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. ELECTRONICS AND INSTRUMENTATION ENGINEERING

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(III & IV)

Vision of the Department:

To develop competent Electronics and Instrumentation Engineers with Societal, Environmental and Human Values through Quality Education, Training and Research

Mission of the Department:

Department of Electronics and Instrumentation Engineering is committed to

1. Impart technical knowledge and skills to meet the industry needs .
2. Build self-learning capability among the students to update the recent technology.
3. Tie up with the industries and research institution.
4. Create passion for serving the society with moral and ethical values.

Program Educational Objectives (PEOs):

Graduates of the programme will be able to

PEO 1:

Work in the Design, Automation, Testing and Software Industries.

PEO 2:

Pursue higher studies and research in the field of Process Control, Biomedical, Robotics & Automation and Renewable Energy Resources.

PEO 3:

Be an Entrepreneur by building leadership quality and teamwork.

PROGRAM OUTCOMES:

After going through the four years of study, the Electronics and Instrumentation 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 sustainability	Understand the impact of the professional engineering 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

Program Specific Outcomes (PSOs):

PSO 1: Design and develop mathematical model for transducer, process control system.

PSO 2: Select and use appropriate hardware circuit and software tools to control industrial and automation process

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.ELECTRONICS AND INSTRUMENTATION ENGINEERING

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(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	FC	3	1	0	4	4
2	EE1371	Electronic Devices and Circuits	PC	3	0	0	3	3
3	EI1301	Digital Logic Circuits	PC	3	0	0	3	3
4	EI1302	Electrical Machines	PC	3	0	0	3	3
5	EI1303	Sensors and Transducers	PC	3	0	0	3	3
PRACTICALS								
6	EI1311	Devices and Machines Laboratory	PC	0	0	4	4	2
7	EI1312	Sensors and Transducers Laboratory	PC	0	0	4	4	2
8	HS1321	Interpersonal Skills - Listening and Speaking	EEC	0	0	2	2	1
			TOTAL	**18**	**1**	**10**	**29**	**21**

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	FC	3	1	0	4	4
2	IT1471	Object Oriented Programming using JAVA (Theory Cum Lab)	FC	3	0	2	5	4
3	EI1401	Electrical and Electronics Measurements	PC	3	0	0	3	3
4	EI1402	Industrial Instrumentation	PC	3	0	0	3	3
5	EI1403	Linear Integrated Circuits and its Applications	PC	3	0	0	3	3
PRACTICALS								
6	EI1411	Industrial Instrumentation 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	**18**	**2**	**10**	**30**	**22**

SEMESTER III

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:

After completing the course the students will be able to

CO1 Compute the Fourier transforms of standard functions and learn the properties.

CO2 Apply the techniques of Z- transform to get the solutions of difference equations.

CO3 Test the given system of equation is linearly dependent or independent.

CO4 Apply the concept of eigen values and eigenvectors for diagonalization of a matrix.

CO5 Calculate the orthonormal vector and minimal solution to system of linear equation using inner product techniques.

TEXT BOOKS:

1. Erwin kreyszig, 2015. *Advanced Engineering Mathematics*, John Wiley & Sons, 10th Edition, New Delhi.
2. Grewal B,S, 2017. *Higher Engineering Mathematics*, Khanna Publishers, 44th Edition, New Delhi.
3. Friedberg, A.H., Insel, A.J. &Spence L,2004.,*Linear Algebra*, Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. Bali, N, Goyal, M,& Watkins C, 2009*, Advanced Engineering Mathematics,* Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi.
2. Glyn James, 2011, *Advanced Modern Engineering Mathematics*, Pearson Education, 4th Edition, New Delhi.
3. Peter V, O'Neil, 2012, *Advanced Engineering Mathematics*, Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi.
4. Ramana, 2010, B,V*, Higher Engineering Mathematics*, Tata McGraw Hill, 11th Reprint, New Delhi
5. Kumaresan, S.,2010, *Linear Algebra ,A Geometric Approach*, Prentice , Hall of India, New Delhi, Reprint.

EE1371 **ELECTRONIC DEVICES AND CIRCUITS**

(Common to EEE & EIE)

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 junction diode – Switch, clipper, clamper & Rectifier-halfwave, full wave, bridge Rectifier– Zener Diode- Characteristics – as a voltage regulator. Introduction to Special diodes- Schottky diode, Varactor Doide, 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 model and approximate model) – 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 amplifiers.

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

UNITV 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 a diode special diodes

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

CO3 Analyze the operation of 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. Jacob Millman 2009. *Microelectronics*, McGrawhill, 22nd reprint.
2. David, A, Bell 2009. *Fundamentals of Electronic devices and circuits* , Oxford University higher education, 6th edition

REFERENCE BOOKS:

1. Sedra & Smith 2015. *Microelectronic circuits*, Oxford University Press, 7th Edition.
2. Balbir Kumar & Shai,.B,Jain 2014. *Electronic devices and circuits,* PHI learning private limited, 2nd edition.
3. Thomas,L,Floyd 2017. *Electronic devices*, Pearson prentice hall, 10th Edition.
4. Donald,A,Neamen 2003. *Electronic Circuit Analysis and Design*, Tata McGraw Hill, 3rd Edition.
5. Robert,L,Boylestad 2009. *Electronic devices and circuit theory*, Pearson Education, 10th edition.
6. Robert,B, Northrop 2004. *Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation*, CRC Press.

EI1301 **DIGITAL LOGIC CIRCUITS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To review the concept of number system and logic families
- To design the combinational and sequential logic circuits

UNIT I REVIEW OF NUMBER SYSTEM AND LOGIC FAMILIES 7

Review of number systems and conversions-binary, octal, decimal, hexa-decimal and others, Review of codes and conversions-binary, BCD, Gray, Excess-3,bi-quinary code, error detecting and error checking . Digital Logic Families – Introduction to RTL, DTL, TTL, ECL and MOS families – wired and operation, characteristics of digital logic family – comparison of different logic families

UNIT II SIMPLIFICATION OF BOOLEAN THEOREM 7

Introduction to gates-Switching function-Boolean theorems- Simplification using Boolean Algebra- Representation of SOP & POS- Karnaugh map (up-to 6 variables)- Quine Mc-Cluskey method to simplify Boolean functions. Introduction to VHDL.

UNIT III COMBINATIONAL LOGIC CIRCUIT 12

Adder & Subtractor- Half, Full, 4 bit parallel and series adder/subtractor- Carry look ahead adder-BCD adder-Multiplexer, Demultiplexer, Encoder and Decoder- VHDL coding for combinational circuits.

UNIT IV SYNCHRONOUS SEQUENTIAL CIRCUIT 12

Flipflop & Latches-RS, JK, D and T flip flop- Master-Slave flip flop-Conversions- Design of Synchronous and Asynchronous counters- up ,down, up-down-mod-Ring and Johnson counter-Shift register- VHDL coding for synchronous sequential circuit.

UNIT V ASYNCHRONOUS SEQUENTIAL CIRCUIT AND PLD 7

Asynchronous sequential logic circuits-Transition table, flow table – race conditions – circuits with latches, analysis of asynchronous sequential logic circuits – introduction to design –implication table- hazards-programmable logic array and devices.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the learner will be able to:

CO1 Interpret, convert and represent different number systems

CO2 Manipulate and examine Boolean algebra, logic operations, Boolean functions and their simplification

CO3 Analyze the different combinational circuits

CO4 Design synchronous sequential circuits

CO5 Describe the concept of asynchronous sequential circuits and PLDs

TEXT BOOKS:

1. James, W, Bignel 2007. *Digital Electronics*, Cengage learning, 5th Edition.
2. Morris Mano,M, 2013. *Digital Design with an introduction to the VHDL*, Pearson Education.
3. Mandal 2013. *Digital Electronics Principles & Application*, McGraw Hill Education.

REFERENCE BOOKS:

1. Kothari,D.P., & Dhillon,J.S., 2016. *Digital circuits and Design*, Pearson Education.
2. Comer, 2012. *Digital Logic & State Machine Design*, Oxford Press.
3. William Keitz, 2013. *Digital Electronics-A Practical Approach with VHDL*, Pearson Education.
4. Thomas, L,Floyd 2015. *Digital Fundamentals*, Pearson Education ,11th edition.
5. Charles, H,.Roth, Jr, Lizy & Kurian John, 2013. *Digital System Design using VHDL*, Cengage.
6. Donald, P, Leach, Albert Paul Malvino & Goutam Sha, 2010. *Digital Principles and Applications*, The McGraw Hill, 7th edition.

EI1302 **ELECTRICAL MACHINES**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart basic knowledge on different AC & DC Machines.
- To introduce the concept of special machines to motivate the students to solve complex problems related to machines.
- To impart knowledge on testing and controlling of different machines.
- Make the students familiar with the testing and controlling of different machines

UNIT I TRANSFORMERS 9

Principle, Construction and Types of Transformer - EMF equation - Phasor diagrams - Regulation and efficiency of a transformer - Introduction to three phase transformer Connection. Applications of Current and Potential Transformer - Autotransformer

UNIT II DC MACHINES 9

D.C. Machines: – Principle of operation and construction of motor and generator – torque equation – Various excitation schemes – Characteristics of Motor and Generator – Starting, Speed control of D.C. Motor.

UNIT III SINGLE PHASE & THREE PHASE INDUCTION MOTOR 9

Types of single phase induction motors –Double field revolving theory- Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor - Three phase Induction motor-Construction - principle of operation - Equivalent Circuit- Types - Torque-slip characteristics - Starting methods and Speed control of induction motors.

UNIT IV SYNCHRONOUS MACHINES 9

Principle of operation, type - EMF Equation and Phasor diagrams - Synchronous motor- Rotating Magnetic field Starting Methods , Torque V- Curves, inverted – V curves – Hunting

UNITV SPECIAL MACHINES 9

Universal motor – Hysteresis motor – Switched reluctance motor – Brushless D.C motor.- Permanent magnet synchronous motor - Stepper motor

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the learner will be able to:

CO1 To understand basic concepts and working principle of electrical machines

CO2 To understand the performance characteristics of machines

CO3 To identify suitable machines for carrying out interdisciplinary projects

CO4 To apply the knowledge on various machines to choose appropriate machines for specific application useful for society.

CO5 To understand the working principle of new machines and to learn their concepts.

TEXT BOOKS:

1. Fitzgerald,A.E., Kingsley C., Umans, S. & Umans S.D., 2003. *Electric Machinery,* McGraw-Hill, 6th Edition, Singapore.
2. Cotton, H., 1999. *Advanced Electrical Technology,* Sir Isaac Pitman and Sons Ltd., London.

REFERENCE BOOKS:

1. Del Toro. V, 1995. *Electrical Engineering Fundamentals,* Prentice Hall of India, New Delhi, 2nd Edition
2. Theraja, B.L*,2007. A Text book of Electrical Technology,* Vol.II, S.C Chand and Co., New Delhi.
3. Lecture series on *Electrical Machines I and Electrical Machines II* by Dr.Krishna Vasudevan, IIT Madras

EI1303 SENSORS AND TRANSDUCERS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To expose the students to various sensors and transducers for measuring mechanical quantities.
- To make the students familiar with the specifications of sensors and transducers.
- To teach the basic conditioning circuits for various sensors and transducers.
- To introduce about advancements in sensor technology

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis-Odds and Uncertainty – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 9

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor- SQUID sensor , Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD. Acoustic Sensors – flow measurement- electromagnetic flow meter, ultrasonic flow meter, Remote Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors

UNITV SIGNAL CONDITIONING AND DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 To understand the basics of measurement system and static and dynamic characteristics of measurement system.

CO2 To select the appropriate sensor/transducer used to measure motion, proximity and Range.

CO3 To select the appropriate transducer used to measure force, magnetic field.

CO4 To select the appropriate transducer used to measure light intensity, pressure and

temperature

CO5 To design signal conditioning circuit for various transducers

TEXT BOOKS:

1. John P. Bentley, 2005. *Principles of Measurement Systems*, Pearson Education, 4th Edition.
2. Doebelin, E.O., 2008. *Measurement Systems - Application and Design, McGraw-Hill*, Edition.
3. Sawhney ,A.K., 2015. *A course in Electrical & Electronic Measurement Instrumentation*, Dhanpat Rai and Co (P) Ltd.

REFERENCE BOOKS:

1. Murthy ,D. V. S, 2012. *Transducers and Instrumentation*, PHI , 2nd Edition.
2. James, W,Dally,1993. *Instrumentation for Engineering Measurements*, Wiley, 2nd Edition.
3. John, G,Webster, 2008. *Sensors and Signal Conditioning*, Wiley Inter Science, 2nd Edition.
4. Neubert, H.K.P., 1999. *Instrument Transducers - An Introduction to their Performanc and Design*, Oxford University Press, 2nd Edition.
5. Patranabis, 2005. *Sensors and Transducers*, Prentice Hall, 2nd Edition.
6. Waldemar Nawrocki, 2005. *Measurement Systems and Sensors*, Artech House.

EI1311 DEVICES AND MACHINES LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To facilitate the students to study the characteristics of various semiconductor devices.
- To provide practical knowledge on the analysis of regulators and oscillators.
- To obtain the no load and load characteristics of D.C machines.
- To obtain the speed characteristics of D.C motor.
- To find out regulation characteristics of Transformer.

LIST OF EXPERIMENTS:

Simulation and experimental Characterization of Semiconductor diode and Zener diode.

1. Simulation and experimental Characterization of a NPN Transistor under

common emitter configurations.

2. Simulation and experimental Characterization of JFET (Draw the equivalent circuit)
3. Simulation and experimental Characterization of UJT and generation of saw tooth Waveforms
4. Simulation of Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
5. Simulation and experimental Characterization of RC and LC phase shift oscillators.
6. Load test on D.C. shunt motor.
7. Speed control of D.C. shunt motor
8. Open circuit and Load characteristics of D.C. shunt generator.
9. Open circuit and short circuit tests on single phase transformer (Determination of equivalent circuit parameters).
10. Load test on single phase induction motor.

Content Beyond Syllabus:

1. Load Test on Three Phase Induction Motor
2. Simulation of NPN transistor under CB,CC configuration

TOTAL: 60 PERIODS

Equipment Needed for 30 students

FOR DEVICES LAB:

1. Circuit Simulation Software (5 Users) (Pspice / Matlab /other Equivalent software Package) with PC.

2. Sufficient number of power supply, Galvanometer, Bread board, Multimeter, resistors, Decade Capacitance box, Decade resistance box, Decade Inductance box, CRO.

3. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, and UJT.

FOR MACHINES LAB:

1. DC Shunt Motor with Loading Arrangement - 3
2. Single Phase Transformer - 3
3. Single Phase & Three Phase Induction Motor with Loading Arrangement - 1
4. Single Phase Auto Transformer - 3
5. Single Phase Resistive Loading Bank - 2
6. Sufficient number of Ammeters, Voltmeters, (or multimeters), switches, tachometers, Wattmeters

COURSE OUTCOMES:

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

CO1 Gain knowledge on the proper usage of various electronic equipment and simulation tools for design and analysis of electronic circuits.

CO2 Get hands-on experience in studying the characteristics of semiconductor devices.

CO3 Analyze various electronic circuits such as voltage regulators, transistor amplifiers and oscillators.

CO4 Use the basic concepts to obtain the no load and load characteristics of D.C machines.

CO5 Analyze and draw conclusion from the characteristics obtained by conducting experiments on machines.

EI1312 SENSORS AND TRANSDUCERS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To familiarize the students to the basic principles of various transducers.
- To impart knowledge in static and dynamic characteristics of sensors.
- To impart knowledge in the design of signal conditioning circuits for transducers.

LIST OF EXPERIMENTS:

1. Characteristics of (Resistive and Thermo emf) temperature sensor
2. Characteristics of Piezoelectric measurement system
3. Measurement of displacement using LVDT
4. Characteristics of Hall effect sensor
5. Measurement of strain using strain gauges
6. Measurement of torque using Strain gauges
7. Measurement using proximity sensors
8. Characteristics of capacitive measurement systems
9. Loading effects of Potentiometer
10. Design of Opto-coupler using photoelectric transducers
11. Characteristics of Micro pressure and Micro accelerometer sensing device
12. Study of speed measuring devices and Gyroscope

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Regulated power supply – 8 No
2. Strain gauge and Load cell kit. – 1 No
3. Variable power supply – 1 No
4. Loads for measurement – one set
5. LVDT trainer kit – 1 No.

6. Hall effect characteristics trainer – 1 No.
7. Speed control trainer kit – 1 No.
8. Multimeter – 2 No.
9. Photo conductive trainer kit – 1 No.
10. Thermistor Trainer kit – 1 No.
11. Heater – 1 No.
12. Thermistor – 1 No.
13. Thermometer – 1 No.
14. Thermocouple trainer kit – 1 No.
15. Thermocouple and RTD trainer kit – 1 No
16. Thermocouple and RTD sensors – 1 No.
17. Bread board – 5 No.
18. Decade resistance box – 5 No.
19. Multimeter – 3 No.
20. Fixed resistance – 1 No.
21. Unknown resistors – 1 No.
22. Decade Capacitance box – 1 No.
23. CRO – 3 No.
24. Function Generator – 1 No.
25. Decade Inductance box – 1 No.
26. OptoCoupler- 1
27. Crompton potentiometer- 1
28. Microaccelerometer-1

COURSE OUTCOMES:

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

CO1 Analyze the characteristics of different sensors

CO2 Incorporate the measurement of different parameters for the given conditions

CO3 Analyze the effects of load and Calibrate the equipment

CO4 Design opto-coupler using electric transducer

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:

Upon Successful Completion of this course, the 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

TEXTBOOKS:

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

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 University Press, Oxford.
3. Vargo, Mari,2013, *Speak Now Level 4*, Oxford University Press, Oxford.
4. Richards, C, Jack,2006,*Person to Person (Starter)*, Oxford University Press, Oxford.
5. Ladousse, Gillian Porter,2014, *Role Play*. Oxford University Press, Oxford.

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.

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 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

UNITV PROBABILITY ANDRANDOM 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

CO1 Compute numerical solutions to system of linear equations, algebraic, transcendental equations and Eigen value problems.

CO2 Construct approximate polynomial to represent the data and find the intermediate values of unknown function using interpolation.

CO3 Apply numerical methods to find the values of differentiation and integration.

CO4 Solve the initial and boundary value problem numerically.

CO5 Apply the concepts of probability distributions to solve engineering problems

TEXT BOOKS:

1. Grewal, B. S., and Grewal, J. S., 2016, *Numerical methods in Engineering and Science*, Khanna Publishers,10th Edition Reprint.
2. Milton, S. J., and Arnold, J. C., 2001, *Introduction to Probability and Statistics*, McGraw Hill-Education,4th Edition.

REFERENCE BOOKS:

1. SankarRao K., 2018, *Numerical Methods for Scientists and Engineers*, Prentice Hall of India Private, 4th Edition.
2. Kandasamy, P., Thilagavathy K., and Gunavathy, K., 2014, *Numerical Methods* Chand Co. Ltd , 3rd Edition Reprint .
3. Walpole, R.E., Myers, R. H., Myers, S. L., and Ye, K.E., 2007, *Probability and Statistics for Engineers and Scientists,* Pearsons Education, 8th Edition
4. Lipschutz,S., and Schiller, J., 2011 ,*Schaum's outlines - Introduction to Probability Statistics*, Tata McGraw-Hill, 1st Edition.
5. Gupta, S. C., and Kapoor, V. K., 2015, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons,11thEditionReprint

IT1471 OBJECT ORIENTED PROGRAMMING USING JAVA
(Common to EEE,EIE & MTR)

L	T	P	C
3	0	2	4

PRE-REQUISITE :

- 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 I FUNDAMENTALS OF JAVA AND OBJECT ORIENTED PROGRAMMING **11+4**

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

UNIT II BASIC CHARACTERISTICS OF OBJECT ORIENTED PROGRAMMING **8+12**

Theory Component:

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

Lab Component:

Implementation of the following problems using JAVA

3. **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

4. **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
5. **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.
6. **Packages**
   a. Develop a JAVA application using packages to implement the following currency converter Dollar to Indian Rupees, Euro to Indian Rupees
7. **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
8. **Strings**
   a. Write a JAVA program to check whether the given string is a palindrome or not.

UNIT III INHERITANCE AND INTERFACES 9+6

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

9. 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.

10. 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

11. 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 IV EXCEPTION AND MULTITHREADING 8+4

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

12. 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.

13. 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 V STREAMS AND EVENT DRIVEN PROGRAMMING 9+4

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

14. 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.

15. 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+30PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the students will 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 based applications
CO5 Design graphics-based JAVA applications using files and Event driven Programming

TEXT BOOKS:

1. Cay,S.Horstmann, 2019.*Core JAVA Volume – I Fundamentals***,** Pearson Education,11th edition.

REFERENCE BOOKS:

1. Herbert Schildt, 2014,*Java: The Complete Reference*, McGraw Hill Education, 11thedition.
2. Paul Deitel,& Harvey Deitel, 2015.*Java SE8 for Programmers*, Pearson Education,3rd edition.
3. Deitel, P.J., & Deitel, H.M., 2011.*Java: How to Program Java 2*, Prentice Hall, 7th edition.

EI1401 **ELECTRICAL AND ELECTRONIC MEASUREMENTS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To expose the students to the design of bridges for the measurement of resistance, capacitance and inductance.
- To give an overview of current, voltage and power measuring electrical and electronics instruments.
- To give an overview of test and measuring instruments.

UNIT I MEASUREMENT OF R,L,C 9

Resistance Measurement - DC Bridges: Wheatstone bridge, Kelvin double bridge, High Resistance measurement-Loss of charge method, Direct deflection methods-Earth Resistance Measurements- AC Bridges: Inductance Measurement - Maxwell‘s bridge, Hay‘s bridge, Anderson bridge -Capacitance Measurement: Schering bridge – Measurement of Q factor - Western digital ac bridge- Sources and errors in AC bridge circuits.

UNIT II MEASUREMENT OF VOLTAGE AND CURRENT 9

Classification of electrical instruments - Deflecting, controlling and damping torques - D‘Arsonval Galvanometer: Principle and operation – Different types of electrical measuring instruments: Principle, construction and operation of Moving coil, Moving iron, Electro

dynamometer, Induction and Rectifier types, Errors and compensation – Extension of range of voltmeter and ammeter.

UNIT III MEASUREMENT OF POWER AND ENERGY 9

Electrodynamometer type wattmeter: Theory & its errors, Methods of correction – LPF wattmeter – Phantom loading – Induction type kWh meter – Induction type energy meter – Calibration of wattmeter and Energy meter.

UNIT IV POTENTIOMETERS AND INSTRUMENT TRANSFORMERS 9

DC potentiometer: Basic circuit, standardization, Laboratory type (Crompton‘s) – AC potentiometers: Drysdale (polar) type, Gall-Tinsley (coordinate) type – Applications of DC and AC potentiometers – Leeds Northrup self balancing potentiometer – Instrument Transformers: C.T and P.T – construction, theory, operation and characteristics.

UNIT V ELECTRONIC MEASUREMENTS 9

Electronic voltmeter, current measurement with electronic instruments- Digital Multimeter – Digital frequency meter – Programmable decade frequency synthesizer – Basic swept receiver spectrum analyzer – Digital Storage Oscilloscope-Mixed Signal Oscilloscope- LED, LCD and Organic LED displays.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 Select the suitable method for measuring Resistance, Inductance and Capacitance.

CO2 Understand the working principle, theory of operation and solve the problems in differ types of indicating instruments

CO3 Understand the working principle, theory of operation and solve the problems Electrodynamometer type wattmeter and induction type Energy meter

CO4 Express the concept of AC and DC Potentiometer and the working principle operation of Current and potential transformer

CO5 Illustrate the construction and working of various electronic measuring devices

.

TEXT BOOKS:

1. Sawhney, A.K., 2019, *A Course in Electrical & Electronic Measurements and Instrumentation*, DhanpatRai and Company Private Limited,11th Edition.
2. Gupta, J.B., 2003, *A Course in Electronic and Electrical Measurements and*

Instrumentation, S.K. Kataria and Sons, Delhi.

REFERENCE BOOKS:

1. Golding, E.W., & Widdis, F.C., 2011, *Electrical Measurements and Measuring Instruments*, A.H.Wheeler and Company.
2. Kalsi, H.S., 2010, *Electronic Instrumentation*, Tata McGraw Hill Education Private Ltd, Third edition.
3. Martin, U. Reissland, 2001, *Electrical Measurement – Fundamental Concepts and Applications*, New Age International Private Limited.
4. Rajput, R.K., 2013, *A Course in Electrical & Electronic Measurements and Instrumentation*, S.Chand Publications, 4th edition.

EI1402 INDUSTRIAL INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- Learn about Tachometer, Torque meter and various densitometers.
- Have an adequate knowledge about pressure transducers.
- Have an idea about the temperature standards, calibration, thermocouples and pyrometer techniques.
- Study about various types of flow meters and their calibration.
- Have sound knowledge about various types of viscometers, level measurements, humidity and moisture measurements adopted in industries.

UNIT I SPEED, TORQUE & DENSITY MEASUREMENTS 9

Measurement of Speed- Revolution Counter, Drag cup tachometer, Stroboscope, AC & DC tacho generators, Capacitive tachometer- Speed measurement using reluctance pick-up, photo-transducer- Torque measurements using strain gauges and magneto elastic principle – Density measurements for liquids and gases.

UNIT II PRESSURE MEASUREMENT 9

Manometers, Bourdon gauges, Bell gauges, Electrical types – Vacuum gauges, McLeod gauge, Knudsen gauge, Pirani gauge, thermo couple gauge, ionization gauge, Differential Pressure transmitter – Pneumatic and electrical types-Calibration of pressure gauges.

UNIT III TEMPERATURE MEASUREMENT 9

Temperature Scales, Temperature Standard, Bimetallic thermometer, filled – in thermometers, Vapour pressure thermometers, Laws of thermocouples- cold junction compensation of thermocouples, thermo pile, installation of thermocouples-radiation pyrometer, optical pyrometer.

UNIT IV FLOW MEASUREMENT 9

Variable head flow meters, orifice plate, venturi tube, dall tube, flow nozzle, pilot tube-rotameter, mass flowmeter, positive displacement meter, turbine flow meter, solid flow measurement, flow meter calibration.

UNITV LEVEL, HUMIDITY, MOISTURE, VISCOSITY MEASUREMENTS 9

Measurement of level: Sight glass, float gauges, bubbler tube, Differential pressure methods – Hydra step systems- Electrical types of level gauges using resistance, Capacitance, Nuclear radiation and ultrasonic sensors. Humidity: dew point, psychrometers – Hydrometers Moisture measurement in Granular materials, wood and paper. Viscosity terms- Saybolt viscometer – Rotameter Type viscometer.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 Describe the different methods to measure speed, torque and density.

CO2 Understand the different techniques and its operation of pressure measuring instrument used in process industries.

CO3 Select the appropriate temperature measuring instruments in the process industries.

CO4 Select the appropriate flow measuring instrument under specific conditions.

CO5 Comprehend the concept of the operation of measurement level, viscosity, humidity and moisture used in industries.

TEXT BOOKS:

1. Doebelin, E.O., and Manik, D.N., 2011, *Measurement systems Application and Design*, McGraw-Hill Education, 6th edition.

2. Patranabis, D., 2017, *Principles of Industrial Instrumentation*, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 3rd Edition.

REFERENCE BOOKS:

1. Liptak, B.G., 2014. *Instrumentation Engineers Handbook (Measurement)*, CRC Press, 4th edition.
2. Sawhney, A.K., & Sawhney,P., 2018. *A Course on Mechanical Measurements, Instrumentation and Control*, Dhanpath Rai and Co.
3. Eckman.D.P., 2016. *Industrial Instrumentation*, Wiley Eastern Ltd.
4. Jayashankar, V., *Lecture Notes on Industrial Instrumentation*, NPTEL, E-Learning Course, IIT Madras.
5. Alok Barua, *Lecture Notes on Industrial Instrumentation*, NPTEL, E-Learning Course, IIT Kharagpur.
6. Jain, R.K., 2008. *Mechanical and Industrial Measurements*, Khanna Publishers, New Delhi.
7. Singh,S.K., 2010. *Industrial Instrumentation and Control*, Tata McGraw Hill Education Pvt. Ltd., 3rd edition.

EI1403 LINEAR INTEGRATED CIRCUITS AND ITS APPLICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide in-depth instructions on the characteristics and applications of operational amplifiers, timers and voltage regulators.

UNIT I IC FABRICATION 9

IC classification – Various processes in monolithic IC Fabrication techniques –Epitaxial growth, masking and etching, diffusion of impurities -Fabrication of diodes, capacitance, resistance FETs and PV Cell

UNIT II CHARACTERISTICS OF OP-AMP 9

Ideal OP-AMP – DC and AC Characteristics – Inverting and Non–inverting Amplifier – Differential amplifier – Summer, differentiator and integrator. V-I & I-V Converters.

UNIT III APPLICATIONS OF OP-AMP 9

Instrumentation amplifier – Log and antilog amplified-Filters – Comparators – Multivibrators – Peak detector, Sample and Hold circuit – D/A converters – A/D converters.

UNIT IV SPECIAL ICS 9

555 Timers - Monostable and Astable Multivibrators – Schmitt Triggers – Voltage Controlled Oscillator IC 566 – Phase Locked Loops – Applications-Analog multiplier AD633

UNITV APPLICATION ICS 9

IC voltage regulators – LM78XX, 79XX – Variable voltage regulators -switching regulators LM317,723 – LM 380 power amplifier, ICL 8038 function generator– SMPS

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 Describe the IC fabrication procedure for basic electronic circuits.

CO2 Infer the characteristics of OP -AMP ICs.

CO3 Design the basic applications of Op–amp.

CO4 Interpret the internal functional blocks and the applications of special ICs.

CO5 Illustrate the operation of application ICs.

TEXT BOOKS:

1. Gayakwad, R.A., 2009.*Op-amps & Linear Integrated Circuits*, Prentice Hall of India, New Delhi, 4th edition.
2. Roy Choudhury, & Shail Jain, 2014.*Linear Integrated Circuits*, New Age International Publishers, 7th Edition.
3. David,A. Bell, 2011.*Op–amp & Linear ICs*, Prentice Hall Private Limited.

REFERENCE BOOKS:

1. Sergio Franco, 2002, *Design with operational amplifiers and Analog Integrated circuits*, Tata McGraw Hill.
2. Sedra Smith, 2009, *Microelectronic Circuits*, Oxford University Press, 6thEdition.
3. Jacob Millman, & Christos,C. Halkias,2003, *Integrated Electronics – Analog and Digital circuits system*, Tata McGraw Hill Private Limited.
4. Robert, F. Coughlin, & Fredrick, F. Driscoll, 2002, *Op–amp and Linear ICs*, Pearson Education, 4th Edition.

EI1411 INDUSTRIAL INSTRUMENTATION LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To impart an adequate knowledge and expertise to handle equipment generally available in an industry.
- To make the students aware about calibration of meters, sensors and transmitters.
- To make the students conscious about the working and operation of different types of analytical instruments.
- To identify, formulate and analyze problems regarding sensors and transmitter.

LIST OF EXPERIMENTS:

1. Measurement of speed, torque and vibration
2. Calibration of ammeter, voltmeter and wattmeter using multifunction calibrator
3. Calibration of pressure gauge using dead weight tester.
4. Measurement of level using d/p transmitter and fibre optics system.
5. Measurement of flow using orifice plate
6. Calibration of rotameter and thermocouple.
7. Design of linearizing circuits and cold junction compensation circuit for thermocouples.
8. Design of orifice plate and rotameter.
9. Design and Testing of Electromagnetic Flow meters.
10. Measurement of temperature using IR thermometer and IC sensor
11. Measurement of Absorbance and Transmittance of Test solutions using UV-Spectrometer.
12. Measurement of Conductivity, Moisture and Viscosity of test solutions.
13. Standardization and measurement of pH values of different solutions
14. Measurement and analysis of ECG and pulse rate.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Tacho meter 1
2. Torque trainer 1
3. Piezo electric vibration measurement system 1
4. Multifunction Calibrator 1
5. Dead weight tester with pressure gauge 1
6. DP transmitter 1
7. Fibre optics level measurement system 1
8. Orifice plate 1
9. Rotameter and Thermocouple 1

10. Electromagnetic Flow sensor 1
11. IR thermometer & LM 35 1
12. UV – Visible spectrophotometer 1
13. Conductivity meter 1
14. Saybolt Viscometer 1
15. pH meter 1
16. ECG trainer 1
17. Pulse rate trainer 1

COURSE OUTCOMES:

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

CO1 Demonstrate the industrial instruments for measuring industrial process parameters

CO2 Suggest a suitable measuring instrument for an industrial application.

CO3 Design the instrumentation circuits for temperature and flow measurement systems.

CO4 Interpret the industrial process parameters such as flow, level, temperature, pressure, viscosity, pH, conductivity, UV absorbance and transmittance at the specific conditions.

CO5 Analyze physiological parameters such as BP, ECG and pulse rate.

EE1481 LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY

(Common to EEE & EIE)

L	T	P	C
0	0	4	2

OBJECTIVES:

- 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

Analog circuits :

1. Design and Implementation of amplifier circuits using OPAMP – Inverting, Non-inverting, Adder, Subtractor & Comparator.
2. Design and Implementation of Integrator and Differentiator circuit using OPAMP
3. Design and Implementation of OPAMP based Clamper circuit/ clipper circuits.
4. Design and Implementation of Astable multi-vibrator using 555 – Timer IC
5. Study of Voltage Controlled Oscilloscope to generate waveform

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 flop and special IC.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: (3 per Batch)

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			

COURSE OUTCOMES:

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

CO1 Design and demonstrate analog electronic circuits using operational amplifier

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.

HS1421 AN INTRODUCTION TO ADVANCED READING AND WRITING

L	T	P	C
0	0	2	1

OBJECTIVES:

- 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 Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence.-Write a descriptive paragraph

UNIT II CRITICAL READING 6

Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in writing– Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III PARAGRAPH WRITING 6

Reading– Understanding pronoun reference and use of connectors in a passage- speed

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

UNIT IV ESSAY WRITING 6

Reading– Genre and Organization of Ideas- Writing– letter of recommendation- Email writing- visumes – Job application- project writing-writing convincing proposals.

UNIT V EFFECTIVE WRITING 6

Reading– Critical reading and thinking- understanding how the text positions the reader-identify Writing– Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon Successful Completion of this course, the 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.

REFERENCE BOOKS:

1. Davis, Jason & Rhonda LIss.2006, *Effective Academic Writing (Level 3),* Oxford University Press: Oxford.
2. Suresh Kumar, E., 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:

1. http://learnenglishteens.britishcouncil.org/skills/reading
2. http://learnenglish.britishcouncil.org/skills/reading
3. http://www.readingrockets.org/article/25-activities-reading-and-writing-fun
4. http://linguapress.com/advanced.html