3rd Semester Syllabus
(2018-22 batch for AEIE dept.)

Department of Applied Electronics and Instrumentation Engineering
Curriculum for Applied Electronics & Instrumentation Engineering
Under Autonomy (**GR A:** ECE, EE, EIE, BME; **GR B:** CSE, IT, ME, CE, FT)

Implemented from the Academic Year 2018
2nd Year, 3rd Sem

3rd Semester								
Sl No	**Paper Code**		**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	M 301	BS	Mathematics – III	3	1	0	4	4
2	EI 301	PC	Analog Electronic Circuits	3	0	0	3	3
3	EI 302	PC	Digital Electronic Circuits	3	0	0	3	3
4	EI 303	ES	Circuit Theory and Networks	3	1	0	4	4
5	EI 304	PC	Electrical & Electronic Measurement & Instrumentation	3	0	0	3	3
Total of Theory							**17**	**17**
B. PRACTICAL								
6	EI 391	PC	Analog Electronic Circuits Lab	0	0	3	3	1.5
7	EI 392	PC	Digital Electronic Circuits Lab	0	0	3	3	1.5
8	EI 393	ES	Circuits Theory and Networks Lab	0	0	3	3	1.5
9	EI394	PC	Electrical & Electronic Measurement & Instrumentation Lab	0	0	3	3	1.5
C.SESSIONAL								
10	MC 381	MC	Technical Skill Development-I	0	0	2	2	2units
D. PROJECT*								
11	**Project Code**		**Project Name**	**Contact Hours /Week**				**Credit Points**
	M 351		Mathematics- III Project	1				0.5
	EI 351		Analog Electronic Circuits	1				0.5

		Project		
	EI 352	Digital Electronic Circuits Project	1	0.5
	EI 353	Circuit Theory and Networks Project	1	0.5
	EI 354	Electrical & Electronic Measurement & Instrumentation Project	1	0.5
Total of Theory, Practical, Sessional & Project			**33**	**23+2**

* Student need to select any four projects (Total Credit: 0.5+0.5+0.5+0.5=2)

Course Name: Mathematics- III
Course Code: M 301
Total Contact Hours: 44
Credit: 4

Prerequisite:

The students to whom this course will be offered must have the concept of (10+2) standard calculus, basic probability and differential equations.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with advanced techniques for solving ordinary differential equations and basic techniques for solving partial differential equations. It also aims to equip the students with concepts and tools of calculus of complex variables, Fourier series and Fourier transform, and probability distribution as an intermediate to the advanced level of applications that they would find useful in their disciplines.

Course Outcomes (COs):
On successful completion of the learning sessions of the course, the learner will be able to:

CODES	BLOOM'S TAXONOMY	DESCRIPTIONS
M 301.1	Remembering	Recall the underlying principle and properties of Fourier series, Fourier transform, probability distribution of a random variable, calculus of complex variable, partial differential equation and ordinary differential equation.
M 301.2	Understanding	Exemplify the variables, functions, probability distribution and differential equations and find their distinctive measures using the underlying concept of Fourier series, Fourier transform, probability distribution of a random variable, calculus of complex variable, partial differential equation and ordinary differential equation.
M 301.3	Applying	Apply Cauchy's integral theorem and the residue theorem to find the value of complex integration, and compute the probability of real world uncertain phenomena by indentifying probability distribution that fits the phenomena.
M 301.4	Applying	Solve partial differential equation using method of separation of variables and ordinary differential equation using techniques of series solution and special function (Legendre's and Bessel's).
M 301.5	Analyzing	Find the Fourier series and Fourier transform of functions by organizing understandings of underlying principles and also evaluate the integral using Parseval's identity.

Course Content:

MODULE I: ***Fourier series and Fourier Transform: (12 Lectures)***

Fourier series: Dirichlet's Conditions; Euler's Formula for Fourier Series; Fourier Series for functions of period 2π; Sum of Fourier series (examples); Theorem for the convergence of Fourier series (statement only); Fourier series of a function with its periodic extension; Half range Fourier series: Construction of half range Sine series and half range Cosine Series; Parseval's identity (statement only) and related problems.
Fourier Transform: Fourier Transform, Fourier Cosine Transforms, Fourier Sine Transforms (problems only); Properties of Fourier Transform: Linearity, Shifting, Change of Scale, Modulation (problems only); Fourier Transform of Derivatives (problems only); Convolution Theorem (statement only), Inverse of Fourier Transform (problems only).

MODULE II: ***Probability Distributions: (10 Lectures)***

Random Variable: Discrete and Continuous (definition & examples); Probability Distribution (definition & examples); Probability Mass Function, Probability Density Functionand Distribution Function for a single random variable only (definition, properties & related problems); Expectation, Varianceand Standard Deviation for a single random variable only (definition, properties & related problems); Binomial Distribution, Poisson Distribution, Binomial Approximation to Poisson Distribution and Normal Distribution (problems only), Mean, Variance and Standard Deviation of Binomial, Poisson and Normal Distribution (problems only).

MODULE III: ***Calculus of Complex Variable: (12 Lectures)***

Functions of a Complex Variable (definition and examples); Concept of Limit, Continuity and Differentiability (problems only); Analytic Functions (definition and examples); Cauchy-Riemann Equations (statement only& related problems); Sufficient condition for a function to be analytic (statement only & related problems).
Concept of Simple Curve, Closed Curve, Smooth Curve & Contour; Some elementary properties of complex integrals (problems only); Cauchy's Theorem (statement only & related problems); Cauchy's Integral Formula(statement only & related problems); Cauchy's Integral Formula for the derivative of an analytic function(statement only & related problems); Cauchy's Integral Formula for the successive derivatives of an analytic function (statement only & related problems); Taylor's series and Laurent's series (problems only).
Zero of an Analytic Function and its order (definition & related problems); Singularities of an Analytic Function: Isolated Singularity and Non-isolated Singularity (definition & related problems); Essential Singularities, Poles (Simple Pole and Pole of Order m) and Removable Singularities (definition & related problems); Determination of singularities and their nature (problems only); Residue (definition & examples); Determination of the residue of a given function; Cauchy's Residue theorem (statement only & related problems).

MODULE IV: ***Partial Differential Equation (PDE) and Series Solution of Ordinary Differential Equation (ODE): (10 Lectures)***

Solution of PDE: Method of Separation of Variables.
Solution of Initial Value & Boundary Value Problem: One Dimensional Wave Equation, One Dimensional Heat Equation, Two Dimensional Laplace Equation.
Series solution of ODE: General method to solve $P_0\, y'' + P_1 y' + P_2 y = 0$ and related problems to Power series method**,** Bessel's Function, Legendre Polynomial.

Project Domains:

1. Study of physical processes through PDE and ODE.
2. Application of calculus of complex variable in real world engineering problems.
3. Study of uncertainty in real world phenomena using probability distribution.
4. Application of Fourier series and Fourier transform in engineering problems.

Text Books:

1. Herman, R. L. *An Introduction to Fourier Analysis*, Chapman and Hall/CRC, 2016.
2. Grafakos, L. *Classical Fourier Analysis*, Springer, India, Private Ltd.
3. Das, N.G. Probability and Statistics; The McGraw Hill Companies.
4. Gupta, S. C. and Kapoor, V. K. *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons.

5. Mathews, J. H. and Howell, R. W. *Complex Analysis for Mathematics & Engineering,* Jones & Bartlett Pub, 2006.
6. Chowdhury, B. *Elements of Complex Analysis*, New Age International, 1993.
7. Raisinghania, M .D. *Advanced Ordinary & Partial Differential. Equation*; S. Chand Publication.
8. Ross, S. L. *Differential Equations*, John Willey & Sons.
9. Grewal, B. S. *Higher Engineering Mathematics*, Khanna Pub.
10. Kreyszig, E. *Advanced Engineering Mathematics*, John Wiley & Sons, 2006.

Reference Books:

1. Gray, R. M. and Goodman, J. *Fourier Transforms: An Introduction for Engineers,* Springer, US, 1995.
2. Lipschutz & Lipson, *Schaum's Outline in Probability (2ndEd)*, McGraw Hill Education.
3. Spiegel, M. R. *Theory and Problems of Probability and Statistics (Schaum's Outline Series),* McGraw Hill Book Co.
4. Goon, A.M., Gupta M .K. and Dasgupta, B. *Fundamental of Statistics*, The World Press Pvt. Ltd.
5. Soong, T. T. *Fundamentals of Probability and Statistics for Engineers*, John Wiley & Sons Inc, 2004.
6. Delampady, M. *Probability & Statistics*, Universities Press.
7. Spiegel, M. R. *Theory and Problems of Complex Variables (Schaum's Outline Series)*, McGraw Hill Book Co.
8. Sneddon, I. N. *Elements of Partial Differential Equations,* McGraw Hill Book Co.
9. Boyce, W. E. and DiPrima, R. C. *Elementary Differential Equations and Boundary Value Problems*, Wiley India, 2009.
10. Rao, B. *Differential Equations with Applications & Programs*, Universities Press.
11. Murray, D. *Introductory Courses in Differential Equations*, Universities Press.

CO-PO Mapping:

PO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
M 301.1	3	1	1	-	-	-	-	-	-	-	-	1
M 301.2	3	2	1	-	-	-	-	-	-	-	-	1
M 301.3	3	2	2	-	-	-	-	-	-	-	-	1
M 301.4	3	2	2	-	-	-	-	-	-	-	-	1
M 301.5	3	3	2	3	-	-	-	-	-	-	-	1

ANALOG ELECTRONIC CIRCUITS
SUBJECT CODE: EI 301
TOTAL NO. OF CLASSS: 35
CONTACT HOURS: 35 HOURS
CREDIT: 3

Course Objective:

1. Provide a strong foundation on Linear Circuits.
2. Familiarize students with applications of various IC's.
3. Having a broad coverage in the field that is relevant for engineers to design Linear circuits using Op-amps.
4. Familiarize the conversion of data from Analog to Digital and Digital to Analog.

Course Outcome:

Student will be able to

EI 301.1: Define significance of Op Amps and their importance.
EI 301.2: Costruct Circuit using Analog IC's.
EI 301.3: Apply the concepts in real time applications.
EI 301.4: Use OP Amp to generate sine, Square, Triangular wave forms
EI 301.5: Design analog to digital and digital to analog converter.

Module I: **[3]**

Small signal amplifiers: Introduction to Analog Integrated Circuits, BJT Modeling- hybrid model of transistors; Emitter follower circuits, High frequency model of transistors. FET Small signal analysis - Source follower

Module II: **[9]**

Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band amplifier.

Feedback Amplifiers & Oscillators: Feedback concept, Voltage series-shunt, current series-shunt feedback Configurations, Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wien bridge and crystal oscillators

Module III: **[14]**

Operational Amplifier: Introduction to Integrated Circuits, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback loop (positive & negative), Block Diagram of OPAMP, Ideal OPAMP

Applications of Operational Amplifiers: analog adder, subtractor, integrator, differentiator, comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Analog multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running Multivibrator , zero crossing detector

Multivibrator – Monostable, Bistable, Astable multivibrators ; Monostable and astable operation using 555 timer.

Module IV: **[9]**

Large signal Amplifiers: Introduction to power amplifiers (Class A, B, AB)

Power Supply:

Analysis for DC voltage and ripple voltage with C, L-C and C-L-C filters in Rectifier Circuit - Regulated DC power supplies- Line regulation, output resistance and temperature coefficient, Series and Shunt Voltage Regulation – percentage regulation, Fixed output voltage IC regulator 78xx and 79xx series , Adjustable output voltage regulator, LM 337 series power supply ICs , Concept of **Switched** Mode Power Supply`

Text Books:
1. Millman Halkias – Integrated Electronics, McGraw Hill
2. Schilling & Belove—Electronic Circuit: Discrete & Integrated, 3/e, McGraw Hill
3. Ramakant A. Gayakwad —Op- Amps and linear Integrated Circuits, Pub: PHI
4. Boylested & Nashelsky- Electronic Devices and Circuit Theory- Pearson/PHI
5. "Operational Amplifiers and Linear Integrated Circuits" by Robert F. Coughlin, Frederick F. Driscoll

Reference Books:
1. Rashid-Microelectronic Circuits- Analysis and Design- Thomson(Cenege Learning)
2. Linear Integrated Circuits – D. Roy Choudhury & Shail B. Jain
3. Analog Integrated Circuits – J. B. Gupta

CO-PO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
EI301.1	-	-	2	-	-	-	-	-	-	-	-	-	3	3	3
EI301.2	1	-	1	3	-	-	-	-	-	-	-	-	3	2	2
EI301.3	-	2	-	-	-	-	-	-	-	-	-	-	2	3	3
EI301.4	1	-	-	3	-	-	-	-	-	-	-	-	3	3	2
EI301.5	1	2	-	3	-	-	-	-	-	-	-	-	2	3	3

Name of the Paper: Digital Electronic Circuits
Paper Code: EI 302
Contact (periods/week): L-T-P: 3L
Credit point: 3
Number of lectures: 35

Course Objective:

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To introduce number systems and codes
3. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
4. Give students the basic tools for the analysis and design of combinational circuits and sequential circuits
5. To introduce the concept of memories, programmable logic devices and digital ICs.
6. To acquire the knowledge of Digital-to-Analog Conversion, Analog-to-Digital Conversion.

Course Outcome:

On completion of this Subject/Course the student shall be able to:
EI 302.1: understand of the fundamental concepts and techniques used in digital electronics.
EI 302.2: apply the concept of various number systems in digital design.
EI 302.3: analyse and design various cost effective combinational and sequential circuits.
EI 302.4: solve complex circuit problem by applying knowledge of digital electronics.

Module1:

Introduction:

Digital system, Comparison between Analog and Digital system, Logic level, Element of Digital Logic, Functions of Digital logic.

Data and number systems:

Number system: Binary, Octal and Hexadecimal representation and their conversions.
Number Representation: Signed binary number representation with 1's and 2's complement methods, Fixed point - Floating point
Binary Codes: BCD- Gray code- Excess 3 code- Alpha Numeric codes – Error detecting and correcting codes-properties
Binary Arithmetic: Addition, subtraction, Multiplication, Division, Addition and subtraction by 1's and 2's complement, BCD addition and subtraction

[4]

Boolean algebra:

Theorems and operations, Boolean expressions and truth tables, Representation in SOP and POS forms Boolean functions; Min-term and Max-term expansions Minimization of logic expressions by algebraic method, K-map method and Quine- McClauskey method
Various Logic gates- their truth tables and circuits; Design of circuits with universal gates. Exclusive-OR and Exclusive NOR and equivalence operations

[6]

Module II:

Design procedure–Adder: and Subtractor circuit: half and full adder and subtractor, BCD adder and subtractor, controlled invertor.
Convertors: BCD to excess-3 and vice versa, Binary to BCD, Gray to binary and viceversa.
Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

[7]

Module III:

Sequential Logic:

Basic memory element-S-R, J-K, D and T Flip Flops-Truth table and Excitation table, Conversion of Flip-flop
Various types of Registers and their design and application
Synchronous and Asynchronous counters, Irregular counter- counter design

[5]

Sequential Circuits Design: State diagrams and tables, transition table, excitation table, Examples using flip-flops. Analysis of simple synchronous sequential circuits, construction of state diagram, State Machine-Mealy and Moore machine

[5]

Module IV:

Memory Systems: RAM: Static RAM and Dynamic RAM, ROM, EPROM, EEROM
Programmable logic device: programmable read only memory, programmable logic arrays and programmable array logic, Design using PLA, PAL, PROM
[2]

Logic families:
TTL, ECL, MOS and CMOS, their operation and specifications: Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin.
Implementation of Logic gate using TTL, MOS
[2]

Different types of A/D and D/A:
Conversion techniques: analog-to- digital (successive approximation, Dual slope, flash) and digital-to- analog converters (weighted R, R-2R ladder and current steering logic). Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time)

[4]

Text Books:
1. A.Anand Kumar, Fundamentals of Digital Circuits- PHI
2 Morries Mano- Digital Logic Design- PHI
3. R.P.Jain—Modern Digital Electronics
4. Digital Integrated Circuits -- Taub and Schilling . Mcgraw Hill

Reference Books:
1. Digital Fundamental, Floyd-PHI
2. Digital, Principle and Application, Leach Malvino,Mcgraw Hill

CO-PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
EI302.1	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2
EI302.2	3	2	2	-	-	-	-	-	-	-	-	2	2	2	2
EI303.3	3	2	2	2	-	-	-	-	-	-	-	1	3	3	3
EI302.4	2	3	2	2	-	-	-	-	-	-	-	2	3	3	1

Name of the Paper: Circuit theory and networks
Paper Code: EI 303
Contact (periods/week): L-T-P: 3-1-0
Credit point: 4
Number of lectures: 43

Pre-Requisite: Concept of Basic electrical

Course Objective:

1. To prepare the students to have a basic knowledge in the analysis of Electric Networks
2. To solve the electrical network using mesh and nodal analysis by applying network theorems

3. To analyze the transient response of series and parallel circuits and to solve problems in time domain using Laplace Transform.
4. To understand the concept of resonance in series and parallel circuits.
5. To design various types of filters.
6. To relate various two port parameters and transform them.

Course Outcome:

On completion of this Subject/Course the student shall be able to:

EI 303.1: Solve complex circuit problem by applying knowledge of circuit theorems.
EI 303.2: Analyze dynamic performance of the networks using Laplace Transform.
EI 303.3: Find out resonance of different circuit.
EI 303.4: Analyze two port networks using A,B,C,D and Z,Y Parameter Model.
EI 303.5: Design different types of filters.

Module1:
Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Source Transformation, Star-Delta conversation
[4]
Network equations: Kirchoff's Voltage Law & Current Law, Formulation of network equations, Loop variable analysis, Supermesh Analysis, Node variable analysis, Supernode Analysis
Network theorem: Superposition, Thevenin's, Norton's,Maximum power transfer, Compensation & Reciprocity theorem. Millman's theorem and its application. Solution of Problems with DC & AC sources.
[7]

Module II:
Laplace transforms: Concept of complex frequency, properties of Laplace Transform, Initial Value Theorem and Final Value Theorem, Concept of Convolution theorem and its application, Transformation of step, ramp, impulse, exponential, damped and undamped sine & cosine functions. Laplace Transform of Gate function & its application. Laplace transform of Periodic function. Inverse Laplace Transform, application of Laplace Transform in circuit analysis. [7]

Circuit Transients: Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Transient analysis of different electrical circuits with and without initial conditions using AC & DC source. Solutions of Problems with DC & AC sources [5]
Module III:
Two port network analysis: Open circuit Impedance & Short circuit Admittance parameters, Transmission parameters, Hybrid parameters and their inter relations. Condition of Reciprocity & symmetry. Interconnection of two port networks. Solution of Problems with DC & AC sources.
[6]
Resonant Circuits: Series and Parallel Resonance, Impedance and Admittance Characteristics, Quality Factor, Half-Power Points, Bandwidth, Solution of problems
[4]
Module IV:

Graph of Network: Concept of Tree, Branch, Tree link, junctions, Incident matrix, Tie-set matrix and loop currents, Cut-set matrix and node pair potentials, duality of networks, solution of problems.
[4]
Coupled circuits: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems.
[4]
Filter Circuits: Analysis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems
[2]

Text Book:
1. Network Analysis, M.E.Van Valkenburg (Prentice H all)
2. Engineering Circuit Analysis, W.H.Hayt, J.E.Kenmerly, S.M.Durbin,(TMH)
3. Network and Systems, D.Roychowdhury,(New Age International)

References:
1. Network and Systems, Ashfaq Husain,(Khanna Book Publisher)
2. Modern Netwok Analysis, F.M.Reza & S.Seely, McGraw Hill.
3.Circuits and Networks: Analysis and Synthesis Paperback , A. Sudhakar, Shyammohan S. Palli (TMH)
4. Network Analysis And Synthesis, C L Wadhwa, ,(New Age International)

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EI303.1	3	2	2	1	1	-	-	-	-	-	-	-	1	1	2
EI303.2	3	2	1	2	2	-	-	-	-	-	-	-	1	1	1
EI 303.3	3	2	2	1	1	-	-	-	-	-	-	-	1	1	2
EI 303.4	3	2	1	1	1	-	-	-	-	-	-	-	1	1	1
EI 303.5	3	2	3	1	1	-	-	-	-	-	-	-	3	2	2

Name of the Paper: Electrical & Electronic Measurement &Instrumentation
Paper Code: EI304
Contact (periods/week): L-T-P: 3-0-0
Credit point: 3
Number of Lectures: 35

Course objective:

1. To understand students how different types of electrical and electronics meters work and their construction and applications.
2. To provide an extensive knowledge about standards and units of measurements.
3. To provide knowledge for the calibration and standardization of various instruments.
4. To provide students with opportunities to develop basic skills in the design of measuring equipments.
5. To familiarize the students with the available software for virtual instrumentation.

Course Outcome:

On completion of this Subject/Course the student shall be able to:
EI 304.1: Use instruments measuring instruments according to the need of specific application.
EI 304.2: Calibrate and standardize the instruments.
EI 304.3: Design measuring instruments on requirement basis.
EI 304.5: To measure different parameters from the simulated instrumentation systems using virtual instrumentation.

Module I:

Introduction to Electrical & Electronic Measurement &Instrumentation
Static and dynamic characteristics of measuring instruments: Definitions of accuracy, precision, hysteresis, nonlinearity, sensitivity, speed of response, fidelity, static and dynamic error, Statistical analysis of errors [4]

Reliabity, MTTF, Bath tub curve [1]

Introduction to electrical voltmeters and ammeters: PMMC, MI, Electrodynamometer: Construction, Torque equation, Damping, range extension [5]

Module II:

Measurement of Resistance: Wheatstone bridge & Kelvin's Double bridge (DC Bridge), Loss of charge method, Meggar
Measurement of Capacitance: De Sauty's bridge & Schering bridge (AC Bridge)
Measurement of Inductance: Maxwell's inductance capacitance bridge (AC Bridge), Anderson Bridge
(*each bridge should cover: Bridge balance equation, Magnitude and phase balance of AC bridges, Phasor Diagram), Localization of cable faults [7]

Basic concept of Potentiometer, Wattmeter and Energy meter: [4]

Module III:

PLL including VCO: Block diagram, circuit diagram, operation, modes Charge amplifier [2]

True RMS voltmeter, Digital Voltmeter, Digital frequency meter including V to F, F to V [5]

Q meter [1]

Module IV:

Oscilloscopes and its applications: Oscilloscope Time Base, Triggering, Oscilloscope Controls, Oscilloscope Probes, Digital Storage Oscilloscope [5]

Spectrum Analyzer [1]

Text Books:
1. Golding E.W. & Wides F.C. : Electrical Measuring Instruments & Measurements ; Wheeler
2. Sawhney A K : A course in Electrical & Electronic Measurements & Instruments, Dhanpat Rai & Co.
3. Helfrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
4. Bell, David : Electronic Instrumentation & Measurement, Reston Publishers
5. D.C. Patranabis, Principles of Electronic Instrumentation, PHI
6. A. K. Ghosh, Introduction to Measurements and Instrumentation
References:
1. Harris, F. K. – Electrical Measurements, Wiley.
2. H.S. Kalsi, Electronic Instrumentation, Tata McGraw Hill
3. Reissland M.U.: Electrical Measurement, New Age International

CO-PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
EI 304.1	3	3	1	2	1	1	1	1	1	1	1	3	1	1
EI 304.2	3	3	1	3	1	1	1	1	1	1	1	3	1	1
EI 304.3	3	2	3	3	1	1	1	1	1	1	1	3	1	1
EI 304.4	3	3	1	3	1	1	1	1	1	1	1	3	1	1

Analog Electronics Lab
Code : EI 391
Contacts : 3P
Credits : 1.5

Course Objective:

1. Understand the scope of modern electronics.
2. Describe models of basic components.
3. Design and construct simple electronic circuits to perform a specific function, e.g.,designing amplifiers, ADC converters etc.

4. Understand capabilities and limitations and make decisions regarding their best utilization in a specific situation.

Course Outcome:

EI 391.1: Verify the working of diodes, transistors and their applications.

EI 391.2: Build a common emitter/base/collector amplifier and measure its voltage gain.

EI 391.3: Explore the operation and advantages of operational amplifiers.

EI 391.4: To design different types of filters and apply the same to oscillators and amplifiers.

EI Exploring the circuitry which converts an analog signal to

List of Experiments:
1. Study of ripple and regulation characteristics of full wave rectifier with and without capacitor filter
2. Construction of a R-C coupled amplifier & study of its input impedance, output impedance and frequency response
3. Study of timer circuit using NE555 & configuration for monostable & astable multivibrator
4. Study a linear voltage regulator using regulator IC chip
5. Construction of analog adder and subtractor using opamp
6. Construction of integrator and differentiator using opamp
7. Construction of precision rectifier using opamp
8. Construction of a simple function generator using opamp
9. Construction of a Schmitt trigger circuit using opamp
10. Design and testing of Wien bridge oscillator
11. Study and analysis of Instrumentation Amplifier
12. Extramural Experiment

Digital Electronic Circuits Lab
Code: EI 392
Contacts: 3P
Credits: 1.5

Course Objective:
1. To reinforce learning through hands-on experience with design, construction, and implementation of digital circuits.
2. To train students with all the equipment which will help in improving the basic knowledge

Course Outcome:

EI 392.1: Have an ability to operate laboratory equipment.

EI 392.2: Have an ability to the designed digital circuits

EI 392.3: Have an ability to construct, analyse, and troubleshoot the digital circuits.

EI 392.4: Have ability to measure and record the experimental data, analyse the results and prepare a formal laboratory report

List of Experiments:

1. Realization of basic gates using Universal logic gates

2. Code conversion circuits- BCD to Excess-3 & vice-versa

3. 4-bit parity generator & comparator circuits

4. Construction of simple Decoder & Multiplexer circuits using logic gates

5. Design of combinational circuit for BCD to decimal conversion to drive 7segment display using multiplexer

6. Construction of simple arithmetic circuits-Adder, Subtractor.

7. Realization of RS-JK & D flip-flops using Universal logic gates.

8. Realization of Universal Register using JK flip-flops & logic gates.

9. Realization of Universal Register using multiplexer & flip-flops.

10. Realization of Asynchronous and Synchronous Up/Down counter.

11. Design of Sequential Counter with irregular sequences.

12. Realization of Ring counters.

13. Extramural Experiment.

Circuits and Networks Lab
Code: EI 393
Contacts: 3P
Credits : 1.5

Course Objective:

1. To acquaint students with the simulation software such as MATLAB to carry out design experiments as it is a key analysis software of engineering design
2. To generate different signals and transform those to s- domain using MATLAB
3. To verify various network theorem and other network aspects using SIMULINK.
4. To provide basic laboratory experience with analyzing the frequency response of different filters using simulation software.

Course Outcome: On completion of this Subject/Course the student shall be able to:

EI 393.1: Use the techniques and skills of modern engineering tools necessary for engineering practice.
EI 393.2: Identify, formulate and solve engineering problems with simulation.
EI 393.3: Find transient response of series /parallel R-L-C circuit using simulation software.
EI 393.4: Find frequency response of different filters using simulation software

List of Experiments:

1. Introduction to MATLAB

2. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form

3. Verification of Network Theorems using simulation software

4. Determination of Laplace transform and inverse Laplace transformation using MATLAB

5. Transient response in R-L and R-C Network: Simulation/hardware

6. Transient response in R-L-C Series circuits Network: Simulation and hardware.

7. Determination of Impedance (Z) and Admittance(Y) parameters of two port network

8. Frequency response of LP and HP filters: Hardware

9. Frequency response of BP and BR filters

10. Evaluation of convolution integral for periodic & non-periodic signal using MATLAB

11. Extramural Experiment

Electrical & Electronic Measurement & Instrumentation Lab
Code: EI 394
Contacts: 3P
Credits: 1.5

Course objective:
1. To understand how different types of bridge circuits are to be operated
2. To understand about different types of static and dynamic characteristics.
3. To understand the operation of VCO and PLL
4. To understand the operation of Digital Storage Oscilloscope
5. To familiarize the calibration procedure of different electrical meters

Course outcome:
On completion of this Subject/Course the student shall be able to:
EI 394.1: Calibrate different electrical meters.
EI 394.2: Measure different static and dynamic characteristics of any measuring instrument.
EI 394.3: Analyse the measured data statistically.
EI 394.4: Use Digital Storage Oscilloscope for measuring and storing different waveforms.

List of Experiments:

1. Measure the resistivity of material using Kelvin Double Bridge
2. Measurement of Capacitance by De Sauty Bridge
3. Calibrate dynamometer type Wattmeter by potentiometer
4. Calibrate A.C. energy meter.
5. Measurement of Power using Instrument transformer
6. Study of Static Characteristics of a Measuring Instrument
7. Study of Dynamic Characteristics of a Measuring Instrument
8. Realization of a V-to-I & I-to-V converter.
9. Statistical analysis of errors in measurement.
10. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).
11. Analysis of various waveforms and spectrum using Spectrum Analyser.
12. Familiarization with Digital Storage Oscilloscope.
13. Extramural experiment

Technical Skill Development I - Skill development for signal simulation and numerical methods

Paper Code: MC 301
Contact (periods/week): L-T-P: 2-0-0
Credit point: 0
<u>Course Objective:</u>

1. Developing Knowledge about basic signal concept.
2. Understanding the LTI system modelling using MATLAB
3. The knowledge about the application and use of mathematical transforms.
4. Development of the mathematical skills to solve problems involving convolution using MATLAB

<u>Course outcome:</u>

On completion of this Subject/Course the student shall be able to:
MC 381.1: Student will be able to Explain commonly used signals through mathematically

MC 381.2: Student will use the tool to analyse continuous-time and discrete-time Fourier series.

MC 381.3: Student will be able to develop the continuous-time and discrete-time signals and systems.

MC 381.4: Student will be able to apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as the solution of linear and nonlinear equations, the solution of differential equations

MC381.5: Student will be able to select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources

Module I:

Skill development for signal simulation and analysis using MAT LAB [14]

- Students will be introduced to the basic concepts of continuous and discrete time signal representation using MAT LAB Simulation Software.
- Representation of Linear Time Invariant Systems (LTI) using hardware model & MAT LAB Simulation Software.
- Fourier series representation of periodic signals & those will be obtained using MAT LAB Simulation Software.
- Continuous time Fourier transform and their application using MAT LAB Simulation Software .

- Laplace transforms and their application using MAT LAB Simulation Software.

Module II:

Numerical method [14]

- Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Secant Method, Newton-Raphson method.
(6L)
- Numerical solution of ordinary differential equation:Taylor series method,Euler's method, Euler's modified method, fourth order Runge- Kutta method and Milne's Predictor-Corrector methods.
(8L)

Text Book:

1. Linear System and Signals, 2nd Edition by B.P.Lathi, Oxford University Press
2. Signals and systems with MATlab computing and simulink modeling- Steven T. Karris, Orchard Publications
3. Dutta& Jana: Introductory Numerical Analysis. PHI Learning
4. J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing
5. Jain, M. K., Iyengar, S. R. K. and Jain, R. K. *Numerical Methods (Problems and Solution)*. New age International Publisher.

Mapping of CO- PO:

CO Vs PO, PSO MAPPING FOR MC381															
COs for the course	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
MC381.1	Student will be able to Explain commonly used signals through mathematically	2	2	1	3	-	2	1	1	1	1	2	-	1	1
MC381.2	Student will use the tool to analyse continuous-time and discrete-time Fourier series.	2	2	2	3	2	1	1	1	1	1	1	1	2	1
MC381.3	Student will be able to develop the continuous-time and discrete-time signals and systems.	3	1	2	1	2	2	1	1	1	-	1	1	1	2
MC381.4	Student will be able to apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as the solution of linear and nonlinear equations, the solution of differential equations	3	2	2	-	-	-	-	-	-	-	-	1	3	2
MC381.4	Student will be able to select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources	3	3	2	3	-	-	-	-	-	-	-	1	3	3