RAMGARH ENGINEERING COLLEGE

(Estd. by Govt. Of Jharkhand & run by Techno India Group under PPP)

Department of
Electronics and Communication Engineering

SEMESTER – IV

ANALOG ELECTRONICS AND CIRCUITS

Course Code- EC401

Module 1: Diode & Transistor Circuits:

P-N junction diode, I-V characteristics of a diode, review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits. Amplifier models, Voltage amplifier, current amplifier, transconductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers, high-frequency equivalent circuits.

Module II: Oscillators, DAC & ADC:

Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Digital-to-analog converters (DAC) Weighted resistor, R-2R ladder, resistor string etc., Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

Module III: MOSFET Circuits:

MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier: small signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

Module IV: Differential, multi-stage and operational amplifiers:

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module V: Linear & Nonlinear applications of op-amp:

Idealized analysis of op-amp circuits, Inverting and non-inverting amplifier, Differential amplifier, Instrumentation amplifier, Integrator, Active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, Voltage regulator, Oscillators (Wein bridge and phase shift).Analog to Digital Conversion. Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators, Precision rectifier, peak detector, Monoshot.

ANALOG COMMUNICATION

Course Code- EC402

Module I: Introduction

Block schematic of communication system, Electromagnetic Spectrum, Necessity of modulation, Types of modulation – AM, FM, PM and Pulse Modulation. Noise types (Internal & External), Signal to Noise ratio, Noise factor, Noise figure, Noise Resistance, Noise Temperature, Noise factor of Amplifiers in Cascade(Numerical expected)

Module II: Amplitude Modulation

Amplitude Modulation principle, AM envelope, frequency spectrum & BW, phase representation of AM wave, Modulation index, % modulation, Power relations in AM (Numerical expected) AM modulating circuits: Low level AM modulation, medium power AM modulation,AM transmitters: Block diagram of low level DSBFC, High level DSBFC, Trapezoidal patterns, SSB Principles, Balanced modulator, SSB Generation Methods: Filter system, phase shift & third method ,Independent sideband system (ISB),Vestigial sideband(VSB)

Module III: Angle Modulation

Theory of frequency and phase modulation, mathematical analysis, FM and PM waveforms, frequency deviation and percentage modulation, deviation sensitivity, deviation ratio ,phase deviation and modulation index, frequency analysis of angle modulated wave-Bessel function, BW requirements, Narrow band & wide band FM, FM modulators(Direct & Indirect) , Noise and angle modulation, Pre-emphasis and de-emphasis.

Module IV: Pulse Modulation

Pulse amplitude modulation, Sampling theorem , types :Natural & flat top, PAM modulation Demodulation, TDM and FDM, Crosstalk in TDM, PWM modulator & demodulator, PPM modulators & demodulator.

Module V: Digital Modulation Schemes & AM/FM Receiver

Digital modulation schemes- phase shift keying, frequency shift keying, quadrature amplitude modulation, continuous phase modulation and minimum shift keying. Simplified block diagram of AM receiver, receiver parameters: Sensitivity, Selectivity, BW, dynamic range, fidelity, Types of AM receiver: TRF and superhetrodyne (block diagram), Block diagram, Double conversion FM receivers.

SIGNALS AND SYSTEMS

Course Code- EE 403

Module I: Introduction to Signals and Systems:

Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Module II: Behavior of continuous and discrete-time LTI systems:

Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Module III: Fourier Transforms:

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

Module IV: Laplace and z- Transforms:

Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

Module V: Sampling and Reconstruction:

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

MICROPROCESSOR AND INTERFACING

Course Code- EE404

Module I: Architecture & Programming of 8085:

Functional block diagram—Registers, ALU, Bus systems. Pin configuration, Timing and control signals, Machine cycle and timing diagrams. Interrupts—Types of interrupt, interrupt structure, Instruction format, Addressing modes, Instruction set. Development of assembly language programs.

Module II: Interfacing Devices:

(a). The 8255 PPI chip: Architecture, pin configuration, control words, modes and Interfacing with 8085. (b). The 8254 PIC chip: Architecture, pin configuration, control words and Interfacing with 8085. Interrupt and DMA Controller (a). The 8259 Interrupt controller chip: Architecture, pin configuration and control words only (b).The 8257 DMA controller chip: Architecture, pin configuration and control words only.

Module III : Architecture & Programming of 8086:

Functional block diagram of 8086, details of sub-blocks such as EU, BIU, memory segmentation, physical address computations, pin configuration, program relocation, Minimum and Maximum modes of 8086— Block diagrams and machine cycles. Interrupts—Types of interrupt, interrupt structure. Instruction format, Addressing modes, Instruction set. Development of assembly language programs Assembler directives.

Module IV: 8051 Microcontroller :

8-bit Microprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers, Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems Overview of the 8051family. 8051 - Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Module V: Instruction Set and Programming of 8051:

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

DATA STRUCTURES AND ALGORITHMS

Course code -CS 301

Module I

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

Module II

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types (Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications.

Module III

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; B-tree.

Module IV

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths,, Floydd's Algorithm for All-Pairs Shortest Paths Problem.

UNIT-5

Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing .

CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime : Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security : Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.
Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale. Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)
Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle
Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation.

ANALOG ELECTRONICS & CIRCUITS LAB

Course Code- EC 401P

List of Experiments (Minimum 10)

1. Design & study of half wave and full wave rectifier and calculation its various parameters.
2. Design and study of clipper and clamper circuit.
3. Design & Implement Transistor as a switch.
4. To study the input & output characteristics of common emitter configuration.
5. Design & measure the frequency response of an RC coupled amplifier using discrete components. (Draw Gain vs frequency response curve on semilog graph paper).
6. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth
7. Design & study of RC Oscillator.
8. Design & realize inverting amplifier, non-inverting and buffer amplifier using 741 Op Amp.
9. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.
10. Verify the operation of a integrator circuit using 741 op amp and show that it acts as a low pass filter.
11. Design and verify the operations of op amp adder and subtractor circuits.
12. To design and realize Schmitt trigger using op amp 741.
13. Design & realize Wein -bridge oscillator using op amp 741.
14. To design & realize square wave generator using op amp 741.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

ANALOG COMMUNICATION LAB

Course Code- EC 402P

List of Experiments (Minimum 10)

1. Study of Amplitude Modulation (A.M.)
2. Study of Frequency Modulation.(F.M.)
3. Study of AM Detection.
4. Study of SSB Modulation & Demodulation.
5. Study of DSB Modulation & Demodulation.
6. Study of FM Demodulation.
7. Sampling and Reconstruction.
8. Study of Pulse Amplitude Modulation & Demodulation.
9. Study of Pulse Width Modulation& Demodulation.
10. Study of Pulse Position Modulation & Demodulation.
11. Study of PAM-TDM.
12. Study of AM Receiver Characteristics.(Sensitivity, Selectivity & Fidelity)
13. Visit to radio station (AM/FM) or any local communication center /mobile tower

(Visit to radio station is compulsory. Student should attach report of visit in practical file)

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

MICROPROCESSOR AND INTERFACING LAB

Course Code- EE404P

List of Experiments (Minimum 10)

1. Study of 8085 Microprocessor kit.
2. Write a program using 8085 and verify for : a. Addition of two 8-bit numbers. b. Addition of two 8-bit numbers (with carry) and write a program using 8085 and verify for : a. 8-bit subtraction (display borrow) b. 16-bit subtraction (display borrow).
3. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data and write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.
4. Write a program using 8085 for division of two 8- bit numbers by repeated subtraction method and test for typical data and write a program using 8085 for dividing two 8- bit numbers by bit rotation method and test for typical data.
5. Write a program using 8086 and verify for: a. Finding the largest number from an array. b. Finding the smallest number from an array.
6. Write a program using 8086 for arranging an array of numbers in descending order and verify and write a program using 8086 for arranging an array of numbers in ascending order and verify.
7. Write a program for finding square of a number using look-up table and verify. .
8. Write a program to interface a two digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.
9. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.
10. . Study of 8051 Micro controller kit/programming software.
11. Write a program using 8051 and verify for : a. Addition of two 8-bit numbers. b. Addition of two 8-bit numbers (with carry) and write a program using 8051 and verify for : a. 8-bit subtraction (display borrow) b. 16-bit subtraction (display borrow).
12. Write a program using 8051 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data and write a program using 8051 for multiplication of two 8- bit numbers by bit rotation method and verify.
13. Write a program using 8051 for blinking of two LED with suitable delay.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.