FYUGP CURRICULAR FRAMEWORK FOR BACHELORS PROGRAMME WITH ELECTRONICS AS MINOR

SEMESTER	COURSE CODE	TYPE OF COURSE	TITLE OF COURSE	CREDITS	
				THEORY	TUTORIAL
I	**ELT122N**	**CT-1**	**ELECTRONICS:** NETWORK ANALYSIS & ANALOG ELECTRONICS	**4**	**2**
II	**ELT222N**	**CT-1**	**ELECTRONICS:** DIGITAL ELECTRONICS	**4**	**2**
III	**ELT322N**	**CT-1**	**ELECTRONICS:** OPERATIONAL AMPLIFIER & LINEAR INTEGRATED CIRCUITS	**4**	**2**
IV	**ELT422N**	**CT-1**	**ELECTRONICS:** SIGNALS AND SYSTEMS	**3**	**1**
V	**ELT522N**	**CT-1**	**ELECTRONICS:** MICROPROCESSORS AND MICROCONTROLLERS	**3**	**1**
VI	**ELT622N**	**CT-1**	**ELECTRONICS:** COMMUNICATION ELECTRONICS-I	**3**	**1**
VII	**ELT722N**	**CT-1**	**ELECTRONICS:** ELECTRONIC INSTRUMENTATION	**3**	**1**
VIII	**ELT822N**	**CT-1**	**ELECTRONICS:** POWER ELECTRONICS & PHOTONICS	**3**	**1**

HEAD OF THE DEPARTMENT / CONVENOR BOUGS

SEMESTER: 1st

MINOR COURSE

ELT122N: ELECTRONICS (NETWORK ANALYSIS AND ANALOG ELECTRONICS)

(Credits: Theory-04, Lab-02)

Learning Objectives:

1. *To review the basic concepts of emf sources and Kirchhoff's laws*
2. *To study network topology, network theorems and two port networks*
3. *To provide a comprehensive understanding of electronic devices and circuits*
4. *To understand the working of diode and transistor and to study basic circuits using diodes and transistors*
5. *To understand the diode and transistor characteristics*
6. *To study the effect of feedback on amplifiers*
7. *To study different types of oscillators*

Course Outcome: After successful completion of the course student will be able to:

1. *Have a comprehensive understanding of electronic devices and circuits*
2. *Apply their knowledge in analyzing Circuits by using network theorems*
3. *Know the characteristics of diodes and transistors*
4. *Know the benefits of feedback in amplifiers*
5. *Compare and classify oscillators*

THEORY (4 CREDITS)

UNIT-I: CIRCUIT ANALYSIS

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh and Node Analysis. Star and Delta Networks, Star-Delta Conversion. Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Two Port Networks: h, y and z parameters and their conversion. **(12 Lectures)**

UNIT-II: SEMICONDUCTOR DEVICES-I

Junction Diode and its applications: PN junction diode (Ideal and practical)- I-V characteristics, dc load line analysis, Quiescent (Q) point. Zener diode, Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Zener diode as voltage regulator, Introduction to Tunnel diode, Metal contact diode **(15 Lectures)**

UNIT-III: SEMICONDUCTOR DEVICES - II

Bipolar Junction Transistor: Review of the characteristics of transistor in CE and CB configurations, Regions ofoperation (active, cut off and saturation), Current gains α and β. Relations between α and β. dc load line and Q point. Unipolar Devices: JFET and MOSFET. Construction, working and I-V characteristics (output and transfer), Pinch-off voltage. **(15 Lectures)**

UNIT-IV: AMPLIFIERS AND OSCILLATORS

Transistor biasing and Stabilization Circuits-Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S. Transistor as a two- port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers. Cascaded Amplifiers, two stage RC Coupled Amplifier and its Frequency Response. Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only). Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency and Condition of oscillation. **(18 Lectures)**

REFERENCE BOOKS:

1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
2. Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
3. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
4. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
5. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
6. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
7. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
8. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline.

LABORATORY (2 CREDITS)

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING:

1. To familiarize with basic electronic components (R, C, L, diodes, transistors),
2. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.
3. Verification of (a) Thevenin's theorem and (b) Norton's theorem.
4. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem.
5. Verification of the Maximum Power Transfer Theorem.
6. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
7. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR).
8. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.
9. Study of the I-V Characteristics of UJT and design relaxation oscillator.
10. Study of the output and transfer I-V characteristics of common source JFET.
11. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
12. Design of a Single Stage CE amplifier of given gain.
13. Study of the RC Phase Shift Oscillator.
14. Study the Colpitt`s oscillator.

REFERENCE BOOKS:

1. Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.
2. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
3. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation.

SEMESTER: 2nd

MINOR COURSE

ELT222N: ELECTRONICS (LINEAR AND DIGITAL INTEGRATED CIRCUITS)

(Credits: Theory-04, Lab-02)

Learning Objectives:

1. *To study Operational Amplifier working, characteristics and its applications*
2. *To design simple linear and non-linear circuits using Op-Amp*
3. *To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables*
4. *To describe and explain the operation of fundamental digital gates*
5. *To study the design and implementation of various combinational and sequential logic circuits*

Course Outcome: After successful completion of the course student will be able to:

1. *Design and analyze Op-Amp based circuits*
2. *Use the basic logic gates and various reduction techniques of digital logic circuits*
3. *Design combinational and sequential circuits*
4. *Analyze the operation of standard combinational circuits like encoder, decoder, multiplexer, demultiplexer, adder etc*
5. *Analyze the operation of flip-flops and examine relevant timing diagrams*
6. *Analyze the operation of counters and shift registers*

Unit-I: Linear Integrated Circuits and its Applications (Theory: 4 Credits)

Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground. Inverting and non-inverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Wein bridge oscillator, Comparator and Zero- crossing detector, and Active low pass and high pass Butterworth filter (1st and second order only). (**15 Lectures**)

Unit-II: Number System and logic Gates

Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication. Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra. (**15 Lectures**)

Unit- III: Combinational Logic Analysis and Design

Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP). Arithmetic Circuits: Binary Addition. Half and Full Adder. Half and Full Subtractor, 4- bit binary Adder/Subtractor. Multiplexers, De-multiplexers, Decoders, Encoders. (**15Lectures**)

Unit- IV: Sequential Circuits

Introduction to 555 timers. SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. **Shift registers**: Serial-in- Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits). Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter. (**15Lectures**)

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
5. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
8. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

Laboratory (2 Credits)

AT LEAST 7 EXPERIMENTS EACH FROM SECTION A, B AND C

Section-A: Op-Amp. Circuits (Hardware)

1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
2. (a) To design inverting amplifier using Op-amp (741,351) & study its frequency response
   (b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response
3. (a) To add two dc voltages using Op-amp in inverting and non-inverting mode
   (b) To study the zero-crossing detector and comparator.
4. To design a precision Differential amplifier of given I/O specification using Op-amp.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To design a Wien bridge oscillator for given frequency using an op-amp.
8. To design a circuit to simulate the solution of simultaneous equation and1st/2ndorder differential
9. Design a Butterworth Low Pass Active Filter (1st order) & study Frequency Response
10. Design a Butterworth High Pass Active Filter (1st order) & study Frequency Response

Section-B: Digital circuits (Hardware)

1. (a) To design a combinational logic system for a specified Truth Table.
   (b) To convert Boolean expression into logic circuit & design it using logic gate ICs.
   (c) To minimize a given logic circuit.
2. Half Adder and Full Adder.
3. Half Subtractor and Full Subtractor.
4. 4-bit binary adder and adder-subtractor using Full adder IC.
5. To design a seven-segment decoder.
6. To design an Astable Multivibrator of given specification using IC 555 Timer.
7. To design a Monostable Multivibrator of given specification using IC 555 Timer.
8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
9. To build JK Master-slave flip-flop using Flip-Flop ICs
10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
11. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices

1. To verify the Thevenin and Norton Theorems.
2. Design and analyze the series and parallel LCR circuits
3. Design the inverting and non-inverting amplifier using an Op-Amp of given gain
4. Design and Verification of op-amp as integrator and differentiator
5. Design the 1storder active low pass and high pass filters of given cutoff frequency
6. Design a Wein`s Bridge oscillator of given frequency.
7. Design clocked SR and JK Flip-Flop`s using NAND Gates
8. Design 4-bit asynchronous counter using Flip-Flop ICs
9. Design the CE amplifier of a given gain and its frequency response.

Reference Books

1. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn., 2000, Prentice Hall
3. R. L. Tokheim, Digital Principles, Schaum’s Outline Series, Tata McGraw-Hill (1994)
4. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill.

Bachelors with Electronics as Minor

3rd Semester

ELE322N: OPERATIONAL AMPLIFIER AND LINEAR INTEGRATED CIRCUITS

Credits: THEORY: 4, PRACTICAL: 2

Course Objectives:

1. *To introduce students to the basic concepts of operational amplifiers.*
2. *To expose students to different applications of operational amplifiers.*
3. *To expose the students to some specialized ICs which are based on operational amplifiers.*

Expected Learning Outcomes:

After going through this course, the student shall be able to use operational amplifier IC and design several applications. Besides, the student shall be able to use some specialized ICs for different applications. After studying the course, the student shall be confident to convert any idea into its circuit-based product.

THEORY (4 Credits):

UNIT-I:Operational Amplifier (15 HOURS)

Operational Amplifiers: Basic differential Amplifier, Block Diagram of Op-Amp (IC 741), Characteristics of an Ideal and Practical Operational Amplifier, Open and Closed Loop configuration, Concept of Virtual Ground.

Op-Amp Parameters: Input Offset Voltage, Input Offset Current, Input Bias Current, Common Mode Rejection Ratio (CMRR), Slew Rate, Power Supply Rejection Ratio (PSRR).

Unit-II: Operational Amplifier Applications (15 HOURS)

Op-Amp with Negative feedback: General concept of Voltage Series, Voltage Shunt, Current Series and Current Shunt Negative Feedback, Op Amp circuits with Voltage Series and Voltage Shunt Feedback,

Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Summing and Difference Amplifier, Instrumentation Amplifier, Differentiator and Integrator, Comparator and Schmitt Trigger.

Unit-III:Data Converters and Active Filters (15 HOURS)

Data Converters: Analog-to-Digital (Flash and Successive Approximation type), Digital-to-Analog Converters (Weighted Resistor and R-2R Ladder type).

Active Filters using Op-Amps: First and Second Order Active Low Pass, high Pass, Band Pass and Band Stop Butterworth Filters.

Oscillators and Signal Generators: Barkhausen criterion for Sustained Oscillations, Phase Shift Oscillator, Wien-bridge oscillator, Square Wave Generator, Triangle Wave Generators.

Unit-IV:Specialized ICs and applications(15 HOURS)

IC 555 Timer: Introduction, Block diagram, Astable and Monostable multivibrator circuits.

Phase Locked Loops (PLL): Block Diagram and Characteristics, IC565 PLL, Phase Detectors, Voltage Controlled Oscillator (IC 566), Overview of PLL Applications.

Voltage Regulators: Basic circuit configuration and characteristics, Basic blocks of linear voltage regulator, three terminal fixed regulators (78XX and 79XX), Concept of Adjustable and Switching Regulators.

Text Books:

1. Microelectronics circuits By Sedra and Smith, HRW Publishing.
2. Integrated Electronics By Milliman, McGraw Hill Book Company
3. OP- Amp and Linear Integrated Circuits by R. A. Gayakward, Prentice Hall of India Ltd.

References:

1. Operational Amplifiers and Linear Integrated Circuits by Robert F. Coughlin and Frederick F. Drisiol, Gayakward, Prentice Hall of India Private Ltd.
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, McGraw Hill, 2002.

PRACTICAL (2 CREDITS: 60 HOURS)

Note: The student is required to attempt at least 10 experiments

1. Study Op-Amp Characteristics: CMRR and Slew Rate.
2. Design Inverting Amplifier of given Gain using Op-Amp.
3. Design of Non-Inverting Amplifier of given Gain using Op-Amp

4. Design Analog Adder and Subtractor Circuit using Op-Amp.

5. Design Integrator using Op-Amp.

6. Design Differentiator using Op-Amp.

7. Design First Order Low-Pass and High-Pass Filters using Op-Amp.

8. Design Second Order Low-Pass Filter using Op-Amp.

9. Design Second Order High-Pass Filter using Op-Amp

10. Design RC Phase Shift Oscillator using Op-Amp.

11. Design Wien Bridge Oscillator using Op-Amp.

12. Design of Square Wave and Triangle Wave Generators.

13. Study IC 555 as Astable Multivibrator.

14. Study IC 555 as Monostable Multivibrator.

15. Study the operation of 565 PLL with a given free running frequency.

Study line and load regulation using three-terminal

BACHELORS WITH ELECTRONICS AS MINOR

4th SEMESTER

MINOR

ELE422N:SIGNALS AND SYSTEMS

Credits: THEORY: 3, PRACTICAL: 1

Course Objectives:

1. *To understand the fundamental characteristics of signals and systems.*
2. *To understand signals and systems in terms of both the time and transform domains.*
3. *To develop the mathematical skills to solve problems involving convolution, filtering and sampling.*

Expected Learning Outcomes:

At the end of this course students will demonstrate the ability to:

1. *Analyse different types of signals.*
2. *Analyse linear shift-invariant (LSI) systems.*
3. *Represent continuous and discrete systems in time and frequency domain using Fourierseries and transform.*
4. *Analyse discrete time signals in z-domain.*
5. *Study sampling and reconstruction of a signal.*

THEORY (3 Credits):

UNIT-I: Representation and Classification of Signals and Systems(15 HOURS)

Representation and Classifications of Continuous and Discrete Time Signals and Systems; Linear and Nonlinear systems, Causal and non-causal Systems, Time varying and Time Invariant systems, Singularity Functions; Convolution Operation of Continuous and Discrete Time Signals; Impulse Response and Its Properties.

Unit-II: Fourier Series and Frequency analysis of Continuous time systems(15 HOURS)

Fourier Transform and its Properties; System Analysis Using Fourier Transform; Hilbert Transform; Representation and Analysis of Bandpass Signals and Systems: Review of Laplace Transform; Two-Sided Laplace Transform; System Analysis of I and II Order Systems; Transfer Function; Frequency Response of I and II Order Systems.

Unit-III: Discrete Time Systems(15 HOURS)

Sampling: Representation of a Continuous-Time Signal by its Samples, Sampling Theorem. Reconstruction of a Signal from its Samples, Aliasing, Discrete-Time Processing of Continuous-Time Signals: Arithmetic operations on discrete time signals. Solutions of Discrete time systems using Z-transform. Introduction to Random Variables; Probability Distribution and Probability Density Functions; Uniform, Gaussian, Exponential and Poisson Random Variables; Statistical Averages; Random Processes; Correlation; Power Spectral Density.

Recommended Books:

1. Alan V, Oppenheim and A.S Wilsky, Signals and Systems, prentice Hall India
2. Simon Hykin, Signals and systems, John Wiley.
3. B. P Lathi, Signals and systems
4. Simon Hykin, Communication systems, John wiley
5. D. M. Etter, D.C, Kuncicky, H. Moore, Introduction to MATLAB 7, Pearson.

PRACTICAL (1 CREDIT: 30 HOURS)

Note: The student is required to attempt at least 10 experiments

1. Familiarization with MATLAB software.
2. Introduction to Signal Processing toolbox.
3. Matrix Operations & Plotting using MATLAB.
4. Generation of Signals & Signal Operations.
5. Convolution on Continuous Time Signals.
6. Study of Laplace Transforms using MATLAB.
7. To Study sampling of continuous signals using MATLAB.

BACHELORS WITH ELECTRONICS AS MINOR
5th SEMESTER

ELT522N: ELECTRONICS _ MICROPROCESSORS AND MICROCONTROLLERS

CREDITS: THEORY: 3, PRACTICAL: 1

COURSE OBJECTIVES:

1. *To understand the differences in architecture and applications between Microprocessors and Microcontrollers*
2. *To understand basic architecture of 8085 microprocessor*
3. *To understand the 8085 instruction set and write programs in assembly language*
4. *To understand basic architecture of 8051 microcontroller*
5. *To understand the 8051 instruction set and write programs in assembly language*

EXPECTED LEARNING OUTCOMES:

On completion of this course the students will be:

1. *Familiar with the components and functioning of a computer system, gaining an understanding of how a computer system operates.*
2. *Familiar with the fundamental concepts and architecture of 8085 microprocessor and 8051 Microcontroller.*
3. *Familiar with the addressing modes, computer instructions and its types.*
4. *Able to write assembly language programs for microprocessors and microcontrollers.*
5. *Able to interface different peripherals with 8051 Microcontrollers.*

THEORY (3 Credits):

UNIT-I: INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS (15 HOURS)

Computer System: Central Processing Unit, Memory, I/O, System Bus; Functions of a computer system. Introduction/History/Evolution and Applications of Microprocessors, types and Characteristics of a Microprocessors, Programmer's Model of Microprocessors, Von Neumann and Harvard Architectures, CISC and RISC Architectures. Introduction/Evolution and Applications of Microcontrollers, Comparison of Microprocessor and Microcontroller, Microcontrollers for embedded system, Criteria for choosing a Microcontroller, Programming Languages.

UNIT-II: 8085 ARCHITECTURE AND PROGRAMMING (15 HOURS)

Introduction and Architecture of 8085 Microprocessor, 8085 Bus Structure, Addressing Modes, 8085 instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions), Subroutines, delay loops, Instruction and Data Formats. Instruction Timing Diagram, Memory read/write Timing Diagrams. 8085 Interrupts. Programming of 8085 using Data Transfer, Arithmetic and logic Instructions.

UNIT-III: 8051 ARCHITECTURE AND PROGRAMMING (15 HOURS)

Introduction and Architecture of 8051 microcontroller, Pin description of 8051 microcontroller, Input/Output Ports and Port circuits, Timers and counters, Serial data input/output Interrupts, register set and Addressing Modes of 8051, Instruction set of 8051 (data transfer/arithmetic/logic/bit level and byte control transfer instructions), 8051 Assembly Language Programming: I/O port programming, bit manipulation, programming using Data Transfer, Arithmetic and logic Instructions. Interfacing of LED.

RECOMMENDED BOOKS:

1. *Microprocessor Architecture Programming & applications with 8085, 2002, R.S. Goankar, Prentice Hall.*
2. *Microprocessors and Microcontrollers: Architecture, Programming & Interfacing using 8085, 8086, and 8051, S.K Mandal, Tata Mcgraw Hill Education.*
3. *The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.*
4. *Microprocessor Theory and Applications, M. Rafiq-u Zaman, McGraw Hill Publishing Company*
5. *Microprocessor Techniques by A. P. Godse, 2nd Ed., Technical Publications*

PRACTICAL (1 CREDIT: 30 HOURS)

PROGRAMS USING 8085 MICROPROCESSOR

1. Arithmetic and logical operations of 8-bit/16-bit numbers.
2. Count number of 1's/0's in a given number.
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Block Data transfer.
6. Programs handling 32-bit numbers.
7. Calculate the sum of series of Even/Odd numbers
8. Find larger/smaller of two 8 and 16-bit numbers
9. Find the square of given number.
10. Delay loops.

PROGRAMS USING 8051 MICROCONTROLLER

1. Arithmetic and logical operations of 8-bit/16-bit numbers.
2. Data Transfer and shift operations.
3. Program to toggle the bits of port with some delay
4. Find the Largest/smallest number in a series of 10 numbers.
5. Sort Numbers in Ascending/Descending Order.
6. Singly and Multibit Shifting, Rotation and manipulation.
7. To find the factorial of a number.
8. Program to make the two numbers equal by increasing the smallest number and decreasing the largest number.

BACHELORS WITH ELECTRONICS AS MINOR
6th SEMESTER

ELT622N: ELECTRONICS _ COMMUNICATION ELECTRONICS - I

CREDITS: THEORY: 3, PRACTICAL: 1

COURSE OBJECTIVES:

1. *To understand the transmission of signals through communication channels.*
2. *To understand analog communication systems using amplitude modulation and demodulation.*
3. *To learn about analog communication systems using angle modulation and demodulation.*
4. *To know about various types of noise in communication systems.*

EXPECTED LEARNING OUTCOMES:

At the end of this course students shall be able to demonstrate:

1. *Basic working of communication system*
2. *Analog Modulation Techniques and their comparative analysis and applications suitability*
3. *Process of Modulation and Demodulation*
4. *Types, characterization and performance parameters of transmission channels*
5. *Multiplexing Techniques*
6. *Basic working principles of existing and advanced communication technologies*
7. *Conversion of analog speech into digital speech using PCM.*

THEORY (3 CREDITS):

UNIT-I: AMPLITUDE MODULATION AND DEMODULATION (15 HOURS)

Introduction to Signals and its classification, Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of AM Signal, Double Side band Suppressed Carrier, (DSB- SC) System, Generation and Demodulation of DSB- SC signals, Advantages of SSB transmission, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and reception.

UNIT-II: FM MODULATION, RECEPTION AND NOISE (15 HOURS)

Concept of Angle Modulation: Mathematical theory, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, FM Detector using PLL, Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

UNIT-III: PULSE MODULATION (15 HOURS)

Introduction to PCM, PAM and PWM. Review of Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Companding Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM.

RECOMMENDED BOOKS:

1. *P.Z. Peebles.Jr., Probability, Random Variables and Random Signal Principles, Tata McGraw Hill Education, 3rd edition, 2002.*
2. *A.Papoulis, Probability, Random variables and Stochastic Processes, McGraw Hill, 3rd edition, 1991*
3. *Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.*
4. *George Kennedy, "Electronic Communication System", McGraw- Hill.*
5. *Gary M. Miller and Jeffery S. Beasley, "Modern Electronic Communications ", PHI.*
6. *Simon Haykin, "Communication Systems", 8th edition, Wiley Publishers*

PRACTICAL (1 CREDIT: 30 HOURS)

Note: The student is required to attempt at least 10 experiments

1. Study of ICs (AD633/AD734)
2. Design and realize AM modulator using Square Law modulator and calculate its modulation index and power
3. Design and realize AM detector using Square Law detector and Envelope detector
4. Design and realize DSB-SC signal Modulator using Analog Multiplier
5. Design and realize DSB-SC signal demodulator using Coherent detection and Squaring loop
6. Simulation of SSB-SC modulator and demodulator using MATLAB/Simulink
7. Simulation of Hilbert transformer and VSB filter using MATLAB/Simulink
8. Derivation of modulation index in case of FM signal
9. To design and realize FM generation and Detection
10. To study & realize Op- amp based Pre-Emphasis & De-Emphasis circuits
11. Field study/visit to place such as Radio Kashmir Srinagar