Final

DIPLOMA CURRICULUM OF ELECTRONICS & TELECOMMUNICATION ENGINEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
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Vetted by:
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State Council for Technical Education & Vocational Training
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PROGRAMME TITLE: ELECTRONICS & TELECOMMUNICATION ENGINEERING

SEMESTER – III

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme Core	ETCPC201 TH:1	Electric Circuits & Networks		3	0	0	70	30	-		100	3
2		ETCPC203 TH:2	Electronics Devices		3	0	0	70	30	-		100	3
3		ETCPC205 TH:3	Digital Electronics		3	0	0	70	30	-		100	3
4		ETCPC207 TH:4	Electronics Measurement and Instrumentation		3	0	0	70	30	-		100	3
5		ETCPC209 TH:5	Signal and Systems		3	0	0	70	30	-		100	3
6		ETCPC211 PR:1	Electronics Devices Laboratory		0	0	4	-		15	35	50	2
7		ETCPC213 PR:2	Electric Circuits & Networks Laboratory		0	0	4	-		15	35	50	2
8		ETCPC215 PR:3	Digital Electronics Laboratory		0	0	4	-		15	35	50	2
9		ETCPC217 PR:4	Electronics Measurement and Instrumentation Laboratory		0	0	4	-		15	35	50	2
10													
11	Summer Internship	SI201	Summer internship – I*		0	0	0	-		15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*4-weeks after 2nd Semester

SEMESTER - III COURSES

TH:1- ELECTRIC CIRCUITS & NETWORKS

L	T	P	Total Marks: 100	Course Code: ETCPC201
3	0	0		
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs		End Term Exam 70
				Progressive Assessment : 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

The concept of electrical circuits and networks is very essential for more advanced topics in Electrical and related Engineering programs. This course aims to cover basic circuit concepts, different methods for analyzing large-scale circuits, and applications of these concepts.

LEARNING OUTCOMES:

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

- Use network theorem for solution of DC network
- Explain the response of R,L,C elements to AC supply
- Calculate various parameters of series and parallel resonance,
- Define and state properties of Laplace Transformation
- Explain operations and characteristics of different kinds of Filter Circuits
- Describe two-port networks

DETAILED COURSE CONTENTS

Unit	Topic/Sub Topic	Allotted Time (Hours)
I	**Network Theorems in DC Circuits** 1.1 Node & Mesh Analysis of Electrical Circuits with simple problem. 1.2 Thevenin's Theorem, Norton's Theorem, Maximum Power transfer Theorem, Superposition Theorem, Millman Theorem, Reciprocity Theorem-Statement, Explanation & applications 1.3 Simple numerical problems on above.	**5**
II	**A. C. Fundamentals & Sinusoidal Steady State Analysis:** 2.1 Definitions & explanation of Active & Passive elements. 2.2 Concept of complex impedance, Rectangular & polar form. Simple problems. 2.3 Idea on Apparent, real, and active power. 2.4 Sinusoidal response of a series R-L, R-C, R-L-C circuit 2.5 Sinusoidal response of a parallel R-L, R-C, R-L-C circuit	**8**

III	**Resonance:** 3.1 Introduction to resonance circuits & Resonance tuned circuit, 3.2 Series & Parallel resonance 3.3 Expression for series resonance, Condition for Resonance, Frequency of Resonance, Impedance, Current, Voltage, power, Q Factor and Power Factor of Resonance, Bandwidth in term of Q. Voltage Magnification, Acceptor Circuit. 3.4 Parallel Resonance Condition for Resonance, Frequency of Resonance, Impedance, Current, Voltage, power, Q Factor and Power Factor of Resonance, Bandwidth of resonant circuit / Tank circuit Current magnification, Rejector Circuit, 3.5 Comparisons of Series & Parallel resonance & applications 3.6 Simple problems on above Circuits	**8**
IV	**Passive Filter:** 4.1 Idea of Passive & Active Filter, Their relative advantages and disadvantages 4.2 Idea of Fourier Series & frequency spectrum. (concept only) 4.3 Construction, Principle of operation, Characteristics of Low pass, High pass, Band pass & Band stop filter. 4.4 Design of Low pass filter & High pass filter. 4.5 Numerical problems on the above 4.6 Composite filter (concept only).	**8**
V	**Laplace transform and its applications** 5.1 Definition & properties of Laplace Transform (LT) 5.2 LT of unit step, impulse, ramp, exponential, sine, cosine, pulse, impulse, Dirac delta function. 5.3 Explanation of Laplace Transform theorems like Differential, integral, Time displacement, initial value & final value 5.4 Inverse Laplace Transformation. Simple problem 5.5 Application of Laplace transformation in circuit theory	**7**
VI	**Two Port Network:** 6.1 Idea on Linear & Non linear networks, Unilateral & Bilateral networks 6.2 Explanation of Z parameter (Open Circuit Impedance Parameter) 6.3 Explanation of Y parameter (Short Circuit Admittance Parameter) 6.4 Explanation of h -parameter (Hybrid Parameter) 6.5 Interrelation of above parameters 6.5 Inter Connection of Two Port Network 6.4 Simple problem on above parameters**.**	**9**

REFERENCES:

1.	Network Analysis, M. E. Van Valkenburg; Prentice Hall of India
2.	Circiut Theory (Analysis & Synthesis), A. K. Chakraborty; Dhanpat Rai & Co
3.	Electric Circuit Theory, Chattopadhyay, Rakshit S. Chand &. Co
4.	Network & Systems, D. Roy Choudhury Wiley Eastern Ltd
5.	Networks and Systems, Ashfaq Husain Khanna Publishing House
6.	Engineering Circuit Analysis, W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, McGraw Hill

TH:2- ELECTRONICS DEVICES

L	T	P		
3	0	0		**Course Code: ETCPC203**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course : PC

RATIONALE:

Electronics devices has played a developmental role in the field of Electronics. Now a day's electronics systems are used in each and every field of engineering. Electronics devices is one of the subjects which is the base of all advance electronics. It starts with P-N junction which makes the student to follow the functioning of all semiconductor-based electronics devices. This is a core group subject and it develops cognitive and psychomotor skills on fundamental analysis & design of Electronics systems.

LEARNING OUTCOMES:

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

- Describe the principles of semiconductor physics and apply it to electronic devices
- Select different devices for different applications.
- Explain the mathematical models of semiconductor devices for circuits.
- Discuss the basic processes required for fabrication of electronic devices.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Semiconductor Physics** 1.1 Review of Quantum Mechanics 1.2 Electrons in periodic Lattices 1.3 Energy bands in intrinsic and extrinsic silicon 1.4 Carrier transport 1.4.1 Diffusion current 1.4.2 Drift current 1.4.3 Mobility and resistivity	**3**

II	**P-N Junction Diodes** 2.1 Generation and recombination of carriers 2.2 Poisson and continuity equation 2.3 P-N Junction Diodes 2.3.1 Construction of P-N Junction Diode 2.3.2 Operating Principle 2.3.3 P-N junction characteristics 2.3.4 I-V characteristics 2.3.5 Small signal switching models 2.3.6 Avalanche breakdown 2.3.7 Zener diode 2.3.8 Schottky diode 2.3.9 LED 2.3.10 Photodiode and solar cell	**10**
III	**Bipolar Junction Transistor (BJT)** 3.1 Construction of BJT 3.2 Operating Principle of BJT 3.3 Types of BJT 3.4 Working principle of p-n-p and n-p-n BJT 3.5 I-V characteristics 3.6 Ebers Moll Model 3.7 Different types of transistor connection 3.7.1 Common Base (CB) 3.7.2 Common Emitter (CE) 3.7.3 Common Collector (CC) 3.8 Input and output characteristics of transistor in different connections 3.9 Define ALPHA, BETA and GAMMA of transistors in various modes. 3.10 Establish the Mathematical relationship between ALPHA, BETA and GAMMA 311 Basic concept of Biasing 3.12 Types of Biasing 3.13 h-parameter model of BJT 3.14 Load line and determine the Q-point. 3.15 Types of Coupling 3.16 Working principle and use of R-C Coupled Amplifier 3.17 Frequency Responses of R-C coupled Amplifier	**12**

IV	**FIELD EFFECT TRANSISTOR (FET)** 4.1 FET & its classifications 4.2 Differentiate between JFET & BJT 4.3 Construction, working principle & characteristics of JEFT 4.4 Parameters of JFET & establish relation among JFET parameters 4,5 JEFT as an amplifier 4.5 Construction and working principle of MOSEFT 4.6 Classification of MOSEFT 4.7 Characteristics (Drain & Transfer) of MOSEFT 4.8 Explain the operation of CMOS, VMOS & LDMOS.	**8**
V	**FEED BACK AMPLIFIER & OSCILLATOR** 5.1 Define & classify Feedback Amplifier 5.2 Types of feedback – negative &positive feedback. 5.3 Characteristics voltage gain, bandwidth, input Impedance output impedance, stability, noise and distortion in amplifiers. 5.4 Oscillator 5.4.1 Block diagram of sine wave oscillator 5.4.2 Types Requirement of oscillation 5.4.3 Barkhausen criterion 5.5 LC oscillators 5.5.1 Colpitts Oscillators 5.5.2 Hartley Oscillators 5.5.3 Wien Bridge Oscillators	**9**
VI	**Integrated Circuit Fabrication Process** 6.1 Oxidation 6.2 Diffusion 6.3 Ion implantation 6.4 Photo-lithography 6.5 Etching 6.7 Chemical vapor deposition 6.8 Sputtering 6.9 Twin-tub CMOS process	**3**

REFERENCES:

1.	Solid State Electronic Devices by G. Streetman, and S. K. Banerjee, Pearson, Delhi.
2.	Semiconductor Physics and Devices by Donald Neamen Dhrubes Biswas, McGraw-Hill Education, New Delhi.
3.	Millman's Electronic Devices and Circuits by Millman,Halkias and SatyabrataJit, McGraw-Hill, New Delhi.
4.	Analog Electronics by A.K. Maini, Khanna Book Publishing, New Delhi
5.	Electronics principle by Sahdev, Dhanpat Rai & Co. Pub, New Delhi
6.	Basic Electronics & linear Circuits by N.N.Bhargaya,D.C. Kulshreshtha&S C Gupta-McGraw Hill
7.	Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, -Pearson Education

TH:3- DIGITAL ELECTRONICS

L	T	P		Course Code: ETCPC205	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

Now a day's digital electronics has become a part of our everyday life. The tremendous power and usefulness of digital electronics can be seen from the wide variety of industrial and consumer products, such as automated industrial machinery, computers, microprocessors, pocket calculators, digital watches, microcontrollers, digital life support machines, real time systems and clocks, TV games, etc. which are based on the principles of digital electronics. The areas of applications of digital electronics have been increasing every day. This subject will very much helpful for student to understand clearly about the developmental concept of digital devices. Through a balanced series of lectures and hands-on laboratory sessions in this course, the student will acquire a solid foundation in digital logic, including gates, binary numbers, flip-flops, registers, counters, display devices and applications of Boolean algebra.

LEARNING OUTCOMES:

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

- Comprehend the Basic Logic Gates and Universal Gates and its functions.
- Explain the laws of Boolean algebra and Standard form of Boolean Expression
- Describe the working principle of Latches and Flip Flops
- Comprehend Shift Registers its circuit diagram, truth tables and timing diagram
- Explain circuit diagrams and the working principles of Counters.
- Design combinational and sequential logic circuits
- Explain various types of memories & differentiate between ROM and RAM

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Logic Gates** 1.1 Basic logic gates: OR, AND, and NOT 1.1.1 Truth tables 1.1.2 Logic symbols 1.1.3 Logic voltage levels 1.1.4 Logic circuit design examples 1.2 Integrated Circuits 1.3 NOR, NAND, Exclusive OR, and Exclusive NOR gates. 1.4 NOR and NAND gates used as inverters. 1.5 Fan-in and fan-out 1.6 Termination of unused inputs 1.7 AND and OR gates constructed from NAND and NOR gates	4

II	**Boolean Algebra** 2.1 Boolean operations (OR, AND, NOT) 2.2 Representation of logic circuits by Boolean expressions. 2.3 Laws of Boolean algebra: 2.3.1 Double inversion: A"=A 2.3.2 OR identities: A+0 = A, A+1=1, A+A=A, A+A'=1 2.3.3 AND identities: A.0=0, A.1=A, A.A=A, A.A'=0 2.3.4 Cumulative laws: A+B=B+A, A.B=B.A 2.3.5 Associative laws:(A+B)+C=A+(B+C), (A.B).C=A.(B.C) 2.3.6 Distributive laws: A+(B.C)=(A+B).(A+C), A.(B+C)=A.B+A.C 2.3.7 DeMorgan's theorems :(A+B+C+...)'=A'.B'.C'...,(A.B.C...)'=A'+B'+C'... 2.3.8 Applications to logic circuit simplifications and design 2.4 Equivalent logic gates 2.5 NAND and NOR implementations of logic circuits. 2.6 Standard forms of Boolean expressions 2.6.1 Sum-of-products (SOP) 2.6.2 Product-of-sums (POS) 2.7 Karnaugh mapping	5
III	**Combinational Logic Circuits** 3.1 Half adder 3.2 Full adder 3.3 Half Subtractor 3.4 Full Subtractor 3.5 4 bit adder. 3.6 Multiplexer (4:1) 3.7 De- multiplexer (1:4) 3.8 Decoder 3.9 Encoder 3.10 Digital comparator (3 Bit) 3.11 Seven segment Decoder	6

IV	**Latches & Flip-Flops** 4.1. Basic latches 4.1.1 NOR latch 4.1.2 NAND latch 4.1.3 Example uses of latches 4.2. Gated latches 4.2.1 Gated S-R latch 4.2.2 Gated D-latch 4.3. Flip-flops: 4.3.1 Master-slave and edge-triggered principles 4.3.2 S-R flip-flop 4.3.3 D-type flip-flop 4.3.4 J-K flip-flop 4.3.5 T-type flip-flop 4.3.6 Flip-flop timing diagrams	6

V	**Counters** 5.1 Circuit diagram and working principle of Binary counters 5.2 up-down counter (circuits, truth tables, and timing diagrams) 5.3 Asynchronous counters and ripple counter 5.4 Synchronous counters 5.5 Decade counter 5.6 Module–n counter and its combinations 5.7. Divide-by-n counters obtained from truncated binary sequences 5.8. Synchronous counter design using D-type flip-flops 5.9 Synchronous counter design using J-K flip-flops	7
VI	**Shift Registers** 6.1 Circuit diagram, truth tables, and timing diagrams of Shift Registers 6.2 Serial input shift register 6.3 Serial/parallel load shift register 6.4 Shift register counters 6.4.1. Ring counter 6.4.2. Self-starting ring counter 6.4.3. Johnson counter	5
VII	**Semiconductor Memories** 7.1 Define the terms ROM, RAM, PROM, EPROM. 7.2 Draw a typical memory cell 7.3 Design a small diode matrix ROM to serve as a code converter. 7.4 Design and draw the logic diagram of a specified size memory system 7.5 Operating principle of dynamic memory 7.6 Advantages and disadvantages of dynamic memory vs. static memory 7.7 Difference between dynamic memory vs. static memory	7
VIII	**Sequential Circuit Design** 8.1 Combinational vs. Sequential circuits 8.2 Adder, Subtractor, decoder, multiplexer, de-multiplexer, and comparator 8.3. Finite state machines- Concept only	5

REFERENCES:

1.	Modern Digital Electronics by R P Jain
2.	Electronic Devices And Circuits by S Salivahanan, N Suresh Kumar, and A Vallavaraj
3.	Fundamental of Digital Electronics by Ananda Kumar-PHI Publication
4.	Digital logic and computer design by M. Morris Mano
5.	Digital Electronics by Dr. R. S. Sedha, S. chand
6.	Digital Electronics & Microprocessor - problem & solutions by R.P. Jain ,TMH

TH:4- ELECTRONICS MEASUREMENT & INSTRUMENTATION

L	T	P		Course Code: ETCPC207	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

Electronics Measurement & Instrumentation serves not only in science & technology but also spread over to all branch of engineering. Measurement is basically used to monitor a process or operation as well as controlling the process. Usually instruments which are used to measure any quantity, are known as measuring instruments. If the instruments can measure the basic electrical quantities, such as voltage and current are known as basic measuring instruments. The basic concept and working principle of measuring instruments are incorporated in this subject. The Analog & Digital types of Instruments are also discussed in this subject.

LEARNING OUTCOMES:

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

- Explain the Qualities of Measurement
- Describe the operating principle of Indicating Instruments
- Discuss about Digital Instruments and Oscilloscope.
- Explain different types of Bridges and working principles.
- Discuss about Transducers & Sensors, Signal Generator & Wave Analyzer and measurements using Electronics Devices

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Qualities of Measurement** 1.1 Discuss the Static Characteristics 1.2 Accuracy, sensitivity, reproducibility and static error of instruments 1.3 Dynamic characteristics and speed of instruments. 1-4 Errors of an instrument	4
II	**Indicating Instruments** 2.1 Introduction 2.2 Types of Indicating Instruments 2.3 Basic operating principle of Indicating Instruments 2.4 Working principle of permanent magnetic moving coil Instruments 2.5 Working principle of Moving Iron Instrument 2.6 Basic principle of operation of DC Ammeter and Multi range Ammeter 2.7 Basic principle of operation of AC Ammeter and Multi range Ammeter 2.8 Basic principle of operation of DC Voltmeter and its applications 2.9 Basic principle of operation of AC Voltmeter and its application 2.10 Basic principle of Ohm Meter (Series & Shunt type) 2.11 Basic principle of Analog Multimeter and its types & applications 2.12 Operation of Q meter and its essentials	7
III	**Digital Instruments** 3.1 Principle of operation of Ramp type Digital Voltmeter & applications 3.2 Operation of display of Digital Multimeter & Resolution and Sensitivity 3.3 Basic Operating principle of Digital Multimeter, its types & applications 3.4 Basic Operating principle of Digital Frequency Meter 3.5 Digital Measurement of Time 3.6 Measurement of Frequency 3.7 Operating principle of Digital Tachometer 3.8 LCR meter & its working principle	7
IV	**Oscilloscope** 4.1 Basic Operating principle of Oscilloscope & its Block Diagram 4.2 Basic Operating principle of Dual Trace Oscilloscope & its specification 4.3 CRO Measurements 4.4 Lissajous figures 4.4 Applications of Oscilloscope in measurement of Voltage and frequency 4.5 Basic Operating principle of Digital Storage Oscilloscope 4.6 Basic Operating principle of High frequency Oscilloscope	7
V	**Bridges** 5.1 Types of Bridges (DC & AC Bridges) 5.2 DC Bridges (Measurement of Resistance by Wheatstone's Bridge) 5.3 AC bridges (Measurement of inductance by Maxwell's Bridge & Hay's Bridge) 5.3 Measurement of capacitance by Schering's Bridge & DeSauty Bridge 5.5 Working principle of Q meter its circuit diagram & measurement of Low impedance 5.6 Measurement of frequency 5.7 LCR Meter & its measurements.	6
VI	**Transducers & Sensors** 6.1 Define Transducer and Sensor 6.2 Type of Transducer 6.3 Parameters and advantages of Transducer 6.4 Working principle of Strain Gauges,	7

	6.5 Define Strain Gauge (No mathematical Derivation) 6.6 Working principle of LVDT 6.7 Working principle of capacitive transducers (pressure) 6.8 Working principle of Load Cell (Pressure Cell) 6.9 Working principle of Temperature Transducer (RTD, Optical Pyrometer, Thermocouple, and Thermister) 6.10 Working principle of Current transducer. 6.11 Working principle of Proximity & Light sensors.	
VII	**Signal Generator, Wave Analyser & DAS** 7.1 General aspect & classification of Signal generators 7.2 Working principle of AF Sine and Square wave generator 7.3 Working principle of the Function Generator 7.4 Function of basic Wave Analyser and Spectrum Analyser 7.5 Basic concept of Data Acquisition System (DAS)	7

REFERENCES:

1.	Electronic Instrumentation by H S Kalsi, McGraw Hill
2.	Electrical Measurement Instrumentation by J.B.Gupta, Katson books
3.	Electrical & Electronics Measurement & Instrumentation by A K Sawheny
4.	Electrical and Electronic Measurements and Instrumentation by R.K.Rajput, S Chand

TH:5- SIGNAL & SYSTEMS

L	T	P		Course Code: ETCPC209	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

A sound understanding of the basic concept of modern digital signal processing, communication, and control systems is necessary for all students of Electronics and Communication Engineering. The goal of the course is to teach students how to analyze and represent signals and systems, and to understand how systems manipulate signals to perform a function. The fundamental principles of signals and system analysis is introduced in this course.

LEARNING OUTCOMES:

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

- Identify the sources of signals, and systems in real life.
- Characterize different types of signals and systems.
- Represent continuous-time and discrete-time systems in different mathematical forms.
- Analyze system behaviour using time and frequency domain techniques.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Introduction to Signals and Systems** 1.1 Signals and systems as seen in everyday life 1.2 Signals and systems in various branches of engineering 1.3 Electrical, mechanical, hydraulic, thermal, biomedical signals and systems as examples 1.4 Extracting the common essence and requirements of signal and system	5
II	**Formalizing signals** 2.1 Energy and power signals 2.2 Signal properties 2.2.1 Periodicity 2.2.2 Absolute integrability 2.2.3 Determinism and stochastic character 2.3 Some special signals of importance 2.3.1 The unit step 2.3.2 The unit impulse 2.3.3 The sinusoid 2.3.4 The complex exponential 2.4 some special time-limited signals 2.4.1 Continuous and discrete time signals, 2.4.2 Continuous and discrete amplitude signals. 2.5 Formalizing systems- system properties 2.5.1 Linearity 2.5.2 Additivity and homogeneity 2.5.3 Shift-invariance 2.5.4 Causality 2.5.5 Stability 2.5.6 Reliability	7
III	**Continuous time and discrete time Systems** 3.1 Linear shift-invariant (LSI) systems in detail 3.2 The impulse response and step response 3.3 Convolution 3.4 Input-output behavior with aperiodic convergent inputs 3.5 Cascade interconnections 3.6 Characterization of causality and stability of linear shift-invariant systems 3.7 System representation through differential equations and difference equations	7
IV	**Periodic and semi-periodic inputs to an LSI system** 4.1 The notion of a frequency response and its relation to the impulse response, 4.2 Fourier series representation 4.3 The Fourier Transform 4.4 Convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. 4.5 The Discrete-Time Fourier Transform (DTFT) 4.6 The Discrete Fourier Transform (DFT) 4.7 Parseval's Theorem	7

	4.8 The idea of signal space and Orthogonal bases of signals.	
V	**Laplace Transform for continuous time signals and systems-** 5.1 The notion of Eigen functions of LSI systems 5.2 A basis of Eigen functions 5.3 Region of convergence 5.4 System functions 5.5 Poles and zeros of system functions and signals 5.6 Laplace domain analysis 5.7 Solution to differential equations and system behavior 5.8 Generalization of Parseval's Theorem	7
VI	**System realization** 6.1 System realization through block-diagram representation and system interconnection 6.2 State-space analysis and multi-input, multi-output representation. 6.3 The state-transition matrix and its role. 6.4 The Sampling Theorem and its implications 6.4.1 Spectra of sampled signals. 6.5 Reconstruction: 6.5.1 Ideal interpolator 6.5.2 Zero-order hold 6.5.3 First-order hold 6.6 Aliasing and its effects. 6.7 Relation between continuous and discrete time systems.	7
VII	**Applications of signal and system theory** 7.1 Modulation for communication and filtering 7.2 Time-frequency representation and the uncertainty principle 7.3 Short-time Fourier Transforms and wavelet transforms.	5

REFERENCES:

1.	R. Anand, Signals and Systems, Khanna Publishing House, 2019
2.	B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.
3.	A.V. Oppenheim, A.S. Willsky and I.T. Young,"Signals and Systems", Prentice Hall
4.	R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998
5.	Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
6.	Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International Edition: c1999
7.	P.Ramesh Babu & R Anandanatarajan, Signals and Systems, , SCITECH

PR:1- ELECTRONICS DEVICE LAB

L	T	P	Total Marks: 50	Course Code: ETCPC211	
0	0	4			
Total Contact Hours				**Theory Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Electronics device lab is an introductory experimental laboratory that explores the design, construction, and testing of analog electronic circuits using P-N junction diode, Zener diode, BJT, JFET, MOSFET and CMOS devices. In this laboratory, students investigate the performance characteristics of diodes, transistors, JFETs etc. including the construction of a small audio amplifier and power amplifier. Students will learn to understand and use a wide variety of analog devices in this lab.

LEARNING OUTCOMES:

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

- Study experimentally the characteristics of diodes, BJT's and FET's
- Verify practically the response of various special purpose electronics devices
- Perform various experiments on rectifiers, amplifiers, and oscillatos
- Write the specifications of Electronics components
- Simulate various semiconductor devices using software tools such as PSPICE or multisim.

DETAILED COURSE CONTENTS

Sl No	List of Experiments
1.	Characteristics of P-N junction diode
2.	Characteristics of Zener diode
3.	Input-Output and Transfer characteristics of CE and CC Amplifier
4.	Characteristics of Photo-diode and Photo transistor
5.	Transfer characteristics of JFET
6.	Transfer characteristics of MOSFET (with depletion and enhancement mode)
7.	Characteristics of LED with three different wavelengths
8.	Half wave rectifier
9.	Full wave rectifier with 2 diodes.
10.	Full wave rectifier with 4 diodes (Bridge rectifier)
11.	Construct & Find the gain of

	(i) Class A Amplifier (ii) Class B Amplifier (iii) Class C Tuned Amplifier
12.	Construct & test Class B -Push Pull amplifier & observe the wave form
13.	Construct & calculate the frequency & Draw the wave form of (i) Hartly Oscillator (ii) Collpit's Oscillator (iii) Wein Bridge Oscillator (iv) R-C phase shift Oscillator
14.	Simulation experiments using PSPICE or Multisim.

At least twelve (12) experiments to be performed by each student.

REFERENCES:

1.	Handbook of Experiments in Electronics & Communication Engg by S P Rao & B.Sasikala-VIKAS
2.	Advanced practical Electronics by KAR -Books & Allied Pvt

PR:2- ELECTRIC CIRCUITS & NETWORKS LAB

L	T	P	Total Marks: 50	Course Code: ETCPC213
0	0	4		
Total Contact Hours				**Theory Assessment**
Practical		: 60Hrs		End Term Exam 15
				Progressive Assessment : 35
Pre Requisite		**: NIL**		
Credit		**2**		Category of Course : PC

RATIONALE:

This course aims to cover basic skill development on circuits, different experimental methods for analyzing large-scale circuits, and real time applications of these concepts.

LEARNING OUTCOMES:

After completion of the Lab the students will be able to

- Use network theorems for solution of DC network
- Analyze charging & discharging of RC circuit with CRO
- Design series and parallel resonance circuits with a particular cut of frequency and to plot frequency response
- Design filters and plot frequency response.
- Simulate circuits for various applications.

DETAILED COURSE CONTENTS

Sl No	List of Experiments
1.	Verification of- · Superposition theorem. · Thevenin's theorem. · Norton's theorem. · Maximum power transfer theorem.
2.	Use voltmeter, ammeter to determine current through the given branch of an electric network by applying mesh analysis.
3.	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying node analysis.
4.	Observe an AC wave form on CRO and calculate its average & RMS values, frequency, time period
5.	Analysis of charging & discharging of RC circuit with CRO (calculation of time constant, rise time etc.).
6.	Design of series resonance circuit with a particular cut of frequency and to plot frequency response
7.	Design of parallel resonance circuit with a particular cut of frequency and to plot frequency response

8.	Designing of (considering cut-off frequency) Low pass filter and to plot frequency response
9.	Designing of (considering cut-off frequency) High pass filter to plot frequency response
10.	Simulate the above circuits using circuit simulation software.

PR:3- DIGITAL ELECTRONICS LAB

L	T	P	Total Marks: 100	Course Code: ETCPC215	
0	0	4			
Total Contact Hours				**Theory Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

This course provides students a structured approach to learning the principles and practical applications of digital electronics. Through hands-on laboratory sessions, the student will acquire a solid foundation in digital logic, including gates, binary numbers, flip-flops, registers, counters, display devices and applications of Boolean algebra. Various digital ICs are discussed in this course. This lab also includes combinational logic & sequential logic circuits and its implementations.

LEARNING OUTCOMES:

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

- Describe the pin configuration of digital IC's.
- Implement Arithmetic logic circuits using digital IC's.
- Develop combinational circuits using digital IC's.
- Apply concept of universal logic gates for digital circuit designing.
- Examine the behaviour of sequential circuits using digital IC's.

DETAILED COURSE CONTENTS

Sl No	List of Experiments
1.	Familiarization of Digital Trainer Kit & Digital ICs 7400, 7402, 7404, 7408, 7432 & 7486 (draw their pin diagram and features)
2.	Verify truth tables of AND, OR, NOT, NOR, NAND, XOR, XNOR gates using ICs & simplifications of Boolean gates
3.	
4.	Construct & verify operation of Half adder and Full adder using logic gates
5.	Construct & verify operation of Half Subtractor and Full Subtractor using logic gates
6.	Design & implement a 4-bit Binary to Gray code converter.
7.	Design & implement a single bit/two-bit digital comparator circuit
8.	Design Multiplexer (4:1)
9.	Design De-multiplexer (1:4).
10.	Study the operation of flip-flops (i) S-R flip flop (ii) J-K flip flop (iii) D flip flop (iv) T flip flop

11.	Realize a 4-bit asynchronous UP/Down Counter.
12	Realize a 4-bit synchronous UP/Down Counter.
13.	Study shift registers-4 bit Registers
14.	Seven segment display with a decoder
15.	Develop a 4-bit ripple counter by using FF
16.	Develop a decade counter by using a 7490 IC
17.	Mini Project using Software: To collect data like pin configurations, display devices, Operational characteristics, applications and critical factors etc. on all digital ICs studied in theory and compile a project report throughout and submit at the end of the semester. To assemble and tests circuits using above digital ICs with test points e.g. Digital Clock/Frequency Counter/ Running Glow Light up to 999/Solar cell & Opto coupler applications.

At least twelve (12) experiments to be performed by each student.

REFERENCES:

1.	Modern Digital Electronics' R P Jain
2.	Electronic Devices And Circuits' S Salivahanan, N Suresh Kumar, A Vallavaraj

PR:4- ELECTRONICS MEASUREMENT & INSTRUMENTATION LAB

L	T	P		Course Code: ETCPC217	
0	0	4			
Total Contact Hours				**Theory Assessment**	
Practical		: 60Hrs	**Total Marks: 100**	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Modern electronics measurement and automated instrumentation system is an emerging field, used for data sensing, acquisition, transmission, analysis and control in various practical applications in industry. Analog and digital instruments are mainly used to measure different process control parameters. The physical quantities/parameters are being converted into electrical signal with the help of various types of sensors and transducers and also used to maintain electronic control and automation system. This lab aims to help students to better understand measuring devices and their operating principles, Measurement of Circuit Parameters, Power, Power Factor, Phase Angle, Frequency and Time, DC and AC Bridges, Characteristics of Discrete and Integrated Devices, Digital Instrumentation, Transducers.

LEARNING OUTCOMES:

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

- Measure Current and Voltages by Low range ammeter and voltmeter with shunt and multiplier.
- Construct Bridges to measure R, L, & C.
- Record the wave forms of different frequency by using Function generator
- Draw the diagram. to measure the amplitude and frequency using dual trace CRO.
- Measure the unknown frequency and phase angle using CRO by lissajous pattern.
- Measure the different parameters using Transducer.

DETAILED COURSE CONTENTS

Sl No	List of Experiments
1.	Study and construction of moving coil and moving iron instruments & calibrate
2.	Study of static and dynamic characteristic of PMMC & moving iron instruments
3.	Study of Resolution and sensitivity of Digital Instrument
4.	Measurement of Current and Voltages by Low range ammeter and voltmeter respectively with shunt and multiplier.
5.	Observe the wave forms of different frequency by using Function generator and draw its diagram measure the amplitude and frequency & calculates average & R.M.S. Values, frequency, Time Periods using CRO.
6.	Measure the unknown frequency and phase angle using CRO by Lissajous figure.
7.	Measurement of resistance using Wheatstone's Bridge
8.	Measure the inductance by Maxwell's Bridge &Hay's Bridge

SUMMER INTERNSHIP – I

L	T	P		Course Code: SI201	
0	0	0			
Total Contact Hours				Assessment	
Practical		0	Total Marks: 50	End Term Exam	15
				Progressive Assessment	35
Pre Requisite		: Nil			
Credit		2		Category of Course : SI	

Duration: 3-4 weeks during summer vacation after 2nd Semester.

RATIONALE:

Summer Internship - I is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES:

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

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Enhance specific skills relevant to their field.
- Gain hands-on experience in a professional network by interacting with mentors and industry professionals.
- Manage time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS

SUGGESTED ACTIVITIES:

I Orientation:

- Introduction to the organization's mission, values, and culture.
- Familiarization with workplace policies, procedures, and safety guidelines.
- Orientation to the team and organizational structure.

II Project-Based Learning:

- Description of the main project or tasks the intern will be working on during the internship.
- Detailed project goals and objectives.
- Training and guidance on project-specific tools, technologies, or methodologies.

III Technical and Skill Development:

- Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).
- Soft skills development, including communication, teamwork, problem solving, and time management

IV Mentorship and Supervision:

- Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.
- Mentorship objectives and expectations.

V Professional Development:

- Sessions on professional etiquette, networking, and building a personal brand
- Resume writing and interview preparation workshops.

VI Industry and Field-Specific Knowledge:

- Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies.
- Guest speakers from the field to share insights and experiences.

VII Reporting and Documentation:

- Training on how to document project progress, results, and findings.
- Practice in creating reports, presentations, or other deliverables.

VIII Ethics and Professionalism:

- Discussions on ethical considerations within the field.
- Scenarios and case studies related to ethical decision-making

IX Feedback and Evaluation:

- Regular performance evaluations and feedback sessions.
- Self-assessment and goal-setting exercises.

X Networking and Industry Exposure:

- Opportunities to attend industry conferences, webinars, or networking events.
- Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Suggested Online Link:

Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/12110600/

*****Progressive Assessment to be conducted for ensuring learning of students.