Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

Autonomous

Course Structure For M.Sc.- I : Electronic Science

Semester	Paper Code	Title of Paper	No. of Credits
I	ELE4101	Mathematical Methods in Electronics and Network Analysis	4
	ELE4102	Integrated Circuit Analysis	4
	ELE4103	Digital System Design	4
	ELE4104	Advanced 'C' Programming	3
	ELE4105	Practical Course –I	4
	ELE4106	Practical Course –I	4
	ELE4107	PLE	2
II	ELE4201	Applied Electromagnetics, Microwaves and Antennas	4
	ELE4202	Instrumentation and Measurement techniques	4
	ELE4203	Advanced Embedded System Design	4
	ELE4201	Foundation of Semiconductor Devices	3
	ELE4205	Practical Course –I	4
	ELE4206	Practical Course –I	4
	ELE4207	PLE	2

SYLLABUS (CBCS) FOR M.Sc. I. Electronic Science (w.e. from June, 2019)

Academic Year 2019-2020

Class : M. Sc. I (Semester- I)
Paper Code: ELE4101
Paper : I Title of Paper : Mathematical Methods in Electronics and Network Analysis
Credit : 4 No. of lectures: 60

Objectives:

1. To learn the methods of analysis for CT and DT signals andsystems
2. To learn concept of mathematical modeling of simple electricalcircuits
3. To get familiar with role of differential equations in appliedelectronics
4. To know about mathematical tools and techniques for networkanalysis

Unit-1: Electronic Signals and System (10L)

Signals: periodic, aperiodic, Continuous Time (CT) and Discrete Time (DT), Basic Operations on Signals, signal types, amplitude and phase spectrum, special electronic signals (impulse, unit step, sinusoidal, ramp, square wave, staircase), Amplitude and Phase Spectra, Classification of Systems, Representations of Systems.

Unit-2: Mathematical Tools for Circuit Analysis (20L)

Laplace Transform (LT): definition, LT of standard electronic signals, inverse LT, methods of ILT (partial fraction method), properties of LT (shifting, linear, scaling), initial and final value theorem, LT of derivatives and Integrals, solution of DE using LT, concept of Transient and steady state response, Laplace transformation of electrical circuits, Network Transfer function, s-Plane Poles and Zeros.
Z-Transform (ZT): definition, ZT of standard electronic signals, properties of Z transform, inverse ZT (partial fraction and residue method), linear difference equation and solutions using ZT.
Concept of transfer function of CT and DT systems, time and frequency domain response of systems using transfer function, poles and zeros of transfer function and their significance, applications to simple passive filters such as Low Pass (LP), High Pass (HP), Butterworth filters, synthesis of transfer function using poles and zeros, stability criterion, Routh-Hurwitz criterion,

Unit-3: Differential Equations (15L)

Concept of modeling, types, mathematical modeling using differential equations, Differential Equation, Ordinary Differential Equations (ODE), DE and their occurrences in real life problems, linear differential equation with constant coefficients, partial DE, Introduction to coordinate systems (rectangular, cylindrical and spherical), method of separation of variables, General outline for solution of wave equation in cartesian and cylindrical coordinate system, Bessel DE and zeros of Bessel function and their significance, solution of Laplace equation in spherical coordinate system

Unit-4: Network Analysis (15L)

Two port network functions, Network Topology (nodes, tree, graph, branch, mesh, and

loop), Mesh, loop and nodal analysis of circuits,T and π networks, state variable method with simple examples
Network Theorems and Applications to DC and AC Circuits: Thevenin's, Norton's, superposition, maximum power transfer – theorems

Text / Reference Books:

1. Advanced Engineering Mathematics, E. Kreyzig, John Wiley andSons.
2. Signals and system by P Ramesh Babu and Anandanatarajan, SCItech
3. Network Analysis, G. K. Mittal, KhannaPublication.
4. CircuitsandNetworksAnalysisandSynthesis,A.Sudhakar,ShyamMohanand S. Pilli,TMH.
5. Digital Signal Processing, S. Salivahan, A. Vallavraj and C. Gnanpriya, McGraw Hill.
6. Network Analysis, M. E. Van Valkenberg,PHI.
7. Network and Systems, Roy Choudhary, WileyEastern.
8. Microwave Devices and Circuits, Samuel Y. Liao, 3rd Edition, PHI,2002.

ELE4102: Integrated Circuit Analysis

M.Sc.-I **(SEM-I)** **Credit-(04)**

Objectives:
1. To deliver the knowledge about physics of basic semiconductor devices and circuits.
2. To learn the characteristics and working of electronic devices
3. To study the various device models
4. To study the wideband and narrowband amplifiers using BJT
5. To develop skills in analysis and design of analog circuits
6. To study the designs of opamp applications

Unit-1: Basic Semiconductor Devices (15L)
Diode and applications- Practical diode characteristics (static and dynamic resistance), temperature effects, switching characteristics, diode breakdown, diode applications in wave shaping circuits.
BJT- construction and biasing, Operation, CC, CB and CB configurations
JFET- construction, types and its operation, parameters, characteristics, JFET amplifiers.
MOSFET- types, biasing of MOSFET, applications, comparison between BJT, JFET, MOSFET.

Unit-2: Analysis of Amplifiers (15L)
BJT models and modeling parameters, equivalent circuits for CE, CB and CC configurations, single stage amplifier, class A and class B, class C, class AB amplifier, small signal analysis, distortion. Design of single stage RC-coupled amplifier with frequency response (f_1 and f_2), bode plots, Miller effect, frequency response of multistage amplifiers, different coupling schemes, gain of multistage amplifiers.

Unit-3: Tuned Amplifier and Oscillators (15L)

Tuned amplifier -design, multistage tuned amplifiers: synchronous and stagger tuning cascade configuration, large signal tuned amplifier

Oscillators- design and analysis of LC and RC oscillators, Hartley, Colpitt's, Miller oscillators, phase shift and Wien-bridge oscillators, crystal oscillators and applications

Unit-4: Operational Amplifiers and their Applications (15L)

Practical consideration in opamp based circuit design, opamp parameters such as dc and low frequency parameters and their significance in design of opamp, closed loop stability analysis and frequency compensation.

Inverting and non-inverting amplifiers with design aspects such as input and output impedance, common mode errors and limitations, bandwidth, etc.

Bridge and instrumentation amplifier

Practical design aspect of integrator and differentiators, such as offset error and stability, bandwidth considerations. Concept and applications of PLL.

Active Filters: transfer functions poles and zeros, Design of active filters - LPF, HPF, BPF and BRF (first and higher orders), Butterworth and Chebyshev filters.

Text / Reference Books:

- Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar, 3rd Edn, McGraw Hill.
- Electronic Devices and Circuit Theory, Robert Boylestead, Louis Nashelsky, PHI.
- Electronic Devices & Circuits: Milliman and Halki
- Design with Operational Amplifiers and Linear IC, Sergio Franco, 3rd Edn, TMH.
- Electronic Principles, Malvino and Bates, McGraw Hill.
- Operational amplifier, G.B.Clayton, Elsevier Sci. Tech.
- Microelectronic Circuits: Analysis and Design, Mohammad H. Rashid, PWS Publishing
- Pulse, Digital Switching Circuits, Millman Taub, TMH.
- Electronic devices, Allen Motershed, PHI.
- Integrated electronics, Millman Halkies, McGraw Hill.

ELE4103: Digital System Design

MSc-I **(SEM-I)** **Credit-(04)**

Objectives:

1. To introduceVERILOG
2. To understand sequential and combinational logic designtechniques
3. To learn various digital circuits usingVERILOG
4. To learn VLSI devices and memories

Unit-1: HDL for Digital System Design (10L)

VERILOG: design flow, EDA tools, data types, modules and ports, operators, gate-level modeling, data flow modeling , behavioral modeling, tasks and functions, timing and delays, test bench, types of test bench, comparison between VERILOG and VHDL language

Unit-2: Combinational Logic (15L)

Introduction to combinational circuits, realization of basic combinational functions **-** magnitude comparator, code converters, multiplexers, demultiplexers, multiplexed display, encoder and decoders, priority encoders, parity generator/checker, arithmetic circuits (adder, subtractor, binary multiplier), parallel adder, look ahead carry generator
VERILOG models and simulation of above combinational circuits

Unit-3: Sequential Logic Design and Circuits (20L)

Introduction to sequential circuits
Flip Flops: types, state table, transition table, excitation tables, timing waveforms, clock generators
Counters: synchronous, asynchronous, design of counters, up/down counter
Shift Registers: ring counter, Johnson counter
Finite State Machine (FSM) Design: Mealy and Moore state machines
VERILOG Models and Simulation of above Sequential Circuits and FSMs: stepper motor controller, traffic light control, washing machine control, parking controller, coffee vending machine, LCD controller

Unit-4: PLDs and Memories (15L)

VLSI devices: Need of PLD, antifuse, architecture of simple PLD (SPLD)-PAL, PLA, Complex Programmable Logic Device (CPLD) and Field Programmable Logic Devices (FPGA), CPLD/FPGA based system design applications - typical combinational and sequential system implementation, estimation of uses of blocks, links, LUTs,etc.
Memories: types, data storage principle, control inputs, and timings, applications, Random Access Memories (RAM), Static Ram (SRAM), standard architecture, 6 transistor cell diagram, sense amplifier, address decoders, timings, Dynamic RAM (DRAM), different DRAM cells, refresh circuits, timings, role of memories in PLD

Text / Reference Books:

1. Verilog HDL; A Guide to Digital Design and Synthesis, Samir Palnitkar, Pearson Education, 2nd edition,2003.
2. Verilog HDL synthesis; A Practical Primer, J. Bhaskar, Star Galaxy Publishing, 1998.
3. Digital System Design with VERILOG Design, Stephen Brown, Zvonko Vranesic, TMH, 2nd Edn,2007.
4. Digital design; Principles Practices, Wakerly,PHI.
5. Modern Digital Electronics, R.P Jain, McGrawHill.
6. Digital systems; Principles and Applications, Tocci, PearsonEducation.
7. Digital Logic and Computer Design, Morris Mano,PHI.

EL4104: Advanced 'C' Programming.

MSc-I **(SEM-I)** **Credit-(03)**

Objectives:

1. To understand basic concepts of C programming language.
2. To learn various advanced features, graphics and interfacing
3. To learn concepts of object oriented programming in C++

Unit-1: Basics of C (15L)

C fundamentals: Introduction of high-level programming language, operators and it's precedence, various data types in C, storage classes in C.

Control statements: Decision–making and forming loop in programs.

Arrays & pointers: handling character, arrays in C, pointers in C, advanced pointers, structure and union.

Functions: user defined function, pointer to functions.

Unit-2: Advanced Features and Interfacing (15L)

Miscellaneous and advanced features: command line argument, dynamic memory Allocation, Data files in C, file handling in C.

Graphics in C: graphics-video modes, video adapters, drawing various objects on Screen.

Interfacing: interfacing to external hardware, via serial/parallel port using C, applying C to electronic circuit problems.

Unit-3: Introduction to C++ (15L)

Introduction to object –oriented programming and C++, characteristics, objects, Classes, inheritance, polymorphism, overloading.

Text / Reference Books:

1. Computer programming in C, V. Rajaraman, Pearson Education, 2nd edition, 2003.
2. The C programming language, Dennis Ritchie, Pearson Education, 2nd edition, 2003.
3. Graphics programming in C, Roger T. Stevens, BPB Publications.
4. Object oriented programming in C++, Robert Lafore, Galgotia Publications.
5. Programming in C, Stephen G. Kochan. CBS.

ELE4201: Applied Electromagnetics, Microwaves and Antennas

MSc-I **(SEM-II)** **Credit-(04)**

Objectives:

1. To introduce to students the concepts of electromagnetics
2. To understand the theory of transmission lines and wave guides
3. To study various parameters of antennas
4. To study various methods of generation of microwaves

Prerequisite: Physical quantities as vectors, concept of gradient, curl, and divergence, concept of rotation operator, covariant and contra-variant vectors, line, surface and volume – integrals, Gauss and Stokes theorem complex plane, polar form of complex number, complex functions, Cauchy-Riemann conditions, orthogonal functions and relation with Laplace equation

Unit-1: Electromagnetic Waves:- Review of Maxwell's equations and their meaning, continuity equation, electric and magnetic wave equations in time domain and frequency domain, wave propagation in conducting and non-conducting media, skin depth and high frequency propagation, boundary conditions at the interface between two mediums, Poynting theorem and its applications **(10L)**

Unit-2: Principles of transport of electromagnetic energy Transmission Lines:- Different types of transmission lines, two wire transmission line, lumped and distributed parameters, transmission line equations for voltages and currents using circuit theory and field theory, characteristic impedance, propagation constants, attenuation and phase constants, phase velocity, reflection and transmission coefficient, SWR, line impedance, normalized impedance and admittance, Numerical exercises using circuit and Phasor theory, Smith chart construction and applications, single stub and double stub matching, shielding of transmission lines. Micro stripline – Introduction to striplines, characteristic impedance, effective dielectric constant, dielectric ohmic and radiation losses in microstripline, Q-factor of microstripline, different types of microstriplines such as parallel, coplanar, shielded striplines Waveguides – concept of cut-off frequency, guide impedance, phase velocity, guide wavelength for TE and TM modes, Applications to TE mode in rectangular waveguide, power losses in a rectangular waveguide, circular waveguide, optical fiber- Principal of operation and construction. **(20L)**

Unit-3: RF, microwave devices and applications :- Applications of RF: heating, plasma etching, sputter deposition, EMI shielding Microwave frequencies and frequency bands for different applications, Absorption of microwave by atmospheric constituents, microwave system, generation of microwaves, microwave transistors and tunnel diodes, microwave FETs, MESFET and MOSFETs, Gunn effect diode, IMPATT diode, magnetron oscillator, Reflex Klystron Oscillator, monolithic microwave integrated circuits, microwave waveguides and resonant cavities and components, passive microwave devices -Terminator, variable short circuits, rotary, cut-off, nonreciprocal and ferrite attenuators, Faraday rotation, directional coupler, microwave guide junction , circulators, Application of microwaves –microwave oven, long distance communication **(20L)**

Unit-4: **Electromagnetic Radiation:** Potentials of electromagnetic fields, retarded potential, radiation from oscillating dipole, concept of near zone and radiation zone, radiation resistance, Antenna Parameters: gain, directivity, power, aperture, Friis equation, radiation pattern 18 Application Areas: antenna temperature, Signal to Noise Ratio (SNR), remote sensing, RADAR equation Antennas Types: $\lambda/2$ antenna, antenna arrays, horn antennas, parabolic dish antennas, End fire antenna – Yagi Uda, patch antenna, microstrip antennas EMI and EMC. **(10L)**

Text / Reference Books:

1. Microwave Devices and Circuits, Samuel Y. Liao, PHI, 3rd Edition, 2002.
2. Principles of Electromagnetics, N. Sadiku, Oxford University Press.
3. Electromagnetics with Applications, Kraus and Fleiseh, McGraw Hill, 5th Edn, 1999.
4. Electromagnetics, J.D. Kraus, 4th Edn, McGraw Hill, 1992.

ELE4202: Instrumentation and Measurement techniques.

MSc-I **(SEM-II)** **Credit-(04)**

Objectives:

1. To understand the configurations and functional descriptions of measuring instruments
2. To understand the basic performance characteristics of instruments
3. To understand the working principles of various types of sensors and transducers and their use in measuring systems
4. To study the techniques involved in various types of instruments
5. To understand the relevance of electronics with other disciplines

Unit1: Introduction to sensor and Transducer (15L)

Definition, Types of sensor, classification, Need of Sensors.
Static and dynamic characteristics: Accuracy, Precision, Resolution, Threshold, Sensitivity, Hysteresis, loading effect, linearity, dead zone.
Transducer: Active and passive transducer, Methods of transduction, primary sensing elements and transducers, electrical transducers, classification of transducers
Errors in measurement: Types of Errors - gross, systematic, environmental errors,
Systematic errors, computational error, personal error etc.

Unit 2: Motion Measurement (15L)

Motion and dimensional measurement: relative displacement- translational and rotational, resistive potentiometers, resistance strain gauge, differential transformers- LVDT & RVDT, piezoelectric transducers, digital displacement transducers (translational and rotary encoders), ultrasonic transducers, Hall effect sensor, LVDT and synchros
Relative velocity: translational and rotational, stroboscopic methods, translational–velocity transducers (moving coil and moving magnet pickups)
Relative acceleration measurements: seismic (absolute) displacement pickups,
Seismic (absolute) velocity pickups, seismic (absolute) acceleration pickups
(Accelerometers)

Unit 3: Process Parameter Measurement (15L)

Force, Torque and Shaft power: standards and calibration, basic methods of
Strain gauge, digital system, load cell, torque measurement on rotating shafts
Pressure and Sound Measurement: dead weight gauges and manometers, low pressure measurement - Mcload gauge, Knudsen gauge
Primary devices: Bellows, Bourdon tube, Diaphragms, Capsule. Sound level meter, microphone, and capacitor microphone
Flow measurement: Pitot-static tube, Yaw tube, hot wire and hot film anemometers,
Flow Rate- rotameter, turbine, ultrasonic flow meter, electromagnetic flow meters
Temperature and Heat Measurement Transducers: standards and calibration,
Bimetallic strips, thermometers, pressure thermometers, RTD, thermocouples, thermistors, application circuits, LM35

Radiation Fundamentals: detectors, optical pyrometers, IR imaging systems, heat
Flux sensing- slug type sensors, Gorden gauge

Unit4: Biomedical based instrumentation system (15L)

Fundamentals of medical Instruments: Role of Technology in medicine, Development in biomedical insterumentation medical devices.

Bioelectric signals and electrodes: Electrical and mechanical activity of Heart, ECG measurement, Cardiac analysis, Normal and abnormal ECG, Generation and measurement of EMG Signal. Design of ECG amplifier.

Imaging Techniques: X-ray generation, X-ray tube and its control
CT scan –Scanning System and application
Ultrasonic Imaging: Modes of Scanning and their application.
MRI: Concept and image generation block diagram and its application.

Reference books:

1. Measurement Systems, Applications and Design, Ernest O. Doeblin and Dhanesh N. Manik, 5th Edition, Tata McGraw Hill.
2. A Course in Electrical and Electronic Measurements and Instrumentation By A.K.Sawhney, Dhanpat Rai & Co.
3. Modern Electronic Instrumentation and Measurements Techniques, Cooper and Helfrick, PHI.
4. Biomedical instrumentation and measurement, R.Natrajani.
5. Biomedical Instrumemtation, R.S.Khandpur, 3rd edition.

ELE4203: Advanced Embedded System Design

MSc-I (SEM-II) Credit-(04)

Objectives:

1. To understand the basics of embeddedsystem
2. To learn communication standards andprotocols and RTOS
3. To understand the architecture of different 8-bitmicrocontrollers
4. To learn embedded C and assembly language programming
5. To learn real interfacing devices to microcontroller

Unit-1: Introduction to Embedded System and Bus Standards (15L)

Embedded System: components, examples, development cycle of embedded system, embedded System Development Environment - algorithm, flow chart, IDE, ICE, programmer
Communication Protocols: I2C bus- specification, general characteristics, bus signals, address mechanism
Serial Peripheral Interface (SPI): specifications, master slave configuration,
Controller Area Network (CAN): specifications, basic concepts, frame types, bus signals, error handling and addressing

Unit-2: AVR Microcontroller (15L)

Architecture (Atmega16), instruction set, addressing modes, memory organization, timers, I/O, ADC, interrupts, serial communication
Design of General Purpose Target Board: reset, oscillator circuit, Basic Assembly Programs:

arithmetic, logical, code converter, I/O programming
C Programs: I/O ports, timer, serial communication, PWM, ADC, interrupts, Inter-Integrated Circuit (I2C).
Real world interfacing with the microcontrollers and programming in C: DAC, LED, SSD, dot matrix display, and LCD displays (text and graphic), keyboard and motors, RTC, EEPROM,

Unit-3: PIC Microcontroller (15L)

Architecture (PIC18F4550, 18F458), instruction set, addressing modes, memory organization, timers, I/O, ADC, interrupts, serial communication
Design of General Purpose Target Board: reset, oscillator circuit, derivatives of PIC Basic Assembly Programs: arithmetic, logical, code converter, block data transfer, I/O programming
C Programs: I/O ports, Timer, interrupts, I2C, serial communication, PWM
Real world interfacing with the microcontrollers and programming in C: DAC, LED, SSD, dot matrix display, and LCD displays (text and graphic), keyboard and motors, RTC, EEPROM, DAC and ADC.

Unit -4: Fundamental of Real Time Operating System (15L)

Concept of Real time, Characteristics, Hard and Soft real time system, Structure of RTOS, RTOS kernel, Kernel Objects, Services of Scheduler, Task, Task structure, types of task, Task management
Scheduling Algorithm- Task Scheduling Algorithm, FIFO, Round Robin Scheduling Algorithm, Priority based preemptive scheduling

Text / Reference Books:

1. AVR Microcontroller and Embedded Systems using Assembly and C, Mazidi and Naimi, Pearson education, 2011.
2. Embedded/ Real Time System - Concept Design Programming, KVVK Prasad
3. Embedded C Programming and the Atmel AVR, Barnett, Larry D. O'Cull and Sarah A. Cox, Delmar, Cengage Learning, 2007.
4. PIC Microcontroller and Embedded Systems, Mazidi, Mckinlay and Causey, Pearson Education.
5. C Programming for Embedded Systems, Kirk Zurell, PearsonEducation.
6. Programming in C, Stephen Kochan, HaydenBooks/Macmilla

ELE4204: Foundation of Semiconductor Devices

MSc-I **(SEM-II)** **Credit-(03)**

Objectives:

1. To introduce crystal structure with reference to semiconductors
2. To introduce quantum and statistical mechanics
3. Operating principles of modern semiconductor devices
4. To understand the theory and characteristics of semiconductor devices

Unit-1: Theory of solids, quantum and statistical mechanics (15L)

Crystal structure of solids: types of solids, Semiconductor materials, basics of crystallography, space lattice, unit cell, Crystal structures, atomic bonding,Miller indices, imperfections and impurities in solids, methods for semiconductor crystal growth.
Quantum Theory of solids: Principles of quantum mechanics, Schrodinger wave equation and Applications of Schrodinger's wave equation for bound state potential problems, Allowed & forbidden energy bands, The Kronig–Penney Model, electrical conduction in solids, extensions to three dimensions
Statistical mechanics: Statistical laws, Fermi-Dirac probability function, the distribution function and the Fermienergy

Unit-2: Physics of semiconductors (15L)

Semiconductor in equilibrium: Dopant atoms and energy levels, extrinsic semiconductors, Statistics of donors and acceptors, charge neutrality, position of Fermi energy level.
Carrier transport phenomena: charge, effective mass, drift current density, conductivity, carrier diffusion, graded impurity distribution, Hall effect.
Non-equilibrium excess carriers in semiconductors: Carrier generation and recombination, characteristics of excess carriers, ambipolar transport, quasi-Fermi energy levels, excess carrier lifetime, surface effects

Unit-3: Basics of Semiconductor Devices (15L)

Diode: Fabrication process, Junction terminologies of PN junction diode, junction capacitance, C-V characteristics, Qualitative and Quantitative analysis, diode equation, Reverse-bias breakdown, Transient response, Poisson's equation
BJT: Fabrication process, Terminology, electrostatics and performance parameters, Eber-Moll model, Two port model, hybrid – pi model, Modern BJT structures – polysilicon emitter BJT, Hetero junction bipolar transistor(HBT)
FETs: JFET and MESFET - Junction terminologies, characteristics
MOSFET: Fundamentals, Capacitance- voltage characteristics, I-V characteristics,
Special semiconductor devices-Optical devices, Solar cells, Photodetectors

Text / Reference Books:

1. Semiconductor Physics and Devices Basic Principles, Donald A. Neamen, TMH, 3rd Edition(2003)
2. Semiconductor Device fundamentals, Robert F. Pierret, PearsonEducation
3. Solid State Electronics Devices, Streetman, PHI, 5th Edition,(2006)

ELE4105: Practical Course –I

Group A: Analog Circuit Design $\rightarrow$7

Group B: Digital Electronics(hardware) $\rightarrow$3

GroupC: Activity $\rightarrow$2

Note that for Group C: Activity, please refer Section 5) Examination of this document.

[A] Practical based on Circuit Design

1. Bootstrap ramp generator for delay triggering
2. Blocking oscillator
3. Tuned amplifier small signal / large signal for IF
4. Transistor based microphone amplifier
5. Voltage controlled current source / sink and current mirror and doubler
6. Comparator and Schmitt trigger with single supply operation
7. Second order Butterworth filters (BP and BR)
8. Waveform generation: quadrature oscillator, Bubba oscillator
9. V to f and f to V using commercially available IC
10. Instrumentation amplifier for a given gain
11. Low current negative power supply using IC555 / dual power supply using single battery
12. PLL characteristics and demonstrate any one application(IC565/CD4046)
13. Clipper and Clampper using Opamp.

[B] Practical based on Digital Design

1. Two digit combinational lock
2. Keyboard encoder with latches
3. Traffic light controller
4. Multiplexed display (Bank token / two digit counter)
5. Bidirectional stepper motor control (Sequence Generator)
6. One digit BCD adder and 8-bit adder /subtractor
7. Object counter (use of MMV, counter)
8. Binary-Gray and Gray-Binary code converter

ELE4106: Practical Course –II

Group A: VERILOG programming, CPLD/FPGA →6

Group B: C/MATLAB programming →4

GroupC: Activity →2

Note that for Group C: Activity, please refer Section 5) Examination of this document.

[A] Practical Based on VERILOG Programming and Implementation on CPLD or FPGA

1. 4 bit logic gates
2. Combinational Logic
    a. Parity Generator and checker
    b. Hamming Code Generator
    c. Manchester code Generator
3. Sequential Logic
    a. Up-down bit binary counter (minimum4-bit)
    b. Universal shift register
4. Four bit ALU design (structural modelling)
5. Designing of Traffic light Controller
6. Implementation of 8 bit multiplexer
7. LCD controller
8. Code Converter (BCD to seven Segment)
9. Practical based on state machine (Stepper sequence generator/Vending Machine/ Washing Machine)
10. Adder and subtractor

[B] Practical based on C / MATLAB

1. Phase and frequency response from transfer function of a CT system: Low Pass and High Pass
2. Phase and frequency response from transfer function of a DT system: Low Pass and High Pass
3. Simulation of transfer function using poles and zeros
4. Synthesis of periodic waveform from Fourier coefficients
5. Solution of differential equation with given boundary conditions
6. Analysis of a given dc electrical circuit
7. Effect of locations of poles and zeros on the transfer function and corresponding frequency response
8. Representation of standard test signals
9. AM/FM modulation and demodulation
10. Use of MATLAB for directivity pattern for simple antennas

ELE4107: Practical Course –III

ELE4107: Practical Course –IV PLE : Project Like Experiment

Candidate should carry out a Project Like Experiment (PLE). PLE is a small project equivalent to 5 practical experiments. A project report should be submitted to the department. Log book of the continuous progress of the work should be maintained by candidate.

ELE4205: Practical Course –IV

GroupA: Instrumentation →7

Group B: Electromagnetics,Microwave →3

GroupC: Activity →2

Note that for Group C: Activity, please refer Section 5) Examination of this document.

[A] Practical based on Instrumentation and Measurement System

1. Design build and test rms to dc converter for voltage measurement of ac signal
2. Displacement measurement using LVDT, signal conditioning and DPM
3. Temperature measurement using PT100, signal conditioning and DPM
4. Temperature measurement using thermocouple with cold junction compensation
5. Design build and test IR transmitter and receiver (TSOP1738 or similar) for object detection
6. To build and test current telemetry (4 to 20mA)
7. Ultrasonic transmitter and receiver, distance measurement
8. Pressure measurement using strain gauge
9. RPM measurement using various methods
10. Design light intensity meter using photodiode or LDR and the necessary signal conditioning and display.
11. Use of strain gauge to measure stress on a cantilever made of material known quantity
12. Hot wire anemometer

[B] Practical based on Electromagnetics, Microwaves, Antennas

1. To study the characteristics of Klystron tube
2. To determine the standing wave ratio and reflection coefficient of a given waveguide
3. To measure an unknown impedance with smith chart
4. To determine the frequency and wavelength in rectangular waveguide
5. To study the characteristics of directional coupler
6. Design and test Yagi-Uda antenna with power reflectors
7. Measurement of primary-secondary coupling factor of a given transformer using LCR meter (calculation of transformer model parameters expected)

ELE4206: Practical Course –V

GroupA: AVR Microcontroller 5/6

Group B: PIC Microcontroller 5/6

Group C: Activity 2

Note that for Group C: Activity please refer section 5) Examination of this document.

[A] Practical on AVR Interfacing (5/6)

1. Interfacing of LED array to generate different sequences, use of timer for delay generation
2. LCD / keyboard Interfacing
3. DAC interfacing (sine, staircase, triangular, square wave) use of timer
4. Use of ADC
5. DC motor control using PWM / Intensity control of LED – with CCP
6. Serial EEPROM / EEPROM interface using SPI protocol
7. Real time clock (RTC)
8. Stepper motor Interfacing
9. Dot matrix rolling display
10. Two digit frequency counter or event counter using timer /interrupt
11. Servo motor interfacing

[B] **Practical on PIC Interfacing (5/6)**

1. Two-digit 7-segment display(multiplexed) interfacing
2. LCD / keyboard Interfacing
3. Bidirectional stepper motor interfacing
4. Real Time Clock display on LCD / HyperTerminal(I2C)
5. Use of internal EEPROM
6. DAC interfacing (square wave, staircase, triangular, sine) use of timer for
7. Use of ADC
8. Two digit frequency counter or event counter using timer /interrupt
9. Matrix keyboard / Touch screen
10. Graphic LCD interfacing
11. Zigbee communication
12. DC motor control using PWM / intensity control of LED

ELE4207: Practical Course –III

ELE4207: Practical Course – VI (PLE)

Candidate should carry out a Project Like Experiment (PLE). PLE is a small project equivalent to 5 practical experiments. A project report should be submitted to the department. Log book of the continuous progress of the work should be maintained by candidate.