

EE1481 **LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY**

L	T	P	C
0	0	4	2

OBJECTIVES:

After the Completion of the course the students will be able

- To analyze circuit characteristics with signal analysis using an Operational Amplifier
- To design and construct application circuits with ICs as 555, etc.
- To design combinational logic circuits using digital IC's

Experiments using Linear Integrated

Circuits (ICs) Analog circuits:

1. Design and Implementation of various circuits using OP-AMP – Inverting, Non- inverting, Adder, Subtractor & Comparator.
2. Design and Implementation of Integrator and Differentiator circuit
3. Design and Implementation of OP-AMP based Clamper circuit/ clipper circuits.
4. Design and Implementation of Astable multi-vibrator using 555 – Timer IC
5. Study of Voltage Controlled Oscillator to generate waveforms (Sine, triangular and square wave)

Digital Circuits

6. Implementation of Boolean Functions using logic gates and Karnaugh Map
7. Design and Implementation of Adder, Subtractor, Parity Checker and code converter using basic logic gates and special IC's
8. Design and Implementation of MUX, DEMUX, Encoder and Decoder using special IC's
9. Design of Synchronous and Asynchronous counter using Flip flops and special IC's
10. Design of Shift registers using Flip flops.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will be able to

CO1 Design and demonstrate analog electronic circuits using OP-AMP

CO2 Design and demonstrate analog electronic circuits using timer 555.

CO3 Design and demonstrate digital circuits involving Boolean functions using basic logic gates.

CO4 Design and demonstrate combinational circuits such as adder, subtractor, code converters, encoders and decoders.

CO5 Design and demonstrate sequential logic circuits such as Flip-Flops, Counters (synchronous and asynchronous), and Shift Registers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Name of the Equipment's	Quantity Required	Remarks
1.	Dual ,(0-30V) variability Power Supply	10	
2.	CRO	9	30MHz
3.	Digital Multimeter	10	Digital
4.	Function Generator	8	1 MHz
5.	IC Tester (Analog	2	
6.	Bread board	10	
7.	Computer (PSPICE installed)	1	
Consumable's (sufficient quantity)			
IC 741/ IC NE555/566/565			
Digital IC types			
LED			
LM317			
LM723			
ICSG3524 / SG3525			
Transistor – 2N3391			
Diodes, IN4001,BY126			
Zener diodes			
Potentiometer			
Step-down transformer 230V/12-0-12V			
Capacitor			

Resistors 1/4 Watt Assorted
Single Strand Wire

HS1421 AN INTRODUCTION TO ADVANCED READING AND WRITING

L	T	P	C
0	0	2	1

OBJECTIVES:

The course will enable learners to

- To strengthen the reading skills of students of engineering.
- To enhance their writing skills with specific reference to technical writing
- To develop their critical thinking skills.
- To provide more opportunities to develop their project and proposal writing skills

UNIT I EFFECTIVE READING 6

Reading – Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title. Reading-Read for details-Use of graphic organizers to review and aid comprehension.

UNIT II CRITICAL READING 6

Reading– Understanding pronoun reference and use of connectors in a passage- speed reading techniques. Reading– Genre and Organization of Ideas- Reading– Critical reading and thinking-understanding how the text positions the reader.

UNIT III PARAGRAPH WRITING 6

Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence.-Write a descriptive paragraph Writing-State reasons and examples to support ideas in writing– Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT IV ESSAY WRITING 6

Writing– Elements of a good essay - Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT V EFFECTIVE WRITING **6**

Writing– Email writing- visumes – Job application- Report Writing - Project writing-Writing convincing proposals

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1 Understand how the text positions the reader

CO2 Develop critical thinking while reading a text

CO3 Develop a descriptive paragraph

CO4 Make use of sentence structures effectively when creating an essay.

CO5 Demonstrate proper usage of grammar in writing E-Mails, Job application and project proposals

TEXT BOOKS:

1. Gramer, F, Margot & Colin, S, Ward, 2011, *Reading and Writing (Level 3)* Oxford University Press, Oxford.
2. Debra Daise, CharlNorloff, and Paul Carne, 2011, *Reading and Writing (Level 4)* Oxford University Press: Oxford.

REFERENCES:

1. Davis, Jason & Rhonda LIss. 2006 *Effective Academic Writing (Level 3)* Oxford University Press: Oxford.
2. E. Suresh Kumar and et al. 2012, *Enriching Speaking and Writing Skills,* Second Edition, Orient Black swan: Hyderabad.
3. Withrow, Jeans and et al. 2004 *Inspired to Write. Readings and Tasks to develop writing skills*, Cambridge University Press: Cambridge.
4. Goatly, Andrew, 2000 *Critical Reading and Writing*, Routledge: United States of America.
5. Petelin, Roslyn & Marsh Durham, 2004 *The Professional Writing Guide: Knowing Well and Knowing Why*, Business & Professional Publishing: Australia.

WEB RESOURCES:

- http://learnenglishteens.britishcouncil.org/skills/reading
- https://learnenglish.britishcouncil.org/skills/reading
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