P.D.E.A's.

Prof. Ramkrishna More College, Akurdi, Pune411044

Syllabus Framework and Design of Electronics for

B. Sc. (Comp. Sci.) under Autonomy and NEP-2024

Sem.	Major Elective Courses	Minor Courses	GE/OE
First Year Certificate Course			
I		2 Theory + 1 Practical From Electronics	1 Theory from Electronics in Basket
II		2 Theory + 1 Practical From Electronics	1 Practical from Electronics In Basket
Second Year Graduate Diploma			
III		1 Theory + 1 Practical From Electronics	1 Theory from Electronics in Basket
IV		1 Theory + 1 Practical From Electronics	1 Practical from Electronics In Basket
Third Year Graduate Degree			
V	To B.Sc. (Comp. Sci.) 1 Theory + 1 Practical From Electronics	-	-
VII	To B.Sc. (Comp. Sci.) 1 Theory + 1 Practical From Electronics	-	-

Course Codes for various courses

Sem	Major Elective Courses	Minor Courses	GE/OE
First Year Certificate Course			
I	-	ELMIT-111 ELMIT-112 ELMIP-113	ELOET-111
II	-	ELMIT-121 ELMIT-122 ELMIP-123	ELOEP-121
Second Year Graduate Diploma			
III	-	ELMIT-231 ELMIP-232	ELOET-231
IV	-	ELMIT-241 ELMIP-242	ELOEP-241
Third Year Graduate Degree			
V	CSMAET-351 CSMAEP-352	-	-
VII	CSMAET-361 CSMAEP-362	-	-

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Courses Codes, Generic name and Title of the paper of Electronics

Sem	Course code	Generic name	Title	Credits
I	ELMIT-111	Minor ElectronicsTheory-1	Fundamentals of Analogue electronics	2
	ELMIT-112	Minor ElectronicsTheory-2	Fundamentals of Digital electronics	2
	ELMIP-113	Minor ElectronicsPractical-1	Electronics practical Lab-I	2
II	ELMIT-121	Minor ElectronicsTheory-3	Analogue systems and Computer Instrumentation	2
	ELMIT-122	Minor ElectronicsTheory-4	Digital Systems and computer organization	2
	ELMIP-123	Minor Electronics Practical-2	Electronics practical Lab-II	2
III	ELMIT-231	Minor ElectronicsTheory-5	Principles of Microcontroller and embedded systems	2
	ELMIP-232	Minor ElectronicsPractical-3	Electronics practical Lab- III	2
IV	ELCMIT-241	Minor ElectronicsTheory-6	Principals of Communication Systems	2
	ELCMIP-242	Minor Electronics Practical-4	Electronics practical Lab - IV	2

Major Elective				
V	CSMAET-351	Elective Electronics for Computers Science	Internet of Things	2
	CSMAEP-352	Elective Electronics Practical paper for Computers Science	Practical's on IoT	2
VI	CSMAET-361	Elective Electronics for Computers Science	Architecture and Programming of Raspberry Pi	2
	CSMAEP-362	Elective Electronics Practical paper for Computers Science	Practical's on Raspberry Pi	2

Semester I	
Fundamentals of Analogue Electronics	
Course code: ELMIT-111	**No. of Credits: 2**

Unit No.	Unit Title and Contents
Module 1	
1	**Semiconductor Diodes (5)** Semiconductor, P and N type semiconductors, Formation of PN junction diode, Conduction through PN junction, Forward and Reverse bias characteristics, Zener diode: Principle of operation, breakdown mechanism and its characteristics, Principle of Operation of Light emitting diode, photo diode, Solar cell and their characteristics, Opto-coupler as an application of LED and Photodiode, Applications of Solar cell.
2	**Bipolar Junction Transistor(BJT) (7)** Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor configurations CE configuration: Input and output characteristics, only concept of CB, CC Configurations, Definition of α, β and ϒ, Relation between α and β. Concept and Types of Transistor Biasing, Explanation of Potential Divider bias in details, Transistor as amplifier (Concept of Gain and Bandwidth expected), Transistor as a switch.
3	**Field Effect Transistor and MOSFET (5)** FET: Principle of operation, types and characteristics. MOSFET: Principle of operation, types and characteristics, Application of MOSFET as a Switch.
Module 2	
I	**POWERSUPPLY (7)** Rectifiers (Half wave, full wave, Bridge), Need and types of filters, Capacitor-filter (In details), Use of Zener Diode as a Voltage Regulator, Block Diagram of Regulated Power Supply, IC 78XX and 79XX as regulator, Block Diagram and explanation of SMPS, Block diagram and explanation of UPS.
2	**OSCILLATORS (6)** Barkhauson Criteria, Low frequency oscillator: Wein-bridge oscillator, High frequency oscillator: crystal oscillator, Block diagram of IC 555 and its use as astable multivibrator for square wave generator / clock
Text and Reference Books:	
1.	Malvino Electronics Principles By- Malvino A. P. Ed-6, McGraw Hill publication.
2.	Modern Digital Electronics by Jain R.P. Ed-4, Pub- Tata McGraw Hill publication India
3.	Digital Fundamentals By FloydT.M.Ed-11,Pub-Person Education Publication.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Study and Explain construction details of various semiconductor devices.
CO2	Explain operation and characteristics behavior of various semiconductor devices.
CO3	Explain needs and operation details of elementary electronic circuits and systems.
CO4	Get familiar with concepts of Power supply.
CO5	Understand basic concept of oscillators.
CO6	Explain needs and operation details of electronic circuits and systems, such as amplifiers.

Semester I	
Fundamentals of Digital Electronics	
Course code: ELMIT-112	**No. of Credits: 2**

Unit No.	Unit Title and Contents
Module 1	
1	**Number Systems and Digital codes (8)** Introduction to Decimal, Binary and Hexa-decimal number systems and their inter- conversions, binary addition and binary subtraction, 1's and 2's complement, Binary subtraction using 2's compliment, Binary Coded Decimal code (Weighted and non-weighted, self-complimentary), Error detecting and correcting code : Parity code and Hamming code, Gray Codes, Gray to Binary and Binary to Gray conversion, Alphanumeric representation in ASCII codes
2	**Logic gates and Boolean algebra (7)** Introduction to logic system: Positive logic and Negative logic, Logic gates (NOT, AND, OR, NAND, NOR, XOR gate) with their symbol, Boolean equation and truth table. Introduction of CMOS and TTL logic families, Parameters like voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation
Module 2	
I	**Boolean algebra and Karnaugh's Map (7)** Rules and laws of Boolean algebra, De-Morgan's theorem, simplification of Logic equations using Boolean algebra rules, NAND and NOR as a Universal gate. Min terms, Max terms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form, Introduction to Karnaugh Map, problems based on SOP (up to 4 variables), digital designing using K Map.
2	**Combinational Circuits(8L)** Half adder and full adder, Parallel adder, Parallel Subtractor, 4-Bit Universal adder/Subtractor, applications of Ex-OR gates as parity checker and generator, study of Multiplexer(4:1) and De-multiplexer (1:4), Encoders: Decimal/BCD to binary, Priority encoder, Decoders: BCD to seven segment decoder, IC 74138 and IC 7447, Digital comparator
Text and Reference Books:	
1. **2.** **3.**	Digital Fundamentals: Floyd T. M., Jain R. P., Pearson Education Digital Electronics: Jain R. P., Tata McGraw Hill Digital Computer Design: M. Morris Mano, 3rd Edition, PHI, New Delhi.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Learn various number systems and their representation.
CO2	Get familiarize with concepts of digital electronics.
CO3	Explain and understand the necessity of basic logic gates and universal gates.
CO4	Study of Boolean algebra.
CO5	Simplify and design simple digital systems using Boolean algebra and K-Map.
CO6	Study simple combinational circuits (constriction and operations) using digital techniques

Semester I
Electronics practical Lab-I
Course Code: ELMIP-113 **Number of Credits : 02**

Sr. No.	Title of Experiment / Practical
Total 10 experiments are to be performed by student. Any five experiments from each group	
Group A	
1.	Study of different types of diodes (PN junction diode, LED, Photo diode)
2.	Study of Characteristics of solar cell.
3.	Study of Opto-coupler using LED and Photodiode (Package may be used here), it's application as burglar alarm.
4.	Study of half wave, full wave and bridge rectifier circuit with and without capacitor filters.
5.	Study of Zener diode as Voltage regulator.
6.	Study of CE characteristics of Bipolar Junction Transistor
7.	Study of characteristics of JFET / MOSFET
8.	Study of Bipolar Junction Transistor as a Switch.
9.	Study of Single stage RC coupled CE transistor Amplifier(Gain/ Bandwidth).
10.	Study of Transistorized Phase Shift Oscillator.
Group B	
1.	Study of different types of logic gates and verification of De-Morgan's laws.
2.	Interconversion of logic gates using NAND and NOR gates.
3.	Study of parity code generator and error detector.
4.	Study of Half adder and full adder using Logic Gates.
5.	Study of Multiplexer and De-multiplexer (4:1 MUX and 1:4 DEMUX)
6.	Study of IC 555 as an Astable Multivibrator
7.	Study of Decimal to BCD/(Binary)Converter.
8.	Study of Priority Encoder.
9.	Study of Binary to Gray & Gray to Binary Converter (K- Map based design).
10	Study of Universal 4-bit adder/Subtractor.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Describe the circuit diagrams using different symbols various components.
CO2	To design and connect experimental board circuit.
CO3	Discuss the working of circuits of individual experiments.
CO4	To acquire skills of studying and analyzing the responses of electronic circuits.
CO5	Analyze observations of each experiment based on the aim and objectives of an experiment.
CO6	Evaluate observed outputs with expected theoretical outputs.

Semester II	
Analogue systems and Computer Instrumentation	
Course code: ELMIT-121	**No. of Credits: 2**

Unit No.	Unit title and Contents
Module 1	
1	**Operational Amplifier (8)** Operational Amplifier: Block diagram, symbol, Characteristics of OP-AMP, Concept of virtual ground, Inverting and Non-inverting amplifier, OPAMP as an adder and Subtractor, OP-AMP as an integrator and differentiator, Three OP-AMP instrumentation amplifier.
2	**Data converters (7)** Need of Data converters, Digital to Analog converters (DAC) and Analog to Digital converter, Parameters of DAC, Types of DACs: weighted resistive network and R-2R ladder network. Study of DAC IC-0808 (Block diagram, Parameters) Parameters of ADC, Types of ADCs: Flash ADC, successive approximation ADC. Dual slop ADC. Study of ADC IC-0809 (Block diagram, Parameters).
Module 2	
3	**Sensors and Transducers (9)** Introduction, Need and Definition of sensors and transducers, Classification of sensors: Active and passive sensors, Specifications of sensor: Accuracy, range, linearity, sensitivity, resolution, reproducibility, Temperature and Humidity sensors: Thermistor, LM-35, AD590 and DHT 11, Piezoelectric sensor, Optical sensor (LDR), Displacement sensor (LVDT), Passive Infrared sensor (PIR), Concept of Touch sensor and Ultrasonic sensor. (Pin diagrams, features and applications)
4	**Signal Conditioning Circuits (6)** Introduction and need of signal conditioning, voltage divider circuits, bridge circuits, filters, Sample and hold circuit.
Text and Reference Books:	
1. **2.** **3.** **4.**	Malvino Electronics Principles By- Malvino A. P. Ed-6, McGraw Hill publication. Modern Digital Electronics by Jain R.P. Ed-4, Pub- Tata McGraw Hill publication India Digital Logic and Computer Design By -M. Morris Mano Ed-7 Pub PHI Publication Process control Instrumentation Technology By - C.D. Johnson Ed-8 Pub-Pearson Publication.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Define sensor, transducer and its parameters.
CO2	Classify Sensors and operating principles of various sensors and transducers.
CO3	Concept of Operational amplifier, its parameters and its applications.
CO4	Analyze different types of ADCs and DACs and their parameters
CO5	Discuss the need for signal conditioning circuits and various signal conditioning techniques.
CO6	Compare the frequency response of different types of filters and discuss the their opearation.

Semester II	
Digital Systems and computer organization	
Course code: ELMIT-122	**No. of Credits: 2**

Unit No.	Unit title and Contents
Module 1	
I	**Sequential Circuits (9)** Difference between combinational and sequential circuits, the Concept of clock and types, synchronous and asynchronous circuits, Latch, S-R-latch, D-latch, S-R, J-K, and D flip-flop their operation and truth tables, race around condition, Master-slave JK flip flop, T flip flop (Timing diagram and truth tables). The basic building block of the counter, Ripple counter, up counter, down counter, Up- Down counter, Concept of modulus counters, Decade counter, Shift registers: SISO, SIPO, PISO, PIPO, Ring counter, Universal 4-bit shift register
2	**Semiconductor memory (6)** Memory Architecture, Memory parameters (Access time, speed, capacity, cost), Concept of Address Bus, Data Bus, Control Bus, Memory Hierarchy, Types of semiconductor Memories, Data Read/ Write process, Vertical and Horizontal Memory Expansion,
Module 2	
1	**Basics of Computer System (9)** Basic Computer Organization, CPU block diagram and explanation of each block, CPU organization, Instruction set, Data formats, Instruction format, addressing modes, Pipelining, Concept of Stack & its organization,
2	**Memory and I/O organization (6)** Memory Organization: Role of Cache memory, Memory mapping, role of virtual memory, paging and segmentation, memory management. I/O organization: need of interface, block diagram of general I/O interface.
Text and Reference Books:	
1. **2.** **3.** **4.**	Advanced Microprocessors by Daniel Tabak IInd edition, McGraw Hill publication. Digital Logic and Computer Design By -M. Morris Mano Ed-7 Pub-PHI Publication. Modern Digital Electronics By Jain R.P. Ed-4, Pub- Tata McGraw Hill publication India Computer Architecture and Organization by P. Chakraborty, Jaico Publishing House.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Study and design simple sequential circuits (construction and operations) using digital techniques.
CO2	Understand concept of Clock and timing diagram in sequential circuits used in digital systems.
CO3	Understand and illustrate different types semiconductor memory.
CO4	Understand Memory organization, and need and methods of memory expansion.
CO5	Understand different blocks needed to design digital computer system.
CO6	Understand and illustrate block diagram of central processing unit.
CO7	Understand I/O organization and need of interfacing with general I/O interface.

Semester II
Electronics practical Lab-2
Course Code: ELMIP-123 **Number of Credits : 02**

Sr. no.	Title of Experiment/ Practical
Total 10 experiments are to be performed by student. Any five experiments from each group	
Group A	
1	Study of LDR characteristics.
2	Study of Thermistor / AD-590 / DHT 11 / LM 35.
3	Study of LVDT as a displacement sensor.
4	Study of frequency response of active filter circuits(RC filters)
5	Study of Inverting and Non-inverting amplifier
6	Study of Adder and Subtractor using OP-Amp.
7	Study of Integrator and differentiator using OP-Amp.
8	Study of Crystal Oscillator using inverters.
9	Study of Switch Mode Power Supply (SMPS).(Using suitable IC e.g. IC 3524)
10	Study of stepper motor.
11.	Use of OPAMP as comparator and its use in DC motor driving.
12.	Study of three OPAMP Instrumentation Amplifier.
Group B	
1	Study of SR and JK flip flops (T and D as modification)
2	Study of RAM and read/write action of RAM (using suitable IC e.g. IC 7489).
3	Study of Diode matrix ROM and read action of ROM.
4	Study of 4-bit UP/DOWN counter
5	Study of Modulo counter using IC 7490. (Mod-2 , Mod-5 and Mod 10)
6	Study of 4-bit Shift register.
7	Study of 4 bit Ring counter and Bidirectional Shift register.
8	Study of R-2R Digital to Analog Converter.
9	Study of 3-bit Flash Analog to Digital Converter.
10	Study of BCD to 7-segment Display
11	Study of Keyboard matrix encoder
12	Study of Four bit ALU.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Identify different analog and digital electronic circuits.
CO2	Identify different sensors and analyze their response.
CO3	Recognize need of various circuit elements in analogue and digital systems.
CO4	To acquire skills of studying and analyzing the responses of electronic circuits.
CO5	Analyze observations of each experiment based on the aim and objectives of an experiment.
CO6	Evaluate observed outputs with expected theoretical outputs.

S. Y. B. Sc. (C.S.) Semester III	
Microcontroller and Embedded Systems	
Course code: ELMIT-231	**No. of Credits: 2**

Unit No.	Title and Contents
Module 1	
1	**Basics of Microcontroller & Intel 8051 architecture [8]** Introduction to microcontrollers, difference in microcontroller and microprocessor. **Architecture of 8051:** Internal block diagram of 8051: ALU, PC, DPTR, PSW, Latch, SFRs, General purpose registers, pin diagram and pin functions of 8051, I/O ports: Port0, Port1, Port2, and Port3. Structure, Operation and specifications of I/O Ports, **Memory organization:** Program and Data Memory Map, Internal RAM organization, Internal ROM. External Memory Interface. Stack, Stack Pointer and Stack operation.
2	**Programming model of 8051 [9]** **Instruction set:** Instruction classification, Data Transfer, Arithmetic, Logical, Branching, Machine Control, Stack operations and Boolean operations. **Addressing Modes:** Immediate, register, direct, indirect and relative, **Assembler directives:** ORG, DB, EQU, END, CODE, DATA. **Software development cycle:** editor, assembler, simulator, cross-compiler, linker, compiler. **8051 Assembly language programming and C programming:** arithmetic and logical programming, Looping, Counting, Time delay loop, Look-up table, Bit addressability, I/O Bit & Byte programming
Module 2	
3	**Serial communication [8]** **Timers & Counters:** Timers/Counters SFRs: TMOD, TCON logic diagram and its operation in various Timer modes: mode 0, mode 1 and mode 2. Programming for time delay **Interrupt:** Introduction to interrupt, Interrupt types Interrupt structure, SFRs - Interrupt enable register (IE) and interrupt priority register(IP). vector address, priority and operation. ISR – Interrupt Service Routine. **Serial Communication:** Definition, various modes Synchronous and asynchronous, baud rate for serial communication. Configuration, using SFRs - SCON, SBUFF, PCON Programming serial port without interrupt, Use of timer/counter Programming serial port with interrupt: Configuration of interrupts for serial communication,
4	**Applications of 8051 using Embedded 'C' [5]** **Interfacing Input Devices:** Pushbutton, thumb wheel switch ADC, LM35, rain sensor. **Interfacing Output Digital Devices:** LED, 7-segment LED display, LCD display, DC and Stepper motor, DAC.
Text and Reference Books:	
1. **2.**	8051 microcontroller and Embedded system using assembly and C: Mazidi and McKinley, Pearson pub. The 8051 microcontroller Architecture, programming and applications: K.Uma Rao and Andhe Pallavi, Pearson pub

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	**Demonstrate** the basic concepts of microcontrollers and differentiate between microcontrollers and microprocessors.
CO2	**Familiarize** with the 8051 instruction set, including the classification of instructions (data transfer, arithmetic, logical, branching, machine control, etc.).
CO3	**Understand** the operation of timers and counters in 8051, including the programming for various timer modes (mode 0, mode 1, mode 2) and time delay generation.
CO4	**Develop** 8051 Assembly and 'C' programs using 8051 instruction set for embedded systems using microcontroller.
CO5	**Interface** various input devices (pushbutton, thumb wheel switch, LM35, rain sensor etc.) with the 8051 and develop programs for their control.
CO6	**Interface** various output devices (DAC, LED, LCD, SSD, stepper motor, DC motor etc.) with the 8051 and develop programs for their control.
CO7	**Design and implement** application circuits using the 8051.

S. Y. B. Sc. (C. S.) Semester III	
Electronics Practical Lab-2A	
Course Code: ELMIP-232	**Number of Credits : 02**

Sr. No.	Title of Experiment/ Practical
Total 10 experiments are to be performed by student. Any five experiments from each group	
Group A	
1	Write and execute programs based on Arithmetic Instructions (8/16 bit Addition, Subtraction, Multiplication, Division) in Assembly and Embedded C.
2	Write and execute programs based on Logical Instructions (AND, OR, Rotate, etc.) in Assembly and Embedded C
3	Write and execute programs based on various addressing modes and assembler directives.
4	Write and execute programs based on Branch Instructions in Assembly and Embedded C.
5	Write and execute programs based on Looping, Counting, and Indexing concept in Assembly and Embedded C.
6	Write and execute program to introduce delay (e.g.1ms Delay) using Timer/Counter in Assembly and Embedded C.
7	Write and execute programs to generate various waveforms (square, triangular, saw tooth, trapezoidal) using timers in Assembly and C.
8	Write and execute programs to turn ON/OFF LED using interrupt in Assembly and Embedded C.
9	Write and execute programs to interface 4x4 matrix keypad in Assembly and Embedded C.
Group B (Based on Embedded 'C')	
1	Interfacing of thumbwheel & seven segment display to 8051 microcontroller
2	Interfacing LCD to 8051Microcontroller
3	Interfacing temperature sensor LM35/DHT11 and displaying temperature by configuring ADC (ADS1115).
4	Event counter using opto-coupler, seven segment LED/LCD display interface to 8051Microcontroller
5	Waveform generation using DAC Interface to 8051Microcontroller
6	Interface stepper motor and rotate in clockwise and anticlockwise.
7	ON/OFF temperature controller using LM35/DHT11 and switching relay.
8	Traffic light controller using 8051 microcontroller.
9	Speed control of DC motor.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	**Familiarize** with assembler directives and syntax of embedded C programs used for 8051 Controller.
CO2	**Write programs** with data transfer, arithmetic, logical, branching, machine control, instructions of the 8051 instruction set.
CO3	Write Functions to introduce delay (e.g.1ms Delay) using Timer/Counter in Assembly and embedded C programming
CO4	**Interface** various digital input/ output devices (pushbutton, thumb wheel switch, matrix keypad, LED, LCD, SSD, stepper motor etc.) with the 8051 and develop programs for their control
CO5	**Interface** various Analogue input/ output devices (LM35, rain sensor, DAC, thumb wheel switch, LED, LCD, SSD) with the 8051 and develop programs for their control.
CO6	Analyze observations of each experiment based on the aim and objectives of an experiment.
CO7	Acquire the skill to design and build his /her simple circuit ideas

S. Y. B. Sc. (C. S.) Semester IV	
Communication Systems	
Course code: ELMIT-241	**No. of Credits: 2**

Unit No.	Title and Contents
Module 1	
1	**Introduction to Electronic Communication (9)** Introduction to Communication, Elements of Electronic Communication system. Types of communication: simplex, half duplex, full duplex, baseband and broadband. **Electromagnetic spectrum**: Frequency, Amplitude, Noise, Signal and channel bandwidth. Serial and parallel communication, Types of Serial communication: synchronous, synchronous. **Information Theory**: rate of information (data rate, baud rate), channel capacity, Signal to noise ratio, Noise Figure, Nyquist theorem, Shannon theorem. Introduction and necessity of **Error handling codes**: Hamming code (in detail), CRC. **Antenna**: Introduction, Need, working Principle, Parameters of antenna: Gain, Directivity, Radiation pattern, Beam width, Bandwidth, front to back ratio (FBR).
2	**Modulation and Demodulation (9)** Introduction to concepts of modulation and demodulation. Need of Modulation, Modulation techniques: Analog modulation: Amplitude, Frequency and Phase modulation, Equation of AM and FM Modulated wave, modulation index and frequency spectrum, working of transistorized amplitude modulator and diode demodulator. (Phase and Frequency modulation circuits are not expected). Pulse Modulation, Pulse Amplitude Modulation (PAM), PWM, PPM (Concepts only). FSK, QPSK, QAM. Digital Modulation techniques: Pulse Code Modulation (PCM), delta modulation.
Module 2	
3	**Multiplexing, Multiple Access System and Spread Spectrum (7)** Introduction to Multiplexing Principles, Concept of Time division multiplexing and Code division multiplexing. Introduction to multiple access and corresponding access types: FDMA, TDMA, CDMA. Concept and types of Spread Spectrum techniques: Frequency hopping Spread Spectrum, Direct Sequence Spread Spectrum.
4	**Wireless Communication Systems [5]** Introduction to wireless communication system, Need of wireless communication systems. Introduction to mobile communication, Cellular concept, Working of GSM, Handover, Introduction to GPRS. Introduction to RFID, ZigBee, Bluetooth and Wi-Fi (Comparison Based on range, data rate, frequency, Power).
Text and Reference Books:	
1	**Communication Electronics: Principles and Applications**, by Frenzel, 5th edition, Tata McGraw Hill Publication.
2	**Electronic Communication Systems,** by George Kennedy, Bernard Davis, 5th Edition (2008), McGraw-Hill Education.
3	**Data Communication and Networking**, Forouzan, 5th edition, Mc Graw Hill publication.

Course Outcomes (COs) On completion of the course, the students will be able to:	
CO1	**Demonstrate** of Electronic Communication Systems.
CO2	**Apply** Information Theory to Communication Systems.
CO3	**Analyze** Modulation Systems.
CO4	**Implement and Compare** Multiplexing Techniques.
CO5	**Understand** Wireless Communication Technologies.
CO6	**Demonstrate** Modern Communication Systems and Applications.

S. Y. B.Sc. (C.S.) Semester IV	
Electronics practical Lab-2B	
Course Code: ELMIP-242	**Number of Credits : 02**

Sr. No.	Title of Experiment/ Practical
Total 10 experiments or 8 experiments along with one mini project (equivalent to 2 practical) should be performed by the student.	
1	Study of Radiation Pattern of an Antenna.
2	Study the generation and detection of amplitude-modulated (AM) signals.
3	Study the generation of frequency-modulated (FM) signals.
4	Generate and analyze a pulse amplitude modulated (PAM) signal.
5	Study the generation of ASK signals.
6	Study the generation of FSK signals.
7	Implement and analyze 3 or 4 bit pulse code modulation.
8	Study of Sampling theorem.
9	Error Detection and Correction using Hamming code.
10	Study the principles of Time Division Multiplexing
11	Understand the concept of Code Division Multiplexing and its application.
12	To study the PN sequence generator.
13	Report writing on Wireless technologies like RFID, Zigbee, Bluetooth, and Wi-Fi.
14	Study of Frequency Division Multiplexing.

Course Outcomes (COs): On completion of the course, the students will be able to:	
CO1	Recognize need of various circuit elements in analogue and digital communication systems.
CO2	Acquire skills of studying and analyzing the responses of electronic communication circuits.
CO3	Analyze observations of each experiment based on the aim and objectives of an experiment.
CO4	Evaluate observed outputs with expected theoretical outputs.
CO5	Discuss the need and requirement of electronic communication systems in daily life.
CO6	Acquire the skill of design and build his /her simple circuit ideas

Question paper format for Semester End Examination NEP-2020,

Time: 02 Hours	**Max Marks: 35**
Theory question weightage will be given to each topic equivalent to number of lecturers allotted to unit in a syllabus.	

Instructions to the Candidate:

1. All Questions are compulsory.
2. Figures to the right indicates full marks.
3. Use of log table and scientific calculator is allowed.

Q. No.	**Question format**	**Question Type**	**Marks**
Q. 1	Attempt **any EIGHT (8)** of the following: **out of 10**	**Knowledge based questions:**	**8x1=8**
Q. 2	Attempt **any FOUR (4)** of the following: **out of 6**	**Comprehensions based questions**	**4x2=8**
Q. 3	Attempt **any TWO (2)** of the following: **out of 3**	**Analysis and application based questions**	**2x3=6**
Q. 4	Attempt **any TWO (2)** of the following: **out of 3**	**Synthesis and evaluation based questions**	**2x4=8**
Q. 5	Attempt **any ONE (1)** of the following: **out of 2**	**Synthesis and evaluation based questions**	**1x5=5**

Use Blooms taxonomy