M.Sc. Electronic Science
Revised Syllabus
To be implemented from June 2009.

1) **Title of the course: M.Sc. Electronic Science Part II (Colleges))**
2) **Introduction:** M.Sc. Electronic Science in colleges follows the pattern of University Courses and Departmental Courses. During semester III one theory course and two practical courses are to be completed as university courses and two theory courses as departmental courses to be conducted by the corresponding college. Similarly at the semester IV one theory course and project course equivalent to two courses are to be completed as university courses and two theory courses as departmental courses to be conducted by the corresponding college.
   At the post graduation level focus is on in-depth knowledge and specializations. The research and development approaches are to be cultivated with exposure to current and futuristic requirements of the industry and society at large. The post graduate centers have choice to develop departmental courses with specific goal. The projects can also be conducted corresponding to these theory courses in such a way that, the P.G. Center has orientation in particular domain.
3) **Aims and Objectives :**
   The aim of the Post graduate course is to prepare students for directly becoming suitable for on-site industry jobs. Due weightage is given to incorporate latest industrial trends and technologies in the syllabus with rigorous involvement of practical training.
   Following are the objectives –

   i) To have adequate theory knowledge in the subject area like process control, power electronics, Digital Signal processing, Embedded systems, Optoelectronics, Communication systems, data communication etc.
   ii) To introduce with various application fields of electronics like Agriculture, automotive, Biomedical and mechatronics etc.
   iii) To have practical knowledge in these subjects.
   iv) To have ability of conducting an independent project on identifiable topic.

4) **Eligibility: M.Sc. Electronic Science Part I Pass /** ATKT.

5) **Examination –**

   A) Pattern of Examination :

   i) Semester and Practical

   Theory Papers - Three Theory papers of 100 marks per semester
   (Internal examination 20 +
   Semester Examination 80, Total 100)

   Practical - At the end of Semester III 100 marks Examination.
   (Internal examination 20 +
   Semester Examination 80, Total 100)

   Project: At the end of Semester IV 100 marks Examination per project course (Total 200 Marks)
   (Internal examination 20 +
   Semester Examination 80,
   Total 100 for each project course)

ii) Pattern of the question Paper:

The pattern adopted for theory and practical examination is as below.

Theory: The topic wise weightage is decided as per lecture allotted to cover the syllabus for the topics. The Internal option is also taken into consideration in the process. Equal weightage is given for each topic, and none of the topic can be put up as option by the student for examination.

Internal Examination 20 Marks

Four types of questions – Objective, problems, short answer
There are two or three different sets of the question papers used for internal examination in the same class for same paper.
It is continues evaluation process and is executed by the teacher conducting the course.

External Examination 80 Marks

Pattern is as follows-

Q.1 16 marks
Q.2 16 marks
Q.3 16 marks
Q.4 16 marks
Q.5 16 marks

Questions are to be set with equal weightage to all the topics in the syllabus. Adequate Problems must be included.

Practical : Internal Marks 20 : Continuous assessment
External Examination 80 Marks: – Have to perform one experiment of 80 marks of the duration 3 hours .

Standard of passing: Candidate must score 40% marks at the semester examination in each course.

i.e. 32 marks at semester theory paper
32 marks at the practical course

There is no separate passing for internal course, however the total marks of internal and external should cross 40% of the total marks to be awarded for the paper.

B) ATKT Rules : As per University statues

C) Award of Class: It will as per University rules as –
Above 70% First class with distinction
Between 60% to 70% First Class
Between 50% to 60% Second Class
From 40% to 50 % Pass class.

D) External Students: Not applicable for this course. External Students are not admitted for the course.

E) Setting of Questions paper/ Pattern of Question paper:
Setting of the question paper is as per University Schedule and it is centralized system adopted by University of Pune. Pattern of question paper will be as per decided by Board of Electronic Science, University of Pune.

F) **Verification of Revaluation** : As per University Statues and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result .

6) Structure of the course :

i)

a) Compulsory Papers **:** Four theory papers
b) Optional Paper **:** Nil
c) Question paper **: Theory -**
For Internal Examination 20 Marks
For Semester Examination 80 Marks
Practical "
For Internal Examination 20 Marks
For Semester Examination 80 Marks

ii) Medium and Instructions: ENGLISH

7) Equivalence subject/Paper and Transitory Provision:

OLD Syllabus	New Syllabus
EL3UT 05 DSP systems & applications	EL3UT 05 Embedded Systems
EL4UT 06 Control System: Theory & application	EL4UT 06 Control System: Theory & application
EL3UP 05 Practical Course V	EL3UP 05 Practical Course V
EL3UP 06 Practical Course VI	EL3UP 06 Practical Course VI
EL3UP 07 Project Course I	EL3UP 07 Project Course I
EL4UP 08 Project Course II	EL4UP 08 Project Course II

8) University Terms: More than 75% attendance is necessary for the course as per University statues.
16 Weeks will be available for completion of theory course.
Practical course will be throughout the year.

9) Subject wise Detail Syllabus and Recommended books:

M.Sc. Electronic Science Part II

Semester III and IV

Course Structure

SEM III	SEM IV
EL3UT 05 Embedded Systems	EL4UT 06 Control System: Theory & application
ELDT Departmental Course	ELDT Departmental course
ELDT Departmental Course	ELDT Departmental Course
EL3UP 05 Practical Course V	EL4UP 07 Project Course I
EL3UP 06 Practical Course VI	EL4UP 08 Project Course II

ELUT: University Theory: Compulsory

EL DT: Departmental Course (Any four from list: From EL DT 01 to EL DT 13)

EL UP: University Practical: Two courses per semester.

M.Sc. Electronic Science Part II
Semester III and IV

List of Departmental Courses

Course No	Course Name
ELDT01	Data Communication and Networking
ELDT02	Optoelectronics
ELDT03	Advanced Power Electronics
ELDT04	Mechatronics
ELDT05	Advanced Embedded Systems
EL DT 06	Digital Image Processing
ELDT07	Printed circuit board technology.
ELDT8	Television and Systems
ELDT09	Material properties & Fabrication techniques
ELDT10	Biomedical Instrumentation
ELDT11	Electronics & Computers in Agriculture
EL DT12	Automotive Electronics
EL DT 13	DSP systems and applications

M.Sc. Electronic Science Part II
University courses
SEM – III and IV
(To be implemented from June 2009)

EL4 UT05 Embedded Systems

Objectives:

1. Define Embedded system
2. Describe applications of embedded systems.
3. Understands the architecture, assembly & Interfacing of different 8-bit microcontrollers
4. Learn software techniques to embed codes in to the systems
5. Learn to develop systems that make optimum use of available system resources

1. Embedded Systems overview (10)

An embedded system, features of embedded system, components of embedded system, examples of embedded system application.
Review of Microprocessor family, 8-bit Micro-controllers (Atmel), Architecture(Harvard and Van-Neuman Architecture), Instruction set, Memory organization, Design of target board, Interfacing techniques, Timers, Interrupts I/o pins, Timers, interrupts, serial interface. Processors in embedded systems (RISC, CISC)

2. Embedded system Hardware: (10)

Interfacing: I/O devices (LCD, Keyboard, ADC, DAC, Stepper motor, PWM etc), Data converters, DMA, UART, SPI, PWM, WDT, Memories, serial, parallel Asynchronous and synchronous communication.

Communication standards: – RS 232, I2C, USB, SPI, CAN, PCMCIA, IrDA.

3. Development tools for embedded systems: (06)

Software development tools- Editor, Assembler, linker, simulator, compiler
Hardware development tools: programmer (EPROM programmer, microcontroller programmer, universal programmer), Logic analyzer, General purpose evaluation Boards.
Hardware and Software combination Tools-
1. In circuit emulator 2. Debugger.

4. PIC micro-controllers: (08)

Overview and features (16F877A), Architecture, memory organization interrupts, inbuilt controller features (ADC, PWM and Timer)
Assembly instruction set and introduction to C programming
Interrupt programming, keyboard and LCD programming, ADC, DAC programming.

5. AVR micro-controllers: (08)

Overview and features (8335), Architecture, memory organization interrupts, inbuilt controller features (ADC, PWM and Timer)

Assembly instruction set and introduction to C programming, interrupt programming, keyboard and LCD programming, ADC, DAC programming.

6. Embedded C Programming: (08)

C programming for microcontrollers, optimizing techniques, Interrupt sub, routines, Data types and time delays in 8051, I/O programming, logic operation, data conversions, data serialization using 8051,Timer programming, serial port programming (RS-232, I2C, USB, SPI, CAN), interrupt programming, keyboard and LCD programming, ADC, DAC programming.
Applications: Relay, PWM, DC and Stepper motors. 8

Text Books:

Embedded Systems – Rajkamal
The 8051 Microcontroller and Embedded Systems- Mazidi
Design with PIC Microcontrollers- John Pitmann
Embedded C Programming & Atmel AVR – Richard Barnett – Thomson Publication

Reference Books:

Programming & Customizing 8051 Micro controller – Myke Predko
8051 Microcontroller Programming- Haung
Embedded Microcomputer systems: Jonathan W Valvano – Thomson Publication
An Embedded Software Primer by David E. Simon. Publisher: Addison- Wesley. ISBN 0-201-61569-X. Copyright 1999.
Programming in C" by Stephen Kochan. Publisher: Hayden Books/Macmillan
Programming & Customizing The AV R microcontroller- Dhananjay V Gadre
Embedded microcontroller System – Jonathan Valvano.

EL4 UT06 Control systems: Theory and Applications

Objectives:

1. To make the student familiar with basic concepts of control theory.
2. Understanding open and close loop control.
3. To understand the theoretical background with an emphasis on problem solving.
4. Make the students aware of working knowledge of PLC and its programming.
5. To impart adequate awareness of actuators and anunciators used in industrial control systems.

Basic control system: **(04)**

Functional elements of control system, Continuous and discrete state control systems, Open and closed loop systems. Control strategies: feedback, feed forward and adaptive control.

Laplace transform in control systems: **(04)**

Mathematical models of systems, transfer function, Block diagram of control system and rules for its reduction, analysis of multiple input multiple output systems.

3: **Stability of control systems.** **(06)**

Concept of stability, closed loop poles and stability, Routh-Hurwitz criterion ,Routh's stability criterion, root-locus band frequency response methods of control system analysis. Bode and Nyquist plots. Open-loop transient response method and Ziegler-Nichols methods of process loop tuning.

4: **Rapid overview**: **(04)**

ON/OFF control, proportional integral and derivative control modes. Definitions of related terms, PI, PD and PID controllers and their applications.

5: **Programmable logic controller** **(12)**

PLC operation, input and output status files, fixed PLCs. Sixteen-point I/O modules with decimal addressing, I/O interaction with input and output status files, PLC memory (system and application), data formats. Putting together a modular PLC. Conventional ladder Vs PLC ladder logic. Examples of ladder diagram development. Programming a PLC. Programming Terminals, Open PLC systems. Soft PLC or Open Architecture control.

6. **PLC Processors**: **(12)**

Processor's function, Operating system. Scanning 4 general Electric series 90-30 PLC, Omron Sysmach CQMI Programmable controller, WDT, Processor Ports. Serial communication between a PC and PLC. Interfacing to non- RS232 PLC Processors, Processor Operating Modes.

Choosing the correct Processor for a particular Application.

Program and data organization inside PLC processor,

Understanding relay instructions and PLC in out modules. Timing and counter Instructions. Comparison and data handling instructions. Sequencer instructions. Documenting the system.

7: **Brief Overview** : **(08)**

Principle and Characteristics of Synchro-Servo motors,
Control Valves, Solenoids, Indicators, Anunciators, Alarms, Recorders.
Discussion of Control System Examples such as Bottling Plant, Coffee Vending machine, Heat Exchanger, Boiler control etc.

Text Books:

1. Modern Control Engineering by Katsuhiko Ogata; Prentice Hall-EEE.
2. Process Control by Peter Harriot. TMH Delhi.
3. Introduction to Programmable Logic Controllers by Gary Dunning; Delmar (Thomson Learning)
4. Process Control Instrumentation Technology by Curtis D. Johnson; PHI
5. Control System Engineering by Nagrath, M. Gopal; New Age International LTD.
6. Control Systems by U. A. Bakshi, V. U. Bakshi; Technical Publication, Pune.
7. Automatic Control Systems by B. C. Kuo; PHI
8. Industrial Electronics by T. E. Kissel; PHI
9. Control Engineering Theory & Practice by N. M. Bandopadhyay, PHI

Reference books:

1. Instrument Engineers Handbook- Process Control by B. G. Liptak
2. Microprocessor with application in Process Control by S. I. Ahson, TMH Co.

Departmental course SEM – III and IV

(To be implemented from June 2009)

EL DT 01 Data Communication and Networking

1. **Transmission of digital data** (05)
   Interfaces and MODEMS ,Transmission Media , multiplexing , error detection and correction , data link control , data link protocols.

2. **Network Basics**: (05)
   Network , OSI reference model

3. **Network Hardware** : (10)
   Network Interface Adapters , Cabling a Network , Wireless LAN , Network connection Devices , Wide Area Networking , Server technologies , Designing a network , routing fundamentals.

4. **Network Protocols** : (05)
   Ethernet Basics , Fast Ethernet and Gigabit Ethernet , Token passing protocols , TCP/IP , Netware protocols , Net BIOS , Net BEUI and Server message blocks .

5. **Network operating systems** : (10)
   Windows 2000 and Windows NT , Active directory , Windows NT domains , NOVEL Netware , NOVEL directory services , UNIX , LINUX , Network clients

6. **Network connection services** : (05)
   DHCP , WINS and Net BIOS name resolution , The domain name system

7. **Network services** : (10)
   Internet Services , Network printing , connecting to the internet , internet security , Network Administration : Windows Network Administration , Network management and troubleshooting tools , backing up of index.

Reference Books.

1. Networking the complete reference , Zacker , Mc Graw Hill , 2001.
2. Data Communication and Networking , Forouzan ,Behrouz A . , 2nd Edition , Mc Graw Hill , 2004
3. Data Communication and Networking : Achut S godbole , McGraw Hill, 2002
4. Networking Handbook : Taylor , McGraw Hill
5. Data Communication and Computer Networks , Brijendra Singh , 2nd Edition , PHI publication.

EL DT 02: Optoelectronics

Objectives: After undergoing this course the student will have –

1.Awareness of different optoelectronic devices and systems.
2.Knowledge of optical fiber communication system.
3.Study of Optical Fiber sensors and their applications.

1: Basic Optics [04]

Natural, artificial and specialized light sources, Characterization of light sources based on intensity spectrum, emission, spatial distribution, conversion efficiency. Experimental methods for studying these characteristics use of optical filters, their disadvantages and necessity and use of monochromatic source, wave nature of light, Reflection and refraction, Snell's law, Total internal reflection.

2: Light Sources [12]

Study of LED's: variable band gap semimatreial idea of hetero – junction, simple and double heterostructure light sources, quantum efficiency, internal and external quantum efficiency, expression for total and internal quantum efficiency, reasons for external quantum efficiency to be less than internal quantum efficiency, intensity distribution of Led, Lambertial sources, encapsulation of LED's, types of LED's surface and edge emitting, Burus LED.

Study of LASER: LASER as an amplifier of light and necessary conditions for amplification, special properties of LASER- monochromatic, coherent and light power nature, directionality, divergence and attenuation of LASER beam. Study of three level LASER (Ruby LASER), Study of four level laser, study of tunable laser, semiconductor laser and applications of high power, low power continuous wave and pulse lasers

3: Light detectors [10]

Idea of light detectors and their basic types, natural and specialized light detectors, type of specialized light detectors, thermal, quantum light detectors, types of quantum photo detectors, photo resistive, photovoltaic, photo emissive detectors. Study of quantum detectors-photoelectric cell, photomultiplier tube, photodiode, important characteristics of light detector-spectral response, viewing angle, efficiency, and material used for photodetecors.

4: Optical Fiber –Theory and applications. [12]

Action of optical fiber as wave guide, Advantages of optical fiber communication over normal medium, necessary conditions for wave guiding mechanisms of optical fibers, construction of optical fiber cable, role of strength of material, types of optical fibers. Step index and graded index fibers, comparison of wave guiding action of both expression for angle of acceptance and cone of acceptance, numerical aperture, time dispersion, splicing and fiber connections- what is splicing, requirements of splicing, practical methods of splicing, various types of optical fiber connectors, losses in optical fiber communication. Losses due to fibers, intrinsic and extrinsic losses, intrinsic losses due to atomic scattering and molecular absorption. Expression for loss factor, extrinsic losses due to mechanical effects, micro bends, cracks etc. losses due to connectors, core longitudinal, angular misalignment, mismatch of rate indices of fiber material etc. Comparison between losses due to splicing and connectors. Expression for Electromagnetic wave guided by fiber, modes of transmission, expression to 'V' number and number of maximum modes of transmission, dispersion in optical fibers, wavelength and time dispersion, internodes dispersion, double crucible and chemical deposition methods of manufacturing of optical fibers

5: Optical fiber systems- **[06]**

Optical transmitter/receiver circuits, driver circuits for LED, detector circuit design using photodiode, phototransistors, and fiber choice.
Communication special fibers – DS fiber, NZDS fiber, integrated optics, slab and strip wave-guide, and Electro-optic devices – phase shifters, interferometer modulators.

6: Measurement on Optical fiber – **[06]**

Optical fiber experimental setup, launching light into fiber, detection etc.
Fiber attenuation measurement, dispersion measurement profiles measurement, numerical aperture measurement, diameter measurement.

Text Books

1. Optoelectronics- Kaiser, TMH (1992)
2. Optical fiber communication- Principles and practice, J.M. Senior, PHI (1990)

Reference Book

3. Optoelectronic- an Introduction, J. Wilson and J.F.B. Hawakes, PHI (1992)
4. An introduction to fiber optics: Ajoy Ghatak, K.Thygarajan, Cambridge University Press (1998).

EL DT03: Advanced Power Electronics

Objectives:

To study the principles and applications of power electronics with different topologies.

1. Understand the solid-state devices required for power electronic circuits.
2. To study the basic power circuits.
3. To study and understand the power conversion and power transmission principles.
4. To study the control schemes of power circuits.
5. To study the industrial and domestic applications.

1 : Introduction (04)

Power Electronics and linear electronics, power devices, power circuits, concept of load, Application areas. Basic concepts of electrical and magnetic circuits

2: Power Devices (08)

Power diodes: I-V characteristics, switching characteristics, types, SiC diodes, SPICE model, diode circuits.
Power BJT: Steady state and switching characteristics, switching limits, spice model
Power MOSFETs: Steady state and switching characteristics, COOLMOS, SITS, IGBTs, Spice models, switching limits.
Thyristor: Characteristics, two-transistor model, turn-on and turn-off methods, Thyristor types and their comparison, spice models.

3: Power Circuits (20)

Diode circuits: single phase half-wave, center tapped full wave and bridge rectifiers performance parameters, three phase bridge rectifiers.
Controlled rectifiers: Single phase and three phase – half-wave, semi-full wave and dual converters, Single phase series converters, 12-pulse converters, Power factor improvement techniques.
AC voltage controllers: ON-OFF control, phase control, single phase Bidirectional controller, 3-phase Bi-directional controller and their types, PWM control.
Single phase and 3- phase cycloconverter and their types.
DC-DC converters: step-up and step-down converters, performance parameters, converter classification.
Switch mode regulators: Buck, Boost, Buck-Boost and Cuk regulators, Multioutput Boost-converter.
Inverters: Performance parameter, single-phase bridge inverter.
3- Phase inverters: 180° and 120° conduction, voltage control methods for single phase and 3-phase inverters, harmonic reduction, current source inverters, variable dc- link inverters, Boost inverters.
Introduction to resonant pulse and multilevel inverters
Static Switches: Single phase and three phase AC switches, three-phase reversing switches. AC switches for Bus transfer, DC switches. Solid state and Microelectronic Relays.

4: Applications (12)

DC power supplies: switch mode DC power supplies, flyback, forward, push pull, half bridge, full bridge-converters, resonant DC power supplies, bi-directional power supplies
AC Power supplies (UPS): switch mode AC Power supplies, resonant and bi-directional AC Power supplies
DC drives: Basic characteristics of DC motors, Operating modes, single phase and 3 phase drives, DC –DC converter Drives, Closed loop control of DC drives
AC drives:
Induction motors drives: squirrel cage and wound rotor motor, Performance characteristics control methods, Closed loop control methods
Synchronous motor drives: cylindrical rotor, silent mode, Reluctance, Permanent magnet, switched reluctance- motors, control methods, Closed loop control methods
Brushless DC and AC Motors and Control Stepper Motor – Types and Control
Electric Utility Applications: High voltage DC transmission, flexible AC transmission systems: shunt and series compensators
Other Applications: Integral half cycle /cycle control, space heating and air conditioning, HF fluorescent lightning, Induction and capacitive heating

4: Practical Design Considerations (06)

Snubber circuits for diodes, SCRs and transistors, Turn-on and turn-off and over voltage snubbers.
MOSFET gate drive, BJT base drive, Isolation methods, thyristor firing and gating circuits drive IC's for converters, high voltage drive for motor. Control Circuits: Current mode and voltage mode PWM
Cooling and heat sinks, reverse recovery transients, supply and load side transients, Selenium diodes and MOVs for voltage protections.
Current protection methods
EMI standards, sources and shielding methods.
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Reference books:

1. Modern power electronics and ac drives :Bimal k Bose
2. Power electronics :Ned, mohan, undeland, Robbins
3. Power electronics :Lander
4. Power electronics :M. Rashid

EL DT04: Mechatronics

Objectives:

1. Analysis, Design, Synthesis and selection systems that combine electronic and Mechanical components with Modern control and microprocessors.
2. To make students aware about the role of Electronics in Mechatronics.

1. Introduction to Mechatronics. (04)

Mechanical system components and modeling, mechanical system and design, Mechatronics approach, control, design process, load conditions, flexibility, man machine interface.

2. Mechatronic Components. (08)

Sensors and instrumentation systems, embedded systems, drives and actuators, control devices, linear systems, rotational drives, motion converters, motion control devices, pilot devices, control circuits and load circuits, fuses and circuit breakers, enclosures, conductors, lockout tag and safety.

3. Robotics. (04)

Classification of robots, applications.

4. Systems of a Robot. (06)

Basic components of robot system, functions of robots, robot specifications. Mechanical systems: review of elementary mechanical concepts, motion conversion, and modeling of mechanical systems, end effectors, resolution, repeatability, accuracy of manipulators.

5. Control of Actuators in Robotics. (06)

Closed loop control in position servo, effect of friction and gravity, frequency domain considerations, control of robotic joints.

6. Sensors and Actuators. (08)

Actuators: stepper motors, DC motors, brush less DC motors, direct drive actuators, hydraulic actuators, pneumatic actuators, servo amplifiers.

Sensors: position sensors (non optical and optical), velocity sensors, proximity sensors, accelerometers, touch and slip sensors, force and torque sensors.

7. Transformation and Kinematics. (08)

Homogenous co-ordinates, co-ordinate reference frames, properties of transformation matrices, homogenous transformations and manipulator, forward solution, back solution, motion generation, Jacobean, controller architecture.

8. Role of Computers in Robotics. (06)

Imaging, image representation, picture coding, object recognition and categorization, control-using computer. 6

Reference Books:

1.Mechatronics: Bradley, Dawson, Burd, Loader.

2. Robotic Engineering: R.D. Klafter, M.Negin,T.A.Chmielewski.

EL DT05: Advanced Embedded Systems

Objectives:

1. Define Embedded system
2. Describe applications of embedded systems.
3. Understands the architecture, assembly & Interfacing of different 16-bit and 32-bit microcontrollers
4. Learn software techniques to embed codes in to the systems
5. Learn to develop systems that make optimum use of available system resources

1. Software engineering practices in embedded systems: (02)

Process life cycle, models, and analysis design implementation, testing validating and debugging.

2. Architecture of 16 and 32-bit Processors Embedded Processors (16)

Introduction to 16 and 32-bit Processors, Difference between RISC and CISC Architecture

ARM Controllers- ARM Architecture and Memory Organization, Pipelining and cache concepts, 32 and 16 bit operating modes, Programming Model, ARM and Thumb Instruction Set, Exception Handling, Simple ARM programs. Assembly and C- programming (GNU Tools)

Study of examples of ARM and RISC family Microcontroller: LPC2104/05/06 or LPC2148 or any equivalent

3 RTOS Concepts (10)

Inter process communication and synchronization of processes, Tasks, and Threads

Multiple process in an application, problem of sharing data by multiple tasks and routines

Inter process communication: process, threads, task, semaphores, mailbox queues,

4 Real time operating system (RTOS) (14)

Program modeling concept in single and multiprocessor systems,

Real Time Operating System: Introduction to real-time, hard vs. soft real systems, classic unit processor scheduling, static and dynamic scheduling, OS functions needed for real time computing.

Operating system services, I/O subsystem, network operating system, Real time and embedded system, operating system, interrupt routines in RTOS environment

Introduction to Embedded Linux internals, Linux kernel for device drivers and embedded system

5 Real time operating system (RTOS) programming tools (08)

Overview of Micro C/OS-II: need of well tested and debugged Real time operating system (RTOS), use of Micro C/OS with examples.

Text Books:

1. Embedded Systems – Rajkamal
2. ARM system – on chip Architecture: Steav Furber, Wesley Publication
3. Real time systems: Jane Ws Liu, person Publication
4. Micro C/OS- II, The real time Kernal : Jean Labrose R & D technical Books

Reference Books:

1. Embedded Microcomputer systems: Jonathan W Valvano – Thomson Publication
2. An Embedded Software Primer by David E. Simon. Publisher: Addison- Wesley. ISBN 0-201-61569-X. Copyright 1999.
3. Programming in C" by Stephen Kochan. Publisher: Hayden Books/Macmillan
4. Computer Book Publishing Division. ISBN 0-672-48420-X. Copyright 1988.
5. Programming & Customizing The AV R microcontroller- Dhananjay V Gadre

6. Embedded microcontroller System – Jonathan Valvano.

EL DT 06: Digital Image Processing

Objectives:-

1. To make students aware of basic mathematics needed for Digital Image Processing.
2. To train the students for software required for Digital Image Processing.
3. To get the students acquainted with the various algorithms involved in Digital Image Processing.

1.Introduction (05)

Digital image processing- problems and applications, image representation and modeling; image enhancement, image restoration, image analysis, image reconstruction from projections, image data compression

2. Image perception (05)

Light, Luminance, Brightness and Contrast; MTF of the visual system, the visibility function, monochrome vision models, image fidelity criteria, color representation, color matching and reproduction, color coordinate systems, color difference measures, color vision model, temporal properties of vision.

3. Image sampling and quantization (08)

Two dimensional sampling theory, extensions of sampling theory, practical limitations in sampling and reconstruction, image quantization, the optimum mean square of Lloyd – max quantizer, a compandor design, the optimum mean square uniform quantizer, examples comparison and practical limitations, analytic models for practical quantizer, quantization of complex Gaussian random variables, visual quantization.

4.Image Enhancement (06)

Point operations Histogram modeling, Spatial Operations, Transforms Operations Multispectral Image Enhancement, False color and Pseudo color, Color Image Enhancement

5. Image Filtering and restoration (12)

Image observation Models, Inverse and Weiner filtering, Finite Impulse Response(FIR) Weiner Filters, Other Fourier Domain Filters, Filtering Using Image transforms, Smoothing Splines and Interpolation, Least Square filters, Generalized Inverse, SVD, and Iterative methods, Recursive Filtering for state Variable Systems, Causal Models and recursive filtering, Semi causal Models and Semi recursive Filtering, Digital Processing of Speckle Images, Maximum Entropy Restoration, Baysian Methods, Coordinate Transformation and Geometric Correction, Blind Deconvolution, Extrapolation of Band limited Signals.

6.Image Analysis and Computer Vision (08)

Spatial feature extraction, Transform Features, Edge Detection, Boundary Extraction, Boundary Representation, Region Representation, Moment Representation, structure, shape features, Textures, Scene Matching and Detection, Image Segmentation, Classification Techniques, Image understanding.

7.Overview of Image Data Compression (06)

Pixel Coding, predictive Techniques, RLE,LZW compression, comparison of various image file formats, TGA, GIF, TIFF, BMP, JPEG, CDR.

REFERENCES

Textbooks

1. K. R. Castleman, *Digital Image Processing*, Prentice-Hall, 1996
2. A.K. Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1989
3. A.B. Chanda, Dutta Majumdar , *Digital Image Processing*, Prentice-Hall, 2000
4. Dawyne Philips, Image processing in C: Analyzing & enhancing Digital images, BPB Publications

Recommended Further Reading

1. J. S. Lim, *Two-Dimensional Signal and Image Processing*, Prentice-Hall, 1990
2. R. C. Gonzalez and R. E. Woods, *Digital Image Processing*, Addison-Wesley 1993
3. E. Dudgeon and R. M. Mersereau, *Multidimensional Digital Signal Processing*, Prentice-Hall, 1984
4. *Josef Kittler & Michael Duff*, Image Processing & system Architecture, *Research studies Press*
5. *Image Processing* , Pearson Education India

EL DT07 : Printed circuit board technology.

Objectives:-

1. To make the students aware of the different industry procedures in PCB making.
2. To determine the problems involved in making a good PCB.
3. To make the student aware of the issues of making PCB for high frequency operation.

1. Manufacturing and Fabrication Technology (06)

Introduction to a Printed Circuit Board. Manufacturing: Fabrication Technologies, Defining Fabrication Limits, Drawing, The Fabrication Process. Design for Assembly, Soldering a Thru-Hole Component. Quality Solder Joints. Determining the Annular Ring for Assembly. Component Spacing. Component Placement. Manual Assembly vs. Auto Assembly. Single-Sided Assembly vs. Double-Sided Assembly. Manual Assembly, Auto Assembly.

2. Introduction of PCB Designing Tools (12)

Schematics and the Netlist, Schematic Entry. Understanding Electricity. Software Terminology (Orcad, Protel). Understanding Components. Schematic Standards. Schematic Design Checklist. Schematic Styles, Sheets and Strategies. Connectors and Sheet Connectors. Designing a PCB, Initial Design Determination, Using Tools of the Trade.

Utility tools

Determining the Material Type to Use. Designing the Board. Libraries, Components, and Data Sheets, Understanding Components. Component Consistency. Component Symbol Types. Library Naming Convention. Manufacturer-Generic vs. Manufacturer-Specific Components. Drawing the Components. Board Completion and Inspection.

CAD Tools

Technical Inputs to the CAD System for SM Circuits, Technical Outputs from the CAD System for SM Circuits, Inputs/Outputs from CAD for Planning and Costing Production

3. PCB design for SMDs (10)

Introduction, Board Physical Structure**:** SM PCB Aspect Ratio and Thickness, PCB Base Material Option, Solder Resist Options, Mounting SM Assemblies into Equipment,

4. SM PCB Layout Design Guidelines:- 10)

General Points on Component Positioning , Individual Component Proximity Guidelines **,** Track Widths and Gaps, Termination of Fine Tracks at Solder Pads, Leads not Used Electrically, Track Management, Fan-out and Proximity Guidelines

5. Chemicals used in SMD PCB design: (06)

Solder Resist Specification and Aperture Design Selecting the Right Type of Solder Resist:(i) Soldering Process, (ii) Component Types and Spacing on the Board, (iii) Resist Thickness Requirements, (iv) PCB Material and Manufacturing Process **Solder Paste Application:-** Methods of Solder Paste Reflow: (i) Screen Printing, (ii) Dispensing

Design of Screen Apertures: (i) Controlling Printed Volume of Paste, (ii) Aperture

Design for Selected Mask Materials

6. Mounting Techniques and Design considerations:- **(06)**

Using Through-hole Components on Mixed Technology Boards**:** Layout Guidelines, Use of Plugs and Sockets, Design Constraints due to SM Processes Some Thermal Considerations:-Thermal Plot at CAD Stage, Locally Increasing Thermal Conductivity of PCBs, Thermal Breaks Lead frames**:** SIL Versions, DIL Versions

Reference books:-

1. SURFACE MOUNT & MIXED TECHNOLOGY PCB DESIGN GUIDELINES
A Handbook for Professional Engineers
By David Boswell Electrochemical Publications, IOM, 1997-2005

2.AN INTRODUCTION TO PRINTED CIRCUIT BOARD TECHNOLOGY
by J. A. SCARLETT Electrochemical Publications, IOM, 1997-2005

3. Printed Circuit Board Designer's Reference: Basics.
Author CHRISTOPHER T. ROBERTSON

4. PCB Technology By Bosschart TataMcGraw Hill Pub.s

EL DT 08: Television and Systems

Aim and objective:

1. To make student aware of basic principles of video recording.
2. To make students understand the working of black and white and color television.
3. To make student aware of working principle of videodisc.
4. To understand principle of recording/replay of optical discs.
5. To make students familiar with working of VCD, DVD players.
6. To give general idea of systematic faultfinding of video systems.

1: **Audio and Video signals and their origin**. **(12)**

Conversion of picture information into electrical signal. TV camera black and white and color. Camera adjustments. image oprthicon, vidicon and plumbicon camera tubes. Solid state image sensor, PAL color signal and its encoding. Spectrum of PAL signal.

2: **Scanning and composite video signal**. **(14)**

Resolution of TV system. Picture information and video frequencies. Block diagram of black and whiter and color TV systems, important circuits b/w and color TV such as tuner, IF amplifier, video amplifier, AGC, Sync system, chroma section of color TV etc. B/W and color TV picture tubes, flat panel displays plasma display, LCD display, large screen displays.

Introduction to digital TV and HD TV

3: **Recording of video signal (10)**

magnetic tape need for FM of video signal, Need for rotating head mechanism, Color recording and its problem. VHS tape format, Azimuth Recording, Transverse and helical Scan. Block diagram and working of a VCR (VHS System) Record and Replay electronics. Working of Tape And Head servo control systems.

4: **Principle and working of Magnetic Video Disc (10)**

CLV Vs CAV, CD encoding, CD making process, Optical Pickup Assembly, Servo system and motor. Block diagram and working of CD Player, Block Diagram of MP3 player.

VCD: Construction and working, MPEG, Block Diagram and working of VCD player,

DVD: Construction and working principle, Block diagram of Player

5: **Systematic Fault finding of Color TV** **(04)**

Reference Books:

1. Video Handbook: Vazel and King
2. Basic TV and Video Systems: Grob, Herndon(McGraw Hill)
3. T. V. & Video Engg. : Dhake
4. Modern CD Player servicing Manual: Lotia, Nair, Varu BPB Pub.
5. Modern VCD Player : Lotia, Tonc BPB Publication

EL DT 09: Material properties & Fabrication techniques

Objectives:

1. To give general idea of various properties of materials.
2. To make student aware of various fabrication processes.
3. Design aspects of various components /devices correlated with properties of materials.

1. Types of materials:(Introduction and list of materials in each type) (06)
Conductive, dielectric, resistive, insulating, semiconductor
Plastics, polymer

2. Material properties (in relation with above materials) (24)
Scope: Definitions, ranges of values, units of measurement
Physical properties: Orientation effects, defects- point defects, dislocation, two-dimensional defects, specific gravity, entropy, and density.
Electrical properties: Conductivity, receptivity (DC, RF) superconductivity, thermo electric phenomenon, and dielectric constant Dissipation factor, TCR, vibration, Ferro electricity, anti Ferro electricity

Mechanical Properties: Modulus of elasticity tensile strength, elongation, yield stress, yield strength, impact strength.
Optical properties: Optical constants & physical significance, reflection, refraction, diffraction, scattering, dispersion.
Thermal Properties: Burning rate, heat dissipation, specific heat, thermal expansion coefficient, maximum service temperature, melting point, thermal conductivity, thermion work function, heat capacity, evaporating temperature.

Magnetic Properties: permeability, losses, magnetization, acoustical properties . Permittivity, strength, insulators and its properties, breakdown, piezoelectric properties.
Chemical Properties: chemical resistance, resistance to oxidation.

3. Clean room techniques: Class of clean room, FAB lab & components of FAB system (04)

4.Design and Fabrication Technology: (16)

Resistors and capacitors: Fabrication techniques – 1.bulk (wire, powder, flexes) 2. Thin film 3. Thick films
Study of parameters-value, TCR, wattage, tolerance
Power and IF transformers: Fabrication techniques,
Study of parameters - turns ratio, stampings, efficiency.
Pn junction diode: Fabrication steps- crystal growth, doping, oxidation, diffusion, ion implantation, lithography, metallization and etching.

Text Book:

1. Electronic Properties of Materials: R.E. Hummel
2. Electronic Properties of Materials: David Jiles
3. VLSI fabrication principles: S.K. Ghandhi

Reference books:

1) Electronic components & materials principles, manufacturing, maintenance: -S. M. Dhir TMH
2) Principle of electronic material and devices - S. O. Kasap TMH

EL DT 10 BIOMEDICAL INSTRUMENTATION

OBJECTIVES:

1) To prepare awareness about biological signals, their measurements and interpretation.
2) To understand the working principles of modern medical instruments.
3) To lay down specification and understand design methods for electronic circuits used in medical instrumentation.
4) To understand the role of computers and programming in medical application.
5) To learn advanced image processing as applicable in medical imaging .

PREREQUISITES:

Advanced signal processing

Fourier series, Fourier transforms, Laplace transform of signals, Sampled data signals, DFT, FFT, Auto Correlation, Cross- correlation of signals, Convolution filtering signal sampling & reconstruction, Signal modulation, nonlinear and linear processing syllabus.

1. FUNDAMENTALS OF MEDICAL INSTRUMENTATION (4)

Anatomy and physiology, Physiological system of the body, Biomedical signals and their sources. The need of biomedical instrumentation ,Basic medical instrumentation system

2. BIOMEDICAL TRANSDUCER (6)

Classification of transducer, Performance characteristic of transducer, Transducer for body temperature measurement, Displacement, position and motion transducer
Pressure transducer, Optical fiber sensors, Bio sensors, Smart sensor

3. BIOMEDICAL RECORDERS (8)

Basic electronic recording system, Biomedical signals analysis techniques, Fourier transform, Fast Fourier transform (FFT), Wavelet transforms, Electro cardiograph (ECG)

ECG leads; Microprocessor based multichannel ECG systems, Electroencephalograph (EEG), Electromyograph (EMG), Other biomedical recorders, Ballistocardiograph (BCG), Electro-oculograph (EOG), Electroretinograph (ERG)

4. PATIENT MONITORING SYSTEM (6)

Cardiac monitor, Measurement of heart rate, Measurement of pulse rate, Blood pressure measurement, Measurement of respiration rate, Impedance pneumography

5. INSTRUMENTATION FOR BLOOD (6)

Blood flow meters, Ultrasonic Blood flow meters, Laser Doppler Blood flow meters
Blood gas Analyzer, Blood pH measurement, Blood cell counters, and Types of blood cells
Methods of cell counting

6. OPTHALMOLOGY AND AUDIOLOGY INSTRUMENTATION (6)

Audiometer, Acoustic impedance meter, Evoked response audiometer, Automated perimeter, Funds reflectometer, Tonometer, Eye’s movement measurement

7. THERAPEUTIC EQUIPMENTS (4)

Cardiac pacemaker, Surgical diathermy machine , Ultrasonic therapy unit , Dialyzers Modern lithotriptor systems, Anesthesia machine, Ventilators, mechanics of respiration, Modern ventilators. Radiotherapy instruments

8. MEDICAL IMAGING SYSTEMS (6)

Basic of Diagnostic Radiology, X-Rays & Properties of X-ray, X-ray machine, Dental X-ray machine, CT scanner, Gamma camera, Nuclear magnetic resonance (NMR) system, Echocardiograph.

9. BIO-TELEMETRY (4)

Introduction, Physiological parameters, Components of bio-telemetry system Implantable units, Applications of telemetry in patient care

BOOKS RECOMMENDED

1. Handbook of Biomedical instrumentation
R.S Khandpur -Tata Mc Graw Hill (2001)
2. Biomedical instrumentation and measurement (2^{nd} Edition)
Cromwell, wiebell, Pfeiffer. PHI ,Delhi (1996)
3. Medical instrumentation : Application and design (Third Edition)
John G.Webster - John Willey & Sons (1998)

EL DT11 : Electronics & Computers in Agriculture

1. Basics of Agriculture: 12

Introduction to Soil Science- Soil structure, Soil properties, Soil processes Formation of Soil, types of soils, Organisms and soil processes, Soil as a medium for plant growth, Soil moisture & efficiency soil pH values and crop production

Chemical analysis of soil, water bearing capacity, Soil erosion and conservation, measurement of soil parameters.

Introduction to Crop Science- Elementary crop science, Basic principles and advances in photosynthesis. Paste and disease management, Post harvesting, Role of fertilizers, Different types of crops. (Floriculture, Horticulture , Mushroom culture, etc.)

2. Agriculture equipments and Automation: 18

Introduction to agriculture measurement techniques,: Agricultural parameters (Temperature, pH, Conductivity, Salinity, Soil Moisture,) operating principles of sensors and actuators for Agriculture, Measurement of temperature, Measurement of pH and conductivity, Soil analysis and soil testing, soil moisture measurement, Introduction to Agro meteorology: RH, Wind speed and direction, Radiation, rain Agro meteorological instruments: Anemometer, Use of PLDs, Microprocessors and Microcontroller, Data converters, Display devices, in agricultural automation.

Use of opto-electronic devices for measurement and control of physical parameters in agri- electronics, Salinity tester, specific ion analyzer, field usable , pH meter. Agricultural equipment and automation, Automatic drip irrigation.

3. Computers & Special Information technology in Agriculture: 12

SIT, GIS/ GPS software's Applications for Ground water modeling, crop forecasting & estimate, soil erosion etc, Use of Digital Image processing, Satellite missions, Hyper spectral remote sensing, physics of optical & microwave remote sensing, thermal mapping.

Simulators used for study of crop growth. Data logger, features of data loggers, data loggers for dedicated use in agriculture, Computer based automatic weather station.

4. Green House Instrumentation: 08

Green House Instrumentation: Green House Technology introduction, instrumentation required for tissue culture techniques, Use of simple electronic circuits for control for physical parameters like temperature, humidity and irrigation, and indication of physical parameters.

References:

1. Treaties on Agro-Physics & Agri electronics : Dr. G.N. Acharya & Dr. D.G. Hapse
2. Fundamentals of remote sensing: George Joseph
3. Fundamentals of Soil: V.N. Sahi- Kalyani Publication
   Principles of Agricultural Engineering – A.M. Michale
4. Spatial information technology I.V. Muralikrishna Vol I & II BS Pub.

EL DT 12 Automotive Electronics

1. Introduction to Automotive electronics [15]

Engine management system (EMS), Power train
Driver assistant modules – night vision, cruse control, intelligent control
Body control Modules – Power window, central locking, interior and exterior lighting, heating / cooling (ac approaches inside vehicle), seat movement, steering angle movement
Immobilizers, security systems (Theft alarms
Infotainment – Music system, GPRS, hands free telephony, other Entertainments

2. Microcontrollers used in automotives [15]

Free scale Infenion (16 – 32 bit, Dual core, tri-core) engine management. Selection criterion of microcontrollers in automotive applications, Specific applications e.g. start 12 series – free scale, NEC-V850 widely used in automotive

3. Automotive Networks [10]

CAN Communication, LIN, MOST (used for entertainment), sensors, FLEX RAY

4. Awareness of Industrial Tools for testing these Networks – [10]

Simulation software, vector informatics tools, CAN analyzer (Hardware and software), LABVIEW, Software architecture - AOTOSAR (Automotive software architecture)

Reference: Automotive web sites, Manuals, Books to be searched on google.

EL DT 13 DSP systems and applications

Prerequisite : Background study / Knowledge of Laplace Transform is essential .

Objectives:

After studying this course student will

1. Learn basics of signals.
2. Learn designing of filters & basics of DSP processor.
3. Understand Processor architecture, DSP based hardware design and application.

1 : Electronic Signals and Systems (06)

Concept of signal and signal processing , classification of signals , CT and DT , deterministic and non-deterministic , periodic and aperiodic , even and odd , energy and power signals etc. Singularity functions for signals.

Classification of systems , static and dynamic , linear and non-linear , Time variant and Time invariant , casual and non-casual , stable and unstable.

2 : Fourier Analysis of Signals (10)

Fourier series representation of CT signals , trigonometric , polar and exponential forms of Fourier series , Direchlet conditions , Continuous Time Fourier Transform , Concept of Amplitude and phase spectrum of CT signals.

Discrete Time Signals , Discrete Fourier Transform , Inverse DFT , Fast Fourier Transform , Radix 2 algorithms for FFT , Amplitude and Phase spectrum of DT signals.

3 : Time and Frequency Domain analysis of DT signals (12)

Z-transform , Inverses Z-transform , difference equation and its solution , concept of transfer function of DT system, Impulse response , Time and frequency domain analysis of DT system using transfer function , concept of realization of transfer function.

DT filters , Impulse Invariant and BLT method for designing of DT filters , IIR and FIR filters , Concept of convolution and co-relation , brief introduction of window technique for DT filters

4 : Digital Signals and Systems (06)

Analog to Digital conversion of signals , concept of sampling of CT signals , Shanon's Sampling Theorem , Nyquist frequency , Aloasing effect , antialising filters , concept of quantization and quantization error , encoding . Block diagram representation of a DSP system , Practical A/D and D/A converters.

5 : Digital Signal Processing (08)

. Digital signal processor Architecture , Multiplier and Accumulators, ALU and Barrel shifter , Memory and Cachey, Registers , Buses , peripheral interfaces , circular Buffers , specialized Hardware , Bit reversal , Timer , Counters , Clock and PLL , power supply , Real Time and Off-line processors , Manufacturers of Digital Signal Processors , packaging of Digital Signal Processors.

6 : Applications of DSP : (06)

Qualitative information with block diagram representation (and numerical exercises wherever necessary) of the following applications be given.

Filtering, Modulation. Demodulation, Motion control and positioning, seismography , Radar , Sonar , noise reduction and echo cancellation , speech recognition, interference rejection, image processing.

Books –

1. Digital Signal Processing: S. Salivahan, A. Valuraj, C.Gnanapriya, Tata McGraw Hill Pub. Co. Ltd. Edn. 2006.
2. Digital Signal Processing: A Hands on Approach: Charles Schuller, Mahesh Chugani, Tata McGraw Hill Pub. Co. Ltd. Edn. 2006.
3. Digital Signal Processing: - Principles, Algorithms and Applications: John G Proakis, Dimitris G Monolkis, and Pub. Person 2005.

M.Sc. Electronic Science Part II (From June 2009)

EL3UP05 Practical Course V

Total Experiments to be performed 12

Embedded Systems 4 + Process Control 4 + Department course 4

(As listed below)

Group A : Embedded Systems

6. Basic Assembly language programs for 8-bit microcontroller.
   Signed and unsigned arithmetic, Code conversions, String manipulations
7. Design of 8- bit microcontroller Target board
   Clock circuit, Reset circuit, buffers, port expansion, programming facility
8. Interfacing to 8-bit microcontroller (keyboard and LCD display)
9. Use of cross compiler (Writing a program in 'C' for 8 bit Microcontroller-ADC 0804 interfacing).
10. PWM Motor control with CCP(Compare Capture Pulse-Width-Modulation) using PIC.
11. Flash programming techniques- Phillips, Atmelserial ISP, Parallel Programming. To verify simple assembly programs Square wave generator/ frequency counter/ Relay

Group B : Process Control

To design and test proportional controller .

To design and test PI controller.

3. Simulate the event sequence for operation of washing machine/ coffee vending machine/ bottle filling plant using PLC simulator.
4 To test the event sequence for operation of washing machine/ coffee vending machine/ bottle filling plant using PLC module.
5 Study of Stability of control system.(temp/flow)
   Open loop transient response method OR Zigler Nichols method
6. Study the effect of capacity of process on cyclic response of an on-off controller.

12. To study the position / velocity control of dc servo motor.

Department Course –

Note : Any 04 practical corresponding to departmental course at the center.

1. Design & Simulation of R & various parameters- tolerance, thin film TCR, high frequency resistance.
2. To design, built and test buck regulator.
3. Develop a program in C / MATLAB to understand various image processing techniques. Sharpening of image
   a) Edge detection in the image.
   b) Blurring of the image
   c) Contrast adjustment
   d) Image embossing
   e) Enlarge and reduce
4. Study of Actuators and their driving circuit. Different types of motors and solenoids.
5. Draw a schematic using Orcad /Protel/MicroSim, Simulate the circuit and Design a single/double layer PCB layout for Regulated power supply using IC regulators (78xx, 79xx). (Analog circuit PCB).
6. To measure moisture content in seeds/ grains (Using capacitive sensor)
7 Pulse rate measurement
8 Optical fiber sensor
9 IIR filters Design using Bilinear Transform: Low pass Filter, High pass Filter.
10. Serial EPROM interface using I2C protocol.
11 Study of cable TV system.

EL3UP06 Practical Course VI
Total Experiments to be performed 12
Any Four from each Department course (3 x 4 =12) conducted at the centre

Group C : Data Communication and Networking EL DT 01

1. Study of different error detection and correction codes.
2. Study of LAN topology.
3. Setting of LAN for two nodes. (Server & Nodes)
4. Using Client Server network.
5. Setting of peer to peer network.
6. Using peer to peer network.

Group D : Opto electronics ELDT02

1. Optical Fiber parameter testing
2. Mode field diameter
3. LASER beam Profile
4. LED profile
5. Optical position encoder
6. Setting up fiber optic voice link
7. Design Build & test digital data communication system

Group E : Advanced Power Electronics ELDT03

1. Designing of testing of Boost converter and Buck Boost converter.
2. Stepper motor control using PWM
3. AC motor control
4. DC power supply using fly back / forward / half bridge / full bridge converter
5. Emergency light control
6. Measurement of transformer parameters
7. Motor control using PWM
8. Simulation using PS-SPICE (for converter, inverter, rectifiers, etc.)
9. Design and study of Integral half cycle/full cycle control.
10. Study of synchronous motor drive

Group F : Mechatronics ELDT04

1. Study of kinematics (position, velocity etc) for a robotic system.
2. Study of different types of robots.
3. To build and test a 1D robotic arm.
4. To build and test a 2D and 3D robotic arm.
5. To test, build and control a robotic vehicle.
6. Study of application of fuzzy logic and artificial intelligence in robotics.

Group G : Advanced Embedded Systems ELDT05

1. Basic Assembly language programs for 16/32-bit microcontroller.
2. Interfacing LCD to 16/32 bit microcontroller
3. Interfacing key board to 16/32 bit microcontroller
4. Serial EPROM/EEPROM interface using SPI protocol.
5. Interfacing external interrupt.
6. Interfacing DAC to 16/32 bit microcontroller
7. Interfacing ADC to 16/32 bit microcontroller

Group H : Digital Image Processing EL DT 06

1. Design of API using V2.
2. Study of various available image processing software for performing various operations on a given image.
3. Read and display different image files:-
   BMP, GIF, TGA, TIFF, PCx, JPEG.

Group I : PCB design ELDT07

1. Draw a schematic using OrCAD /Protel/MicroSim and Design a single/double layer PCB layout for Memory interface with 8051 microcontroller. (Digital circuit PCB).
2. Draw a schematic using OrCAD/Protel/MicroSim and Design a single/double layer PCB layout for interfacing ADC with Microcontroller.(Analog + Digital PCB).
3. Draw a schematic using OrCAD/Protel/MicroSim and Design a single/double layer PCB layout for transistorized AM receiver circuit. (RF circuit PCB).
4. Draw a schematic using OrCAD/Protel/MicroSim and Design a single/double layer PCB layout for Instrumentation Amplifier using SMD components.(SMD components circuit PCB)
5. Draw a schematic using Orcad /Protel / MicroSim, Simulate the circuit and Design a single/double layer PCB layout for CE amplifier, 2-stage RC coupled transistorized amplifier. (Analog circuit PCB).

Group J : Television and Systems ELDT8

1. Circuit tracing and studying of waveforms at different test points of a B/W TV Receiver. Compare Faulty and Proper waveforms.
2. Circuit tracing and studying of waveforms at different test points of a Colour TV Receiver.
3. Study of SMPS of a Colour TV
4. Maintenance & Troubleshooting of a VCR
5. Maintenance & Troubleshooting of a CD player(VCD, DVD etc)
   Study of a chroma section waveform in a c

Group K : Material Properties & Fabrication techniques ELDT09
Refractive index measurements using Ellipsometer o f thin films
Design and simulation of R- tolerance, thin film and thick film, TCR, high frequency resistance (frequency dependent/frequency independent)
Magnetic Properties- IF Frequency response characteristics transformer, hysteresis
Young's Modulus – Cantilever (Pressure sensors)

Group L : Biomedical instrumentation ELDT10

1) Heart rate counter
2) Electronic stethoscope.
3) Blood pressure Measurement.
4) Interfacing transducer signals to the N-controller / N-processor
5) Measurement of Skin contact impedance using surface electrodes
6) Bed - side patient monitoring system
7) Pace maker

Group M : **Electronics & Computers in Agriculture ELDT11**

1. Measurement of soil parameters (pH, conductivity, moisture)
2. Measurement of meteorological parameters (wind speed, wind direction, temp.)
3. Use of GPS software to gather data related agriculture
4. Development of automation for green house parameters using microcontroller / PLC.
5. Development of automated drip irrigation system using microcontroller / PLC.
6. To design, built and test temperature controller for green house applications.

Group N: Automotive Electronics EL DT12

1. Study and analysis of central lock system used for cars.
2. Study and analysis of Power window system for car doors
3. Design and test automatic wiper system with respect to raining.
4. Study of Automotive communication network for internal environmental control
5. Study of CAN bus and its application in automobile.

Group O: DSP systems and Applications EL DT 13

Matlab/ C/ Code composer studio (any 2)

1. Basic Practical on Signals using Code to generate unit Impulse, unit step, exponential sequence, sinusoidal sequence
2. Moving average filter: smoothing random variation in data
3. Convolution: Linear, Circular
4. Image processing

Filter designing using DSP processor (any two)

IIR filters Design using Bilinear Transform: Band pass, Filter Notch filter
FIR filters Design using Window method: Low pass Filter, High pass Filter, Band pass Filter Notch filter
Filter realization
Speech processing

EL3UP 07 Project Course I
EL3UP 08 Project Course II

Project Guide lines

Format of the project course

The project work is to be carried out in light of following guidelines in TWO SEMESTERS.

SEM -III:

The Detail Contents Are As Follows:

1. Preparation of the Synopsis & Presentation
2. Literature Review
3. Time Schedule
4. Resource Planning Comprises:
   - Preparatory experiments
   - Hardware experiments
   - Software experiments: Algorithms, flow charts, Coding of the project work using selected programming language.

SEM IV:

5. Paper planning or Paper writing and presentation skills
6. Report / file of each module should be maintained by the student.

Note: overall the examiner should evaluate performance of the student by considering his/her internal performance during the year.
Distribution of total 100 Marks is as under:

- Internal marks: 20
- External marks: 80

M.Sc. Electronic Science Syllabi

Non-credit courses

Purpose:

i) To enhance linguistic skills necessary for overall development and effective communications.

ii) To get preliminary knowledge about technical documentation, project proposals.

iii) To get introduced to the concepts of entrepreneurship development, management techniques.

iv) To learn interview techniques

Non-Credit Courses

1. Development of Scientific Writing Skills

Activities:

- Workshop of approximately 10 lectures of 90 minutes (Distributed on Sundays or once in a month) to be conduced by center
- Or one time workshop of 3 days.
- Assignments to be handled in workshop
    1. Lab and instrument manual
    2. Project Report
    3. Project Presentation Slides
    4. Research Papers
    5. Thesis writing

Common workshop can be held for entire M.Sc. II (of 60/70 students) or at individual Institution / college/ University.

2. Entrepreneurship development:

Activities:

- Identification of opportunities of self employment in the field of electronics
- To visit a Government financial institute which provides financial support for SSI
- Interview of successful entrepreneur.
- Center should arrange a lecture/ workshop of successful entrepreneur.

3. Language skill development

Activities:

1. To read at least three books (novels, stories, scientific fictions etc.) and submit summary (worth 5 pages) of each book. Summary should include the individual remarks about the book in general.
2. To prepare the collection of articles about a particular topic (say a theme) These articles may from newspapers, magazines, special issues, journals etc. They should be of general knowledge type without going into the complexities or mathematics of the topic. The collection should be arranged in a sequence to give completeness. It should have the comments of the students.

4. Personality Development

Activities:

1. Introducing One self
2. Writing Bio data
3. Facing interviews
4. Participating in Group Discussion
5. Methods to improve confidence and commutation skills
6. Preparing for open defenses or oral examination or participating in seminar
7. Collecting information about Address, reference, personalities, institutions
8. Planning a small study tour/arranging Welcome and sendoff functions
   Introduction to a Function/ to a Chief Guest/ Vote of Thanks
9. Listening, speaking, reading, writing skills
10. Library and reference skills
11. Dramatization of a particular theme
12. Interpreting technical, advertisement/document
13. Hobbies
14. Social awareness

Lectures/Seminars/workshop should be conducted by college.