|| अंतरी पेटवू ज्ञानज्योत ||

'A' Grade
NAAC Re-Accredited (3rd Cycle)

NORTH MAHARASHTRA UNIVERSITY
JALGAON

SYLLABUS

FOR

M.Sc. ELECTRONICS Part II

(SEMESTER III & IV)

(For Affiliated College)

With Effective from June 2018

North Maharashtra University Jalgaon

M.Sc. Electronics

Objectives:

- To enhance the knowledge in multidisciplinary approach in the field of Basic Technologies in electronics, Embedded Systems, microwaves, network analysis and synthesis, MEMs, nanoelectronics, control systems, ASIC and FPGA.
- To provide quality education through innovative teaching and learning processes
- To promote scientific and educational activities towards the advancement of the theory, projects and practice of Electronics fields and related arts and sciences.

Syllabus Structure for M.Sc.-II (Semester III & IV)

Semester	Course	Title of the course	Marks		Hours per week
			Internal	External	
III	ELE-301	Digital Signal Processing	40	60	04
	ELE-302	Microwave Devices and Circuits	40	60	04
	ELE-303	Embedded System Design	40	60	04
	ELE-304	Practical * Lab III & Seminars#	40	60	04
	ELE-305	Project I	40	60	04
IV	ELE-401	Network Analysis and Synthesis	40	60	04
	ELE-402	Nanoelectronics and MEMs	40	60	04
	ELE-403(A)@	Control systems	40	60	04
	ELE-403(B) @	ASIC & FPGA	40	60	04
	ELE-404	Practical * Lab III &Seminars#	40	60	04
	ELE-405	Project II	40	60	04

*** indicates workload for one batch (10 students)**
@Select any one of the course (Select ELE- 403 A or B)
Distribution of marks for theory exam would be as below:

External Examination : 60 Marks per Course
Internal Examination : 40 Marks per Course

Total : 100 marks

Distribution of marks for practical exam would be as below:

Experimental Performance : 40 marks
Record/Journal : 10 marks
Viva-voce : 10 marks
Internal : 40# marks (30 Marks Internal Practical+10 Marks for seminar)

Total : 100 marks

ELE-301:Digital Signal Processing

Course Objectives:

1. To understand the concepts of Digital Signal Processing.
2. To understand the various mathematical transformation& filter.
3. To study the architecture of digital signal processor and applications.

Course Outcomes:

After successfully completing the course students will be able to:

1. Know the basics of digital signal processing
2. Show skills to design of filters for real time application.
3. Exhibit the knowledge of DSP algorithms on DSP Platforms.
4. Demonstrate the ability to analyze filter structures

Unit 1:Basics of Digital Signal Processing [10hrs, 10M]

Characterization and classification of signals, typical signal processing operations, Examples and applications of signal processing, Analog Vs. Digital Signal Processing, Block diagram of digital signal processor, Sampling Theorem, Sampling, Quantization, Aliasing, Applications.

Unit 2:Signals and Systems [14hrs, 14M]

Introduction, Basic concept of signals as array of values, discrete time signals: Representation, Standard test Signals, Basic operations on discrete time signals, Discrete time System: Symbols for D-T, Interconnections for D-T systems, Properties, Causality and stability, Linear Shift Invariant (LSI) Systems: Representation, Linear convolution, Computation and properties of Linear convolution, Stability and Causality of LSI system, Correlation, A to D conversion process.

Unit 3: Mathematical Transforms [14hrs, 14M]

Z-transform, Definition, region of convergence, properties of Z-transform, inverse Z-transform: power series expansion method, Partial fraction expansion method, using cauchy's residue theorem, System functions from Z transform and pole zero plot, DTFT, properties, DFT, properties, , circular convolution, graphical method and matrix method, Linear filtering using DFT , FFT. Relationship between Fourier transform and Z transform, Relationship between DFT and Z transform

Unit 4: Filters [10hrs, 10M]

Analog filters, Basics of digital filter: Types, advantages and disadvantages of digital filters, Infinite impulse response filters, and Finite impulse response filters, various window functions, Implementation of these filters.

Unit 5: DSP Chips and Applications [12hrs, 12M]

Introduction, types of DSP processors, architecture of DSP processor, general purpose DSP processors; Digital filter design using DSP chips, applications of DSP: audio echo cancellation, Applications of DSP in Speech, Image processing, Voice privacy, DTMF signal detection, Digital stereo FM generation, Musical sound processing.

References:

1. **Digital Signal Processors,**Kuo and Gan, Pearson Education.

2. **Digital Signal Processing,** D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, JWile and Sons, Singapore.
3. **Digital Signal Processing**:**Principle, Algorithms and Applications**, JohnG.Proakis and D.G. Manolakis, Prentice Hall.
4. **Theory and Application of Digital Signal Processing,** L. R. Rabiner and B. Gold,Prentice Hall.
5. **Introduction to Digital Signal Processing**, J.R. Johnson, Prentice Hall.
6. **Industrial Control Electronics,** Applications and Design, Michael Jacob,Prentice Hall.

ELE-302: MicrowaveDevices and Circuits

Objectives:

1. To introduce the concept of electromagnetics.
2. To understand the theory of wave guides.
3. To study various methods of generation and detection of microwaves.
4. To understand the Antenna Theory.

Course Outcomes:

After successfully completing the course students will be able to:

1. Understand Basics of Microwave and its components
2. Identify different microwave devices with their operating principle.
3. Understand the designing of antenna and its parameter
4. Gain knowledge of microwave detection and measurement which opens up a whole new career option

Unit 1: Introduction to microwaves [10Hrs 10M]

Microwave frequency bands, microwave transmission lines - transmission line equations and solutions, reflection and transmission coefficients, standing waves and standing wave ratio, line impedance and admittance, Smith chart, impedance matching – single stub and double stub matching.

Unit 2: Microwave waveguides and components [16Hrs 16M]

Rectangular waveguides, TE and TM modes, power transmission and power losses, excitation of modes in rectangular waveguides. Circular waveguides, possible modes, power transmission and power losses, co-axial waveguides. Microwave cavities – rectangular and circular cavity resonators, resonant cavities, Q factor of a cavity resonator. Waveguide tees, magic tee, hybrid ring, waveguide corners, bends and twists, two-hole directional coupler, hybrid coupler, microwave circulators and isolators.

Unit 3: Microwave tubes [12Hrs 12M]

High frequency limitation of conventional vacuum tubes, Klystron, multi-cavity klystron amplifier, helix and coupled cavity TWT, cylindrical magnetron – construction, principle of operation, performance characteristics and applications.

Unit 4: Antenna [12Hrs, 12M]

Antenna Parameters: gain, directivity, power, aperture, Friis equation, radiationPattern, 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.

Unit 5: Microwave detection and measurement [10Hrs, 10M]

Crystal detectors, slotted line measurements, measurement of VSWR, phase shift attenuation frequency power and impedance, dielectric constants of liquids and solids, Q of cavity.

References:

1. **Microwave Devices and Circuits,** Liao Samuel Y, PHI, 3rd edition.
2. **Solid state electronic devices**, Streetman Ben G, PHI, 3rd edition.
3. **Introduction to Electrodynamics**, Griffiths D J, PHI, 4th edition.

4. **Microwave engineering**, Annapurna Das, Sisir Das, TMH, 9th edition.
5. **Microwaves Engineering**, David M Pozar, Wiley 3rd edition.
6. **Electronic communication systems**, Kennedy, TMH, 4th edition.
7. **Foundations of microwave engineering,** Robert E Collin,Wiley, 2nd edition.
8. **Microwave engineering**, Chatterjee R., PHI.
9. **Principles of Microwave Measurement**, J. H. Bryant

ELE-303: Embedded System Design

Objectives:

1. To learn communication standards and protocols.
2. To understand the architecture, assembly language and interfacing of different microcontrollers
3. To learn basics of embedded system and embedded C programming, software techniques to embed codes in to the systems.
4. To learn the designing of embedded system at professional level.

Course Outcomes:

After successfully completing the course students will be able to:

1. Consider the different constraints of embedded system design
2. Use the I2C, SPI communication protocols.to interface the devices with controllers.
3. Establish Controller Area Network and program it.
4. Familiar with AVR, PIC controllersand able to interface all peripherals with these controllers
5. Use the Arduino boards for various applications at professional level.

Unit 1: Fundamentals of Embedded System [12hrs, 12M]

Embedded System components, embedded System Development Environment - algorithm, flow chart, IDE, 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

Unit2: AVR Microcontroller [14hrs, 14M]

Architecture (Atmega16), instruction set, addressing modes, memory organization, timers, I/O, ADC, interrupts, serial communication Design of General Purpose Target Board: reset, oscillator circuit, derivatives of AVR Basic Assembly Programs: arithmetic, logical, code converter, block data transfer, I/O programming C Programs: ADC, timer, I/O ports, interrupts, Inter-Integrated Circuit (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 (DC, stepper, and servo), I2C and SPI based RTC, EEPROM, DAC and ADC, coding assembly in C and code optimization

Unit 3: Arduino [10hrs, 10M]

Exploring the Arduino ecosystem, Arduino functionality,Programming Interfaces, General I/O and ADCs interfacing,types and specifications of Arduino Boards: nano, Pro mini, UNO, Due, Mega, Leonordo boards. Architecture of Arduino UNO, Creating Program: Downloading and Installing the Arduino IDE - Running the IDE and Connecting to the Arduino - Breaking down a program.

Unit-4: PIC Microcontroller [12hrs, 12M]

Architecture (PIC18F458), 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 and logical.

Unit 5: Applications of Embedded Systems [12hrs, 12M]

Mobile phones, home appliances, microwave oven, washing machine, laser printer, Automated Teller Machines, Bluetooth communication, automated car assembly plant, chemical plant control.

References:

1. **AVR Microcontroller and Embedded Systems using Assembly and C**, Mazidi and SarmadNaimi, Pearson education.
2. **Embedded C Programming and the Atmel AVR**, Barnett, Larry D. O'Cull and Sarah A. Cox, Delmar, Cengage Learning.
3. **Exploring Arduino,** Jeremy Blum, John Wiley & Sons Inc.
4. **Programming and Customizing the AVR Microcontroller**DhananjayGadre, McGraw Hill Education.
5. **PIC Microcontroller and Embedded Systems,**Mazidi, Mckinlay and Causey, Pearson Education.
6. **C Programming for Embedded Systems**, Kirk Zurell, Pearson Education.
7. **Programming in C**, Stephen Kochan, Hayden Books/Macmillan.

ELE-304: Practical Lab III & Seminars

I. Practical * Lab III

Part A:Practical based on DSP

1. Implement moving average filter.
2. Study of Auto-correlation.
3. Study of Liner and Circular convolution techniques.
4. Study of DFT computation.
5. Study of DTFT computation.
6. Implement IIR filter.
7. Implement FIR filter.
8. Implement Butterworth low pass/High pass filter.

Part 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 plot directivity pattern of a given antenna
4. To determine a characteristics of a microstrip transmission line
5. Design and test Yagi-Uda antenna with power reflectors
6. Measurement of primary-secondary coupling factor of a given transformer usingLCR meter (calculation of transformer model parameters expected)

Simulation / Mathematical Modeling of Electromagnetics, Microwaves, Antennas

7. To plot Equipotential contours and field lines for given charge distribution
8. Use of Smith chart for transmission line pattern and verify using C
9. Use of MATLAB for potential distribution in a region bound by two conductors
10. Use of MATLAB for directivity pattern for simple antennas
11. Measure the characteristics of a Directional Coupler

Part C:

C1: Practical on AVR/ARDUINO

1. Interfacing of LED array to generate different sequences, use of timer for delay generation
2. DC motor control using PWM / Intensity control of LED
3. Serial EPROM / EEPROM interface using SPI protocol
4. Measurement of Distance using Ultrasonic Sensor and LCD
5. Measurement of temperature/Humidity
6. Measurement of Light intercity
7. Interfacing of Hall Sensor
8. Dot matrix rolling display
9. Interfacing the Joy Stick
10. Interfacing of Camera
11. Interfacing of Pressure sensor

C2: Practical on PIC

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. On-off controller with hysteresis (ADC).
8. Two digit frequency counter or event counter using timer / interrupt
9. Matrix keyboard / Touch screen
10. Zigbee communication.
11. DC motor control using PWM / intensity control of LED

Note: *The student has to perform at least 06 practical from each part.*

II. Seminars

- Student should delivered minimum four seminars using power point presentation on the following topics.
- Topics (but not limited to this topics)
    1) Virtual Instrumentation
    2) Python
    3) SCADA
    4) Raspberry Pi
    5) Internet of Things(IoT)
    6) RTOS
    7) FPGA
- Duration of seminar is minimum 30 minutes.

Assessment (Examination) of seminars:

- Student should delivered one seminars for internal assessment (CA).
- Maximum marks for internal assessment: 10
- No external assessment (UA) of seminar.

ELE-401: Network Analysis and synthesis

Course Objectives

1. To understand the basics of electronic networks.
2. To introduce the concept Network Theorems and applications.
3. To understand the use of Laplace transform in Circuit analysis.
4. To learnthe Network Functions and synthesis techniques

Course Outcome:

After completion of this course student will able to:

1. Know the various types of electronics network and its mathematical models.
2. Solve the electronics networks using mathematical theorems.
3. Use the Laplace transform to solve electronic network.
4. Know the network functions and synthesis techniques.

Unit 1: Network Analysis [16hrs, 16M]

Mesh analysis, mesh equations, super-mesh analysis; nodal analysis, nodal equations; sourcetransformation technique; graph theory and network equations: graph of a network, trees and co-trees, twigs and links, incidence matrix, tie set matrix, cut set matrix; state variable analysis; time domainanalysis: steady state and transient response, DC response of RL, RC and RLC circuit, sinusoidalresponse of RL, RC and RLC circuit

Unit 2: Network Theorems and Applications [12hrs, 12M]

Star-delta transformations; network theorems: superposition, maximum power transfer,Thevenin's, Norton's and reciprocity, duals and duality, Tellegen's and Millman's theorem with suitable examples

Unit 3: Laplace Transform and Properties [14hrs, 14M]

Laplace transformation, properties of Laplace transforms, partial fraction expansion, InverseLaplace transforms, Heaviside's expansion theorem: illustrative examples, application of the Laplace transform in circuit analysis.

Unit 4: Network Functions and synthesis Techniques [18hrs, 18M]

One-port and two-port networks, synthesis of RC and LC networks two-port networkparameters: open circuit impedance, short circuit admittance, transmission, inverse transmission, hybrid,inverse hybrid parameters, interrelationship of different parameters, interconnection of two port networks; poles and Zeros of network functions, time domain behavior from the pole zero plot; stability of activenetworks, Hurwitz polynomials, positive real functions, Ruth-Hurwitz array and R-H criteria, Foster andCauer methods, frequency response plots: magnitude and phase, polar plot, root loci, Nyquist stabilitycriterion.

References:

1. **Network Analysis**, M. E. Van Valkenberg, PHI, New Delhi
2. **Circuits and Networks: Analysis and Synthesis,** A. Sudhakar and S. P. Shyammohan, Tata McGraw Hill, New Delhi
3. **Networks and Systems,** D. Roy Choudhuri, New Age International (P) Limited, Publishers, New Delhi
4. **Basic Circuit Theory,**G.K.Mithall
5. **Circuit theory- analysis and synthesis,** A. Chakrabarti, DhanpatRai and Co.
6. **Network analysis and synthesis,** Franklin F Kuo, John Wiley and Sons.

7. **Engineering Circuit analysis,**W.H. Hayt& Jack E-Kemmerly, TMH Pub.
8. **Network Analysis Theory and Compute Methods,**Donson and Watkins, PHI Pub.
9. **Circuit, Theory Fundamentals and Applications,**AamBudak, PHI Pub.

ELE-402: Nano Electronics & MEMS

Course Objectives:

1. To understand the Nano-CMOS Devices.
2. To learn the applications of nanotechnology in electronics.
3. To understand the various MEMS controls.
4. To learn different types of MEMS transducers.

Course Outcomes:

After successfully completing the course students will be able to

1. Explain the properties of Nano particles and Nanotube with their applications inelectronics.
2. Identify the suitable MEMS transducer for a given electronic system.

Unit 1: Introduction to Nano-CMOS Devices [10hrs, 10M]

Introduction to Nanotechnology: Fundamental science behind nanotechnology, tools formeasuring nanostructures, tools to make nanostructures and imagine nano-behaviours SiliconNanocrystal non-volatile memories, Novel dielectric materials for future transistors, NanoCMOSdevices and applications. Tools for measuring nanostructures, scanning probe instrument,nanoscale lithography.

Unit 2: Nano particles and Nanotubes [08Hrs, 08M]

Properties of Nano particles: Metal nanostructures and semiconducting nanoparticles, Carbonnanostructures: carbon molecules, clusters, nanotubes, properties of nanotubes-strength andelasticity, applications of carbon nanotubes.

Unit 3: Nanotechnology in Electronics [08hrs, 08M]

Use of Nanotechnology in Electronics: Application of nano structures in electronics, sensors, optics,energy capture, transformation and storage. Application of nanotechnology in biomedical electronics.

Unit 4: Introduction to MEMS [10hrs, 10M]

Introduction, History, Concepts of MEMS: Principles, application and design, ScalingProperties/Issues, Micromachining Processes: Substrates, lithography, wet/dry etching processes,deposition processes, film stress, exotic processes.

Unit 5: Control and Materials of MEMS [12hrs, 12M]

Controls of MEMS: Analog control of MEMS, Sliding mode control of MEMS, Digital controlof MEMS, Materials for MEMS: Substrate and wafers, Active substrate material, silicon, Siliconcompound, Silicon piezoresisters, Gallium arsenide, Quartz, piezoelectric crystals, Polymers.

Unit 6: Transducers [12hrs, 12M]

Mechanical Transducers: transduction methods, accelerometers, gyroscopes, pressure sensors,MEMS microphones, mechanical structures, actuators.Chemical and Biological Transducers: basic concepts of cellular biology, chemical sensors,molecule-based biosensors, cell-based biosensors, chemical actuators, biological transducers.

References:

5. **Microelectronics to Nanoelectronics: Materials, Devices & Manufacturing ability**, Anupama B. Kaul,CRC press, 2013.
6. **Introduction to Microelectromechanical systems engineering**, NadimMaluf, Kirt Williams Second edition, Artech house, Boston.
7. **Introduction to Nanoscale science and technology**, Massimiliano Di ventra, StephaneEvory and James R. Hefline, Jr., Kluwer, Academic Publishers.
8. **Nanotechnology: A Gentle Introduction to the Next Big Idea**, Mark ratner,Daniel Rattner,
9. **Micromachined Transducers Sourcebook**, Kovacs, Gregory T. A, McGraw-Hill.
10. **Introduction to Nanotechnology**, Charles P. Poole Jr., Frank J. Owens, John Wiley & Sons.
11. **MEMS Practical Guide to Design, analysis andApplications**, Jan G Korvinik and Oliver Paul, William Andrew, Inc Springer
12. **Springer Handbook of Nanotechnology** ISBN: 978-3-540-35172-6
13. **Nanotechnology :Principals &practices**, Sulbha K.Kulkarni, Capital publishing company

ELE-403: (A) Control systems

Course objectives:

1. To understand the physical parameter measurement in the form of electrical quantities.
2. To learn the mathematical analysis of control system.
3. To understand the analysis of signals in time domain and frequency domain.
4. To study the various signal controllers.

Course outcomes:

After completion of this course the student will:

1. Know the concepts of sensing physical parameters and convert it into electrical parameter.
2. Have knowledge of open loop and close loop control systems.
3. Able to analyze the control system by various mathematical theorem.
4. Able to analyze the signal in time domain and frequency domain.
5. Know the various signal controllers.

Unit 1: Physical Parameters Measurement [10 Hrs, 10M]

Transducers: static and dynamic specifications, Position transducers, Force transducers, Motion transducers, Fluid transducers, Temperature transducers

Unit 2: Control System Introduction [08 Hrs, 08M]

Introduction, terminology and Feedback characteristics of control system definitions, closed and open loop systems, Effect of Feedback on the gain, Stability, Sensitivity Noise, Types of Feedback Control Systems- Linear Vs Non-Linear, Continuous, Discrete, Position Control and Velocity Control.

Unit 3: Mathematical Analysis of Control Systems [12 Hrs, 12M]

S-plane, Poles and Zeros of Function, Differential Equations, State Equations, Transfer Functions – Examples, Block Diagrams, Bock Diagram Types, Simplification Rules, and Reduction Techniques – Examples, Signal Flow Graphs, Basic Elements, Basic Properties, Definition of Terms, Gain Formulas, Stability Analysis, Characteristics Equations, Methods ofDetermining Stability, Hurwitz Criteria, Routh's Tabulation.

Unit 4: Time domain analysis and Root Locus Techniques [12 Hrs, 12M]

Standard test signals, Time domain performance of control systems, Transient response of the first order system, the second order system, stability, steady state errors, effect of adding zero to the system, Routh stability criterion.

Root locus techniques: The root locus concept, properties, construction of root loci, Number ofBranches, Intersection of Asymptotes, Root Loci on Real Axis, Intersection of Root Loci with

Imaginary Axis, Break Away and Saddle Point, Calculation of K on Root Loci.

Unit 5: Frequency Domain Analysis [10 Hrs, 10M]

Frequency Response, Correlation between time and frequency response, Bode plots, experimental determination of transfer function, log magnitude versus phase plots, Nyquist stability criterion Stability Analysis with Magnitude Phase Plot, Constant M and Constant N Circles, Nichol Chart.

Unit 6: Controllers **[08 Hrs, 08M]**

Error amplifiers, on-off controller, Proportional (P), Proportional Integral (PI), Proportional Derivative (PD), PID controllers

References:

1. **Control system Engineeringm,**I.J. Nagrath and M. Gopal, Wiley Eastern Ltd.
2. **Process Control System,** C. D. Johnson.
3. **Modern Control Engineering**, K. Ogata.
4. **Automatic Control System,**Benzamin . C. Kuo
5. **Industrial control electronics applications and design,** J. Michael Jacob

ELE-403: (B) ASIC & FPGA

Course Objectives:

1. To understand the basics of ASIC and PLDs.
2. To understand the architecture of FPGA
3. To learn sequential and combinational logic design techniques.
4. To learn the designing of FPGA based system at professional level.

Course Outcomes:

After successfully completing the course students will be able to

1. Know the difference between ASIC and FPGA and its application.
2. Design and develop digital circuit using FPGA.
3. Gain the knowledge of FPGA and its system design which unlock the new area of profession.

Unit 1: Introduction to ASIC and PLDs [16Hrs 16M]

Types of ASICs: Full-Custom ASICs; Standard-Cell Based ASICs – Gate-Array Based ASICs – Channeled Gate Array – Channel-less Gate Array – Structured Gate Array – Field-Programmable Gate Arrays – Design Flow – Programmable ASICs: Anti-fuse – Static RAM - EPROM and EEPROM Technology – Programmable Logic Devices: PLA, PAL, CPLD, Field-Programmable Gate Arrays

Unit2: FPGA Fabrics. [14Hrs 14M]

Introduction, FPGA Architectures, SRAM-Based FPGAs, Permanently Programmed FPGAs, Chip I/O, Circuit Design of FPGA Fabrics, Architecture of FPGA Fabrics.

Unit3: Combinational Logic. [16Hrs 16M]

Introduction, the Logic Design Process, Hardware Description Language, Combinational Network Delay, Power and Energy Optimization, Arithmetic Logic, Logic Implementation for FPGAs, Physical Design for FPGAs. The Logic Design Process Revisited.

Unit 4: Sequential Machines. [14Hrs 14M]

Introduction, The Sequential Machine Design Process, Sequential Design Styles, Rules for Clocking, Performance Analysis, Power Optimization. Architecture: Introduction, Behavioural Design. Design Methodologies. Design Example.

References:

1. FPGA based System design by Wayne Wolf.

2. Digital Systems Design with FPGAs And CPLDs By Ian Grout, Elsevier (2008)

3. Unleash the System On Chip Using FPGAs and Handel C By Rajanish K. Kamat, Santosh A. Shinde, Vinod G Shelake, Springer (2010)

4. M.J.S. Smith, “Application specific Integrated Circuits", Addition-Wesley, 2000.

ELE-404: Practical Lab III & Seminars

I. Practical Lab IV

Part A:

Practical based on Network Analysis: Modeling and Simulation

5. Equivalent Resistance and Power Dissipation in a Resistor
6. Voltage and Current of an RL Circuit
7. Gain versus Frequency of an RC Amplifier
8. Nodal Voltages of a Simple Circuit
9. Loop Analysis of a Bridge Circuit
10. Maximum Power Dissipation
11. Charging of a Capacitor with Different Time Constants
12. Charging and Discharging of a Capacitor
13. Current Flowing through Inductor of RL Circuit
14. Current Flowing through a Series RLC Circuit
15. Voltage across a Parallel RLC Circuit
16. Power Calculations of One-port Network
17. AC Voltage of an RLC Circuit
18. Magnitude and Phase Response of an RLC Circuit
19. Inverse Laplace Transform
20. Network Function, Poles and Zeros of a Circuit

Part B:

Practical Based on MEMS

1. To study the types of nanoscale lithography.
2. To study the tool for measuring nanostructures.
3. To study the deposition process.
4. To study the characteristics of accelerometers and its application.
5. To study the characteristics of pressure sensors and its application.
6. To study the characteristics of chemical sensors and its application.

Part C:

Practical Based on Control System

1. Write MATLAB code for step & impulse response of
    a. A first order unity feedback system
    b. A second order unity feedback system
2. Write MATLAB code for step & impulse response of
    a. Type '0' systems
    b. Type '1' systems
    c. Type'2' systems
3. Study of root locus plot using matlab control system toolbox for 2nd order system & obtain controller specification parameters.
4. Study of bode plot using matlab control system toolbox for 2nd order system & obtain controller specification parameters.
5. Determination of nyquist plot using matlab control system toolbox.
6. Study the effect of PI & PD controller on system performance.

7. Study the effect of addition of zeros to the forward path transfer function of a closed loop system
8. Study the effect of addition of poles to the forward path transfer function of a closed loop system.

Part C:

Practical Based on FPGA

Design following circuit in VHDL and implementing them on an FPGA.

1. Design a 4 bit Arithmetic and Logic Unit (ALU).

2. Synthesizing and implementing the subtractor

3. Excess-3 code converter

4. Synthesizing and implementing the BCD counter

5. Traffic Light Controller

6. Design of pulse gulper circuit

7. Design of sequence detector circuits

6. Design of circuits using a decoder and gates

8. Design of binary comparator circuit

9. Design of Ripple counter using TFFs

11. 4 bit Shift register

12. Multiplier

Note: The student has to perform at least 06 practical from each part.

II. Seminars

- Student should delivered minimum four seminars using power point presentation on specific topic.
- Do not repeat the topic of seminar used for semester III.
- Duration of seminar is minimum 30 minutes

Assessment (Examination) of seminars:

- Student should delivered one seminars for internal assessment (CA).
- Maximum marks for internal assessment: 10
- No external assessment (UA) of seminar.

Equivalent

Following table shows equivalent subject codes and title from old syllabus

M.Sc. II Electronics (Old)			M.Sc. II Electronics (New)		
SEM	**Code**	**Title**	**SEM**	**Code**	**Title**
III	ELE-301	Digital Image Processing	**III**	ELE-301	Digital Signal Processing
	ELE-302	Wireless sensors & Networks		ELE-302	Microwave Devices and Circuits
	ELE-303	VHDL Programming		ELE-303	Embedded System Design
	ELE-304	Special Lab I		ELE-304	Practical * Lab III & Seminars#
	ELE-305	Project I		ELE-305	Project I
IV	ELE-401	Electromagnetic theory and Antenna engineering	**IV**	ELE-401	Network Analysis and Synthesis
	ELE-402	Nanoelectronics		ELE-402	Nanoelectronics and MEMs
	ELE-403(A)	CMOS technology		ELE-403(A)	Control systems
	ELE-403(A)	Agro Electronics		ELE-403(B)	ASIC&FPGA
	ELE-404	Special Lab II		ELE-404	Practical * Lab IV& Seminars#
	ELE-405	Project II		ELE-405	Project II

Opportunities after completion of M.Sc.(Electronics)

After completion of M. Sc. Electronics with good academic record, student will get opportunities in the following fields/sectors

- Lectureship - After NET/SET
- M.Tech.----after GATE
- Research (Ph. D.)
- BSNL----as a TTA and JTO
- Railway ----as a Section Engineer
- Airport Authority of India: ATC (Air Traffic Controller)
- Air force ----as Technical Officer after clearing EKT Exam
- UPSC---- Indian Engineering Services (ES)
- Private sector-Electronics/IT companies.