JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in
An Autonomous Institute, with NAAC "A" Grade
Department of Electronics and Telecommunication Engineering
"Rectifying Ideas, Amplifying Knowledge"
Session: 2021-22

Course Structure and Syllabus (Autonomous)

For

B. Tech. Fifth Semester in Electronics and Telecommunication Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC	ET5T001	Digital Signal Processing	2	1	0	20	20	60	100	3
2	PCC	ET5T002	Microcontroller and Application	3	0	0	20	20	60	100	3
3	PCC	ET5T003	Control System Engineering	3	0	0	20	20	60	100	3
4	PEC	ET5E004	Professional Elective Course-I	3	0	0	20	20	60	100	3
5	OEC	ET5O001	OPEN Elective Course-I	4	0	0	20	20	60	100	4
6	ESC	ET5L005	Software Workshop Lab	0	0	2	60	0	40	100	1
7	PCC	ET5L001	Digital Signal Processing Lab	0	0	2	60	0	40	100	1
8	PCC	ET5L002	Microcontroller and Application Lab	0	0	2	60	0	40	100	1
9	Internship	ET5P001	Field Training-2	0	0	0	20	0	30	50	1
10	Project	ET5P002	Mini Project	0	0	2	20	0	30	50	1
11	MC	ET5T006	Consumer Affairs	2	0	0	10	15	25	50	Audit
			Total	**17**	**1**	**8**	**330**	**115**	**505**	**950**	**21**

ET5T001	Digital Signal Processing	3 Credit

Prerequisites: Basic knowledge of mathematics.

Course Objectives:

1. To study the basic concepts of digital signal processing.
2. To study analysis and processing of signals for different kind of applications and retrieval of information from signals.
3. To understand the physical significance of circular convolution and its relation with linear convolution.
4. To study designing of digital filters and its realization.
5. To study analysis of signals using the discrete Fourier transform (DFT) and Z-Transform.
6. To study behaviour of discrete time systems using Z-Transform.

Course Outcomes:

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

1. Represent discrete-time signals analytically and visualize them in the time domain.
2. Meet the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
3. Apply the concepts of different transforms and analyze the discrete time signals and systems.
4. Realize the use of LTI filters for filtering different real world signals.
5. Justify the use of multi rate signal processing to estimate the wavelet transform.
6. Design and implement digital filter, multistage sampling rate converter for various applications.

Course Contents:

Module-1: DSP Preliminaries [5 Hrs]

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.

Module-2: Discrete Fourier Transform [5 Hrs]

DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm

Module-3: Z transforms **[5 Hrs]**

Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behaviour, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

Module-4: IIR Filter Design **[5 Hrs]**

Concept of analog filter design (required for digital filter design), Design of IIR filters from analog filters, IIR filter design by impulse invariance method, bilinear transformation method. Characteristics of Butterworth filters, Chebyshev filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Lowpass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters using Lowpass filter)

Module-5: FIR Filter Design **[5 Hrs]**

Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form.

Module-6: Introduction to Multirate signal processing **[5 Hrs]**

Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filter bank, Sampling rate conversion by rational factor I/D, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing.

Text Books:

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, Pearson Education.

2. S. K. Mitra, Digital Signal Processing: A computer based approach.TMH

3. S. salivahanan, A Vallavaraj, C. Gnanapriya , „Digital Signal Processing", 2nd Edition McGraw Hill.

Reference Books.

1. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

2. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.

3. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.

4. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988

5. A. Nagoor Kani, „Digital Signal Processing“, 2nd Edition McGraw Hill.

E-Resources:

1. https://nptel.ac.in/courses/117/102/117102060/
2. https://onlinecourses.nptel.ac.in/noc21_ee20/preview
3. https://www.tutorialspoint.com/digital_signal_processing/index.htm
4. https://lecturenotes.in/notes/15433-note-for-digital-signal-processing-dsp-by-vtu-rangers
5. http://ndl.iitkgp.ac.in/document/WGZ3c3g4Sk9LK3VrdjJRMk41NnFqOEtUOWY5d3MvTCtpbGp0OFBCcS95bz0

ET5T002	Microcontroller and Application	3 Credit

Prerequisites: Basic knowledge of Digital Circuits and microprocessor (ET3T004)

Course Objectives:

1. To understand the applications of Microcontrollers.
2. To understand need of microcontrollers in embedded system.
3. To understand architecture and features of typical Microcontroller.
4. To learn interfacing of real world input and output devices.
5. To study various hardware and software tools for developing applications.

Course Outcomes:

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

1. **Remember** importance of microcontroller in designing embedded application and use of hardware and software tools.

2. **Understand** modern tools like Programmers, Debuggers, cross compilers and current IDE i.e. integrated development environment tools.

3. **Apply** knowledge of microcontroller to interface mechanical system to function in multidisciplinary system like robotics, Automobiles.

4. **Analyze** and formulate control and monitoring systems using microcontrollers.

5. **Evaluate** experiments based on interfacing of devices to real world applications.

6. **Design** real time cost effective controllers using microcontroller based system and develop interfacing to real world devices to serve engineering solution for Global, social and economic context.

Course Contents:

Module-1: Fundamentals of Microcontrollers [6 Hrs]

Introduction to the general structure of 8 and 16 bit Microcontrollers Harvard & Von Neumann architecture, RISC & CISC processors, Role of microcontroller in embedded system, Selection criteria of microcontroller Block diagram and explanation of 8051, Port structure, memory organization, Interrupt structure, timers and its modes, serial communication modes. Overview of Instruction set, Sample programs (assembly): Delay using Timer and interrupt, Programming Timer 0&1, Data transmission and reception using Serial port.

Module-2: Interfacing with 8051 PART I [6 Hrs]

Software and Hardware tools for development of microcontroller-based systems such as assemblers, compliers, IDE, Emulators, debuggers, programmers, development board, DSO, Logic Analyzer,

Interfacing LED with and without interrupt, Keypads, Seven Segment multiplexed Display, LCD, ADC Interfacing. All Programs in assembly language and C.

Module-3: Interfacing with 8051 PART II [6 Hrs]

8051 timer programming, serial port and its programming, interrupt programming, LCD and keyboard interfacing, ADC and DAC interfacing, interfacing to external memory Interfacing of DAC, Temperature sensors, Stepper motor, Motion detectors, Relay, Buzzer, Optoisolators. All programs in assembly and C

Module-4: PIC Microcontroller Architecture [6 Hrs]

PIC 10, PIC12, PIC16, PIC18 series comparison, features and selection as per application PIC18FXX architecture, registers, memory Organization and types, stack, oscillator options, BOD, power down modes and configuration bit settings, timer and its programming, Brief summary of Peripheral support, Overview of instruction set, MPLAB IDE & C18 Compiler.

Module-5: Real World Interfacing Part I [6 Hrs]

Port structure with programming, Interrupt Structure (Legacy and priority mode) of PIC18F with SFRS, Interfacing of switch, LED, LCD (4&8 bits), and Key board, Use of timers with interrupts, CCP modes: Capture, Compare and PWM generation, DC Motor speed control with CCP: All programs in embedded C.

Module-6: Real World Interfacing Part II [6 Hrs]

Basics of Serial Communication Protocol: Study of RS232, RS 485, I2C, SPI, MSSP structure (SPI &I2C), UART, Sensor interfacing using ADC, RTC (DS1306) with I2C and EEPROM with SPI. Design of PIC test Board, Home protection System: All programs in embedded C.

Text Books:

1. Mazidi & Mazidi, The 8085 microcontroller & embedded system, using assembly and C, 2nd edi, pearson edu.
2. Calcut, 8051 microcontrollers: Applications based introduction, Elsevier.
3. Udyashankara V., Mallikarjunaswamy, 8051 microcontroller, TMH.
4. Han-way Huang, using The MCS-51 microcontroller, Oxford university press.

Reference Books:

1. M.Bates, “PIC Microcontrollers”, Newnes, 2011

2. M.A. Mazidi, S. Naimi, S. Naimi, “The AVR Microcontroller and Embedded Systems: Using Assembly and C”, Prentice Hall, 2011.

3. M.A. Mazidi, R.D. McKinlay, J.G. Mazidi, “The 8051 Microcontroller: A Systems Approach”, Pearson, 2013.

E-Resources:

6. https://onlinecourses.nptel.ac.in/noc21_ee18/preview
7. https://onlinecourses.swayam2.ac.in/aic20_sp04/course
8. https://www.electronicshub.org/?s=microcontroller
9. https://www.exploreembedded.com/
10. www.atmel.com
11. https://www.express-technology.com/part-type/microcontrollers

ET5T003	Control System Engineering	3 Credits

Prerequisites: Basic knowledge of mathematics (Laplace transform)

Course Objectives:

1. To introduce the elements of control system and their modeling using various techniques.
2. To introduce methods for analyzing the time response, the frequency response and the stability of systems.
3. To introduce the concept of root locus, Bode plots, Nyquist plots.
4. To introduce the state variable analysis method.
5. To introduce concepts of PID controllers and digital and control systems.
6. To introduce concepts programmable logic controller.

Course Outcomes:

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

1. **Categorize** different types of system and **identify** a set of algebraic equations to represent and model a complicated system into a more simplified form.

2. **Characterize** any system in Laplace domain to illustrate different specification of the system using transfer function concept.

3. **Interpret** different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.

4. **Employ** time domain analysis to **predict** and **diagnose** transient performance parameters of the system for standard input functions.

5. **Formulate** different types of analysis in frequency domain to explain the nature of stability of the system.

6. **Identify** the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

Course Contents:

Module-1: Introduction to Control Problem **[7 Hrs]**

Industrial Control examples, Mathematical models of physical systems, Control hardware and their models, Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback, Block diagram reduction techniques, Signal flow graph analysis.

Module -2: Time Response Analysis **[6 Hrs]**

Standard test signals, Time response of first and second order systems for standard test inputs. Application of initial and final value theorem, Design specifications for second-order systems based on the time-response

Module -3: Stability Analysis **[7 Hrs]**

Concept of Stability, Routh-Hurwitz Criteria, Relative Stability analysis, Root-Locus technique. Construction of Root-loci, Dominant Poles, Application of Root Locus Diagram,

Module -4: Frequency-Response Analysis **[8 Hrs]**

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion, Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

Module -5: Introduction to Controller Design **[6 Hrs]**

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems, Application of Proportional, Integral and Derivative Controllers, Designing of Lag and Lead Compensator using Root Locus and Bode Plot.

Module -6: State Variable Analysis **[7 Hrs]**

Concepts of state variables, State space model. Diagonalization of State Matrix, Solution of state equations, Eigenvalues and Stability Analysis, Concept of controllability and observability, Pole-placement by state feedback, Discrete-time systems, Difference Equations, State-space models of linear discrete-time systems. Stability of linear discretetime systems.

Text Books:

1. N. J. Nagrath and M. Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2009.
2. Schaum‟s Outline Series, "Feedback and Control Systems" Tata McGraw-Hill, 2007.
3. John J. D‟Azzo & Constantine H. Houpis, "Linear Control System Analysis and Design", Tata McGraw-Hill, Inc., 1995.
4. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.
5. R. A. Barapate, "Feedback Control System" Tech Max Publication, 11th revised Edition

Reference Books:

1. Norman S Nise, "Control Systems Engineering", Wiley Publications, 6th Edition.
2. M. Gopal, "Control System – Principles and Design", Tata McGraw Hill, 4th Edition, 2012.
3. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition, 1995.
4. Ghosh, "Control Systems: Theory and Applications", Pearson India; 2nd edition, 2012.

Professional Elective Course - I

ET5E004A	Introduction to Robotics and Computer Programming	3 Credit

Prerequisites: Basics of Sensors and logical thinking and prior knowledge of programming

Course Objectives:

1. Robotics-Introduction-classification with respect to geometrical configuration
2. Industrial robots" specifications. Selection based on the Application
3. Introduction to Robot Programming Robot Programming-Introduction-Types

Course Outcomes:

1. Understand the basic components of robots.
2. Differentiate types of robots and robot grippers.
3. Explain robot programming methods
4. Understand the components of robot programming
5. Develop simple program to simulate robot movements
6. Develop robot program for specific application.

Course Contents:

Module-1: Robotics-Introduction [6 Hrs]

Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator. Components of Industrial robotics-prepossession of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors. Grippers – Mechanical Gripper-Grasping force--mechanisms for actuation, Magnetic gripper vacuum cup gripper-considerations in gripper selection & design.

Module-2: Industrial Robots Specifications [6 Hrs]

Selection based on the Application. Kinematics-Manipulators Kinematics, Rotation Matrix, Homogeneous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots Robot Applications: Material transfer and machine loading/unloading, processing operations assembly and inspection. Concepts of safety in robotics, social factors in use of robots, economics of robots.

Module-3: Introduction to Robot Programming [6 Hrs]

Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions. Wrist Mechanism-Interpolation-

Interlock commands Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effector and sensors command.

Module-4: Rapid Language [6 Hrs]

RAPID language basic commands- Motion Instructions-Pick and place operation using Industrial robot manual mode, automatic mode, subroutine command based programming. Move master command language-Introduction, syntax, simple problems.

Module-5: Robotics Based Industrial Automation [6 Hrs]

Fixed Automation: Automated Flow lines, Methods of Work part Transport, Transfer Mechanism - Continuous transfer, intermittent transfer, Indexing mechanism, Operator-Paced Free Transfer Machine, Buffer Storage, Control Functions, Automation for Machining Operations, Design and Fabrication Considerations.

Module-6: Practical Study of Virtual Robot [6 Hrs]

Robot cycle time analysis-Multiple robot and machine Interference-Process chart-Simple problems-Virtual robotics, Robot studio online software- Introduction, Jogging, components, work planning, program modules, input and output signals-Singularities-Collision detection-Repeatability measurement of robot-Robot economics.

Text Books:

1. Groover M P, Industrial Robotics, Mc Graw Hill Ltd.
2. John J. Craig, Introduction to Robotics, Pearson Education Asia
3. Jazar, Theory of Applied Robotics, Springer.
4. S. R.Deb, "Robotics technology and flexible automation", Tata McGraw Hill publishing company limited, 1994.
5. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995. [T3] Robotcs Lab manual, 2007.

Reference Books.

1. Ghosal, Robotics, Oxford india .
2. Cameron Hughes Tracey Hughes, Robot ProMikell. P. Groover, Industrial Robotics: Technology, Programming, and Applications 2nd Edition, McGraw Higher Ed. 2012, ISBN: 9781259006210,
3. Industrial Robotics Technology, Programming and Applications, McGraw Hill Co, 1995. 5) Robotics Lab manual, 2007.

4. Programming: A Guide to Controlling Autonomous Robots, 1/e First Edition, 2016, ISBN: 9789332577442 2) S. R. Deb, Robotics Technology and Flexible Automation, 2010. McGraw Hill ISBN: 9780070077911.

E-Resources

1. https://onlinecourses.nptel.ac.in/noc20_de11/preview
2. https://nptel.ac.in/courses/112/105/112105249/
3. https://robotacademy.net.au/masterclass/introduction-to-robotics

ET5E004B	Telecommunication Switching System	3 Credit

Prerequisites: Basic knowledge of networks, switching and signalling.

Course Objectives:

1. To understand properties, characteristics and behaviour of Telecommunication Switching Systems and Telecommunication Traffic.
2. To know and analyse different Switching Networks.
3. To introduce concepts of Network Synchronization and Management.
4. To design different Network using Cellular Telephone Concepts.

Course Outcomes:

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

1. Understand the main concepts of telecommunication network design.
2. Analyse and evaluate fundamental telecommunication traffic models.
3. Understand basic modern signalling system.
4. Analyse and Solve traditional interconnection switching system design problems.
5. Interpret concept of Network engineering.
6. Compare and Design telephone network, data network and integrated service digital network related to Cellular Telephone Concepts.

Course Contents:

Module-1: Telecommunication Switching Systems [5 Hrs]

Principles of manual switching system, electronic telephone, local and central battery system, trunk exchange, junction working. Automatic telephony: strowger exchange, line switches and selectors, ringing and tone circuit, subscriber uniselector circuit, trunking diagram, cross bar switching system Message switching, Circuit switching, manual switching and Electronic Switching. Digital switching: Switching functions, space division switching, time division switching, two dimensional switching, digital cross connect systems, digital switching in an analog environment

Module-2: Telecommunication Traffic [5 Hrs]

Unit of Traffic, Traffic measurement, a mathematical model, Lost- call systems: Theory, traffic performance, loss systems in tandem. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, systems with a single server, Queues in tandem, delay tables and application of Delay formulae. Analysis: Traffic Characteristics: Arrival Distributions, Holding time Distribution. Loss Systems: Lost calls cleared, lost calls returning, lost calls Held, lost calls cleared.

Module-3: Switching Networks **[5 Hrs]**

Single Stage Networks, Grading: Principle, Design of progressive grading, other grading, Traffic capacity of grading, Applications of grading. Link Systems: General, Two stage networks, three stage networks. Grades of service of link systems: General, Two stage networks, three stage networks, Call packing, Rearrangeable networks, Strict sense non blocking networks, Sectionalized switching networks Control of Switching Systems: Call processing Functions: Sequence f operations, Signal exchanges, State transition diagrams. Common Control, Reliability, Availability and Security.

Module-4: Network Synchronization and Management **[5 Hrs]**

Timing: Timing Recovery, Clock Instability, Elastic Stores, Jitter measurements, systematic jitter. Timing Inaccuracy: Slips, Asynchronous Multiplexing, Waiting time jitter. Network Synchronization: Plesiochronous, pulse stuffing, mutual synchronization, Network master, Master – Slave synchronization, Hierarchical synchronization Processes. Network management: Routing control, Flow control.

Module-5: Networks **[5 Hrs]**

Data Networks: Data Transmission in PSTN, Data Communication Architecture, Link to link layers, End to End layers, Satellite based Data networks, LANs, MANs, Fiber optic networks, Data network Standards, Protocol stacks, Interworking. Integrated Services Digital Networks: ISDN, Network and protocol Architecture, Transmission Channels, User network interfaces, signaling, Numbering and Addressing, ISDN Standards, Broadband ISDN, Voice Data Integration

Module-6: Cellular Telephone Concepts **[5 Hrs]**

Mobile telephone services, cellular telephone, Frequency reuse, Interference, Cellular System topology, Roaming and handoffs, Cellular telephone network components, Cellular telephone calls processing. Cellular Telephone systems: Digital cellular telephone.

Text Books:

1. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education
2. John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications
3. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications.
4. Wayne Tomasi, “Electronic Communications Systems”; 5th Edition; Pearson Education

Reference Books.

5. P.Gnanasivam, ”Telecommunication Switching and Networks ”

6. Rappaport, ”Wireless communication”
7. Tannenbaum ”Data communication and networks” 4th Edition,TMH

E-Resources:

1. https://nptel.ac.in/content/storage2/courses/117105076/pdf/1.1%20Lesson%201.pdf
2. https://sites.google.com/a/mvn.edu.in/telecomm-switching-system/products-services
3. https://onlinecourses.nptel.ac.in/noc19_ee52/preview
4. https://www.vssut.ac.in/lecture_notes/lecture1528107908.pdf
5. https://www.iare.ac.in/sites/default/files/IARE_TSTA_LECTURE%20NOTES_0.pdf

ET5L005	Software Workshop Lab	1 Credit

Prerequisites: Basic knowledge of computer programming and Analog and Digital Electronics.

Course Objectives:

1. To instil in students the ability to formulate and solve engineering problems in electric and electronic circuits involving both steady state and transient conditions using MATLAB and pSpice.
2. Learn to use the pSpice simulation software tool for the analysis of Electrical and Electronic Circuits.
3. Learn to insert simple instructions to MATLAB, to find the solution of a system of linear algebraic equations, with constant (real and complex) coefficients

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Write MATLAB program for any given problem.
2) Plot various functions using different graphical techniques.
3) Make mathematical analysis for the given problem.
4) Get the complete expert hand on pSpice Software.
5) To draw, analyse and plot the electronic circuits using pSpice Software.

List of Experiments:

SCILAB

1. Introduction to SCILAB Environment
2. To study simple matrix and array manipulations using SCILAB
3. Programming using SCILAB
4. Calculus using SCILAB
5. To plot signals: discrete and continuous using SCILAB
6. Function programming and SCILAB
7. Signal Manipulation using SCILAB

Spice

1. Design and simulation of resistive circuit
2. Plotting of VI characteristics of diode
3. Plotting of VI characteristics of BJT/FET
4. Plotting of VI characteristics of UJT/SCR
5. Design and simulation of half wave & full wave rectifier
6. Design and simulation of clipper and clamper circuits
7. Simulation of frequency response of a transistorized RC coupled amplifier.

ET5L001	Digital Signal Processing Lab	1 Credit

Prerequisites: Basic knowledge of MATLAB or SCILAB software.

Course Objectives:

1. To understand principle & working of digital signal processing for various applications.
2. To understand Z transforms and discrete time Fourier transforms for the analysis of digital signals and systems.
3. To design and implement FIR & IIR filter and analysis of their frequency response

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Acquire the basic concepts of various digital signals by plotting them.
2. Analyse and process the signals in the discrete domain.
3. Apply the techniques, skills, and modern engineering tools like MATLAB and digital processors.
4. Write and simulate the MATLAB/SCILAB program for various applications.
5. Design the filters to suit requirements of specific applications.

List of Experiments:

0. Introduction to SCILAB. (Spoken tutorial)
1. To plot and represent following basic discrete time signals using MATLAB functions. : Unit impulse, unit step, ramp, real and complex exponential and its representations.
2. To plot linear convolution of discrete signals using MATLAB functions.
3. Write a program to compute cross-correlation and auto-correlation of the given sequences with corresponding plot.
4. Write a program to test stability of given discrete- time system.
5. To find Z transform of discrete time signal and its ROC with corresponding plot.
6. To find inverse Z transform of given discrete time signal.
7. Write a program to find frequency response of given system.
8. To compute DFT and IDFT of discrete time signals.
9. Write a program to find FFT and IFFT of given sequences.
10. Compute linear and circular convolution using DFT / IDFT method.
11. Designing of Digital IIR filter using MATLAB functions.

12. Designing of Digital FIR filter using window.

13. Designing of Digital FIR filter using GUI tool box.

14. To perform linear convolution and circular convolution on Processor kit.

15. To designing and implementation of High pass filter on DSP processor.

16. Study of sampling theorem, effect of under sampling. (Virtual lab:http://vlabs.iitkgp.ernet.in/dsp/)

17. Study of properties of Linear time-invariant system. (Virtual lab:http://vlabs.iitkgp.ernet.in/dsp/#)

18. Study of convolution: series and parallel system. (Virtual lab:http://vlabs.iitkgp.ernet.in/dsp/#)

19. Study of Discrete Fourier Transform (DFT) and its inverse. (Virtual lab:
http://vlabs.iitkgp.ernet.in/dsp/)

20. Study of Transform domain properties and its use. (Virtual lab:http://vlabs.iitkgp.ernet.in/dsp/#)

ET5L002	Microcontroller and Application Lab	1 Credit

Prerequisites: Basic knowledge of Microprocessor and microcontroller programming.

Course Objectives:

1. To perform a practical based on microcontroller based system.
2. To study assembly language programming skills.
3. Interface different peripherals with microcontroller with its use.

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. The concept of Assembly languages structure and programming.
2. Interface various peripherals with 8051 microcontroller.
3. Simulate the programs on different software platforms.

List of Experiments:

1. Write and execute an assembly language program to perform addition & subtraction on 8 bit / 16 bit number for 8051using Keil uvision 4.
2. Write and execute an assembly language program to perform Multiplication & Division on 8 bit / 16 bit number for 8051using Keil uvision 4.
3. Write and execute 8051 assembly language program to find smallest byte in a string of bytes.
4. Write and execute 8051 assembly language program to exchange two data strings.
5. Write and execute 8051 assembly language program to generate square wave of 1 KHz (and any other frequency) on one of the pin of output port
6. Design & implementation of LED & Switch interfacing with 8051.
7. Design & implementation of 7 segment display interfacing with 8051.
8. Design & implementation of 16 x 2 LCD interfacing with 8051.
9. Design & implementation of DC Motor interfacing with 8051.
10. Design & implementation of Stepper Motor interfacing with 8051.
11. Design & implementation of 4 x 4 matrix keyboard interfacing with PIC Microcontroller.
12. Interfacing of 8051 Microcontroller with various display devices.
13. Interfacing of 8051 Microcontroller with ADC and DAC.
14. Interfacing of 8051 Microcontroller with DC motor.
15. To study the serial port communication with 8051 microcontroller.

ET5T006	Consumer Affairs	Audit

Objective: This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards. The student should be able to comprehend the business firms" interface with consumers and the consumer related regulatory and business environment.

Unit 1: Conceptual Framework **06 Lectures**

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, GST, and Digital consumer issues.

Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

Unit 2: The Consumer Protection Law in India **06 Lectures**

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice.

Unit 3: Grievance Redressal Mechanism under the Indian Consumer Protection Law 06 Lect.

Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Unit 4: Role of Industry Regulators in Consumer Protection **06 Lectures**

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI
iv. Food Products: FSSAI
v. Electricity Supply: Electricity Regulatory Commission
vi. Real Estate Regulatory Authority

Text Books

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2004) *Consumer Affairs,*

Universities Press.

2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure*, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), *Consumer is King*, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book, www.consumeraffairs.nic.in
9. ebook, www.bis.org
10. *The Consumer Protection Act, 1986 and its later versions.*

Reference Books

1. Misra Suresh, (Aug 2017) "Is the Indian Consumer Protected? One India OnePeople.
2. Raman Mittal, Sonkar Sumit and Parineet Kaur (2016) Regulating Unfair Trade Practices: An Analysis of the Past and Present Indian Legislative Models, Journal ofConsumer Policy.
3. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTSInstitute for Regulation and Competition position paper. Available online at www.cuts-international.org/doc01.doc.
4. Kapoor Sheetal (2013) "Banking and the Consumer" Akademos (ISSN 2231-0584)
5. Bhatt K. N., Misra Suresh and Chadah Sapna (2010). Consumer, Consumerism and Consumer Protection, Abhijeet Publications.
6. Kapoor Sheetal (2010) "Advertising-An Essential Part of Consumer"s Life-Its Legaland Ethical Aspects", Consumer Protection and Trade Practices Journal, October 2010.
7. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.

Website:

www.ncdrc.nic.in
www.consumeraffairs.nic.in
www.iso.org
www.bis.org.in
www.consumereducation.in
www.consumer-voice.in
www.cercindia.org

JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in
An Autonomous Institute, with NAAC "A" Grade
Department of Electronics and Telecommunication Engineering
"Rectifying Ideas, Amplifying Knowledge"
Session: 2021-22

Course Structure and Syllabus (Autonomous)

For

B. Tech. Sixth Semester in Electronics and Telecommunication Engineering

Sr. No.	Category of Course	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	Total	
1	HSMC	ET6T001	Education, Technology and Society	2	0	0	20	20	60	100	2
2	PCC	ET6T002	Antennas and Wave Propagation	3	0	0	20	20	60	100	3
3	PCC	ET6T003	Computer Networks and Cloud Computing	3	0	0	20	20	60	100	3
4	PEC	ET6E004	Professional Elective Course-II	3	0	0	20	20	60	100	3
5	OEC	ET6O002	OPEN Elective Course-II	4	0	0	20	20	60	100	4
6	PCC	ET6L003	Computer Networks and Cloud Computing Lab	0	0	2	60	0	40	100	1
7	PCC	ET6L005	Electronic Design Engineering Lab	0	0	2	60	0	40	100	1
8	Project	ET6P001	Campus Recruitment Training (CRT)	0	0	2	50	0	0	50	1
9	Project	ET6P002	Skill Development	0	0	2	15	0	35	50	1
10	Project	ET6P003	Mini Project	0	0	2	30	0	20	50	1
11	MC	ET6T006	Research Methodology	2	0	0	10	15	25	50	Audit
Total				**17**	**0**	**10**	**325**	**115**	**460**	**900**	**20**

ET6T001	Education, Technology and Society	2 Credits

Course Objectives:

The goal of the proposed course is to enable students:

1. To explore the various ways in which technology has and may in future affect not only the mode of delivery of education but also the very nature of education.
2. To understand the requirement of education for becoming an effective member of the society.
3. To understand the requirement of education to fulfil the potential of a learner to the fullest without too much thought of an individual's responsibility towards the contemporary society.

Course Outcomes:

On successful completion of this course, the students will be able to integrate their technical education for betterment of society as well motivates them to lead a good human life.

Course Contents:

Module 1- Necessity of Education [5 Hrs]

Necessity of education for human life, Impact of education on society

Module 2- Nature and Scope of Education [5 Hrs]

Nature and scope of education (Gurukul to ICT driven), Emotional intelligence Domains of learning, Approaches to learning, Learning outcomes.

Module 3- Role of Education in Technology [5 Hrs]

Role of education in technology advancement.

Module 4- Technology and Society [5 Hrs]

Technology and society; management of technology; technology transfer

Module 5- Ethical and Value Implications [6 Hrs]

Ethical and value implications of education and technology on individual and society

Text/ Reference Books:

1. Education and Social order by Bertrand Russel
2. Theories of learning by Bower and Hilgard
3. Technology and Society by Jan L Harrington

ET6T002	Antennas and Wave Propagation	3 Credit

Prerequisites: Basic knowledge of electromagnetic field.

Course Objectives:

1. To understand the applications of electromagnetic engineering.
2. To study transmission line characteristics.
3. To analyse and understand the Uniform plane wave propagation in various media.
4. To study the antennas, their principle of operation, analysis and their applications.
5. To study designing aspects of Antenna.

Course Outcomes:

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

1. Formulate the wave equation and solve it for uniform plane wave.
2. Describe transmission line characteristics.
3. Analyse and design antenna arrays.
4. Analyse the given wire antenna and its radiation characteristics.
5. Describe the operation of aperture and reflector antennas.
6. Identify the suitable antenna for a given communication system.

Course Contents:

Module-1: Uniform Plane Waves [6 Hrs]

Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in Homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular & Elliptical polarization, unpolarised wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting theorem and vector.

Module-2: Transmission Lines [6 Hrs]

Transmission line equations and their solution, Transmission line parameters, Characteristics impedance, Propagation constant, Attenuation constant and Phase constant, waveform distortion, Distortionless transmission lines, Loading of transmission lines, Reflection coefficient and VSWR, Equivalent circuits of transmission lines, Transmission lines at radio frequency, Open and short circuited lines, Smith chart, Stub matching.

Module-3: Wave Propagation & Antenna Fundamentals [8 Hrs]

Fundamental equations for free space propagation, Friis Transmission equation, Ground, sky & space wave propagations, Structure of atmosphere, Characteristics of ionized regions, Space link geometry,

Characteristics of Wireless Channel: Fading, Multipath delay spread, Coherence Bandwidth, and Coherence Time.

Introduction, Types of Antenna, Radiation Mechanism, Antenna Terminology: Radiation pattern, sradiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation, efficiency, effective length, effective area, reciprocity.

Module-4: Wire Antennas [4 Hrs]

Analysis of Linear and Loop antennas: Infinitesimal dipole, Small dipole and Finite length dipole, Half wave length dipole, Small circular loop antenna. Complete Analytical treatment of all these elements.

Module-5: Antenna Arrays [6 Hrs]

Antenna Arrays: Two element array, Pattern multiplication N-element linear array, Uniform amplitude and spacing, Broad side and End-fire array, N-element array: Uniform spacing, Non-uniform amplitude, Array factor, Binomial and Dolph Tchebyshev array, Planar Array, Circular Array, Log Periodic Antenna, Yagi Uda Antenna Array.

Module-6: Antennas and Applications [6 Hrs]

Structural details, dimensions, radiation pattern, specifications, features and applications of following Antennas: Hertz & Marconi antennas, V- Antenna, Rhombic antenna. TW antennas. Loop antenna, Whip antenna, Biconical, Helical, Horn, Slot, Microstrip, Turnstile, Super turnstile & Lens antennas. Antennas with parabolic reflectors, Aperture antenna.

Text Books:

1. C. A. Balanis, “Antenna Theory - Analysis and Design", John Wiley.
2. K. D. Prasad, “Antenna & Wave Propagation”, Satya Prakashan, New Delhi.
3. Mathew N O Sadiku, “Elements of Electromagnetics” 3rd edition, Oxford University Press.
4. John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, the McGraw Hill Companies.
5. John D Kraus, “Antenna& Wave Propagation”, 4th Edition, McGraw Hill, 2010.
6. Vijay K Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

Reference Books:-

1. Antenna & Wave Propagation , Sisir K Das, Mc Graw Hill.

2. Harish A. R., Antenna and wave Propagation, Oxford University Press.
3. Antennas and Radio Propagation, R.E. Collins, Mc Graw –Hill.

E-Resources:-

1. https://nptel.ac.in/courses/108/101/108101092/
2. https://nptel.ac.in/courses/117/107/117107035/

ET6T003	Computer Networks and Cloud Computing	3 Credit

Prerequisites: Basic knowledge of Computer Networking

Course Objectives:

1. To develop an understanding of modern network architectures from a design and performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3. To provide an opportunity to do network programming.
4. To provide WLAN measurement ideas.

Course Outcomes:

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

1. **Understand** the terminology and concepts of the OSI reference model and the TCP-IP reference model.

2. **Analyze** the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks and Remember the wireless networking concepts.

3. **Understand** the contemporary issues in networking technologies and Apply network tools and network programming.

4. **Analyze** a given requirement of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) and design it based on the market available component.

5. **Apply** the network programming for a given problem related TCP/IP protocol.

6. **Create** DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Course Contents:

Module-1: Physical Layer [5 Hrs]

Data Communications, Networks, Network types, Protocol layering, OSI model, Layers in OSI model, TCP / IP protocol suite, Addressing, Guided and Unguided Transmission media. Switching: Circuit switched networks, Packet Switching, Structure of a switch.

Module-2: Data Link Layer [5 Hrs]

Introduction to Data Link Layer, DLC Services, DLL protocols, HDLC, PPP, Media Access Control: Random Access, Controlled Access, Channelization. Wired LAN: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Giagabit Ethernet, 10 Gigabit Ethernet.

Module-3: Wireless LANS & Virtual Circuit Networks [5 Hrs]

Introduction, Wireless LANS: IEEE 802.11 project, Bluetooth, Zigbee, Connecting devices and Virtual LANS: Connecting devices, Virtual LANS.

Module-4: Network Layer [5 Hrs]

Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Module-5: Transport Layer [5 Hrs]

Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Module-6: Application Layer [5 Hrs]

Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography, Internet Protocols.

Text Books:

1. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. TCP/IP Protocol Suite, 4th Edition, Behrouz A. Forouzan, Tata McGraw-Hill.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.

Reference Books:

1. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.
4. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011

E-Resources:

1. https://onlinecourses.swayam2.ac.in/cec21_cs04/course
2. https://onlinecourses.nptel.ac.in/noc21_cs14

Professional Elective Course - II

ET6E004A	Embedded Processor & it's Interfacing with RTOS	3 Credit

Prerequisites: Basics of Processor and Programming knowledge

Course Objectives:

4. Define and Classify Embedded System and understand role of each element of embedded system.
5. State special requirements and constraints (such as sustainability, reliability) that are imposed on embedded systems.
6. Understand 8-bit 8051 microcontroller architecture, External Memory, Counters & Timers,

Course Outcomes:

1. Define and Classify Embedded System and understand role of each element of embedded system. State special requirements and constraints (such as sustainability, reliability) that are imposed on embedded systems.
2. Serial Data Input/Output and Interrupts. Design example for interfacing Keys, LED/LCD Displays, ADC and DAC.
3. Conversant with Assembly and C language programming for 8051.Formulate and Develop efficient assembly/C code for embedded system
4. Describe ARM processor, its modes, exception handling, instruction pipelining and basic programming.
5. Understand concepts of RTOS and its functionalities. Model system tasks using specification techniques such as FSM, State chart, UML
6. Build a typical cost-effective real-world embedded system in team with appropriate hardware components and software algorithms.

Course Contents:

Module-1: Introduction to 8-Bit Microcontroller [6 Hrs]

8051 Architecture, I/O Pins, Ports, External Memory, Counters & Timers, Serial Data Input/Output, Interrupts Moving Data, Logical Operations, Arithmetic Operations, Jump And Call Instructions, Embedded "C" PIC, AVR Microcontroller Architecture Overview With Applications Examples.

Module-2: Applications of 8051 [6 Hrs]

8051 Microcontroller Design, Applications Like Keys, Switched And LED/LCD Displays, Pulse Measurement, ADC And DAC, Serial Data Communication, CAN, I2C And SPI Serial Bus Protocols.

Module-3: Real Time Operating Systems [6 Hrs]

Hard and Soft Real Time Systems, Introduction To RTOS, Process And Thread, System Call, Process Scheduling And Scheduling Algorithms, Resource Access Control, Deadlock And Its Prevention RTOS Case Study: RT-Linux And Win-CE, Device Driver Programming.

Module-4: RTOS Porting on ARM Board [6 Hrs]

ARM processor architecture and programming ARM Processor Architecture, Pipeline Characteristics, ARM Addressing Modes, ARM Instruction Set, Programming Techniques, Exception Modes and Handling, Thumb Instructions, Cortex Architecture Overview

Module-5: ARM Processor Architecture and Programming [6 Hrs]

ARM Processor Architecture, Pipeline Characteristics, ARM Addressing Modes, ARM Instruction Set, Programming Techniques, Exception Modes and Handling, Thumb Instructions, Cortex Architecture Overview**.**

Module-6: Embedded Software Design Techniques [6 Hrs]

Embedded Software Requirements, Software Modelling With FSM, State Charts And Petri- Nets, Examples Of Software Modelling, Various Data Structure (FIFO, LIFO And Stack) Handling.

Text Books:

1. Kenneth J. Ayala and Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded System Using Assembly And C", Cenage Learning, India Edition, 2nd impression, 2010.
2. Mazidi A. M., Mazidi J. G. and McKinley R. D., "The 8051 Microcontrolier And Embedded Systems-Using Assembly And C", Pearson Education, 2nd Ed., 2008.
3. Raj Kemal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Publications, 2nd Ed., 2008
4. Sloss A. N., Symes D. and Wright C., "ARM System Developer's Guide", Morgan Kaufmann Publishers, 1st Ed., 3rd Reprint, 2006.

Reference Books.

1. Jonathan W. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing"; Thomson Learning, INDIA Edition, 2nd Reprint, 2007
2. Alex Doboll and Edward H. Currie, "Introduction To Mixed-Signal Embedded Design"; Springer, 131 Ed., 2007.
3. Shibu K. V., "Introduction To Embedded System"; TMH, 1st Ed., 2007

E-Resources

1. https://www.coursera.org/lecture/embedded-software-hardware/4-interacting-with-memory-hUTQp
2. https://nptel.ac.in/courses/117/106/117106111/
3. https://nptel.ac.in/courses/108/103/108103157/

ET6E004B	AI: Knowledge Representation & Reasoning	3 Credits

Prerequisites: Data Structures, Mathematics

Course Objectives:

1. The module aims to present the basic representation and reasoning paradigms used in AI in both theory and practice with careful attention to the underlying principles of logic, search, and probability.
2. It is also designed to show students practical examples of the use of AI in applications and to encourage further reading. The e-learning part enables students to practice self-learning.
3. The Assignments aim to give students a sound practical introduction to knowledge based systems and a basic introduction to modern paradigms of knowledge representation and belief networks.
4. The examples classes aim to provide an introduction to the underlying issues in cognitive emulation and to provide an opportunity for practical exercises in logic and probability.

Course Outcomes:

1. Understand various search methods
2. Use various knowledge representation methods
3. Understand various Game Playing techniques
4. Use Prolog Programming language using predicate logic

Course Contents:

Module-1: Introduction [3 Hrs]

What is AI? : The AI Problems, The Underlying Assumption, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, One Final Word.

Module-2: Search Techniques [5 Hrs]

Problems, State Space Search & Heuristic Search Techniques, Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

Module-3: Expending Predicate Logic [5 Hrs]

Representation Simple Facts in Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution.

Module-4: Representing Knowledge Using Rules **[5 Hrs]**

Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.

Module-5: Game Playing **[5 Hrs]**

Overview, And Example Domain : Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

Module-6: Introduction to Prolog **[5 Hrs]**

Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages.

Text Books:

1. Artificial Intelligence – A Modern Approach (3rd Edition) By – Stuart Russell and Peter Norvig
2. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning By – James V Stone
3. Artificial Intelligence By Example By – Denis Rothman
4. Artificial Intelligence and Machine Learning By – Chandra S.S.V

Reference Books.

1. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill

2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI

3. Introduction to Prolog Programming By Carl Townsend.

4. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley)

5. "Programming with PROLOG" –By Klocksin and Mellish

E-Resources:

1. https://www.journals.elsevier.com/artificial-intelligence/
2. https://www.technologyreview.com/2015/02/11/169210/our-fear-of-artificial-intelligence/
3. https://www.coursera.org/
4. https://www.courses.com/

ET6L003	Computer Networks and Cloud Computing Lab	1 Credit

Prerequisites: Basic knowledge of Semiconductor Physics and theoretical knowledge about the practical.

Course Objectives:

1. To Understand and select various cables and connectors used for Networking.
2. To establish peer to peer computers as well as Local Area Network Connectivity.
3. To effectively use available networking tools in Computer Communication Network.

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. **Understand** the terminology and concepts of Networking.
2. **Analyze** the concepts of network interfaces and design/performance issues in local area networks and wide area networks.
3. **Understand** the contemporary issues in networking technologies and Apply network tools.
4. **Analyze** a given requirement of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) and design it based on the market available component.
5. **Apply** the network programming for a given problem related TCP/IP protocol.
6. **Create** DNS, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Firewalls using open source available software and tools.

List of Experiments:

1. To study network hardware components – Cables, NIC, Repeaters, Hubs, Bridges, Switches, Routers and Gateway.
2. To practise the colour code for different cables and Observe the Lan Tester.
3. To demonstrate data transmission using Ping protocol, tracert, IP configuration
4. To understand IP Address of the system and configure dhcp server.
5. To construct Peer to Peer Topology
6. To connect the computers in Local Area Network using Star Topology
7. To give IP Address of different classes in given Network id.
8. To give IP Address of different classes in given Network id and Subnet (IPv4 Subnetting)
9. To share a folder from a computer and access the shared folder from another computer (Windows File Sharing)
10. To understand the domain name server (DNS Server).
11. To implement FTP protocol.
12. To implement HTTP protocol

ET6L005	Electronic Design Engineering Lab	1 Credit

Prerequisites: Basic knowledge of electronics components identification, testing,

Course Objectives:

1. To make students familiar with measuring instruments like CRO, DSO, signal Generator.
2. To make students familiar with Interfacing Peripheral with computer.
3. To understand PCB Designing process
4. To enable students to design & fabricate their own Hardware.

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Use DSO and Spectrum Analyzer.
2. Interface peripherals with computer.
3. Design PCB using PCB designing software.
4. Design & fabricate mini project.

List of Experiments:

1. Study of Functioning of Spectrum Analyzer and Digital Storage oscilloscope.
2. Study of different Electronic components.
3. Printed Circuit Boards (PCB)

   Types, Layout procedure, artwork, Fabrication (In this, fabrications of small circuit Using discrete component on single side PCB is expected).
4. Interfacing of displays (LCD, LED, 7 Segment) with PCs
5. Hardware Mini Project
   - Hardware Mini project should consist of Circuit design, PCB fabrication, assembling & testing of small digital or analog application circuit.
   - Mini Project work should be carried out by a group of maximum three students.
   - Student should use standard software available for drawing circuit schematic, simulating the design and PCB (single/double sided) layout of circuit.
   - Project report should consist of details of work carried out including layouts, circuits, datasheets, list of components, cost.

Reference Books:

1 Electronic Instruments and Instrumentation Technology

2. A course in Electrical and Electronics Measurements and Instrumentation - A.K. Sawhney - Dhanpat Rai & Co.

3. Electronic Components and Materials - Dr. Madhuri A. Joshi - Shroff Publications Third Edition

4. Electrical and Electronic Measurements –Banerjee,PHI

5. Introduction to Measurements and Instrumentation, 4th edition- Ghosh PHI

6. Electronic Instrumentation and Measurement Techniques, W.D. Copper,PHI Web Resources: Refer online datasheets

7. Printed Circuit Boards: Design and Technology; Bosshart; Tata McGraw-Hill Education.

8. Integrated circuit fabrication technology; David J. Elliott; McGraw-Hill.

ET6P001	Campus Recruitment Training	1 Credit

About CRT Training Campus Recruitment training (CRT) at is designed to aid candidates in their preparation for Recruitment through Campuses or outside campuses (i.e On campus or off campus). Students in their final step of graduation looking for placement in reputed organizations can make use of this training to get trained to deliver their best in the selection processes of organizations.

Course Objectives

1. To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of campus recruitment drive.
2. To groom the students to the corporate level
3. To ensure that all eligible students are employed by the end of the final year of study.

Course Outcomes

At the end of the course students will be able to

1. Solve the problems easily by using Short-cut method with time management which will be helpful to them to clear the competitive exams for better job opportunity.
2. Analyze the Problems logically and approach the problems in a different manner.
3. Students will be able to apply mathematical analysis of data to make connections, draw conclusions and solve problems.
4. Students will learn a series of techniques through practical activities to develop presenting skills and enhance confidence to expand the potential of the individual.
5. Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
6. Students demonstrate an ability to target the resume to the presenting purpose
7. Demonstrate professional behavior(s) including preparedness, professional attire, and respectful presentation during interviews.

<u>Part I: - Quantitative Ability</u>

Unit 1: - 03 Hrs

Speed Maths Calculation, Number Systems, Ratio & Proportion, Percentage

Unit 2: - 03 Hrs

Profit – Loss & Discount, Simple Interest & Compound Interest, Simple Equation and Age‟s

Unit 3:- 03 Hrs

Averages Mixture & Allegation, Time and work, Time Speed & Distance, Permutation– Combination & Probability.

Part Ii: - Reasoning Ability

Unit 1: - 03 Hrs

Coding Decoding, Blood Relation, Direction sense, Number Series, Analogy

Unit 2: - 03 Hrs

Sitting Arrangement Puzzles.

Unit 3:- 03 Hrs

Syllogism, Statement course of action, Statement arguments, Statement Assumptions, Miscellaneous Type of Reasoning

Part Iii: - Employability Skills

Unit 1: - Presentation Skills (02 Hrs)

What is a presentation? Essential characteristics of Good presentation.

Preparation of presentation: Identify the purpose, Analyze the audience, Design and organize the information, Medium of presentation and Visual aids

Delivering Presentation: rehearsal, body Language, Handling questions, Tips to fight stage fear.

Unit 2: - Job Interview Skills (02 Hrs)

Types of interviews, Focus of interview, dress code, importance of body language.

Probable interview questions, Telephonic and video interview, Strategies for success at interview.

Unit 3: - Resume Building (02 Hrs)

Meaning, Difference among Bio-data, Curriculum vitae and Resume.

CV writing tips, the content of Resume, Structure of Resume

Books

1. Prashant Sharma, Soft Skills Personality Development For Life Success. BPB Publication.
2. P. D. Chaturvedi & Mukesh Chaturvedi, Business Communication: Concepts, Cases, and Applications 2nd Edition. Pearson Education.
3. Barun Mitra, Personality Development and Soft Skills. Oxford University Press.
4. Dr.K.Alex, *Soft Skills Know yourself and Know the World*. S.ChandPublishing, 2014
5. R.S Agrawal, Quantitative Aptitude.
6. Arun Sharma, How to Prepare for Quantitative Aptitude.
7. R. S Agrawal, Verbal and Non Verbal Reasoning.
8. R.V.Praveen,Quantitative Aptitude and Reasoning, 2nd Revised Edition 2013, Prentice-Hall of India Pvt.Ltd.
9. G. K. Ranganath, C. S. Sampangiram and Y. Rajaram, A text Book of business Mathematics, 2008, Himalaya Publishing House.

ET6T006	Research Methodology	Audit

Prerequisites: Basic knowledge of communication engineering

Course Objectives:

1. To develop a research orientation among the scholars and to acquaint them with fundamentals of research methods.
2. To develop understanding of the basic framework of research process.
3. To identify various sources of information for literature review and data collection.
4. To understand the components of scholarly writing and evaluate its quality.

Course Outcomes:

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

1. Student will learn the meaning, objective, motivation and type of research
2. Student will be able to formulate their research work with the help of literature review
3. Student will be able to develop an understanding of various research design and techniques
4. Student will have overview knowledge of modeling and simulation of research work
5. Student will be able to collect the statistical data with different methods related to research work
6. Student will be able to write their own research work with ethics and non-plagiarized way

Course Contents:

Module-1: Objectives and Types of Research [5 Hrs]

Motivation and objectives, research methods vs methodology. Types of research – descriptive vs analytical, applied vs fundamental, quantitative vs qualitative, conceptual vs empirical. Introduction to drug discovery & development research, objectives, flowchart from discovery to post-marketing research, overview of research methodology in various areas of drug discovery and development research.

Module-2: Research Formulation [5 Hrs]

Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, Literature review - primary and secondary sources, reviews, monographs, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature review and research databases, development of working hypothesis.

Module-3: Research Design and Methods [5 Hrs]

Research design – basic principles, need of research design, features of good design, important concepts relating to research design, observation and facts, laws and theories, prediction and

explanation, research databases, development of models, developing a research plan – exploration, description, diagnosis, and experimentation.

Module-4: Execution of the Research, Data Collection and Analysis [5 Hrs]

Aspects of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statistical packages (Sigma STAT, SPSS for Student t-test, ANOVA, etc), hypothesis testing, generalization and interpretation.

Module-5: Reporting and Thesis Writing [5 Hrs]

Structure and components of scientific reports, types of report, technical reports and thesis. Thesis writing – different steps and software tools (Word processing, etc) in the design and preparation of thesis, layout, structure (chapter plan) and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral presentation – planning, software tools, creating and making effective presentation, use of visual aids, importance of effective communication.

Module-6: Research Ethics, IPR and Scholarly Publishing [5 Hrs]

Ethics – ethical issues, ethical committees (human & animal); IPR - intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); Scholarly publishing – IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.

Text Books:

1. Kothari, C.R. Research Methodology (Methods and Techniques), New Age Publisher.
2. Best and Kahn, Research Methodology, PHI Limited.
4 Fundamentals of modern statistical methods by Rand R.wilcox.

Reference Books.

1. Kerlinger, Foundation of Research.
2. Power Analysis for Experimental research A Practical Guide for the Biological, Medical and social Sciences by R. Barker Bausell, Yi-Fang Li Cambridge University Press.
3. Design of Experience: Statistical Principles of Research Design and Analysis, by Robert O. Kuehl Brooks/cole.
4. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
5. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.

E-Resources:

1. https://nptel.ac.in/courses/121/106/121106007/
2. https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
3. https://www.youtube.com/watch?v=QddNp6nYEqU