West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electronics & Tele-Communication Engineering [ETCE] & Electronics & Communication Engineering [ECE]

Part-II (3rd Semester)

Revised 2022

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION											
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES											
COURSE NAME: FULL TIME DIPLOMA IN ETCE & ECE											
DURATION OF COURSE: 6 SEMESTERS											
SEMESTER: THIRD											
BRANCH: ELECTRONICS & TELECOMMUNICATION ENGG. and ELECTRONICS & COMMUNICATION ENGG.											
SR. NO.	SUBJECT	CREDITS	PERIODS		EVALUATION SCHEME						
			L	PR	THEORETICAL				PRACTICAL		Total Marks
					TA	CT	Total	ESE	Internal	External	
1.	Principles of Electronic Communication	3	4	-	20	20	40	60	-	-	100
2.	Electronic Devices and Circuits	3	4	-	20	20	40	60	-	-	100
3.	Digital Electronics	2	3	-	20	20	40	60	-	-	100
4.	Electric circuits and network	3	4	-	20	20	40	60	-	-	100
5.	Computer Programming Language	2	3	-	20	20	40	60	-	-	100
6.	Principles of Electronic Communication Lab	1	-	3	-	-	-	-	60	40	100
7.	Electronic Devices and Circuits Laboratory	1	-	3	-	-	-	-	60	40	100
8.	Digital Electronics Laboratory	1	-	2	-	-	-	-	60	40	100
9.	Electric circuits and network Laboratory	1	-	3	-	-	-	-	60	40	100
10.	Computer Programming Language Laboratory	1	-	2	-	-	-	-	60	40	100
11.	Internship-I	1	-	-	-	-	-	-	-	-	100
	Total	19	18	13	100	100	200	300	300	200	1100

- STUDENT CONTACT HOURS PER WEEK: 31+2 = 33 hours (2 hours for Library)
- ACADEMIC CONTACT WEEKS PER SEMESTER : 17 weeks (Teaching-15 weeks + Internal Exam-2 weeks)
- THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH
- ABBREVIATIONS: L- Lecture, PR- Practical, IA- Internal Assessment, CT- Class Test, ESE- End Semester Exam
- IA (Internal Assessment for Theoretical) = 40 marks: CT= 20 Marks, Attendance =10 marks and Quizzes/Assignment/Student Activity = 10 marks.
- Minimum qualifying marks for both Theoretical and Sessional subjects (for internal assessment and external assessment separately) are 40%.
- IA (Internal Assessment for Practical) =60 marks: 50 marks for continuous evaluation and 10 marks for Class attendance.
- Internship-I will be completely assessed internally.

Name of the course: **Principles of Electronic Communication**	
Course Code: ETCE/PEC/S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 4 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Practical: 3 contact hours/ week	Attendance =10 marks and Quizzes/Assignment/Student Activity = 10 marks
	End Semester Examination: 60 Marks
Credit: 4 (TH:3+PR:1)	Practical: 100 Marks

Course Outcomes:

On completion of the course students will be able to :

- Describe the basic structure of a telecommunication system, frequency and time domain representation of a signal.
- Know how and why signals are modulated and different types of analog modulation system including pulse modulation and also the demodulation process of modulated signals.
- Understand the functions and operating principles of transmitting and receiving systems with clear idea of basic telephony system, electronic exchange and switching systems used in telephony.
- Acquire knowledge on propagation of electromagnetic wave of different frequency bands and using various methods.
- Differentiate the analog and digital communication systems and understand the form of digital data including information theory, error correction and coding methods.

Content (Name of the topic)		**Periods**
	Group – A	
Unit 1	**Basics of Electronic communication**	**07**
	1.1 Electromagnetic spectrum, elements of basic electronic communication system 1.2 Concept of noise, signal to noise ratio 1.3 Idea of simplex, half duplex and full duplex 1.4 Basic idea of Fourier series and Fourier transform	
Unit 2	**Analog modulation techniques**	**12**
	2.1 Concept of modulation and need for modulation 2.2 Amplitude Modulation(AM) – Mathematical representation of AM wave, Modulation Index, percentage of modulation, Bandwidth and side bands, Representation of AM wave in time domain and frequency domain, Concept of DSB, SSB and VSB, Power requirement in AM wave 2.3 Frequency Modulation(FM) -Mathematical representation of FM wave, Frequency deviation, Modulation Index, Representation of FM wave in time domain and frequency domain, Bandwidth requirement, NB and WB frequency modulation 2.4 Phase Modulation(PM) - Mathematical representation of PM wave, Modulation Index 2.5 Comparison of AM, FM and PM	
	Group – B	

Unit 3	**Transmitter and Receiver**	**12**
	3.1 Generation of AM wave – Collector modulated class C amplifier for generation of AM wave, operation of Balanced Modulator, Filter method for SSB generation, Block diagram of AM broadcast transmitter 3.2 Receiver of AM – Block diagram of AM super heterodyne receiver and its working principle, IF amplifier and choice of IF, Mixer and converter, Alignment and tracking, Receiver characteristics and testing, sensitivity, selectivity and fidelity 3,3 Demodulation of AM – Envelop detector, AGC and delayed AGC circuit and its operation 3.4 Generation of FM wave – Direct (Varactor diode modulator) and Indirect (Armstrong) method, Block diagram and operation of FM broadcast transmitter 3.5 Receiver of FM – Block diagram and operation of FM receiver, Pre-emphasis and De-emphasis, AFC and PLL 3.6 Demodulation of FM – Foster-Seeley discriminator, ratio detector, limiter	
Unit 4	**Wave propagation**	**07**
	4.1 Concept of Electromagnetic Wave and its properties – Transverse electromagnetic wave, concept of plane and spherical wavefronts, Reflection, Refraction, Polarization, Diffraction, radiation, absorption, attenuation, interference 4.2 Ground wave propagation – VLF propagation 4.3 Sky wave propagation – Ionosphericlayers, virtual height, critical frequency, MUF, skip distance 4.4 Space wave propagation – Line of sight propagation, multipath space wave propagation, Radio horizon, Duct propagation (microwave space wave propagation) 4.5 Tropospheric scatter propagation	
Unit 5	**Telephony**	**08**
	5.1 Block diagram and operation of Telephone hand set, Transmitter, Receiver, side tone and anti-side tone circuit and operation, ringer, switch hook, tone dialing, DTMF, Hybrid circuit and its operation, local loop 5.2 Block diagram of Electronic exchange, Space division switching, Time division switching 5.3 Numbering plan of telephone network- National and International scheme of numbering plan	
	Group – C	
Unit 6	**Analog Pulse Modulation**	**06**
	6.1 Introduction and comparison with continuous wave modulation and advantages, Sampling Theorem, Nyquist rate, natural and flat top sampling 6.2 Definition, principle of generation and reception of PAM (Pulse Amplitude Modulation), PWM (Pulse Width Modulation) and PPM (Pulse Position Modulation) with block diagram and applications	
Unit 7	**Digital Communication Systems and Coding Methods**	**08**

	7.1 Idea of Digital Communication – Advantages of digital communication over analog communication, Elements of digital communication system with block diagram – source, channel, transmitter and receiver 7.2 Channel characteristic – Bit rate, Baud rate, channel capacity, Synchronous and Asynchronous data 7.3 Information Theory – Relationship between data speed and channel capacity, Hartley's Law, Hartley – Shannon Theorem 7.4 Error correction – Causes of error and its effect, error detection and correction using Parity Check, Cyclic Redundancy Check (CRC) 7.5 Idea of Inter Symbol Interference (ISI) and interpretation of EYE diagram 7.6 Line coding format – RZ, NRZ, AMI and Manchester code	
	Total	**60**

Sl. No.	Suggested List of Laboratory Experiments
1	To study generation of AM signal and the waveforms
2	To study Envelop detector for demodulation of AM and observe the effect
3	To study generation of FM signal using varactor and reactance modulator and the waveforms
4	To study detection of FM signal using Foster Seeley method.
5	To study the frequency spectrum of AM and FM using spectrum analyzer
6	To study super heterodyne AM receiver and measurement receiver parameters as i)Sensitivity, ii) selectivity and iii) Fidelity
7	To study PAM modulation and demodulation
8	To study PWM modulation and demodulation
9	To study PPM modulation and demodulation
10	To study the analog signal sampling and reconstruction for different sampling frequency
11	To study the different blocks of a telephone receiver
12	Mini projects on (A) AM radio receiver (B) FM radio receiver (C) AM transmitter (D) FM transmitter

Name of the course: **Electronic Devices and Circuits**	
Course Code: ETCE/EDC/S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 4 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Practical: 3 contact hours/ week	Attendance =10 marks and Quizzes/Assignment/Student Activity = 10 marks

	End Semester Examination: 60 Marks
Credit: 4 (TH:3+PR:1)	Practical: 100 Marks

Course Outcomes:

On completion of the study of the subject a student should be able to:

- Explain the principle of operation and application of different types of diodes viz. Rectifiers (without filters and with filters), Clippers and Clampers.
- Discuss the working principle of BJT, its biasing circuit, different types of gains in terms of h-parameter and stabilization of their operating points.
- Compare different types of Coupling in Amplifier
- Explain the construction and working principle of JFET, MOSFET and UJT
- Illustrate and compare the performance of different types of Power amplifiers.
- Explain different types of feedback in amplifiers, illustrate the effect of feedback on different parameters of an amplifier and hence, deduce the concept of oscillation.

Content (Name of the topic)		Periods
	Group – A	
Unit 1	**Diodes and their applications**	**10**
	1.1 Half Wave and Full Wave Rectifiers(with Centre Tapped Transformer and Bridge) : Average voltage – R.M.S. voltage, efficiency and ripple factor, Percentage voltage regulation & TUF 1.2 Function of filter circuits – Capacitor input filter – Inductive filter – PI filter – Calculation of ripple factor and average output voltage 1.3 Diode wave shaping circuits – clipper and clamper circuits 1.4 Zener diode, Zener breakdown & Avalanche Breakdown. 1.5 Varactor diode & Schottky diode.	
Unit 2	**Bipolar Junction Transistor and its biasing**	**10**
	2.1 Transistor configurations (CB, CE & CC), input and output characteristics. α, β, and γ factors 2.2 Comparison of CB, CE, and CC configurations 2.3 Concept of Q-point, ac and dc load lines 2.4 Stabilization and stability factor 2.5. BIASING: Base bias — Collector feedback bias — Emitter feedback bias — Potential divider bias.	
	Group – B	
Unit 3	**Small Signal Transistor Amplifiers**	**10**
	3.1 Hybrid model and h-parameters of CB, CE & CC mode transistor amplifiers – Calculation of voltage gain, current gain, power gain, input and output impedance in terms of h-parameters 3.2 High frequency model of BJT 3.3 Types of Coupling in Amplifier: RC coupled, Direct coupled & Transformer-coupled amplifiers; their relative advantages and disadvantages. 3.4 Effect of cascading on Gain & Bandwidth and Frequency response	

Unit 4	**JFET, MOSFET AND UJT**	**10**
	4.1 Field Effect Transistors: FET – Working Principle, Classification 4.2 N-Channel/ P-Channel MOSFETs – characteristics, enhancement and depletion mode, MOSFET as a Switch 4.3 MOSFET Small Signal model 4.4 Small signal FET equivalent circuits – Common Source and Common Drain amplifier – FET application as VVR, Constant Current Source etc. 4.5 Uni-Junction Transistor – equivalent circuit, operation and application.	
	Group – C	
Unit 5	**Power Amplifier**	**08**
	5.1 Characteristics of Class A, Class B, Class C and Class AB amplifier 5.2 Transformer Coupled Audio Power Amplifier- Impedance Matching and Maximum Power Output. 5.3 Push-Pull Amplifiers: Advantages of Push-Pull amplifier, Power considerations& Distortion in class B Push-Pull Amplifier.	
Unit 6	**Feedback Amplifier and concept of oscillation**	**12**
	6.1 Basic idea of positive and negative feedback 6.2 Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt, Current Series, Current Shunt 6.3 Effect of negative feedback on gain, gain stability, distortion, noise, bandwidth, phase shift, input and output impedances 6.4 Performance of emitter follower circuit – Calculation of gain and input & output impedances 6.5 Barkhausen criteria and operation of Tuned Collector Oscillator.	
	Total	**60**

Sl. No.	**Suggested List of Laboratory Experiments**
1	To study the rectifier with and without capacitor filter for : — (a) Half-wave rectifier, (b) Full-wave rectifier,
2	To observe the waveform at the input and output of clipping circuits in different clipping configuration.
3	To study the operation of positive and negative clamper circuit.
4	To study the VI characteristics of a forward and reverse biased Zener diode.
5	To study the input and output characteristics and to determine the h-parameters of a BJT for : — (a) C-E configuration, (b) C-B configuration, (c) C-C configuration
6	To determine frequency response characteristics of RC coupled amplifier circuit and calculation of bandwidth, midband gain, input impedance and output impedance for : (a) Single-stage amplifier, (b) Double-stage amplifier
7	To study Drain Characteristics and Transfer Characteristics of a Field Effect Transistor (FET).

8	To study Drain Characteristics and Transfer Characteristics of a MOSFET.
9	To study the V-I characteristics of UJT (show the cut-off, saturation and negative resistance region)
10	To study the operation of a Class B Push-Pull Amplifier
11	To determine the frequency characteristics of a negative feedback amplifier and compare with that of an amplifier without feedback.

Name of the course: **Digital Electronics**	
Course Code: ETCE/DE/S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Practical: 2 contact hours/ week	Attendance =10 marks and Quizzes/Assignment/Student Activity = 10 marks
	End Semester Examination: 60 Marks
Credit: 3 (TH:2+PR:1)	Practical: 100 Marks

Course Outcomes:

On completion of the course students will be able to :

- Describe the difference between Analog and Digital logic systems, different number systems and their conversions
- Know the rules and laws of Boolean Algebra, basic logic, derived and special logic gates, De-Morgan's theorem , minimization technique of Boolean expressions by using K- Map
- Understand the operation of different Combinational Logic Circuits like Adder, Subtractor, MUX, DEMUX, Encoder, Decoder etc
- Acquire knowledge on basic working principle of different types of FLIP-FLOPS like JK, SR, D, T, Master-Slave
- Have a clear idea of Asynchronous and synchronous counters, Ring and Twisted Ring Counters and Shift REGISTERS
- Understand ideas on different Memory Devices and different types of A to D and D to A converter.

Content (Name of the topic)		**Periods**
	Group – A	
Unit 1	**NUMBER SYSTEMS AND CODES**	**03**
	1.1 Difference between Analog and Digital Logic system, Positive and Negative Logic system, Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal and Conversion from one number system to another. 1.2 Gray code (unit distance code), BCD (weighted code), Excess3(self-complementary) code, ASCII, EBCDIC Code, conversion between Gray and Binary codes	
Unit 2	**LOGIC GATES, BOOLEAN ALGEBRA & SIMPLIFICATION OF LOGIC**	**08**

	EXPRESSIONS	
	2.1 Symbolic representation , truth table and expressions of different logic gates: BUFFER – (NOT, OR, AND) – (NAND,NOR)– (XOR, X-NOR) 2.2 Rules and laws of Boolean Algebra, Difference between boole and ordinary variables, Basic logic circuits, De-Morgan's theorem 2.3 Max. term and Min term – Canonical form of equation – Simplification of Boolean expressions 2.4 Karnaugh Map technique (upto 4 variables) – Don't care condition – Prime implicants – Canonical forms – Quine-McClusky method 2.5 Realization of Boolean expression with different logic gates	
Unit 3	**Combinational Logic Circuits**	**12**
	3.1 Arithmetic Circuits – Addition, Subtraction, 1's 2's Complement and 9's complement method of addition, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallal and Series Adders. 3.2 Realization of NAND and NOR as a universal Logic Gate, Realization of AND-OR is equivalent to NAND-NAND and OR-AND is equivalent to NOR-NOR 3.3 Different Code converters, Operation, Truth Table and Circuit diagram of 2: 4 ,3: 8 Decoder and 4: 16 Decoders, Cascading of Decoders, Realization of different Boolean functions by using Decoders, BCD to seven segment Decoder, Operation of 4: 2 Encoder, 8: 3 Encoder and Priority Encoder. 3.4 Multiplexer – Operation, Truth Table and Circuit diagram of 2 to 1 MUX, 4:1 MUX, 8:1 MUX and 16: 1 MUX. Cascading of MUX, Realization of Boolean functions by using MUX, Design of Universal Gate by using MUX. 3.5 Demultiplexer – Operation, Truth Table and Circuit diagram of 1:2 DEMUX, 1:4 DEMUX, 1:8 DEMUX, Conversion in between Decoder and Demultiplexer. 3.6 Design of 2,3,4 bit odd and even Parity Generator and Checker, Design of 2, 3 and 4 bit Binary Comparators.	
	Group – B	
Unit 4	**Sequential Logic Circuits (FLIP-FLOP)**	**05**
	4.1 Difference between Combinational and Sequential Logic Circuits, Idea of clock pulse, Concept of Flip Flops – Difference between flip flop and latch 4.2 Construction and Operation of RS, JK, D and T Flip Flops, Operation of preset and clear signal. Race Around Condition, Master slave JK Flip flop, Positive and Negative Edge triggered flip-flop, Excitation/ Transition Table of all Flip flops.	
Unit 5	**Sequential Logic Circuits (COUNTERS and REGISTERS)**	**08**
	5.1 Concept of Counter, Difference between Asynchronous and Synchronous counter – Operation of 3 & 4 bit Ripple UP/DOWN counter with timing diagram–Programmable ripple counter, Application of counter 5.2 Design of (a) Ring (N:1) counter with Truth Table and waveform diagram. (b) Johnson counter (2N:1) with Truth Table and waveform diagram. 5.3 Design of Synchronous counter with the help of RS, JK, D, and T Flip-Flop (e.g Mod 5,7,10 etc.) 5.4 Registers – 4bit Shift Register: Operation of Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out, Parallel In Parallel Out, Concept of Bidirectional Shift Register, Application of Shift Register	

Group – C		
Unit 6	**Memory Devices**	**04**
	6.1 Classification of Memories – RAM Organization, Address Lines and Memory Lines, Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM 6.2 Read Only memory – ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory CDROM 6.3 Digital Logic Arrays- PLA, PAL, GAL, FPLA, FPGA	
Unit 7	**Data Converters**	**05**
	7.1 DIGITAL TO ANALOG CONVERTERS: Binary weighted resistor type DAC, R-2R ladder type DAC, specifications and applications of DAC. 7.2 ANALOG TO DIGITAL CONVERTER: Comparator type, Successive approximation type, Dual slope AD converter specifications and applications of AD converter.	
	Total	**45**

Sl. No.	Suggested List of Laboratory Experiments
1	To verify the truth tables for all logic fates – NOT, OR ,AND, NAND, NOR ,XOR and XNOR using CMOS Logic gates [CMOS ICs4001,4011,4030,4070,4071,4077,4081,4093] and TTL Logic Gates [TTL ICs-7400,7402,7404,7408,7432,7486]
2	Implement and realize Boolean Expressions with different Logic Gates
3	Implement Half Adder, Full Adder, Half Sub tractor and Full sub tractor by using different digital ICs
4	Realization of parallel and serial full-adder using ICs (IC- 74LS83)
5	To implement encoder (IC-74147), decoder (IC-74138), multiplexer (IC-74151) and demultiplexer (IC-74138).
6	Construct a Single digit Decade Counter (0-9) with 7 segment display (74LS90)
7	To construct 2 bit parity generator and checker & 2 bit comparator by using logic gates.
8	To verify the Truth Table of SR, D, JK and T Flip-flops (IC-74LS76)
9	To construct binary synchronous and asynchronous counter.
10	To design programmable up / down counter.
11	To design controlled shift register and study their function as SIPO.SISO, PIPO, PISO (by using IC74LS76)
12	To study different memory ICs.
13	To study DA and AD converters

Name of the course: **Electric Circuits and Network**	
Course Code: ETCE/ECN/S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 4 contact hrs./ week	Class Test (Internal Examination): 20 Marks

Practical: 3 contact hours/ week	Attendance =10 marks and Quizzes/Assignment/Student Activity = 10 marks
	End Semester Examination: 60 Marks
Credit: 4 (TH:3+PR:1)	Practical: 100 Marks
Course Outcomes:	

On completion of the course students will be able to :

- Simplify networks using graph theory or proper reduction techniques.
- Solve two-port network and resonant circuit.
- Design filter, attenuator and equalizer circuit.
- Interpret the circuit response and output spectrum by using Laplace and Fourier Transform respectively.
- Develop an understanding on Transmission Lines.

Content (Name of the topic)		Periods
	Group – A	
Unit 1	**Basic of Network and Network Theorems**	**12**
	1.1 Kirchhoff's Voltage Law, Kirchhoff's Current Law, Voltage divider, current divider rule, star – delta conversion, Source Transformation and duality. 1.2 Node and Mesh Analysis using Independent and Controlled Source 1.3 Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem – simple problems. 1.4 Idea of resonance – series and parallel resonant circuits – Q value, Selectivity and Bandwidth.	
Unit 2	**Graph Theory**	**04**
	2.1 Graph of a network, tree, incident matrix, concepts of path, cycle and tree, independent loops 2.2 F – Tie Set and analysis of resistive network using tie – set 2.3 F - Cut Set and analysis of resistive network using cut – set. Duality.	
Unit 3	**Two Port Network**	**08**
	3.1 Introduction of Two Port Network - Open circuit impedance parameters, Short circuit impedance parameters, hybrid parameters, transmission parameters – simple problems. 3.2 Open and short circuit impedance, characteristics impedance and its relation with open and short circuit impedance, propagation constant and image impedance.	
	Group – B	
Unit 4	**Filter Circuits**	**05**
	4.1 Definition and relationship between neper and decibel. 4.2 Basic idea of passive filters – definition of pass band, stop band, cut – off frequency. 4.3 Constant K – prototype filters: a) Low pass filter b) high pass filter c) Band pass filter d) Band reject filter 4.4 Active filter - Basic idea, advantages and disadvantages of basic filters, application of filter circuits.	
Unit 5	**Attenuators and Equalizers**	**07**

	5.1 Basic idea of attenuators, difference between attenuator and filter, symmetrical T and π attenuator – field of application of attenuators. 5.2 Concept of equalizer – purpose of equalizer and its classification – Difference between series & shunt equalizer and their field of applications	
Unit 6	**Transmission Lines**	**06**
	6.1 Types of transmission lines: Parallel wire and coaxial cable 6.2 Primary and secondary constants of transmission lines 6.3 Characteristic impedance – Reflection co-efficient – Standing wave ratio and their relationship 6.4 Simple matching methods, single and double stub match for transmission lines 6.5 Losses in transmission lines 6.6 Distortion in transmission line – Causes of distortion and condition for distortion less transmission – Practical feasibility for distortion less transmission	
	Group – C	
Unit 7	**Laplace Transform**	**12**
	7.1 Laplace Transform and its properties 7.2 Analysis of electrical circuits using Laplace transform for standard inputs (unit step, ramp) 7.3 Initial and Final Conditions for network elements 7.4 Forced and free response, time constants 7.5 Steady state and transient state response 7.6 Solution of 1st and 2nd order differential equations for series and parallel RL, RC, RLC circuits 7.7 Inverse Laplace Transform	
Unit 8	**Fourier Series**	**06**
	8.1 Discrete spectra and symmetry of waveforms for Exponential and Trigonometric Fourier Series 8.2 Steady state response of a network to non-sinusoidal periodic inputs, power factors, effective values. 8.3 Fourier Transform and continuous spectra	
	Total	**60**

Sl. No.	**Suggested List of Laboratory Experiments**
1	To verify node and mesh analysis using independent and controlled sources
2	To verify Thevenin's and Norton's theorems
3	To verify Superposition theorem.
4	To verify Maximum Power Transfer theorem and Reciprocity Theorem.
5	To verify characteristics of Series resonant Circuit
6	To verify characteristics of Parallel resonant Circuit
7	To measure the characteristic impedance of symmetrical T and π networks

8	To measure the cut –off frequencies of the following: — (a) constant k-type low pass filter; (b) constant k-type high pass filter;
9	To measure T and π type attenuator
10	To observe standing wave pattern for a transmission line of finite length with: (a) open termination, (b) shorted termination and (c) matched termination,
11	To measure the attenuation constant and phase shift constant for matched termination.

Name of the course: **Computer Programming Language**	
Course Code: ETCE/CPL/S3	Semester: Third
Duration: One Semester (Teaching - 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Practical: 2 contact hours/ week	Attendance =10 marks and Quizzes/Assignment/Student Activity = 10 marks
	End Semester Examination: 60 Marks
Credit: 3 (TH:2+PR:1)	Practical: 100 Marks
Course Outcomes:	

On completion of the course students will be able to :

- Understand the concept of hardware and software part of a computer.
- Explain compiler, interpreter, linker and loader function.
- Understand flow charts and algorithms and the basic structure of a program in C.
- Learn about one dimensional array and pointers.
- Understand the definition of a function and its advantages.
- Understand the concept of Object Oriented Programming.

Content (Name of the topic)		**Periods**
	Group – A	
Unit 1	**Computer Fundamentals**	**07**
	1.1 Introduction of computers, Classification of computers, Anatomy of a computer, Memory hierarchy, Introduction to OS, Operational overview of a CPU. 1.2 Generation and classification of programming languages, Compiling, Interpreting, Loading, Linking of a program, Developing program, Software development. 1.3 Flow chart and algorithm development.	
Unit 2	**Basics of C**	**07**

	2.1 Overview of C, Structure of a C program, Comments, Program statements, C tokens, Keywords, Identifiers, Data types, Variables, Constants, Operators, Expressions and precedence. 2.2 Non-formatted and formatted input and output functions.	
Unit 3	**Control Statements**	**06**
	3.1 Selection statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch. 3.2 Iterative statements – while, for, do-while. 3.3 Special control statements – goto, break, continue, return, exit.	
	Group – B	
Unit 4	**Arrays and Pointers**	**09**
	4.1 Introduction of one-dimensional arrays, Declaration and initialization of Array, Accessing of array elements and other allowed operations, Definition of header file, Use of header files, Different header files, Functions from ctype.h, string.h, Simple program with a one dimensional array. 4.2 Understanding pointers, declaring and accessing pointer, '&' and '*' operators, Pointer expressions, Pointer assignments, Pointer arithmetic.	
Unit 5	**Functions**	**07**
	5.1 Concept of function, Using functions, Call-by-value Vs Callby-reference, Passing arrays to functions, Recursion, Simple programs.	
Unit 6	**Basic Concepts of Object Oriented Programming**	**09**
	6.1 Introduction to Object Oriented Programming, Concepts of Objects and Classes.	
	Total	**45**

Sl. No.	**Suggested List of Laboratory Experiments**
1	Familiarization with programming environment (Editor, Compiler, etc.)
2	Verify the programs using I/O statements and various operators
3	Verify the programs to check whether a number is even or odd
4	Verify the programs to find the sum of n natural numbers
5	Verify the programs to find the largest and smallest number among five numbers
6	Verify the programs to find factorial of a number
7	Verify the programs to display Fibonacci sequence
8	Verify the programs to find GCD and LCM of two numbers
9	Verify the programs to count number of digits in an integer
10	Verify the programs to demonstrate recursion
11	Verify the programs to demonstrate use of pointers
12	Verify the programs to sort 10 elements in ascending or descending order

13	Verify the programs to find the summation of three numbers using function
14	Verify the programs to find the maximum between two numbers using function

Name of the course: **Internship-I**	
Course Code: ETCE/INT-I/S3	Semester: Third
Duration: During vacation	Maximum Marks: 100 Marks
Credit: 1	
Students are required to be involved in Inter/Intra Institutional activities viz: Training and simulation program with different Institutes like Workshop of ITI, Other Polytechnics and other technical institutes; Soft skill training organized by Training and Placement Cell of the respective institutions, contribution at innovation/entrepreneurship cell of the institute; participation in workshops/competitions etc.; Learning at Departmental Lab/Institutional workshop.	
Course Outcomes:	
On completion of the course students will be able to : • Understand the real time industrial environment. • Get exposure about entrepreneurship development. • Learn about the training and simulation program of the industry/institute. • Handle different Industrial/Institutional equipments/machineries.	