FYUGP CURRICULAR FRAMEWORK FOR BACHELORS PROGRAMME WITH ELECTRONICS AS MAJOR

SEMESTER	COURSE CODE	TYPE OF COURSE	TITLE OF COURSE	CREDITS	
				THEORY	TUTORIAL
I	ELT122J	CT-1	**ELECTRONICS:** NETWORK ANALYSIS & ANALOG ELECTRONICS	4	2
II	ELT222J	CT-1	**ELECTRONICS:** DIGITAL ELECTRONICS	4	2
III	ELT322J	CT-1	**ELECTRONICS:** OPERATIONAL AMPLIFIER & LINEAR INTEGRATED CIRCUITS	4	2
IV	ELT422J1	CT-1	**ELECTRONICS:** SIGNALS AND SYSTEMS	3	1
	ELT422J2	CT-2	**ELECTRONICS:** APPLIED MATHEMATICS AND PROGRAMMING	4	2
	ELT422J3	CT-3	**ELECTRONICS:** ELECTROMAGNETIC WAVES AND ANTENNAS	4	2
V	ELT522J1	CT-1	**ELECTRONICS:** MICROPROCESSORS AND MICROCONTROLLERS	3	1
	ELT522J2	CT-2	**ELECTRONICS:** DIGITAL SYSTEM DESIGN & VHDL	4	2
	ELT522J3	CT-3	**ELECTRONICS:** MICROWAVE ENGINEERING	4	2
VI	ELT622J1	CT-1	**ELECTRONICS:** COMMUNICATION ELECTRONICS-I	3	1
	ELT622J2	CT-2	**ELECTRONICS:** ADVANCED MICROPROCESSORS AND MICROCONTROLLERS	4	2
	ELT622J3	CT-3	**ELECTRONICS:** ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	4	2
FOR FYUGP HONOURS					
VII	ELT722J1	CT-1	**ELECTRONICS:** ELECTRONIC INSTRUMENTATION	3	1
	ELT722J2	CT-2	**ELECTRONICS:** EMBEDDED SYSTEMS AND IOT	4	2
	ELT722J3	CT-3	**ELECTRONICS:** COMMUNICATION ELECTRONICS-II	4	2
VIII	ELT822J1	CT-1	**ELECTRONICS:** POWER ELECTRONICS & PHOTONICS	3	1
	ELT822J2	CT-2	**ELECTRONICS:** CONTROL SYSTEMS	4	2
	ELT822J3	CT-3	**ELECTRONICS:** MATERIAL SCIENCES & VLSI TECHNOLOGY	4	2
FOR FYUGP HONOURS WITH RESEARCH					
VII	ELT722RJ1	CT-1	**ELECTRONICS:** ELECTRONIC INSTRUMENTATION	3	1
	ELT722RJ4	CT-2	**ELECTRONICS:** EMBEDDED SYSTEMS AND IOT	4	2
	ELT722RJ5	CT-3	**ELECTRONICS:** COMMUNICATION ELECTRONICS-II	4	2
VIII	ELT822RJ1	CT-1	**ELECTRONICS:** POWER ELECTRONICS & PHOTONICS	3	1
	ELT822P	PROJECT	**ELECTRONICS: PROJECT WITH DISSERTATION**	-	12

HEAD OF THE DEPARTMENT / CONVENOR BOUGS

SEMESTER: 1st

MAJOR COURSE

ELT122J: 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

MAJOR COURSE

ELT222J: 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*

THEORY (4 CREDITS)

UNIT-I: LINEAR INTEGRATED CIRCUITS AND ITS APPLICATIONS

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 Major

3rd Semester

ELE322J: 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 MAJOR
4thSEMESTER

ELT422J1: ELECTRONICS _ 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 Fourier series 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 ELECTRONIC AS MAJOR

4th SEMESTER

ELECTRONICS

MAJOR

ELE422J2: APPLIED MATHEMATICS & PROGRAMMING

Credits: THEORY: 4, PRACTICAL: 2

Course Objectives:

1. *To understand Fourier series and its applicability in different fields of electronics.*
2. *To understand the Fourier transform and its application in electronics.*
3. *To use Laplace transform methods to solve differential equations.*
4. *To understand various numerical techniques for the solution of algebraic equations.*
5. *To develop programming skills using C-programming.*

Expected Learning Outcomes:

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

1. *Familiarize with the concept of Fourier transform & Fourier series*
2. *Understand the utility of Laplace transform*
3. *Develop algorithms for arithmetic and logical problems and write programs in C language*

THEORY (4 Credits):

UNIT-I: Fourier Series and Fourier Transform(15 HOURS)

Dirichlet's Condition, Determination of Fourier Coefficients, Fourier Series for functions of arbitrary period, Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals, Fourier Transforms: Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit-II: Laplace Transformation(15 HOURS)

Integral transforms, Laplace transforms, Properties of Laplace transforms, Laplace transform of some elementary functions, Shifting theorems, Laplace Transform of a derivative, Laplace transforms of integrals, Inverse of Laplace transform by partial fractions, Heavisize's expansion formula, Solving differential equation using Laplace transform, Applications of Laplace transform in the field of Electronics.

Unit-III: Numerical Methods(15 HOURS)

Empirical laws & Curve fitting methods: Method of group averages, Method of least squares Solution of Algebraic & transcendental equations: Bisection Method, Method of False Position, Iteration Method, Newton –Raphson Method, Solution of Simultaneous Algebraic equations: Cramer's rule, Matrix Inversion method, Gauss Elimination method, Gauss-Jordan Method.

Unit-III: C Programming (15 HOURS)

Character set, Variables and Identifiers, Data Types,Variables, operators andExpressions, Constants and Literals, assignment and Basic input/output statement, Conditional Statements andLoops- Relational Operators, Logical, Switch Statement, Arrays and theirprocessing; Functions and their processing, Pointer Arithmetic.Introduction to files and their processing.

Recommended Books:

1. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
2. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
3. Fourier Transformation and Laplace Transformations, Schaum Series Book, TMH Course
4. Numerical Methods, E.Balaguruswamy, TMH
5. Introductory Methods of Numerical Analysis, S.S.Sastry, PHI
6. Computer Oriented Numerical Methods, R.S. Salaria, Khanna Publishing House

7. Numerical Methods in Engineering and Science, B. S. Grewal

8. Numerical Methods, Khandasamy, K. Thilagavathy, K. Gunavathy.

9. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain. New Age International Publisher.

10. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, TMH

11. C How to Program by Deitel

12. Programming with C by Byron S Gottfried

PRACTICAL (2 CREDIT: 60 HOURS)

Note: The student is required to attempt at least 15 experiments

1. Write a C program toGenerate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Write a C program toFind minimum and maximum of N numbers.
3. Write a C program toFind the GCD of two integer numbers.
4. Write a C program toCalculate factorial of a given number.
5. Write a C program to Generate and print prime numbers up to an integer N.
6. Write a C program to Sort given N numbers in ascending order.
7. Write a C program to add two Matrices Using Multi-Dimensional Arrays.
8. Write a C program to multiply two Matrices Using Multi-Dimensional Arrays.
9. Write a C program to multiply two Matrices by passing Matrix to a Function.
10. Write a C Program to Find Largest Element in an Array

11. Write a program to evaluate the sine series using recursive and non-recursive functions.
12. Write programs using structures, and unions for selected cases.
13. Write programs employing pointers instead of the use of arrays.
14. Write programs to create files, and read and write on these files.
15. Write a program to evaluate the sine series using recursive and non-recursive functions.
16. Write a C program to find the solution of a non-linear equation using repetitive substitution method.
17. Write a C program to find the solution of a non-linear equation using Bisection method.
18. Write a C program to find the solution of a non-linear equation using RegulaFalsi method.
19. Write a computational program for solving algebraic equations by Newton Rapson method.
20. Write a computational program for solving simultaneous algebraic equations by Gaussian Elimination method.
21. Write a C program of fitting a straight line, exponential curve, geometric curve, hyperbola and a polynomial

BACHELORS WITH ELECTRONIC AS MAJOR

4th SEMESTER

ELECTRONICS

MAJOR

ELE422J3: ELECTROMAGNETIC WAVES & ANTENNAS

Credits: THEORY: 4, PRACTICAL: 2

Course Objectives:

1. *Use Maxwell's equations to calculate fields from dynamic charge/current distributions.*
2. *Analyse plane waves in lossless and lossy media.*
3. *Calculate fields from antennas and antenna systems.*
4. *To study various polarization techniques.*

Expected Learning Outcomes:

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

1. *Understand the radiation mechanism of EM waves by antennas and their radiation patterns.*
2. *Analyse the power radiated by different antennas and their radiation characteristics.*
3. *Interpret the relationships between antenna parameters.*
4. *Design and analyse different antennas and antenna arrays. 5. understand the wave propagation mechanism at different frequencies.*

THEORY (4 Credits):

UNIT-I: Electromagnetic Fields and Maxwell's Equations (15 HOURS)

Introduction, Coulomb's law of forces, Principle of Superposition of Maxwell's Equations in differential and integral form. fields, Electric scalar potential, Relation of Electric field lines and equi-potential contours, The electric dipole and dipole moment, Gauss's law, Characteristics of dielectrics. Boundary relations, Capacitance, Divergence of flux density, Divergence Theorem, Poisson's and Laplace Equations, Equations of continuity for time varying fields, inconsistency of Amperes law, Boundary condition, Boundary Conditions at media interface (Dielectric and Conducting interface). Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave.

Unit-II: Wave Polarization and Communication (15 HOURS)

Biot Savart law, Force between two parallel linear conductors, Magnetic flux and flux density, Magnetic field relations, Torque of a loop, Energy stored in a magnetic field, Inductance, Ampere's law, Maxwell's First curl equation, Comparison of divergence and curl, The vector potential, permeability, Analogies between electric and magnetic fields. M wave polarization, power flow and pointing vector (Physical interpretation), plane wave at dielectric interface, reflection and refraction of waves in dielectric interface, Normal Incidence on a layered medium, Total Internal Reflection, Wave Polarization at Media interface.

Unit-III: Antenna Fundamentals (15 HOURS)

Basics of antenna radiation, Potential functions, solution of potential functions, radiation from the hertz dipole, total power radiated by the hertz dipole, radiation resistance of the hertz dipole, radiation pattern of the hertz dipole, directivity, antenna gain, effective area of antenna. Folded dipole antennas, modification of folded dipoles, loop antennas, far-field patterns of circular loop antennas, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and Rr relations for small loops.

Unit-IV: Antenna Arrays and Special Structures (15 HOURS)

Two element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays, Yagi-Uda Arrays, Folded Dipoles and their characteristics, Introduction, Traveling wave radiators – basic concepts, Long wire antennas – field strength calculations and patterns, Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas.

Recommended Books:

1. Antennas and Wave propagation: John D Kraus, Ronald J Marhefka, Ahmad S Khan McGraw Hill, 4th edition.
2. Electromagnetic Waves: R. K. Shevgaonkar Tata McGraw Hill.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi
4. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition,2001.

PRACTICAL (2 CREDIT: 60 HOURS)

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

1. Measurement of Antenna Parameters using Microwave Antenna Training System
2. Plot of Polarization (Horizontaland Vertical).
3. Design of dipole antenna system using waveguide.
4. Some experiments using Microwave Antenna Trainer and CST Tool or HFSS.

BACHELORS WITH ELECTRONICS AS MAJOR
5th SEMESTER

ELT522J1: 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 MAJOR

5th SEMESTER

ELT522J2: ELECTRONICS _ DIGITAL SYSTEM DESIGN AND VHDL

CREDITS: THEORY: 4, INTERNSHIP / PRACTICALS: 2

COURSE OBJECTIVES:

1. *To impart basic concepts of computer architecture and organization.*
2. *To explain key skills of constructing cost-effective computer systems.*
3. *To familiarize the basic CPU organization.*
4. *To help students in understanding various memory devices.*
5. *To facilitate students in learning IO communication.*

EXPECTED LEARNING OUTCOMES:

At the end of this course students will be able to:

1. *Identify various components of computer and their interconnection*
2. *Identify basic components and design of the CPU: the ALU and control unit.*
3. *Compare and select various Memory devices as per requirement.*
4. *Compare various types of IO mapping techniques*
5. *Critique the performance issues of cache memory and virtual memory.*

THEORY (4 CREDITS):

UNIT-I: INTRODUCTION TO VHDL PROGRAMMING (15 HOURS)

Fundamental units of VHDL, Library declaration, Entity declaration, Architecture declaration, Data types, Primitive programming Data flow programming, Structural Programming, Signals and variables, Test benches, State machines.

UNIT-II: STRUCTURE OF COMPUTERS (15 HOURS)

Computer types, Functional units, Basic operational concepts, Von-Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Computer Arithmetic's: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic. Implementation of Arithmetic circuits in VHDL.

UNIT-III: REGISTER TRANSFER, MICRO-OPERATIONS & MEMORY SYSTEMS (15 HOURS)

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit. MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit. Semiconductor Memories, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory. Implementation of registers in VHDL

UNIT-IV: BASIC COMPUTER ORGANIZATION AND DESIGN (15 HOURS)

Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC. Implementation of simple CPU in VHDL.

RECOMMENDED BOOKS:

1. *William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.*
2. *M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.*
3. *Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.*
4. *Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,*
5. *John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGraw Hill*
6. *Nikrouz Faroughi, (2015), Digital Logic Design and Computer Organization with computer architecture for security, 1st edition, McGraw Hill Education.*

INTERNSHIP OR PRACTICAL (2 CREDIT: 60 HOURS)

Note: The student is required to attempt at least 15 experiments

1. Design the Datapath of a computer from its register transfer language transcription
2. Implement a simple instruction set computer with a control unit and a data path.
3. Design a control unit of a computer using the Microprogrammed logic based on its RTL.
4. Design an 8-bit ALU using VHDL?
5. Implement the HALF Adder using VHDL?
6. Implement the FULL Adder using VHDL?
7. Implement the Binary to Gray and Gray to Binary code converters using VHDL?
8. Design a 3 x 8-line decoder using VHDL?
9. Implement the 4 x 1 and 8 x 1 Multiplexer using VHDL?
10. Implement the various flip-flops using VHDL and verify the excitation tables?
11. Implementation of various logic gates using VHDL?
12. Implementation of Booth's Algorithm using VHDL?
13. Implementation of direct mapped cache design using VHDL?
14. Implementation of restoring division algorithm using VHDL?
15. Implementation of synchronous counters using VHDL?
16. Implementation of Ripple Carry Ahead (RCA) using VHDL?
17. Design an 8-bit Barrel Shifter using VHDL?
18. Using VHDL to implement Subtractors circuits using 2's compliment method?
19. Implementation of Moore's Machines using VHDL?
20. Implementation of Melay Machine using VHDL?
21. Verification of the designed circuits using FPGA.

BACHELORS WITH ELECTRONICS AS MAJOR
5th SEMESTER

ELT522J3: ELECTRONICS _ MICROWAVE ENGINEERING

CREDITS: THEORY: 4, PRACTICAL: 2

COURSE OBJECTIVES:

1. *To understand and gain complete knowledge about microwave devices and components.*
2. *To learn about transmission lines and analysis of wave guides.*
3. *To learn the importance of S parameters and VSWR in microwave measurements.*

EXPECTED LEARNING OUTCOMES:

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

1. *Use of different types of waveguides and their respective modes of propagation.*
2. *Analyse typical microwave networks using impedance, admittance, transmission and scattering matrix representations.*
3. *Design microwave matching networks using L section, single and double stub and quarter wave transformer.*
4. *Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc.*
5. *Describe and explain working of microwave tubes and solid-state devices.*
6. *Perform measurements on microwave devices and networks using power meter and VNA*

THEORY (4 CREDITS):

UNIT-I: MICROWAVE TRANSMISSION LINES (15 HOURS)

Transmission Line and Distributed parameters, Basic Transmission line equations, Solutions of Transmission line equations, Physical significance of Transmission line equations, Distortions in Transmission line, Condition for Distortion less line, Characteristic impedance, Propagation Constant, Reflection and Transmission coefficients, Velocity of propagation, Standing wave and Standing wave ratio, Reflection of line terminated in impedance other than characteristic impedance, Single stub impedance matching, Smith Chart.

UNIT-II: MICROWAVE NETWORK ANALYSIS (15 HOURS)

Impedance and Equivalent Voltages and Currents, Equivalent Voltages and Currents, The Concept of Impedance, Even and Odd Properties of Z(ω) and (ω), Impedance and Admittance Matrices, Reciprocal Networks Lossless Networks, The Scattering Matrix , Reciprocal Networks and Lossless Networks, A Shift in Reference Planes , Power Waves and Generalized Scattering Parameters, The Transmission (ABCD) Matrix, Relation to Impedance Matrix, Equivalent Circuits for Two-Port Networks, Signal Flow Graphs, Decomposition of Signal Flow Graphs, Application to Thru-Reflect-Line Network Analyzer Calibration.

UNIT-III: MICROWAVE WAVEGUIDES (15 HOURS)

Rectangular Waveguides, Solution of Wave Equations in Rectangular Coordinates, TE modes in rectangular magnitudes, TM Modes in Rectangular waveguide, Power Transmission in Rectangular Waveguides, Power Losses in Rectangular Waveguides, Excitations of Modes in Rectangular waveguides, Circular Waveguides, TEM Modes in Circular Waveguide.

UNIT-IV: MICROWAVE DEVICES AND STRIP LINES (15 HOURS)

Klystrons: Multi-cavity Klystron and Reflex Klystron, Microwave Tunnel Diode Gunn Oscillator, Travelling Wave Tube, Characteristic Impedance of Micro strip Lines and Quality factor of Micro-strip lines, Characteristic impedance of Parallel strip lines and Attenuation losses, MMIC Fabrication techniques.

RECOMMENDED BOOKS:

1. *G. S. Raghuvanshi, Microwave Engineering; Cengage*
2. *S.Y. Liao, Microwave Devices & Circuits; PHI 3rd Ed.*
3. *A Das and S.K. Das, Microwave Engineering; McGraw Hill Education*
4. *S. Vasuki, D Margaret Helena, R Rajeswari, Microwave Engineering; MHE*
5. *Om P. Gandhi, Microwave Engineering and Applications; Pergamon Press*
6. *Microwave Engineering Fourth Edition David M. Pozar University of Massachusetts at Amherst, John Wiley & Sons, Inc 4th Edition.*

PRACTICAL (2 CREDIT: 60 HOURS)

LABORATORY WORK I:

Study of different Microwave guide components, determination the frequency and wavelength in a rectangular wave guide working on T_{E10} mode, Finding the standing wave ratio and reflection coefficient. Measurement of an unknown impedance with smith chart,

LABORATORY WORK II:

VI characteristics of Gunn diode, O/P power and frequency as a function of voltage in case of Gunn diode, Magic tee, Characteristics of Klystron tube and determination of its electronic tuning range, various experiments using MATLAB and HFSS Tool.

BACHELORS WITH ELECTRONICS AS MAJOR
6th SEMESTER

ELT622J1: 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

BACHELORS WITH ELECTRONICS AS MAJOR
6th SEMESTER

ELT622J2: ELECTRONICS _ ADVANCED MICROPROCESSORS & MICROCONTROLLERS

CREDITS: THEORY: 4, PRACTICAL: 2

COURSE OBJECTIVES:

1. *To understand basic architecture of 8086 microprocessor*
2. *To understand 8086 instruction set and write programs in assembly language*
3. *To understand interrupt system of 8086 microprocessor*
4. *To study PIC microcontroller family*

EXPECTED LEARNING OUTCOMES:

On completion of this course the students will be able to

1. *Write programs for 8086 microprocessors.*
2. *Interface memory and I/O devices with 8086 microprocessors.*
3. *Write programs for PIC microcontrollers*
4. *Design and implement PIC microcontroller-based systems*

THEORY (4 CREDITS):

UNIT-I: INTRODUCTION TO X86 MICROPROCESSOR FAMILY (15 HOURS)

Introduction to 8086 Microprocessor, Working and Architecture of 8086, Register organization of 8086 Microprocessor, Addressing Modes and memory segmentation in 8086. Pin Description of 8086. Features and comparison of 80186, 80286, 80386, 80486 and Pentium Processors. Recent trends in microprocessor design.

UNIT-II: 8086 INSTRUCTIONS SET AND ASSEMBLY LANGUAGE PROGRAMMING (15 HOURS)

Instruction set of 8086 Microprocessor: Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions. Assembly language Programming for 8086 microprocessors. Use of Macros and Procedures in ALP.

UNIT-III: INTERRUPTS, TIMING AND PERIPHERAL DEVICES (15 HOURS)

Interrupts and interrupt service subroutines, 8086 Interrupt Structures, Interrupt Vector table, various types of Interrupts. ALP using interrupts, 8259 Programmable Interrupt Controller, Interfacing & Programming, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum and Maximum Mode 8086 System, 8288 Bus Controller. 8086 Memory Interfacing.

UNIT-IV: PIC MICROCONTROLLERS (15 HOURS)

Introduction to PIC Microcontroller families (8/16 and 32 bit), PIC 16F series family overview of architecture and peripherals, Pin diagram and Architecture of PIC16F84/PIC16F84A Microcontroller, Memory organization, configuration, memory addressing, and special function registers, parallel and serial ports, timer and counters, Interrupts, Watchdog Timer. Instruction set of PIC16F84 Microcontroller. Programming of PIC16F84 Microcontroller. Introduction to 18F, 24F and 32F series of PIC microcontrollers.

RECOMMENDED BOOKS:

1. *Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, TMG*
2. *Advanced Microprocessors by Daniel Tabak McGraw-Hill.*
3. *Advanced Microprocessors by A. P. Godse, D. A. Godse Technical Publications.*
4. *Advanced Microprocessors and Peripherals by K. M. Burchandi, A. K. Ray Tata McGraw Hill Education*
5. *Designing Embedded Systems with PIC Microcontrollers: Principles and Applications, 2nd Edition, Tim Wilmshurst, Elsevier Publication.*
6. *Interfacing PIC Microcontrollers Embedded Design by Interactive Simulation by Martin Bates, Elsevier Publication.*

PRACTICAL (2 CREDIT: 60 HOURS)

EXPERIMENTS USING 8086 MICROPROCESSOR:

1. WAP for Arithmetic and logic operations of 8-bit/16-bit and 32- bit numbers.
2. WAP for signed multiplication of 16-bit numbers.
3. WAP to add a series 10-byte array stored in Data Segment.
4. WAP to find square/cube of a given number.
5. WAP to transfer a block of 10 bytes from Data Segment to Extra Segment.
6. WAP to find whether a given number is positive or negative.
7. WAP to Convert a Hex number into Decimal Number.
8. WAP to find whether a given number is Even or Odd.
9. WAP to find whether a given byte is bit wise Palindrome
10. WAP to find Factorial of a number.
11. WAP to SORT a series of 10 numbers in ascending/ descending order
12. WAP to find Maximum/Minimum in a given series of 10 numbers.

EXPERIMENTS USING PIC16F84 MICROCONTROLLER:

1. WAP for Arithmetic and logic operations of 8-bit and 16-bit numbers.
2. WAP for Multiplication and Division.
3. WAP to add a series 10-byte array stored in data memory.
4. WAP to find square/cube of a given number.
5. WAP to find Factorial of a number.
6. WAP to SORT a series of 10 numbers in ascending/ descending order
7. Interfacing of LED with PIC16F84 Microcontroller.
8. Interfacing a Switch with PIC16F84 Microcontroller.
9. Interfacing of both LED and Switch with 16F84 Microcontroller.
10. PIC 16F84 Microcontroller and Seven segment interfacing.
11. WAP to generate a square waveform with PIC16F84 Microcontroller
12. 8-bit ADC Interfacing
13. PWM signal generation at various frequencies.

BACHELORS WITH ELECTRONICS AS MAJOR
6th SEMESTER

ELT622J3: ELECTRONICS _ ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

CREDITS: THEORY: 4, PRACTICAL: 2

COURSE OBJECTIVES:

1. *Study about uninformed and Heuristic search techniques.*
2. *Learn techniques for reasoning under uncertainty*
3. *Introduce Machine Learning and supervised learning algorithms*
4. *Study about ensembling and unsupervised learning algorithms*
5. *Learn the basics of deep learning using neural networksFA*

EXPECTED LEARNING OUTCOMES:

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

1. *Use appropriate search algorithms for problem solving*
2. *Apply reasoning under uncertainty*
3. *Build supervised learning models*
4. *Build ensembling and unsupervised models*
5. *Build deep learning neural network models*

THEORY (4 CREDITS):

UNIT-I: PROBLEM SOLVING AND PROBABILISTIC REASONING (15 HOURS)

Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP).

Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

UNIT-II: SUPERVISED REASONING (15 HOURS)

Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.

UNIT-III: ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING (15 HOURS)

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT-IV: NEURAL NETWORKS (15 HOURS)

Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

RECOMMENDED BOOKS:

1. *Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.*
2. *Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020*
3. *Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education,2007*
4. *Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008*
5. *Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006*
6. *Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)*
7. *Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.*
8. *Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014*
9. *Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.*
10. *Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016*

PRACTICAL (2 CREDIT: 60 HOURS)

LABORATORY WORK I (PYTHON PROGRAMMING I):

Python Data structure and Data types, Simple Input-Output operators, String Operators, if, if-else, nested if, Loops, functions, classes in Python , Instance methods, inheritance, polymorphism, python GUI

LABORATORY WORK II (PYTHON PROGRAMMING II):

1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple NN models
12. Build deep learning NN models