CHAPTER

9

Electronics and Communication Engineering Curriculum Structure

(III to VI Semesters)

9.1 List of Programme Core Courses [PC]

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.	ECPC201	Principles of Electronic Communication	3	0	0	3	3
2.	ECPC203	Principles of Electronic Communication Lab	0	0	2	3	1
3.	ECPC205	Electronic Devices and Circuits	3	0	0	3	3
4.	ECPC207	Electronic Devices and Circuits Lab	0	0	2	3	1
5.	ECPC209	Digital Techniques	2	0	0	3	2
6.	ECPC211	Digital Techniques Lab	0	0	2	3	1
7.	ECPC213	Electronic Measurements and Instrumentation	3	0	0	3	3
8.	ECPC215	Electronic Measurements and Instrumentation Lab	0	0	2	3	1
9.	ECPC217	Electric circuits and network	2	1	0	3	3
10.	ECPC202	Microcontroller and Applications	3	0	0	4	3
11.	ECPC204	Microcontroller and Applications Lab	0	0	2	4	1
12.	ECPC206	Consumer Electronics	3	0	0	4	3
13.	ECPC208	Digital Communication Systems	3	0	0	4	3
14.	ECPC210	Digital Communication Systems Lab	0	0	2	4	1
15.	ECPC301	Embedded Systems	3	0	0	3	3
16.	ECPC303	Embedded Systems Lab	0	0	2	2	1
17.	ECPC305	Mobile and Wireless Communication	3	0	0	3	3
18.	ECPC307	Mobile and Wireless Communication Lab	0	0	2	2	1
19.	ECPC302	Computer Networking and Data Communication	3	0	0	3	3
20.	ECPC304	Computer Networking and Data Communication Lab	0	0	2	2	1
		Total Credits					**41**

9.2 List of Program Elective Courses [PE]

Sl. No	Code No.	Course Title	Hours per week			Total hrs/ week	Cred-its
			L	T	P		
1.	ECPE201	Electronic Equipment Maintenance Or Simulation Software	0	0	4	4	2
2.	ECPE202	Linear Integrated Circuits	3	1	0	4	4
3.	ECPE203	Linear Integrated Circuits	0	0	2	4	1
4.	ECPE301	Industrial Automation or Control System and PLC	3	0	0	3	3
5.	ECPE302	Industrial Automation Lab or Control System and PLC Lab	0	0	2	2	1
6.	ECPE303	Microwave and RADAR or Optical Communication and network-ing	3	0	0	3	3
7.	ECPE304	Microwave and RADAR Lab or Optical Communication and network-ing Lab	0	0	2	2	1
Total Credits							**15**

9.3 Semester-wise Detailed Curriculum

Semester III

Sl. No	Category	Code No.	Course Title	Hours per week			Total contact hrs/ week	Cred-its
				L	T	P		
1.	Program core course	ECPC201	Principles of Electronic Communication	3	0	0	3	3
2.	Program core course	ECPC203	Principles of Electronic Communication Lab	0	0	2	2	1
3.	Program core course	ECPC205	Electronic Devices and Circuits	3	0	0	3	3
4.	Program core course	ECPC207	Electronic Devices and Circuits	0	0	2	2	1
5.	Program core course	ECPC209	Digital Electronics	2	0	0	2	2
6.	Program core course	ECPC211	Digital Electronics Lab	0	0	2	2	1
7.	Program core course	ECPC213	Electronic Measurements and Instrumentation	3	0	0	3	3
8.	Program core course	ECPC215	Electronic Measurements and Instrumentation Lab	0	0	2	2	1
9.	Program core course	ECPC217	Electric circuits and network	2	1	0	3	3
10.	Summer Internship-I (4 weeks) after II Semester	SI201		0	0	0	0	2
	Total Credits							**20**

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Semester IV

Sl. No	Category	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits
				L	T	P		
1.	Program core course	ECPC202	Microcontroller and Applications	3	0	0	3	3
2.	Program core course	ECPC204	Microcontroller and Applications Lab	0	0	2	2	1
3.	Program core course	ECPC206	Consumer Electronics	3	0	0	3	3
4.	Program core course	ECPC208	Digital Communication Systems	3	0	0	3	3
5.	Program core course	ECPC210	Digital Communication Systems Lab	0	0	2	2	1
6.	Program Elective course	ECPE202	Electronic Equipment Maintenance	2	0	0	2	2
7.	Program Elective course	ECPE204	Linear Integrated Circuits	3	1	0	4	4
8.	Program Elective course	ECPE206	Linear Integrated Circuits Lab	0	0	2	2	1
9.	Minor Project	PR202		0	0	4	4	2
10.	Mandatory Course	AU202	Essence of Indian Knowledge and Tradition	2	0	0	0	0
	Total Credits							**20**

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Semester V

Sl. No	Category	Code No.	Course Title	Hours per week			Total contact hrs/ Week	Credits
				L	T	P		
1.	Program core course	ECPC301	Embedded Systems	3	0	0	3	3
2.	Program core course	ECPC303	Embedded Systems Lab	0	0	2	2	1
3.	Program core course	ECPC305	Mobile and Wireless Communication	3	0	0	3	3
4.	Program core course	ECPC307	Mobile and Wireless Communication Lab	0	0	2	2	1
5.	Program Elective course	ECPE301	Industrial Automation or Control System and PLC	3	0	0	3	3
6.	Program Elective course	ECPE303	Industrial Automation Lab or Control System and PLC Lab	0	0	2	2	1
7.	Program Elective course	ECPE305	Microwave and RADAR or Optical Communication and networking	3	0	0	3	3
8.	Program Elective course	ECPE307	Microwave and RADAR Lab or Optical Communication and networking Lab	0	0	2	2	1
9.	Open Elective	ECOE301	Renewable Energy Technologies or Internet of Things	3	0	0	3	3
10.	Summer Internship-II(6 weeks) after IV Semester	SI301		0	0	0	0	3
11.	Major Project	PR302		0	0	2	2	^
	Total Credits							**22**

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Semester VI

Sl. No	Category	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits
				L	T	P		
1.	Program core course	ECPC302	Computer Networking and Data Communication	3	0	0	3	3
2.	Program core course	ECPC304	Computer Networking and Data Communication Lab	0	0	2	2	1
3.	Humanities and Social Science course	HS302	Entrepreneurship and Start-ups	3	1	0	4	4
4.	Open Elective	ECOE302	Robotics or Mechatronics	3	0	0	3	3
5.	Open Elective	ECOE303	Artificial Intelligence or Product Design	3	0	0	3	3
6.	Mandatory Course	AU302	Indian Constitution	2	0	0	2	0
7.	Major Project	PR302		0	0	6	6	4^
8.	Seminar	SE302		1	0	0	1	1
	Total Credits							**19**

^one credit is carried forward from the Vth semester major project evaluation.

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Semester III		
Course Code	:	ECPC 201
Course Title	:	Principles of Electronic Communication
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

ANALOG MODULATION: Concept of frequency translation. Amplitude Modulation: Description of full AM, DSBSC, SSB and VSB in time and frequency domains, methods of generation & demodulation, descriptions of FM signal in time and frequency domains

PULSE ANALOG MODULATION: Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains

PCM & DELTA MODULATION SYSTEMS: Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation.

DIGITAL MODULATION: Baseband transmission: Line coding (RZ, NRZ), inter symbol interference (ISI), pulse shaping, Nyquist criterion for distortion free base band transmission, raised cosine spectrum. Pass band transmission: Geometric interpretation of signals, orthogonalization.

SPREAD-SPECTRUM MODULATION: Introduction, Pseudo-Noise sequences, direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.

Books:

1. Principles of communication systems By Taub Schilling, T.M.H.
2. Fundamentals of communication systems By Proakis & Salehi, Pearson education
3. Communication Systems by Simon Haykin, John Wiley
4. Communication Systems (Analog and Digital) By R.P. Singh, S.D. Sapre, T.M.H.
5. Modern Digital & Analog Communication By B.P. Lathi, Oxford Publications
6. Digital & Analog Communication Systems By K.S. Shanmugam, John Wiley

Course Outcomes:

1. Use of different modulation and demodulation techniques used in analog communication.
2. Identify and solve basic communication problems.
3. Analyse transmitter and receiver circuits.
4. Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems.

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Course Code	:	ECPC 203
Course Title	:	Principles of Electronic Communications Lab
Number of Credits	:	1 (L: 3, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

1. Harmonic analysis of a square wave of modulated waveform: measures modulation index.

2. To modulate a high frequency carrier with sinusoidal signal to obtain FM signal.
3. To study and observe the operation of a super heterodyne receiver
4. To modulate a pulse carrier with sinusoidal signal to obtain PWM signal and demodulate it.
5. To modulate a pulse carrier with sinusoidal signal to obtain PPM signal and demodulate it.
6. To observe pulse amplitude modulated waveform and its demodulation.
7. To observe the operation of a PCM encoder and decoder. To consider reason for using digital signal x-missions of analog signals.
8. To study & observe the amplitude response of automatic gain controller (AGC).

Practical Outcomes (PrOs)

1. Understanding the different techniques of signal modulation and demodulation.
2. Understanding the variation in amplitude of controllers.

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Course Code	:	ECPC 205
Course Title	:	Electronics Devices and Circuits
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit 1 – Semiconductor and Diodes

Definition, Extrinsic/Intrinsic, N-type & p-type

PN Junction Diode – Forward and Reverse Bias Characteristics

Zener Diode – Principle, characteristics, construction, working

Diode Rectifiers – Half Wave and Full Wave

Filters – C, LC and PI Filters

Unit 2 – Bipolar Junction Transistor (BJT)

NPN and PNP Transistor – Operation and characteristics

Common Base Configuration – characteristics and working

Common Emitter Configuration – characteristics and working

Common Base Configuration – characteristics and working

High frequency model of BJT

Classification of amplifiers, negative feedback

Unit 3 – Field Effect Transistors

FET – Working Principle, Classification

MOSFET Small Signal model

N-Channel/ P-Channel MOSFETs – characteristics, enhancement and depletion mode, MOS-FET as a Switch

Common Source Amplifiers

Uni-Junction Transistor – equivalent circuit and operation

Unit 4 – SCR DIAC & TRIAC

SCR – Construction, operation, working, characteristics

DIAC - Construction, operation, working, characteristics

TRIAC - Construction, operation, working, characteristics

SCR and MOSFET as a Switch, DIAC as bidirectional switch

Comparison of SCR, DIAC, TRIAC, MOSFET

Unit 5 – Amplifiers and Oscillators

Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters

Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt Current Series, Current Shunt

Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	Analog Circuits	A.K. Maini	Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
2.	Electronic Devices and Circuits	S. Salivahanan and N. Suresh Kumar	McGraw Hill Education; Fourth edition (١ July ٢٠١٧) ISBN: 978-9339219505
3.	Electronics Devices and circuit theory	Boyestad & Nashelsky	Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
4.	Electronic Principles	Albert Malvino & David Bates	Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
5.	Electronics Devices & Circuits	Jacob Millman	McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543

SUGGESTED SOFTWARE/LEARNING WEBSITES:

a. https://www.electronics-tutorials.ws/

b. https://www.youtube.com/watch?v=Rx43l-QpeWQ

c. https://electronicsforu.com/resources/electronic-devices-and-circuit-theory

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Course Code	:	ECPC207
Course Title	:	Electronic Devices and Circuits Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.
1.	Construct the circuit and plot the VI characteristics of the PN Junction Diode , find the cut in voltage	1
2.	Construct the circuit and plot the characteristics of a Zener Diode. Find the breakdown voltage	1
3.	Construct a Half Wave Rectifier and obtain regulation characteristics – Without Filters and with Filters Compare the results	1
4.	Construct a Full Wave Rectifier and obtain regulation characteristics – Without Filters and with Filters Compare the results	1
5.	Construct a Bridge Rectifier and obtain regulation characteristics – Without Filters and with Filters	1
6.	Obtain the characteristics of DIAC and TRIAC	3
7.	Simulate half wave, full wave and bridge rectifier using simulation tool like PSpice/ Orcad/ Multisim.	3
8.	Develop a simulation model for Voltage Series and Voltage Shunt Feedback Amplifiers	5
9.	Develop circuits for Voltage Series and Voltage Shunt Feedback Amplifiers and obtain output plots. Compare the results with the simulation model.	5
10.	Develop a simulation model for Current Series and Current Shunt Feedback Amplifiers	5
11.	Develop circuits for Current Series and Current Shunt Feedback Amplifiers and obtain output plots. Compare the results with the simulation model.	
12.	**Total**	

Reference Books:

S. No.	Title of Book	Author	Publication
1.	Analog Circuits	A.K. Maini	Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
2.	Electronic Devices and Circuits	S. Salivahanan and N. Suresh Kumar	McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
3.	Electronics Devices and circuit theory	Boyestad & Nashelsky	Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
4.	Electronic Principles	Albert Malvino & David Bates	Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
5.	Electronics Devices & Circuits	Jacob Millman	McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543

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Course Code	:	ECPC209
Course Title	:	Digital Electronics
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit 1 – Number Systems & Boolean Algebra

Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal

Conversion from one number system to another.

Boolean variables – Rules and laws of Boolean Algebra

De-Morgan's Theorem

Karnaugh Maps and their use for simplification of Boolean expressions

Unit 2 – Logic Gates

Logic Gates – AND, OR, NOT, NAND, NOR , XOR, XNOR: Symbolic representation and truth table

Implementation of Boolean expressions and Logic Functions using gates

Simplification of expressions

Unit 3 – Combinational Logic Circuits

Arithmetic Circuits – Addition, Subtraction, 1's 2's Complement, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel and Series Adders

Encoder, Decoder

Multiplexer – 2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX. Applications

Demultiplexer – 1 to 2 DEMUX, 1- 4 DEMUX, 1- 8 DEMUX

Unit 4 – Sequential Logic Circuits

Flip Flops – SR,JK, T, D, FF, JK-MS, Triggering

Counters – 4 bit Up – Down Counters, Asynchronous/ Ripple Counter, Decade Counter- Mod 3, Mod 7 Counter, Johnson Counter, Ring Counter

Registers – 4bit Shift Register: Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out, Parallel In Parallel Out

Unit 5 – Memory Devices

Classification of Memories – RAM Organization, Address Lines and Memory Sixe,

Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM

Read Only memory – ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory

Data Converters – Digital to Analog converters, Analog to Digital Converters

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	Digital principles & Applications	Albert Paul Malvino & Donald P. Leach	McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2.	Digital Electronics	Roger L. Tokheim Macmillian	McGraw-Hill Education (ISE Editions); International 2 Revised ed edition ISBN: 978-0071167963
3.	Digital Electronics – an introduction to theory and practice	William H. Gothmann	Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485
4.	Fundamentals of Logic Design	Charles H. Roth Jr.	Jaico Publishing House; First edition ISBN: 978-8172247744
5.	Digital Electronics	R. Anand	Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93-82609445

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Course Code	:	ESPC211
Course Title	:	Digital Electronics Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	To verify the truth tables for all logic fates – NOT OR AND NAND NOR XOR XNOR using CMOS Logic gates and TTL Logic Gates	1	02
2.	Implement and realize Boolean Expressions with Logic Gates	2	02
3.	Implement Half Adder, Full Adder, Half Subtractor, Full subtractor using ICs	3	02
4.	Implement parallel and serial full-adder using ICs	3	02
5.	Design and development of Multiplexer and De-multiplexer using multiplexer ICs	3	02
6.	Verification of the function of SR,D, JK and T Flip Flops	4	02
7.	Design controlled shift registers	4	02
8.	Construct a Single digit Decade Counter (0-9) with 7 segment display	4	03
9.	To design a programmable Up-Down Counter with a 7 segment display.	4	03
10.	Study of different memory ICs	5	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
11.	Study Digital- to – Analog and Analog to Digital Converters	5	02
12.	Simulate in Software (such as PSpice) an Analog to Digital Converter	5	03
13.	Simulate in Software (such as PSpice) an Analog to Digital Converter	5	03
	Total		**30**

Reference Books:

S.No.	Title of Book	Author	Publication
1.	Digital principles & Applications	Albert Paul Malvino & Donald P. Leach	McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2.	Digital Electronics	Roger L. Tokheim Macmillian	McGraw-Hill Education (ISE Editions); International 2 Revised ed edition ISBN: 978-0071167963
3.	Digital Electronics – an introduction to theory and practice	William H. Gothmann	Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485
4.	Fundamentals of Logic Design	Charles H. Roth Jr.	Jaico Publishing House; First edition ISBN: 978-8172247744
5.	Digital Electronics	R. Anand	Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93-82609445

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Course Code	:	ECPC213
Course Title	:	Electronic Measurement and Instrumentation
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit – I Basics of Measurements and Bridges

Accuracy & precision, Resolution
Types of Errors
DC Bridges – Wheatstone and Kelvin Double Bridge
AC Bridges - Maxwell's Bridge, Hay's Bridge, Anderson Bridge, De-Sauty's Bridge

Unit- II Potentiometer

Basic DC slide wire Potentiometer
Crompton's DC Potentiometer
Applications of DC Potentiometer
AC Potentiometers
Applications of AC Potentiometers

Unit– III Measuring Instruments

Permanent Magnet Moving Coil Instruments (PMMC)
Moving Iron type Instruments (MI)
Electro Dynamo Type Instruments
Single Phase Energy Meter

Unit– IV Electronic Instruments

Electronic Voltmeter and Digital Voltmeter
Electronic Multimeters
Q – Meter
Vector Impedance Meter

Unit– V Oscilloscopes

Cathode ray tube: construction, operation, screens, graticules
Vertical deflection system, Horizontal deflection system, Delay line,
Measurement of frequency, time delay, phase angle and modulation index (trapezoidal method)
Oscilloscope probe: Structure of 1:1 and 10:1 probe
Multiple Trace CRO

Unit- VI Transducers

Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers:
RTD, Thermocouple, Thermistor
LVDT, Strain Gauge
Load Cell
Piezoelectric Transducers

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	Electrical & Electronic Measurement & Instruments	A.K. Sawhney	Dhanpat Rai & Sons, India
2.	Electronic Instrument and Measurement Technique	W.D. Cooper	Prentice Hall International, India.
3.	Electronic Measurement & Instrumentation	J.G. Joshi	Khanna Publishing House, Delhi
4.	Measurement systems application and design	E.O. Doebelin and D. N. Manik	The Mcgraw-Hill
5.	Electronic Measurements and Instrumentation	Oliver and Cage	The Mcgraw-Hill
6.	Basic Electrical Measurement	M.B. Stout	Prentice hall of India, India
7.	Electronic Instrumentation	H. S. Kalsi	The Mcgraw-Hill
8.	Electrical and Electronics Measurement and Instrumentation	Prithwiraj Pukrait, Budhaditya Biswas, Santanu Das, Chiranjib Koley	The Mcgraw-Hill

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Course Code	:	ECPC215
Course Title	:	Electronic Measurements and Instrumentation Lab
Number of Credits	:	1 (L: 0, T:0 P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx Hrs. Required
1.	Measure unknown inductance using following bridges (a) Anderson Bridge (b) Maxwell Bridge	I	4
2.	Measure Low resistance by Kelvin's Double Bridge	I	2
3.	Calibrate an ammeter using DC slide wire potentiometer	II	2
4.	Calibrate a voltmeter using Crompton potentiometer	II	2
5.	Measure low resistance by Crompton potentiometer	II	2
6.	Calibrate a single-phase energy meter by phantom loading	III	2
7.	Study the working of Q-meter and measure Q of coils	IV	2

8.	Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes	V	2
9.	Measurement of displacement with the help of LVDT	VI	2
10.	Draw the characteristics of the following temperature transducers (a) RTD (Pt-100) (b) Thermistor	VI	2
11.	Measurement of strain/force with the help of strain gauge load cell	VI	2

Reference Books:

S. No.	Title of Book	Author	Publication
1.	Electrical & Electronic Measurement & Instruments	A.K. Sawhney	Dhanpat Rai & Sons, India
2.	Electronic Instrument and Measurement Technique	W.D. Cooper	Prentice Hall International, India.
3.	Electronic Measurement & Instrumentation	J.G. Joshi	Khanna Publishing House, Delhi
4.	Measurement systems application and design	E.O. Doebelin and D. N. Manik	The Mcgraw-Hill
5.	Electronic Measurements and Instrumentation	Oliver and Cage	The Mcgraw-Hill
6.	Basic Electrical Measurement	M.B. Stout	Prentice hall of India, India
7.	Electronic Instrumentation	H. S. Kalsi	The Mcgraw-Hill
8.	Electrical and Electronics Measurement and Instrumentation	Prithwiraj Pukrait, Budhaditya Biswas, Santanu Das, Chiranjib Koley	The Mcgraw-Hill

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Course Code	:	ECPC217
Course Title	:	Electric Circuits & Network
Number of Credits	:	3 (L: 2, T: 1 P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit – 1 Basics of Network and Network Theorem

Node and Mesh Analysis
Superposition Theorem
Thevenin Theorem
Norton Theorem
Maximum Power transfer theorem
Reciprocity Theorem

Unit– 2 Graph Theory

Graph of network, tree, incidence matrix

F- Tie Set Analysis

F-Cut Set Analysis

Analysis of resistive network using cut-set and tie-set

Duality

Unit– 3 Time Domain and Frequency Domain Analysis

Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits

Initial and Final conditions in network elements

Forced and Free response, time constants

Steady State and Transient State Response

Analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step)

Unit– 4 Trigonometric and exponential Fourier series

Discrete spectra and symmetry of waveform

Steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values

Fourier transform and continuous spectra

Unit- 5 Two Port Network

Two Port Network

Open Circuit Impedance Parameters

Short Circuit Admittance Parameters

Transmission Parameters

Hybrid Parameters

Interrelationship of Two Port Network

Inter Connection of Two Port Network

SUGGESTED LEARNING RESOURCES:

SUGGESTED SOFTWARE/LEARNING WEBSITES

S. No.	Title of Book	Author	Publication
1	Networks and Systems	Ashfaq Husain	Khanna Publishing House
2	Network Analysis	M. E. Van Valkenburg	Prentice Hall of India
3	Engineering Circuit Analysis	W. H. Hayt, J. E. Kemmerly and S. M. Durbin	McGraw Hill
4	Electrical Circuits	Joseph Edminister	Schaum's Outline, Tata McGraw Hill
5	Basic Circuit Theory	Lawrence P. Huelsma	Prentice Hall of India
6	Network & Systems	D. Roy Choudhury	Wiley Eastern Ltd
7	Linear Circuit Analysis	De Carlo and Lin	Oxford Press

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SEMESTER IV

Course Code	:	ECPC202
Course Title	:	Microcontroller and Applications
Number of Credits	:	3 (L: 3, T:0 P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit I Introduction

Introduction to Microprocessors and Microcontrollers, Architectures [8085,8086] Intel MCS-51 family features – 8051 -organization and architecture

Unit II Programming with 8051

10 8051 instruction set, addressing modes, conditional instructions, I/O Programming, Arithmetic logic instructions, single bit instructions, interrupt handling, programming counters, timers and Stack

Unit III

MCS51 and external Interfaces 8 User interface – keyboard, LCD, LED, Real world interface - ADC, DAC, SENSORS Communication interface.

Unit IV C programming with 8051

8 I/O Programming, Timers/counters, Serial Communication, Interrupt, User Interfaces-LCD, Keypad, LED and communication interfaces [RS232].

Unit V ARM processor core based microcontrollers 14 Need for RISC Processor-ARM processor fundamentals, ARM core based controller [LPC214X], IO ports, ADC/DAC, Timers.

References:

S. No.	Title of Book	Author	Publication
1.	The 8051 Micro Controller and Embedded Systems	Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely	PHI Pearson Education, 5th Indian reprint
2.	Microprocessor and Microcontrollers	Krishna Kant	Eastern Company Edition, Prentice Hall of India, New Delhi
3.	Microprocessor & Microcontroller Architecture: Programming & Interfacing using 8085,8086,8051	Soumitra Kumar Mandal	McGraw Hill Edu,
4.	Microcontrollers: Architecture implementation and Programming	Tabak Daniel, Hintz Kenneth j	Tata McGraw Hill, 2007
5.	ARM Developer's Guide.UM10139 LPC214X User manual – Rev.4	Andrew N.Sloss, Dominic Symes, Chris Wright	User manual – Rev.4
6.	Microprocessors and interfacing: programming and hardware	Douglas V. Hall	Tata McGraw Hill, 2editon, 2007
7.	"Microcontroller – Fundamentals and Applications with Pic	Valder – Perez	Yeesdee Publishers, Tayler & Francis

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Course Code	:	ECPC204
Course Title	:	Microcontroller and Applications Lab
Number of Credits	:	1 (L: 0, T:0 P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

1. Programming 8051 Micro controller using ASM and C, and implementation in flash 8051 microcontroller.
2. Programming with Arithmetic logic instructions [Assembly]
3. Program using constructs (Sorting an array) [Assembly]
4. Programming using Ports [Assembly and C]
5. Delay generation using Timer [Assembly and C]
6. Programming Interrupts [Assembly and C]
7. Implementation of standard UART communication (using hyper terminal) [Assembly and C].
8. Interfacing LCD Display. [Assembly and C]
9. Interfacing with Keypad [Assembly and C]
10. Programming ADC/DAC [Assembly and C]
11. Interfacing with stepper motor. [Assembly and C]
12. Pulse Width Modulation. [Assembly and C] Programming ARM Micro controller using ASM and C using simulator. 11.Programming with Arithmetic logic instructions[Assembly]
13. GPIO programming in ARM microcontroller. [C Programming].
14. Timers programing in ARM Microcontroller. [C Programming].

References:

S.No.	Title of Book	Author	Publication
1.	The 8051 Micro Controller and Embedded Systems	Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely	PHI Pearson Education, 5th Indian reprint
2.	Microprocessor and Microcontrollers	Krishna Kant	Eastern Company Edition, Prentice Hall of India, New Delhi
3.	Microprocessor & Microcontroller Architecture: Programming & Interfacing using 8085,8086,8051	Soumitra Kumar Mandal	McGraw Hill Edu,
4.	Microcontrollers: Architecture implementation and Programming	Tabak Daniel, Hintz Kenneth j	Tata McGraw Hill, 2007
5.	ARM Developer's Guide. UM10139 LPC214X User manual – Rev.4	Andrew N.Sloss, Dominic Symes, Chris Wright	User manual – Rev.4
6.	Microprocessors and interfacing: programming and hardware	Douglas V. Hall	Tata McGraw Hill, 2editon, 2007
7.	"Microcontroller – Fundamentals and Applications with Pic	Valder – Perez	Yeesdee Publishers, Tayler & Francis

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Course Code	:	ECPC206
Course Title	:	Consumer Electronics
Number of Credits	:	3 (L: 3, T:0 P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

UNIT-I Audio Fundamentals and Devices

Basic characteristics of sound signal, Audio level metering, decibel level in acoustic measurement, Microphone & Types, speaker types & working principle, Sound recording principle & types

UNIT-II Audio Systems

CD player, home theatre sound system, surround sound, Digital console block diagram, working principle, applications, FM tuner , ICs used in FM tuner TDA 7021T , PA address system.

UNIT-III Television Systems-

Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution, Composite video signal, Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance, Different types of TV camera, Transmission standards

UNIT-IV Television Receivers and Video Systems-

PAL-D colour TV receiver, Digital TVs:- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface, Digital Video, SDI, HDMI Multimedia Interface , Digital Video Interface, CD and DVD player

UNIT-V Home / Office Appliances

Diagrams, operating principles and controller for FAX and Photocopier, Microwave Oven, Washing Machine, Air conditioner and Refrigerators, Digital camera and cam coder.

References:

S. No.	Title of Book	Author	Publication
1.	Consumer Electronics	Bali S.P.	Pearson Education India,2010 , latest edition
2.	Audio video systems : principle practices & troubleshooting	Bali R and Bali S.P	Khanna Book Publishing Co. (P) Ltd., 2010Delhi , India, latest edition
3.	Modern Television practices	Gulati R.R.	New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition
4.	Audio video systems	Gupta R.G.	Tata Mc graw Hill, New Delhi, India 2010, latest edition
5.	Mastering Digital Television	Whitaker Jerry & Benson Blair	McGraw-Hill Professional, 2010, latest edition
6.	Standard handbook of Audio engineering	Whitaker Jerry & Benson Blair	McGraw-Hill Professional, 2010 , latest edition.

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Course Code	:	ECPC208
Course Title	:	Digital Communication Systems
Number of Credits	:	3 (L: 3, T:0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

UNIT1

Block diagram and sub-system description of a digital communication system. Sampling of low-pass and band-pass signals, PAM , PCM, signal to quantization noise ratio analysis of linear and nonlinear quantizers, Line codes and bandwidth considerations; PCM TDM hierarchies, frame structures, frame synchronization and bit stuffing.

UNIT 2

Quantization noise analysis of DM and ADM; DPCM and ADPCM; Low bit rate coding of speech and video signals. Baseband transmission, matched filter, performance in additive Gaussian noise; Intersymbol interference (ISI), Nyquist criterion for zero ISI, sinusoidal roll-off filtering, correlative coding, equalizers and adaptive equalizers; Digital subscriber lines.

UNIT 3

Geometric representation of signals, maximum likelihood decoding; Correlation receiver, equivalence with matched filter.Generation, detection and probability of error analysis of OOK, BPSK, coherent and non-coherent FSK, QPSK and DPSK; QAM, MSK and multicarrier modulation; Comparison of bandwidth and bit rate of digital modulation schemes.

UNIT 4

Introduction to Information and Coding Theories: Information Theory: information measures, Shannon entropy, differential entropy, mutual information, capacity theorem for point-to-point channels with discrete and continuous alphabets. Coding Theory: linear block codes – definitions, properties, bounds on minimum distance (singleton, Hamming, GV, MRRW), soft versus hard decision decoding, some specific codes (Hamming, RS, Concatenated); Convolutional codes – structure, decoding (the Viterbi and BCJR algorithms); Turbo codes, LDPC codes.

References:

S. No.	Title of Book	Author	Publication
1.	Communication Systems	Haykin, S	4th Ed., John Wiley & Sons
2.	Modern Digital and Analog Communication Systems	Lathi, B.P. and Ding, Z	Intl. 4th Ed., Oxford University Press.
3.	Digital Communications	Proakis, J.G. and Saheli, M	5th Ed., McGraw-Hill
4.	Digital Communication: Fundamentals and Applications	Sklar, B., and Ray, P.K	2nd Ed., Dorling Kindersley
5.	Elements of Information Theory	T. Cover and J. Thomas	2/e, Wiley.
6.	Principles of Digital Communication	R. G. Gallager	Cambridge Univ. Press
7.	A Foundation in Digital Communication	A. Lapidoth	Cambridge Univ. Press
8.	Error Control Coding	S. Lin and D. Costello	2/e, Prentice Hall.

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Course Code	:	ECPC210
Course Title	:	Digital Communication Systems Lab
Number of Credits	:	1 (L: 0, T:0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

1. Pulse Code Modulation and Differential Pulse Code Modulation.
2. Delta Modulation and Adaptive Delta modulation.
3. Simulation of Band Pass Signal Transmission and Reception • Amplitude Shift Keying • Frequency Shift Keying • Phase Shift Keying.
4. Performance Analysis of Band Pass Signal Transmission and Reception • Amplitude Shift Keying • Frequency Shift Keying • Phase Shift Keying.
5. Implementation of Amplitude Shift Keying
6. Implementation of Frequency Shift Keying
7. Implementation of Phase Shift Keying.
8. Time Division Multiplexing: PLL (CD 4046) based synch, clock and data extraction

References:

S. No.	Title of Book	Author	Publication
1.	Communication Systems	Haykin, S	4th Ed., John Wiley & Sons
2.	Modern Digital and Analog Communication Systems	Lathi, B.P. and Ding, Z	Intl. 4th Ed., Oxford University Press.
3.	Digital Communications	Proakis, J.G. and Saheli, M	5th Ed., McGraw-Hill
4.	Digital Communication: Fundamentals and Applications	Sklar, B., and Ray, P.K	2nd Ed., Dorling Kindersley
5.	Elements of Information Theory	T. Cover and J. Thomas	2/e, Wiley.
6.	Principles of Digital Communication	R. G. Gallager	Cambridge Univ. Press
7.	A Foundation in Digital Communication	A. Lapidoth	Cambridge Univ. Press
8.	Error Control Coding	S. Lin and D. Costello	2/e, Prentice Hall.

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Course Code	:	ECPE202
Course Title	:	Electronic Equipment Maintenance
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Content:

Unit 1 : Fundamental Troubleshooting Procedures Inside An Electronic Equipment: Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram; Dis-assembly and re-assembly of equipment, Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions, Nature of faults, Fault location procedure, Fault finding aids – Service and maintenance manuals and instruction manuals, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Ground-

ing systems in Electronic Equipment, Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.

Unit 2 : Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions therein, variable capacitor types, Testing of inductors and inductance measurement

Unit 3 : Testing of Semiconductor Devices Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp circuits

Unit 4: Logic IC families, Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator Special consideration for fault diagnosis in digital circuits Handling precautions for ICs sensitive to static electricity Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic.

Unit 5: Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages – SOIC, SOT, LCCC, LGA, BGA, COB, Flatpacks and Quad Packs, Cylindrical Diode Packages, Packaging of Passive Components as SMDs Repairing Surface Mount PCBs, Rework Stations.

References:

S. No.	Title of Book	Author	Publication
1.	Modern Electronic Equipment: Troubleshooting, Repair and Maintenance	Khandpur	TMH 2006
2.	Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting	R. G. Gupta	Tata McGraw Hill Edition 2001
3.	Student Reference Manual for Electronic Instrumentation Laboratories	David L Terrell	Butterworth-Heinemann
4.	Electronic Testing and Fault Diagnosis	G. C. Loveday, A. H	Wheeler Publishing

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Course Code	:	ECPE204
Course Title	:	Linear Integrated Circuits
Number of Credits	:	4 (L: 3, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Contents:

UNIT I - IC Fabrication and Circuit Configuration for Linear IC

Advantages of ICs over discrete components – Manufacturing process of monolithic Ics Construction of monolithic bipolar transistor – Monolithic diodes – Integrated Resistors Monolithic Capacitors – Inductors. Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT II Applications Of Operational Amplifiers

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III Analog Multiplier and PLL

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV Analog to digital and digital to analog converters

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R2R Ladder types switches for D/A converters, high speed sample-and-hold circuits, A/D Converters specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT V Waveform generators and special function ICs

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

SUGGESTED TEXT/REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1.	Design with operational amplifiers and analog integrated circuits, 3rd Edition	Sergio Franco	Tata McGraw-Hill, 2007
2.	Linear Integrated Circuits,	. D.Roy Choudhry, Shail Jain	New Age International Pvt. Ltd
3.	System design using Integrated Circuits	. B.S.Sonde	New Age Pub, 2nd Edition, 2001
4.	Analysis and Design of Analog Integrated Circuits	Gray and Meyer	Wiley International, 2005.
5.	OP-AMP and Linear ICs	Ramakant A.Gayakwad	Prentice Hall / Pearson Education, 4th Edition, 2001
6.	Operational Amplifier and Linear Integrated Circuits	K Lal Kishore	, Pearson Education, 2006

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Course Code	:	ECPE206
Course Title	:	Electronic Devices and Circuits Practical
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

1. Operational Amplifiers (IC741)-Characteristics and Application.
2. Waveform Generation using Op-Amp (IC741).
3. Applications of Timer IC555.
4. Design of Active filters.
5. Study and application of PLL IC's
6. Design of binary adder and subtractor.
7. Design of counters.
8. Study of multiplexer and demultiplexer /decoders.
9. Implementation of combinational logic circuits.
10. Study of DAC and ADC 11. Op-Amp voltage Regulator- IC 723

SEMESTER V

Course Code	:	ECPC301
Course Title	:	Embedded Systems
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit I -Embedded C basics operators for Arduino

Familiarizing with the Arduino IDE.

Sketch designing for Arduino

Communication interface using serial port

Basic understanding of the code with boolean operations, pointer access operations, bitwise operations, compounded operations.

Unit II - Embedded C control structure blocks

Looping mechanism – for, do and while.

The branching operations based on conditions expression

Unit III Introduction to Arduino Mega

Arduino Mega specifications including power ratings, digital and analog peripherals.

Difference between the C language and Embedded C language

Arduino Mega Ports, Pins, Digital and Analog Peripherals

Unit IV Communication with Arduino

Different communication modules available with their real-life application

Communication interface

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	Arduino Projects For Dummies (For Dummies Series)	Kennedy George; Davis Bernard; Prasanna SRM	Wiley (5 July 2013) ISBN : 978-1118551479
2.	Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform	Massimo Banzi and Michael Shiloh	Shroff/Maker Media; Third edition (27 December 2014) ISBN : 978-9351109075

SUGGESTED SOFTWARE/LEARNING WEBSITES:

d. https://www.arduino.cc/reference/en/

e. https://learn.adafruit.com/category/learn-arduino

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Course Code	:	ECPC303
Course Title	:	Embedded Systems Lab
Number of Credits	:	1 (L: 0, T: 0 P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Built-in LED state control by push button sketch implementation	I	02*
2.	Built-in LED blinking sketch implementation	I	02
3.	Built-in LED blinking by toggling states based on binary operation	I	02
4.	Built-in LED state control by user interface through serial port	I	02*
5.	User interface for boolean operation and bit wise operation through serial port	I	02
6.	User interface for compounded operation through serial port	I	02
7.	Looping mechanism to check the state of pin and if change print its status on serial port	II	02
8.	Controlling multiple LEDs with a loop and an array	II	02
9.	Use a potentiometer to control the blinking of an LED	III	02*
10.	Uses an analog output (PWM pin) to fade an LED.	III	02
11.	Servo Motor Control using PWM	III	02
12.	Temperature sensor interfacing and sending its reading over serial port	IV	04
13.	I2C light sensor interfacing and sending its reading over serial port	IV	04*
	Total		**30**

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	Arduino Projects For Dummies (For Dummies Series)	Kennedy George; Davis Bernard; Prasanna SRM	Wiley (5 July 2013) ISBN : 978-1118551479
2.	Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform	Massimo Banzi and Michael Shiloh	Shroff/Maker Media; Third edition (27 December 2014) ISBN : 978-9351109075

SUGGESTED SOFTWARE/LEARNING WEBSITES:

f. https://www.arduino.cc/reference/en/

g. https://learn.adafruit.com/category/learn-arduino

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Course Code	:	ECPC305
Course Title	:	Mobile and Wireless Communication
Number of Credits	:	3 (L: 3, T: 0 P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit I - Overview of Cellular Systems

Evolution 2g/3G/4G/5G

Cellular Concepts – Frequency reuse, Cochannel and Adjacent channel Interference

Unit II - Wireless propagation

Link budget, Free-space path loss, Noise figure of receiver

Multipath fading, Shadowing, Fading margin, Shadowing margin

Unit III Antenna diversity, wireless channel capacity and MIMO

Unit IV Overview of CDMA , OFDM and LTE

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1	Wireless Communications – Principles and Practice	T. S. Rappaport,	(2nd edition) Pearson ISBN 9788131731864
2	Modern Wireless Communications	Haykin & Moher	Pearson 2011 (Indian Edition) ISBN : 978-8131704431

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Course Code	:	ECPC307
Course Title	:	Mobile and Wireless Communication Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	To understand the cellular frequency reuse concept to find the co-channel cells for a particular cell.	I	04
2.	To understand the path loss	II	04
3.	Understand the path loss with shadowing	II	04

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
4.	Understanding the Flat fading	II	04
5.	Understanding the Frequency selective fading	II	04
6.	Understanding the Multipath channel for the following objectives 1. No Fading 2. Flat Fading 3. Dispersive Fading	II	04
7.	To simulate a dipole antenna (λ, λ/4, λ/2, 3λ/2) for a particular frequency using 4NEC2	III	04
8.	Perform following experiments using CDMA trainer kit 1. PSK modulation and demodulation experiment 2. Bit synchronization extraction experiment 3. Error correction encoding experiment	IV	04
	Total		**32**

REFERENCES/SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1	Wireless Communications – Principles and Practice	T. S. Rappaport,	(2nd edition) Pearson ISBN 9788131731864
2	Modern Wireless Communications	Haykin & Moher	Pearson 2011 (Indian Edition) ISBN : 978-8131704431

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Course Code	:	ECPE301
Course Title	:	Industrial Automation
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Content:

Unit I - Industrial automation overview and data acquisition

Architecture of Industrial Automation Systems.

Measurement Systems Characteristics

Data Acquisition Systems

Unit II - Control Generation

Introduction to Automatic Control

P-I-D Control

Feedforward Control Ratio Control

The branching operations based on conditions expression

Unit III Sequential control and PLC

Introduction to Sequence Control, PLC , RLL

PLC Hardware Environment

Unit IV Industrial control application

Hydraulic Control Systems

Pneumatic Control Systems

Energy Savings with Variable Speed Drives

Introduction To CNC Machines

REFERENCES / SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	Industrial Instrumentation, Control and Automation	S. Mukhopadhyay, S. Sen and A. K. Deb	Jaico Publishing House, 2013 ISBN : 978-8184954098
2.	Electric Motor Drives, Modelling, Analysis and Control	R. Krishnan	Prentice Hall India, 2002 ISBN : 978-0130910141

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Course Code	:	ECPE303
Course Title	:	Industrial Automation lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Develop a data acquisition system using arduino	I	04
2.	Temperature control system using PID	II	04
3.	Level control system based on error feedback	II	04
4.	PLC programming using Relay ladder Logic for AND , OR XOR and NOR gate	III	04
5.	PLC, RLL programming using CASCADE method	III	04
6.	PLC timer, counter, registers and analog input/output functions	III	04
7.	Variable Speed drive of an induction motor	IV	04
8.	PLC/ microcontroller based computer numerical control machine job completion	IV	04
	Total		**32**

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1	Industrial Instrumentation, Control and Automation	S. Mukhopadhyay, S. Sen and A. K. Deb	Jaico Publishing House, 2013 ISBN : 978-8184954098
2	Electric Motor Drives, Modelling, Analysis and Control	R. Krishnan	Prentice Hall India, 2002 ISBN : 978-0130910141

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Course Code	:	ECPE305
Course Title	:	Microwave and Radar
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

Course Content:

Unit I - Introduction to Microwaves

History and applications of Microwaves

Mathematical Model of Microwave Transmission-Microwave transmission modes, waveguides and transmission lines, Impedance Matching

Microwave Network Analysis

Unit II - Passive and Active Microwave Devices

Directional Coupler, Power Divider, Attenuator, Resonator.

Microwave active components: Diodes, Transistors, Microwave Tubes

Unit III -Microwave Design Principles- Microwave Filter Design, Microwave Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas

Unit IV - Microwave Measurements, Microwave Systems, Effect of Microwaves on human body.

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1	Microwave Engineering	D.M. Pozar	Wiley; Fourth edition (2013) ISBN 978-8126541904
2	Foundation for Microwave Engineering	R.E. Collins	Wiley; Second edition (2007) ISBN : 978-8126515288

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Course Code	:	ECPE307
Course Title	:	Microwave and RADAR Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	To study wave guide components.	I	04
2.	To study the characteristics of Gunn oscillator Gun diode as modulated source.	I	04
3.	Introduction to Smith chart and its application for the unknown impedance measurement.	I	04
4.	Study the behavior of impedance matching for passive networks using Smith chart.	II	04
5.	To study loss and attenuation measurement of attenuator	II	04
6.	Construct a cavity resonator in waveguide and study its characteristics using the network analyzer and a frequency counter.	III	04
7.	To determine the frequency and wavelength in a rectangular waveguide working in TE10 mode	IV	04
	Total		**28**

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1	Microwave Engineering	D.M. Pozar	Wiley; Fourth edition (2013) ISBN 978-8126541904
2	Foundation for Microwave Engineering	R.E. Collins	Wiley; Second edition (2007) ISBN : 978-8126515288

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SEMESTER VI

Course Code	:	ECPC302
Course Title	:	Computer Networking and Data Communication
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

Unit 1 - Introduction to data communication.

Concept of analog and digital signals. Bandwidth. Network architecture.

Basics of OSI and TCP/IP reference models.

Types of Computer Networks – Personal Area Network, Local Area Netwrk, Metropolitan Area Network, Wide Area Network, Internetwork.

Computer Network Topologies – Point to Point, Bus topology, Star topology, ring topology, mesh topology, tree topology, Daisy Chain, Hybrid Topology,

Computer Network Model. Transmission media. Wired and wireless connectivity.

Unit 2 – Digital & Analog Transmission.

Digital Transmission – Digital to Digital Conversion, Line Coding, Unipolar Encoding, Polar Encoding, Bipolar Encoding, block Coding

Analog Transmission - Analog-to-Digital Conversion, Digital to analog Conversion, Analog to Analog Conversion.

Sampling, Quantization, Encoding, Transmission Modes.

Unit 3 – Wireless Communication.

Radio, Micowave, Infra-red, Light Transmission.

Wireless Communication Standards, Characterization of the Wireless Channel, Receiver Techniques for Fading Dispersive Channels,

Mobility Management in Wireless Networks, Mobile IP, Mobile Ad hoc Networks, Ad hoc Routing Protocols, Performance Analysis of DSR and CBRP,

Cluster Techniques, Incremental Cluster Maintenance Scheme, Space time Coding for Wireless Communication.

Unit 4 – Data Link Layer Technologies.

Types of Network Routing, Network Layer Protocols. FDM, TDM and CDMA.

Circuit and packet switching. Frame relay and ATM switching. ISDN. Local area network protocols. Fibre optic networks. Satellite networks.

Data link layer design issues: its functions and protocols. Internet protocol. Routing algorithms. Congestion control algorithms. IP addressing schemes. Internetworking and sub-netting.

Error Detection and Correction - Types of Errors, Detection, Correction Switching and Data link layer, data link control and protocols

Unit 5 - Transmission Media & Transmission Control protocol.

Magnetic Media, Twisted Pair Cable, Coaxial Cable, Power Lines, Fiber Optics.

Protocol– Features, Header, Addressing, Connection Management, Error Control and Flow Control, Multiplexing, Congestion Control, Timer Management, Crash Recover

REFERENCES / SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	Computer Networking A top down Approach:	J.F.Kurose	Pearson
2.	Computer Networks and Internet	D.E. Comer	Pearson
3.	Wireless Communications: Principles and Practice, 2nd edition	T. Rappaport	Prentice Hall, 2002
4.	Wireless Communication and Networking	John W. Mark, Weihua Zhuang	
5.	Modelling and Analysis of Computer Communication Networks	Jeremiah F. Hayes	
6.	Data communication & Networking	Stallings	

SUGGESTED SOFTWARE/LEARNING WEBSITES:

a) www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
b) www. turbofuture.com/industrial/Elements-of-Electronic-Communications-System
c) www.st-andrews.ac.uk/~www_pa/Scots_Guide/iandm/part3/page1.html
d) www.antenna-theory.com/basics/main.php
e) www.explainthatstuff.com/antennas.html
f) www.circuitdiagram.org/am-radio-receiver-with-mk484.html
g) www.circuitstoday.com/single-chip-fm-radio-circuit

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Course Code	:	ECPC304
Course Title	:	Computer Networking and Data Communication Lab
Number of Credits	:	1 (L : 0 , T : 0, P : 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	To study the different physical equipment used for networking		02*
2.	Study the different internetworking devices in a computer network		02*
3.	Study the working of basic networking commands		02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
4.	To study PC to PC communication using parallel port		02
5.	Study of LAN in Star Topology		02
6.	Study of LAN in Bus Topology		02
7.	Study of LAN in Tree Topology		02
8.	Study and configuration of modem of computer		02
9.	Study of wireless communication		02*
10.	Studying PC Communication using LAN		02
	Total		**20**

Reference Books:

S. No.	Title of Book	Author	Publication
1.	Basic Electrical Engineering	Mittle and Mittal	McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
2.	Basic Electrical Engineering	Ritu Sahdev	Khanna Publishing House, Delhi 2018, ISBN: 978-93-86173-49-2
3.	Fundamentals of Electrical Engineering	Saxena, S. B. Lal	Cambridge University Press, latest edition ISBN : 9781107464353
4.	Electrical Technology Vol – I	Theraja, B. L.	S. Chand publications, New Delhi, 2015, ISBN: 9788121924405
5.	Basic Electronics	S. Biswas	Khanna Publishing House, Delhi ISBN: 978-81-87522-164
6.	Electrical Technology Vol – II	Theraja, B. L.	S. Chand publications, New Delhi, 2015, ISBN: 9788121924375
7.	Basic Electrical and Electronics Engineering	Jegathesan, V.	Wiley India, New Delhi, 2015 ISBN : 97881236529513
8.	A text book of Applied Electronics	Sedha, R.S.	S.Chand ,New Delhi, 2008 ISBN-13: 978-8121927833
9.	Electronics Principles	Malvino, Albert Paul, David	McGraw Hill Eduction, New Delhi,2015, ISBN-13: ٠٠٧٠٦٣٤٢٤٤-٩٧٨
10.	Principles of Electronics	Mehta, V.K. Mehta, Rohit	S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
11.	Fundamental of Electronic Devices and Circuits	Bell Devid	Oxford University Press, New Delhi 2015 ISBN : 9780195425239

SUGGESTED SOFTWARE/LEARNING WEBSITES:

a. en.wikipedia.org/wiki/Transformer
b. www.animations.physics.unsw.edu.au//jw/AC.html
c. www.alpharubicon.com/altenergy/understandingAC.htm
d. www.electronics-tutorials
e. learn.sparkfun.com/tutorials/transistors
f. www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
g. www.technologystudent.com/elec1/transis1.htm
h. www.learningaboutelectronics.com
i. www.electrical4u.com

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