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<th>Sr. No</th>
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<tr>
<td>1</td>
<td>ELC101</td>
<td>MICROELECTRONICS AND VLSI DESIGN</td>
<td>4</td>
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<tr>
<td>2</td>
<td>ELC102</td>
<td>NUMERICAL COMPUTATION AND ALGORITHMS</td>
<td>4</td>
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<td>3</td>
<td>ELC103</td>
<td>EDA TOOLS-I</td>
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<td>ELC104</td>
<td>ELECTRONICS PRACTICALS – I</td>
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<td>UEL101</td>
<td>ADVANCED DIGITAL COMMUNICATION SYSTEMS</td>
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**Semester II**

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<td>ELC201</td>
<td>EMBEDDED SYSTEMS DESIGNS</td>
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<tr>
<td>2</td>
<td>ELC105</td>
<td>OPERATING SYSTEM AND RTOS</td>
<td>4</td>
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<td>3</td>
<td>ELC202</td>
<td>OPTICAL COMMUNICATION SYSTEMS</td>
<td>4</td>
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<td>4</td>
<td>ELC203</td>
<td>ELECTRONICS PRACTICALS- II</td>
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<td>UEL102</td>
<td>MICROPROCESSORS ARCHITECTURES AND PROGRAMMING</td>
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**Semester III**

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<tr>
<td>1</td>
<td>ELC204</td>
<td>INSTRUMENTATION &amp; CONTROL THEORY</td>
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<td>ELC301</td>
<td>ELECTRONICS PRACTICALS - III</td>
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<td>ELD201</td>
<td>SIGNALS AND SYSTEMS</td>
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<td>ELD202</td>
<td>DIGITAL SIGNAL PROCESSING</td>
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<td>ELD301</td>
<td>DIGITAL SYSTEM DESIGN USING HDL</td>
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<td>6</td>
<td>ELD302</td>
<td>EDA TOOLS-II</td>
<td>4</td>
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<tr>
<td>7</td>
<td>UEL103</td>
<td>INDUSTRIAL TRAINING, MINI-PROJECT AND SEMINAR</td>
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**Semester IV**

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<td>ELD203</td>
<td>NANOELECTRONICS &amp; NANOSYSTEMS</td>
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<td>3</td>
<td>ELD303</td>
<td>LASER SYSTEM ENGINEERING</td>
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<td>ELD402</td>
<td>PROJECT</td>
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<td>UEL104</td>
<td>PHARMACEUTICAL INSTRUMENTATION</td>
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<td>6</td>
<td>UEL105</td>
<td>COMMUNICATION AND TECHNICAL SKILLS</td>
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ELC 101: MICROELECTRONICS AND VLSI DESIGN

An overview of VLSI, Modern CMOS Technology  4
Silicon Logic, Logic design with MOSFET.  5
Physical structure of CMOS Integrated circuits  4
Fabrication Technologies of CMOS Integrated Circuits  7
Elements of Physical Design  3
Electrical characteristics of MOSFETS  6
Electronic analysis of CMOS Logic gates  5
Advanced Techniques in CMOS Logic Circuits  6
System specifications using HDL, General VLSI components  4
Memories and Programmable Logic  4
VLSI Clocking and System Design  4
Reliability and Testing of VLSI circuits  4

Tutorials:
1. 2\textsuperscript{nd} order Butterworth filter using P-Spice student version.
3. CMOS based Op-Amp using P-Spice student version.
4. Study of Lithography.
5. Compares various Static memories.

Reference Books:
1. Introduction to VLSI Circuits and Systems, John P. Uyemura, WILEY.

ELC 102: NUMERICAL COMPUTATION AND ALGORITHMS

Computer Programming:
- Algorithm order and complexity
- Backtracking example.

Data Structures:
Introduction to Data Structures, Vectors and Lists, Binary Trees, Graphs, Hashing.
- Implementation of Shortest path algorithm
- Implementation of binary tree

Theory of Numerical programming:
Theory of numerical errors, Numerical Integration: Trapezoidal & Simpsons rule, Romberg

- Trapezoid methods, Newton's Raphson methods
- Bisection and Regular falsi methods
- Runge Kutta

**Database:**

Basic Concepts, Relational Data Model, Database Design, DBMS storage structures and access methods, Query Processing, Transaction Processing, Security & Integrity, Distributed Databases, Client Server Computing.

- SQL for database
- Client Server database query

**Tutorials:**

1. Implementation of Vector in C++.
2. Implementation of List in C++.
3. Implementation of minimum path algorithms in C++.
4. Simple Example of Database querying in C++.
5. Case study on the Emerging Trends in databases (Data mining).

**Reference Books:**

2. Data Abstraction and Problem solving in Java by Frank M Carrano, Janet J Prichard, Addison-Wesley, 2001

**ELC103: EDA TOOLS-I**

Study of EDA tools, EDA Structure; Various EDA tools in VLSI technologies; Bottom up (Full custom), Top Down (Standard Cell) approach; Various Simulations in VLSI EDA; Layout format (CIF, GDS), p-Spice code examples.

1. **Microwind /Cadence**
   a. 4:1 multiplexure.
   b. 3:8 decoder
c. Design Shift Registers
d. Design of Counters for digital clock
e. Memory design using 6T cell.
f. Dynamic Memory design.
g. Radiofrequency circuit.
h. Resistive circuit
i. Differential amplifier

2. **p-Spice**
   a. 2\textsuperscript{nd} order Butter-worth Notch Filter.
b. Clipper Circuit.
c. Buffer design using SPICE.

Ref. Book:
3. p-Spice manual.

**ELC 104: ELECTRONICS PRACTICALS –I**
1. Design of 4-bit UP-DOWN Counter.
2. Design of variable voltage supply @ 2 Amps.
5. Design of Stepper driver using Monoshot & 555 Timer.
7. DS-CDMA simulation.
8. Error detection and correction Algorithm
   a. CRC
   b. Hamming code
9. Channel Coding methods.
   a. Convolution  b. Block code
10. Implementation of MSK modulation and demodulation.
11. ASK, FSK, QPSK, modulation & demodulation.
12. QPSK, modulation & demodulation.

**UEL101: ADVANCED DIGITAL COMMUNICATION SYSTEMS**


Mobile Communication Channel including antennas: The mobile wireless propagation channel, Notions on antennas especially the near and far field concept, Line of Sight (LOS) propagation, Multipath fading and shadowing and over the horizon propagation, outdoor and Indoor Propagation, Flat and selective fading, Special antennas for base stations and
headsets, Deterministic, Empirical and Statistical Methods for propagation link computations.


Overview of Multiple Accesses Techniques: Simplex, Duplex TDD and Time Division Duplex, Time division multiple access (TDMA) FDMA and OFDM, Code Division multiple access (CDMA), Hybrid multiple access, Management of voice, Data and Video (Multimedia) information.

Modern Digital Radio Systems: standards, proposals and comparisons GSM (Europe and all over the world) - TDMA, IS-54 (U.S.A.)- TDMA, IS-95 (U.S.A., Korea) CDMA-, PHS (Japan) - TDMA, Frequency Hopping (FH) (U.S.A.) - CDMA, Short Range Distance Nanocells and Picocells Systems, PCS, PCS Cordless telephone 2nd generation (CT-2), Cellular digital packet data (CDPD), and Wireless LAN, New standard trends Edge, 3rd and 4th generation beginning.

Mitigation Techniques for Mobile System: Overview of Natural and manmade external noise sources, Radiation hazards effects from base stations, Mobile and portable equipments.

Diversity Techniques for Mobile Radio Systems: Dispersive channels, Space diversity, Frequency diversity, Polarization diversity, Hybrid and quadruple diversity, Equalizer techniques


Tutorials:
1. Study of Global Positioning system working principle.
2. Study of mobile Service providers in Goa Region.
3. Study of AIR station Bambolim, Goa.
4. Study of Distance Education Infrastructure Setup (DEITE) at Goa University.
5. Study of various interfacing of mobile set eg. Bluetooth.

Reference Books:


Semester II

ELC 201: EMBEDDED SYSTEMS DESIGNS
Architectures: RISC/CISC and Harvard/Princeton Architectures(4); Types of Memories (3), Introduction to 8-bit Micro controllers (4), Timers/Counters, UART, SPI, PWM, WDT,(6)
Tutorials
1. Programming of EEPROM memory.
2. Subsystem SBI.
3. Communication of SPI with RTC Chip
4. ST Series Microcontrollers study.
5. Motorola Series Microcontrollers study.

Reference Books:
6. Building Embedded Linux Systems, by Karim Yaghmour, O’Reilly

ELC 105: OPERATING SYSTEM AND RTOS

Introduction to Computer Organization and Architecture: hardware vs software - the virtual machine concept, concept of von Neumann architecture, hardware components and functions, trends in hardware development, system configurations and classifications.

Process Description and Control: Processes, process states, processor modes, context switching, CPU scheduling algorithms, threads.

Concurrency Control: Concurrent processes, critical section problem and solutions, mutual exclusion solution requirements, semaphores and monitors.

Deadlocks: Characterization, detection and recovery, avoidance, prevention.

Inter Process Communication: classical IPC problems and solutions, IPC techniques.

The Input/Output and File Subsystem: I/O devices, controllers and channels, bus structures, I/O techniques (programmed, interrupt driven and DMA), I/O subsystem layers. Concepts of files and directories, issues and techniques for efficient storage and access of data. I/O and file system support for graphics, multimedia, databases, transaction processing and networking.

The Memory Subsystem: Memory types and hierarchy, module level Organization, cache memory. Memory partitioning, swapping, paging, segmentation, virtual memory.

The Central Processing Unit: CPU components, register sets, instruction cycles, addressing
modes, instruction sets, concept of micro-programming, Basics of RISC approach, pipelined and super-scalar approaches, vector processors and parallel processors, hardware support for the OS.

μCOS case study

Tutorial
1. Implementing Lower Level Shell
2. Implementing Signal in Unix
3. Hard disk partitioning in Linux

Text/Reference Books:

2. Operating system concepts by Silberchatz and Galvin -Addision wesley
3. Operating system by Tanaumbuam, PHI New Delhi

ELC207: OPTICAL COMMUNICATION SYSTEMS

Light Propagation in Optical Fiber: Geometric picture, Pulse spread due to material dispersion, loss mechanism, Theory of Optical waveguides, methods of waveguides analyses, modes in steps and graded index fiber, new types of optical fibers.

Fiber Optics Technology: Glass fiber fabrication, cable design, coupling, splicing and connectors, splicing methods, connectors, fiber measurements.

Optical Sources: LED and LDs, development of Laser diodes structures, transmitter circuits, Coupling efficiency of source to fiber.

Optical detectors: Photodiodes, Avalanche diodes and other detectors.

Receiver sensitivity and BER: Receiver design, Noise in detectors.

Communication System design: System requirement, System design, Link analyses, Power budgeting.

Voice Transmission: Characteristics of Voice signals, TDM, Undersea fiber optics communication system, fibers in telephone network.

Tutorials:
1. Goa University network of Optical Fiber in LAN.
2. Coupling Efficiency in connectors.
3. Optical fiber as Sensor
4. Power budget calculation
5. Study of different detectors and comparison.

Reference Books:

**ELC 203: ELECTRONICS PRACTICALS II**

1. LCD & LED Interfacing to ATMEL 89C52
2. 7-segment Interfacing to ATMEL 89C52 (BCD counter)
3. Display Temperature using ATMEL 89C52
4. Serial Transmission and reception PIC16F877
5. Configuring On-chip ADC PIC16F877
6. Waveform generation using I2C based Max5822 interfaced to PIC 16F877
7. Hex Keypad Interfaced to ARM controller
8. LCD & LED Interfacing using ARM controller
9. Switching of tasks using ARM controller
10. OS-I using ARM
11. OS-II using ARM
12. Coping the memory segment using 8086 Assembler
13. Sorting of numbers using 8086 Assembler
14. Multiplication & Division using 8086 Assembler
15. Shell programming -I
16. Shell programming -II
17. Shell programming -III

**UEL102: MICROPROCESSOR ARCHITECTURE AND PROGRAMMING**

**Introduction and Historical Perspectives:** Architecture basics, Complex Instruction Set Computers (CISC) and Reduced Instruction Set Computers (RISC) processors, Advantages and Drawbacks of CISC & RISC, Logical Similarity with example of a typical microprocessor, Short Chronology of Microprocessor Development with reference to CISC families such as INTEL, AMD and MOTOROLA, RISC families development of POWER PC, Alpha, Sparc.

**Fundamental Architectures:** Defining a Computer Architecture e.g. degree of pipelining, basic topology, technology used etc., Neumann and Haward Architectures, Single Processor Systems, Parallelism Implementation using pipelines and multiple units, Super-pipelining, Superscalar, Very Long Instruction Word (VLIW) architectures, Building multithreaded processors, Multiple Processor Systems - SIMD, MIMD and multi-computer approaches.

**Implementation Considerations:** Memory Hierarchy, pre-fetching techniques, coherent caches, pipelining, ternary logic, packaging considerations, wafer scale integration.

**Implementation of Functional Units:** Memory Management, Arithmetic Logic Unit, Floating Point Unit, Branch Unit, Vector Unit, Load/Store Unit.

**Development Tools:** Microcomputer Development Systems (MDS), In Circuit Emulator (ICE), Assembler, Editors, Logic Analyser

**Case Study of INTEL X 86 families:** Overview and Features in brief.

**Tutorials:**
1. Memory test problem.
2. Study of Z-80 microprocessor.
3. Study of Motorola Microprocessor family.
5. Cache memory and importance.
Reference Books:
4. The Electronics Handbook Edited by Jerry C. Whitaker, Published by CRC, Press and IEEE Press (1996), Section VII: Microelectronics and Section XIX: Computer Systems

**semester III**

**ELC 204: INSTRUMENTATION & CONTROL THEORY**

**Introduction:** Basic Concepts of measurements, calibrations and standards.  
Transducers (Types and parameters) and Sensors: Displacement, strain, vibration, Pressure, Flow, Temperature, Force and Torque (linearity, accuracy, precision, bandwidth, repeatability)  
**Amplification:** Simple ended, Differential and Instrumentation amplifier.  
**Sampling:** An Anti-aliasing, Multiplexers, Sample and Hold, Track and Hold.  
**Computer Interfaces:** Serial (RS-232), Parallel, GPIB (IEEE-488), Universal Serial Bus (USB)  
**Display Devices:** Review of LED, LCD, CRT devices, segmental and dot matrix displays.  

**General purpose test equipments:** CRO, Digital storage oscilloscope, Digital voltmeter, Wave Spectrum analysis, Lock-in-amplifiers, Pulse generators and waveform generators, Box-car averager.  
**Control System:** Types of control system - open loop, closed loop, linear, non-linear, continuous, discrete, time invariant, modes of linear systems, frequency and time response, sampled data system, open loop motor control, DC motor phase control.

Tutorials:
1. Study of Open loops control System.  
2. Electronics Chocks.  
3. Design of On/Off temperature controller using thermistor sensor.  
4. Study of SEM.  
5. Study of Scanning Probe technique.

Reference Books:
4. Instrumentation Measurement by Northrop CRC 2001
ELC301: ELECTRONICS PRACTICALS – III

Hardware.
1. Design of S/C circuit for Strain gauge /Glucose strip @ 3.3V.
2. Design of S/C circuit for Thermistor sensor @ 3.3 V and interfacing with ARM.
3. Serial (Rs232) implementation with 89C52.
4. EO to OE Convector for Analog Signal.
5. EO to OE converter for PWM Signal.
6. Implementation of FIR BP using Xilinx XC3S400Cyclone II.
7. FFT using TMS 320.
9. Analysis of frequency components using Spectrum Analyzer

Software.
10. Simulink HPF & BPF Simulation
11. VHDL implementation for the Multiplexer & Demultiplexer
12. VHDL Implementation for Encoder & Decoder
13. VHDL implementation for the Counter.
14. Verilog implementation for the Memory Module.
15. Verilog implementation for the Latch.
16. Display Hello world and blinking Led’s using NiosII soft core
17. Matrix Manipulation on NIOS II core (Multiplication, determinant, Inverse, Transpose)
ELD 201: SIGNAL AND SYSTEMS


Discrete Time Fourier Transform: Continuous Discrete-time FT, Energy Density Spectrum, Phase and Group Delays, Sampling of continuous tie signal, Low pass & Band pass Signal, Anti-Alising Filter design, Sample and Hold, A to D, D to A convertors, Effects of sample and hold.

Z- Tranform: Defination and properties, inverse Z-Tranform, The transfer function
FIR Digital Filter Design: Preliminary considerations, FIR Design based on windowed FS, Design of minimum phase.

Tutorials:
1. History of Fourier Transform.
2. Understanding Speech Spectral Analysis Problem.
3. Understanding FFT.
4. Study of TMS Series of processors.
5. MALAB program for generation of complex exponential sequence.

Reference books:
1. Sanjit K Mitra, Digital Signal Processing: A computer Based Approach
2. Discrete Time Signal Processing, Steven A. Tretter, Wiley(1976),
3. Digital Signal Processing, Johnny Johnson, PHI.
4. Digital Signal Processing, Prokis, PHI.
ELD202: DIGITAL SIGNAL PROCESSING

Students have to design the following experiments in Matlab and Simulink and plot the characteristics of the signal processing system under design.

1. Filters
   a. Lp norm
   b. Ensemble averaging Filters
   c. Exponential moving average systems
   d. Median filter
   e. FIR
2. Demonstration of aliasing effect.
3. Oscillators
   a. Design using Van der Pol’s equation
   b. Lorentz oscillators systems
   c. Gaussian oscillators systems
4. FFT
5. Image processing
   a. Interpolations
   b. Pattern recognition using PCA
6. Simulink
   a. Transfer function design and study for impulse and finite sequence.
   b. Convolution

ELD301: DIGITAL SYSTEMS DESIGNS WITH HDL


Digital Concept and Number System: General Positional number system conversions, Operation, BCD, Gray Code, Character Codes, Codes for Actions, Conditions, and States n-Cubes and Distance, Codes for Detecting and Correcting Errors, Error-Detecting Codes, Error-Correcting and Multiple-Error-Detecting Codes, Hamming Codes, CRC Codes, Two-Dimensional Codes, Checksum Codes, m-out-of-n Codes, Codes for Serial Data Transmission and Storage, Parallel and Serial Data, Serial Line Codes,


HARDWARE DESCRIPTION LANGUAGES: HDL-Based Digital Design, ABEL Hardware Description Language, The VHDL Hardware Description Language, The Verilog Hardware Description Language,

COMBINATIONAL LOGIC DESIGN PRACTICES: Documentation Standards, Circuit Timing, Combinational PLDs, Decoders, Encoders, Three-State Devices, Multiplexers, Exclusive-OR Gates and Parity Circuits, Comparators, Adders, Subtractors, and ALUs, Combinational Multipliers.

SEQUENTIAL LOGIC DESIGN PRINCIPLES & PRACTICES: Bistable Elements, Latches and Flip-Flops, Clocked Synchronous State-Machine Analysis, Clocked Synchronous State-

MEMORY, CPLDS, AND FPGAS

Read-Only Memory, Read/Write Memory, Static RAM, Dynamic RAM, Complex Programmable Logic Devices, Field-Programmable Gate Arrays

Tutorials:
1. Design flow for the simple microprocessor in HDL
2. Study and compares types of RAMS.
3. Design of GRAY code circuit.
4. Study of ALTERA PLD’s
5. Study of XYLINX PLD’s.

Reference Books:

ELD302: EDA TOOLS-II

Study of JTAG, Modelsim Syntax study.
1. Study of Phases of Quartus compilations.
2. Study of phases of ISE compilations
3. Testing logic using ChipScope-I.
4. Testing logic using ChipScope-II
5. Parallel implementation of CRC.
6. Serial implementation of CRC.
7. FIFO implementation
8. pulse stretcher
9. Test bench using Modelsim-I
10. Test bench using Modelsim-I
11. Test bench using Modelsim-I
12. Test bench using Modelsim-I

Reference Books:

UEL103: INDUSTRIAL TRAINING, MINI-PROJECT AND SEMINAR

Industrial training: A student has to undergo Industrial training equivalent to one credit for the period of minimum 1 month in the respective Electronics industries / Research Laboratory anywhere in India.

Mini-Project: A student has to carry out a mini-project equivalent to 2 credit in the areas of embedded system design.

Seminar: Each student has to present a power point presentation for total 20 minutes in the title suggested by DC equivalent to 1 credit. The participating students should participate in Q&A.

Semester IV

ELD401: ELECTRONICS PRACTICALS – IV
   1. Reading from flash using DE2 board
   2. LCD and 7 segment Interfacing using DE2 board
   3. PS/2 Mouse Interface on DE2 board
   4. UART Interface using DE2 board
   5. Task switching LCD and 7 segments with uCOS.
   6. RTOS-I with RTLINUX
   7. RTOS-II with RTLINUX
   8. Video processing on Altera DSP kit
   9. Audio processing on Altera DSP kit
   10. Multirate signal processing using Xilinx Spartan XC3S400
   11. Echo implementation on Xilinx Spartan XC3S400
   12. Obstacle detection for varying range using 89C52 based Robot
   13. Line follower using 89C52 based Robot
ELD203: NANOELECTRONICS & NANOSYSTEMS

Introduction: Development of microelectronics; Potential of Silicon Technology; Basics of Nanoelectronics, some physical fundamentals, basics of information theory; Biology Inspired Concepts.- Biological networks, Biology Inspired Concepts; Bio-chemical and Quantum-Mechanical Computers.- DNA computer, Quantum computer; Parallel Architectures for Nanosystems.- Architectural principles, Architectures for parallel processing; Softcomputing and Nanoelectronics.- methods of soft computing, characteristics of neural networks in nanoelectronics; Quantum Electronics; Bio and Molecular Electronics.- Bio electronics, molecular electronics; Nanoelectronics with Tunneling Devices; Single Electron Transistor (SET); Nanoelectronics with Superconducting Devices; The Limits of Integrated Electronics

Tutorials:
5. Laser tweezers.
6. Study of AFM.
7. Study of STM.

Reference Books:
1. NANOELECTRONICS AND NANOSYSTEM BY K. GOSER, P GLOSEKOTTER & J. DIENSTUHL SPRINGER
2. Introduction to Nanoelectronics Science, Nanotechnology, Engineering, and Applications By Vladimir V. Mitin et al; From Cambridge

ELD303: LASER SYSTEM ENGINEERING


Non-Linear Optics: Origins of Non-Linear Polarization, relation between induced Polarization and Electric Field, Non-Linear Optical Coefficient, SHG, Phase Matching Experimental verification.

Interaction of Light and Sound: Scattering of Light by Sound, RamanNath and Bragg diffraction, Defraction of light by Sound, Intensity modulation.

Optical Communication: Advances in optical Communication, Optical Network.

Tutorials:
1. Understanding Diffraction of Laser Light using grating
2. Comparison of resolving power of Prism and Grating.
3. Focusing of Laser Light.
5. Study of Raman Laser system.

Reference Books:

ELD404: PROJECT
Student project of 200 marks of duration 6 months in the area of electronics hardware/software. Normally students are encouraged to undertake these projects in industrial/research organizations. In such case the student/batch of student will have one external guide and one internal guide.

UEL104: PHARMACEUTICAL INSTRUMENTATION
Introduction to Chemical Instrumental Analysis, advantages over classical methods, classification, various units used in chemical analysis. Introduction to Electroanalytical methods, potentiometry, voltametry, coulometry.

Spectrometric Methods-I: A. Laws of Photometry, Instrument components, UV-visible instrument component, photolorimeters, single and double beam instruments, various types of UV-visible spectrophotometers.
B. Atomic absorption spectrophotometer: Principle, working, hollow cathode lamp, atomizer, back-ground correction.


Spectrometric Methods-III and Miscellaneous Instruments: Fluorimeters and Phosphorimeters: Principle, spectrofluorimeters, spectrophosphorimeter, Raman effect, Raman spectrometer
Nuclear Magnetic Resonance (NMR) spectrometry: Chemical shift, principle, working of NMR, FT-NMR Gas analysers: CO, CO2, Hydrocarbons, O2, NOx

Separative Methods: Chromatography: Classification, Gas chromatography: principle,
constructional details, GC detectors, High Performance Liquid Chromatography (HPLC): principle, constructional details, HPLC detectors


Electron microscopy: TEM & SEM- principles, instrumentation and analysis, scanning tunneling microscopy, atomic force microscopy, principles, instrumentation and analysis-applications.

Tutorial:
1. Study of filter photometer.
2. Study of UV-visible spectrophotometer.
3. Study of ESR.

Reference Books:

UEL105: COMMUNICATION TECHNICAL SKILLS
This will be self study module where students will be assigned case studies reading material in the areas of technical writing, Group discussion, Management & Communication Skills.

Here Students has to participate in the

- Group discussion in topic related to electronics (25%)
- Answer paper in the area of management and communication skills(25%)
- Has to write /compile technical papers & present (25%)
- Modeling of electronics systems (25%)

Reference Books

1. Essentials of Technical Communication Sunil Gokhale
2. Communication Skills By Leena Sen, Prentice Hall of India.
3. http://owl.english.purdue.edu/
ANNEXURE III

PAPER I: RESEARCH METHODOLOGY: EXPERIMENTAL

Methods of material Preparation: crystal growth, single crystal, zone melting, Epitaxy, compaction and sintering, methods of quenching, sol-gel process, deposition technique, chemical analysis.

Vacuum Technique: production and measurement of vacuum, Different types of vacuum systems and gauges, their working, limitation and leak Detection.


Computer programming and Numerical Techniques: C/Fortran programming, error definition, Error propagation, Finite difference calculus, Interpolation and extrapolation, Roots of equations, solutions of simultaneous linear Algebraic equation, Linear and non linear least square curve fitting, Numerical differentiation and integration, Fourier transform techniques, numerical solutions of ordinary differential Equations, Matrix Eigen Value Problem, Monte Carlo and maximum entropy methods

References:
7. Introduction to numerical analysis, F.B.Hilderband, 2nd , Tata Mcgraw-Hill Publishing co.ltd

PAPER II-1: BOMEDICAL INSTRUMENTAION & MESUREMENTS

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Biometrics, Components of Man-Measurement system, Physiological system of body,
problems encountered in measuring a living System, Basic transducer principle, Source of Bioelectric Potential, Skin contact Impedance, Electrodes: ECG, EEG, EMG, Microelectrodes

CARDIOVASCULAR MEASUREMENTS.
Heart and cardiovascular system, characteristics of blood flow, Electrocardiography, measurement for Blood Pressure, Plethysmography.

NON-INVASIVE DIAGNOSTIC IMAGING
X-Ray, CT, MRI, fMRI, PET and SPECT, ULTRASOUND, Optical Tomography

BIOTELEMETRY

INSTRUMENTATION FOR CLINICAL LABORATORY
The Blood, Test for Blood cells, chemical Tests, Automation of chemical Test

THE LASER APLICATION IN BIOMEDICAL FIELD:
Pulse Ruby, ND-YAG, Helium-Neon, Argon, CO2 LASER.

NOISE REDUCTION TECHNIQUE IN ELECTRONICS SYSTEMS
Introduction, cabling, grounding, balancing and filtering, shielding, contact protection, Intrinsic Niose Source, Active device Noise, and Electrostatic discharge.

References:
2. Biomedical instrumentation and Measurements By Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer PHI (2nd Edition)
3. Handbook of Biomedical instrumentation, R .S. Khandpur, Tata Mc GRAW Hill.
5. Biomedical Instrumentation by Cromwell-Prentice Hall of India, New Delhi
6. Foundation of Medical Imaging, By Z.H.Cho, J.P. Jones, M.singh, john and Wiley & sons
PAPER II-2: SYSTEM DESIGN USING ADVANCED MICROCONTROLLERS

- Architecture of 80C196 Family of Microcontrollers 6
- Programming of 80C196 Family of Microcontrollers 8
- Peripherals of 80C196 Family of Microcontrollers 6
- Architecture of ARM Family of Microcontrollers 10
- Programming of ARM Family of Microcontrollers 8
- Peripherals of ARM Family of Microcontrollers 10


Programming Language: Assembly Language & ‘C’

Reference
2. Design with Microcontrollers – John B Peatman
3. Embedded Microcontrollers – Intel Hand Book

PAPER II-3: MODELING OF DIGITAL SYSTEMS USING HDL

Introduction to PLDs & FPGAs: ROMs, Logic array (PLA), Programmable array logic, GAL, bipolar PLA, NMOS PLA, PAL 14L4, Altera logic cell array (LCA) – I/O Block – Programmable interconnect – Xilinx – 3000 series and 4000 series FPGAs. Altera CPLDs altera FLEX 10K series PLDs, Cyclone, Startix.


References Books: