

M.Sc. Sem. I to IV

Prospectus No. 20081215

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

अभ्यासक्रमिका
विज्ञान पारंगत परिक्षा (इलेक्ट्रॉनिक्स इन्स्ट्रुमेन्टेशन)
सत्र १, सत्र २, सत्र ३ व सत्र ४

PROSPECTUS
OF
MASTER OF SCIENCE EXAMINATION
Semester -I, Winter 2008,
Semester -II, Summer 2009,
Semester -III, Winter 2009,
Semester -IV, Summer 2010
IN
ELECTRONICS (INSTRUMENTATION)



2008

Visit us at www.sgbau.ac.in

Price Rs. /-

PUBLISHED BY
Dr.K.G.Khamare
Registrar
Sant Gadge Baba
Amravati University
Amravati-444602

-
- © 'या अभ्यासक्रमिकेतील (Prospectus) कोणताही भाग संत गाडगे बाबा अमरावती विद्यापीठाच्या पूर्वानुमती शिवाय कोणासही पुनर्मुद्रित किंवा प्रकाशित करता येणार नाही.'
- © "No part of this prospectus can be reprinted or published without specific permission of Sant Gadge Baba Amravati University"

Syllabus Prescribed for**M.Sc. Electronics (Instrumentation)**

- 1) M.Sc. Electronics (Instrumentation) is divided into four semesters which include 16 theory papers, 7 practicals with internal assessment & project work.
- 2) Assessment of each theory course is done centrally in the University.
- 3) Internal assessment for each practical will be carried out on the basis of (a) Practical record & viva-voce for Practical-I, III, V & VII, (b)* Seminar for Practicals-II, IV, VI & project work.
- 4) Internal Assessment for each seminar course will be carried out on the basis of minimum 4 (four) seminars, presented by the students in periodic manner with relevant technical coverage in each seminar, marks for seminar course will be awarded on the overall performance of the student.
- 5) The external examination shall consist of-
 - (a) Theory course Written Examination.
 - (b) Practical course Practical Examination & viva-voce.
 - (c) Seminar course..... Oral presentation followed by the questions-answers.
 - (d) Project Oral presentation followed by the questions-answers.
- 6) Distribution of Marks for Project shall be as under.

| | | |
|----------------------------|---|----------|
| (i) Project (Experimental) | : | 30 Marks |
| (ii) Guide Report | : | 05 Marks |
| (iii) Project Record | : | 05 Marks |
| | | 40 Marks |

- **Project :**

Execution and documentation of a project on a specific topic with one of the following aspects :

- (i) Part of on-going research projects in the deptt.
- (ii) Developmental work related to Industrial requirements.
- (iii) Theoretical & experimental studies.
- (iv) Technical writing & project documentation.

- **Seminars :**

Seminars on topic of current relevance covering following aspects :

- (i) Collection of reference material.
- (ii) Assimilation of concepts of preparing document.

- (iii) Communication skills.
- (iv) Presentation styles & use of modern teaching aids.
- (v) Appraisal & evaluation of delivered seminars.

| | | | |
|----|-------|----------------------------------|------------------|
| 7) | (a) | Practical-I,III,V and VII and | |
| | (b) | Practical-II,IV & VI. | |
| | (i) | One Experiment | - 30 Marks |
| | (ii) | Practical Record | - 05 Marks |
| | (iii) | Viva-voce | - 05 Marks |
| | | | Total - 40 Marks |

M.Sc. Part-I Semester-I**Electronics (Instrumentation)**

| | | |
|---------------------|----------|--|
| Paper-I | : | Physics of Electronic materials and Semiconductors Devices |
| Paper-II | : | Mathematical and Computational Methods in Electronics: |
| Paper-III | : | Advanced Electronics Design |
| Paper-IV | : | Scientific Instrumentation |
| Practical-I | : | Atleast 8 Experiments based on Paper I & II |
| Practical-II | : | Atleast 8 Experiments based on Paper III & IV |

M.Sc. Part-I Semester-II**Electronics (Instrumentation)**

| | | |
|----------------------|----------|--|
| Paper-V | : | Physics of Semiconductor Devices & Microwave Principles |
| Paper-VI | : | Power Electronics |
| Paper-VII | : | Electronic Communication |
| Paper-VIII | : | Digital Electronic Design |
| Practical-III | : | Atleast 8 Experiments based on Paper V & VI |
| Practical-IV | : | Atleast 8 Experiments based on Paper VII & VIII |

M.Sc. Part-II Semester-III**Electronics (Instrumentation)**

| | | |
|---------------------|----------|--|
| Paper-IX | : | Linear Integrated Circuits |
| Paper-X | : | Microwave-Communication and Antenna |
| Paper-XI | : | Sensors, Transducers & Actuator for Instrumentation |
| Paper-XII | : | Signal Conditioning Processing and Interfacing Techniques/microcontrollers |
| Practical V | : | Atleast 8 Experiments based on Paper-IX & X |
| Practical VI | : | Atleast 8 Experiments based on Paper-XI & XII |

**M.Sc. Part-II Semester-IV
Electronics (Instrumentation)**

| | | |
|------------|---|---|
| Paper-XIII | : | Microprocessors, Microcontroller & Interfacing.II |
| Paper-XIV | : | Cellular and Mobile Communication |
| Paper-XV | : | VLSI and Embedded System Design |
| Paper-XVI | : | Embedded Programming |

Practical VII : **Atleast 8 Experiments based on Paper-XIII, XIV, XV, & XVI**

Project Work: **Practical VIII**

**M.Sc. Part-I Semester-I
Electronics (Instrumentation)**

Paper-I

Physics of Electronic materials and Semiconductors Devices:

- UNIT-I :** Semiconductors Direct and indirect band gap methods to determine the Forbidden gap electronic & hole transport in semiconductors, Electrical parameters, carrier concentration, mobility, temperature dependence, electrical methods to study the electrical parameters.
- UNIT-II :** Intrinsic- Extrinsic semiconductors, N-type,P-type, idea about dielectric properties., Metal semiconductor contacts, metal insulator contacts, Rectifying & Non Rectifying contacts, PN junction, diode equation.
- UNIT-III :** Dielectric properties, electronic polarisability, Clausius Mosotti relation,dielectric constant static &frequency dependence,e.m.waves in solid,Photoluminiscenceand Raman scattering in crystalline & amorphous material,Piezoelectric properties.
- Unit-IV :** Device fabrication methods: Thin film formation, Crystal Growing methods, idea about synthesis of conducting polymers (brief).PN junction diodes – Schottky diode, tunnel diode, PIN diode, Varactor diode zener diode, point contact diodes(Construction & working).
- Unit-V :** Construction working &characteristics of BJT, FET, MOSFET, MESFET.

Books Recommended:

1. Solid State Physics:Dekkar
2. Introduction to Solid State Physics:Kitlre C.
3. Solid State Physics:Ashcroft &Mermin

Paper-II

Mathematical and Computational Methods in Electronics

- UNIT-I :** Differential equations and their solutions. Laplace, Fourier and Z-transforms their properties and applications in electronics. Signal and system modeling, impulse response, energy and power special density, convolution and correlation, Digital filtering.
- UNIT-II :** Numerical methods for solution of simultaneous equations, LU factorization, Pivotal condensation and Gauss – Jordan methods of matrix inversion, applications in network analysis.
- UNIT-III :** Iterative algorithms, solving equations and finding roots, practical considerations of convergence rate and security. Probability, curve fitting and error analysis.
- UNIT-IV :** Numerical methods for solution of differential, partial differential and integral, equations, Euler’s method, Runge-Kutta method, cubic spline method, numerical integration, differentiation and interpolation.
- UNIT-V :** Simpson’s 1/3 rule, Gauss quadrature formula, Euler Maclaurine formula, Finite difference and finite element methods, applications in solution of Poisson’s equation, drift-diffusion transport process, propagation of e.m. waves etc.

Text Books :

- | | | |
|------------------------------------|---|--|
| 1) Applied Numerical Methods | : | Boas M.L.Willey Int. in Physical Science |
| 2) Numerical Analysis | : | Malvin Marion |
| 3) Data Reduction & Error Analysis | : | Bevington P.R. McGraw- Hill for the Physics Sciences |

Reference Books:

- | | | |
|---|---|---|
| 1) Applied Numerical Methods | : | Shoup T.E. Prent. Hall the Micro-computer |
| 2) Mathematical methods for Physics | : | Ariken, A.G. Academic Press |
| 3) Numerical Methods for Scientists and Engineers | : | K. Sankara Rao, DHI, Publication |
| 4) Engineering Mathematics | : | R.M.Baphana, Technova Publication. |

Paper-III**Advanced Electronics Design**

- Unit-I** : Application of thevenin in Norton and Millman theorems high pass, low pass, thin T filters. Impedance matching. Transformation of Impedance using resistive and reactive networks. Design of typical attenuators.
- Unit-II** : Hybrid parameter analysis of CB, CE and CC amplifiers ,applications of H parameters to typical cases.
Low frequency analysis of common drain, common source amplifiers. Design of BJT, FET and MOSFET amplifiers for different frequencies and impedance requirements.
- Unit-III** : Use of .BJT and MOSFET at high frequencies.Hybrid model and admittance model. Design of RF amplifiers for use in converters, and from tens of TA and VHP system.
- Unit-IV** : AF power amplifier, Complementary and monolithic. Analysis and design of AF power amplifiers. Analysis and design of AF low frequency tuned amplifiers, design of monolithic AF amplifiers for Audio application.
- Unit-V** : Negative feedback design and analysis using all four types of feedback.
Oscillators, Conditions for oscillation. Nyquist criterion. Analysis of weinbridge, phase shift and twin T oscillators, Design of laboratory AF oscillators. Analysis of Hartly,Colpitts and Crystal Oscillator,Design of RF laboratory oscillators.

Books Recommended:

1. Electronic Fundamentals & Applications:John Ryder
2. Electronic Devices & Circuits: Millman Halkias
3. Network Analysis: Van Valkenberg
4. Functional Electronics: K.V.Raman(TMh)
5. Electronic Devices & Circuits:Y.N.Bapat(TMh)
6. Network Analysis:G.K.Mittal
7. MicroElectronics:Millman(Macgra Hill)

Paper-IV**Scientific Instrumentation**

- Unit-I** : Basic electronics laboratory equipment, Multimeters . Electronic Multimeters, Measurements techniques for micro-milli and macro voltages / currents. Design principles of electronic voltohmmeters. Measurement of resistance.
- Unit-II** : Signal sources, Audio frequency and radio frequency sources. Design of typical AF and RF standard signal sources using internal standards and PLL techniques.

- Unit-III** : Oscilloscopes and related display systems. Design of a wideband ac / dc oscilloscope. Detailed analysis. Signal sources. Pulse, Square and function sources. Different techniques of design and application .Logic analysis as a tool for circuit evaluation and testing.
- Unit-IV** : RF measurement techniques. Signal synthesisers.Microwave and UHF / VHF sources. Techniques of spectrum analysis. Network analysis.
- Unit-V** : Microprocessor based electronic test and measuring instruments. basic principles. Design of a microprocessor based signal generator. Design analysis/ signature analysis. Microprocessor based frequency meter. Microprocessor based oscilloscope.

List of Books :

- (1) Electronic Instrumentation & Measurement techniques : W.H.Cooper
- (2) Operational amplifier and linear integrated circuits : R.Gaikwad
- (3) Principles of Industrial Instrumentations ;Potranobis
- (4) Electronics Measurements :Malestat.
- (5) Microcomputer based Design:J.B.Pltman
- (6) Measurement System, Application &Design:E.B.Doblin

Practical-I : Atleast 8 Experiments based on Paper-I & II

Practical-II : Atleast 8 Experiments based on Paper-III & IV

M.Sc.Part-I Semester-II**Electronics (Instrumentation)****Paper-V****Physics of Semiconductor Devices & Microwave Principles**

- UNIT-I** : Opto- electronics devices :
LED, Electroluminescence, phonon, laser diode, photo detection, photoconductive detectors, photo electronic cell, Photo multiplier tube, photodiode, pin photodiode, Avalanche photodiode, photo transmitter, opto couplers.
Display Devices: LCD, LED
- UNIT-II** : Microwave devices:
Concept of -ve resistance, Gunn diode, Klystron, Magnatron, Tunnel diode,PIN diode,Travelling wave tube. impatt diode.
- UNIT-III** : Optical fiber theory & application :
Parameters of types of optical fiber, single & multimode

fibers, dispersion step & graded index fibers, construction of optical fibers cables, loss mechanism, connectors and splices power budget of optical fibered link.

UNIT-IV : Advantages and disadvantages of microwave transmission, loss in free space, propagation of microwaves, atmospheric effects on propagation Fresnel zone problem, ground reflection, fading sources, detector components. Antennas used in microwave communication system.

UNIT-V : Wave guides, TEM, TE & TM waves in parallel plane guides, TE & TM waves in rectangular guides, Poynting vector theorem, attenuation, group & phase velocity & wave impedance of wave guides. (Derivation of equations not expected), wave guide Tees, Bends, directional couplers phase shifters, isolators and magic tees E-plane & H-plane.

Books Recommended:

1. Solid State Electronic Devices: Ben G. Steetman
2. Physics of Microwave Semiconductor Devices: H.A. Watson
3. Physics Semiconductor Devices: S.M. Sze

**M.Sc. Part-I
Paper-VI**

Power Electronics

UNIT-I : Thyristor Devices :
Types (DIAC, SCR, TRIAC), Construction, Principle of Operation, I-V Characteristics, Specifications and ratings, Selection criteria and applications, Turn ON methods : Voltage triggering, Gate triggering, dv/dt triggering, High temperature triggering, Light triggering Communications, Series and parallel configuration of thyristors.

UNIT-II : Thyristor Family :
Phase controlled Thyristor, fast switching Thyristor, Gate turn off Thyristor (GTO), Reverse Controlled thyristor, Static Induction Thyristor, Light activated silicon controlled rectifier (LASCR), FET controlled Thyristor (FET-CHT), MOS controlled Thyristor, Programmable Unijunction Transistor (PJT), Silicon Unilateral switch (SUS), Silicon bilateral switch (SBS), Silicon controlled switch, Schokley diode. Power integrated circuits.

UNIT-III : Controlled rectifiers - AC to DC converters :
Performance indices of rectifiers, Single phase half wave, full wave and bridge rectifiers with Resistive and R-L as loads, Three phase fully controlled bridge converter comparison with single phase, single phase, three phase semi converter, dual converters.

UNIT-IV : Choppers (DC to DC Converters) :
Principles, control techniques, classifications : Class A, B, C, D, E : Communication methods.

UNIT-V : DC & AC Power Supplies :
AC Regulators : Principles, Single phase half wave regulator, single phase full wave regulator with resistive and RL load, three phase regulator, static on load tap changing of transformers, static multistage tap changer, industrial applications.

Shunt and Series Regulator, Switching Regulators :
Buck, boost, buck-boost, IC switching regulator, limitations of switching regulators.

SMPS : Fly back, push pull, half bridge, full bridge converter.

UPS : Offline and on Line UPS.

Books Recommended:

1. Power Electronics: Rammurthi
2. Power Electronics: M.H. Rashid (Prentice Hall)
3. Modern Power Electronics: B.K. Bose (Pearson)
4. Power Electronics: P.C. Sen (TMC)

**M.Sc. Part-I
Paper-VII**

Electronic Communication

Unit-I : Amplitude modulation. Frequency spectrum. Methods of Modulation. Balanced modulator. Modulated class C amplifier SSB and DSB techniques. Am-transmitter, basic principles.

Demodulation, AM receivers. Super heterodyne receiver. Converters. IF amplifiers. AGC. Alignment and Tracking. PLL in receivers.

Unit-II : Frequency and phase modulation. Frequency spectrum methods of modulation. Armatron frequency modulator.

TV fundamentals. Sound and picture transmission scanning. Video camera. (Black and white as well as color) resolution. Aspect ratio. The scanning process. Vertical and Horizontal resolution. Interlaces scanning and video band width. Video signal standards, Video modulation and vertical side band. Sound modulation and inter carrier. Standard TV channel. CCIR system (B standard).

- Unit-III** : The TV camera and camera tubes. Image orthicon, Vidiocon and solid state **CCD** cameras.
TV transmitters, IF modulation, Power output stages block diagram of a typical TV transmitter, **Diplexer**, Micro-wave and Satellite TV. TV Receiver.
- Unit-IV** : Antenna requirements, Yagi. antenna, Block diagram of B/W and colour TV, Block diagram of typical VHF / UHF B/W and color tuner.
The Video IF amplifier. Monolithic Video IF system. The Video detector, sound IF amplifier, AGC. The sound detector, the picture tube. Horizontal and vertical deflection circuit EHT generation. Synchronization circuit and control oscillator.
- Unit-V** : Colour TV circuits fundamentals, Typical color TV system such as PAL, SECAM and NSTC.
The audio spectrum. Electro acoustic transducers **Recording** spool and cassette system.

Books Recommended:

1. Electronic Communication Systems:G.Kennedy
2. Communication Electronics:Deshpande
3. Electronic Communication:.Rody&Coolen
4. Principles ofElectronic Communication:H.Taub&Schilling
5. Electronics&Radio Engg.:E.E.Terman

M.Sc. Part-I

Paper-VIII

Digital Electronic Design

- Unit-I** : Logic probes, Pulse Generators and logic state analyzers for digital testing. Error detection. Spike noise purity checking and generation.
Basic logic gate . logic family characteristics ,TTL theory of operation, Tristate and open collector logic, Schottky TTLS, comparison of TTL logic families, EOIS and PL the MOS logic, PMOS and NMOS families, VMOS, DG MOS , HMOS, C MOS characteristics.
- Unit-II** : Comparison of different families, Schmitt triggers, wired gates, Buffers, tristate, Storbed expadable and Expander gates.
Input signal conditioning and signal sources, Single pulse sources, output signal handling, concept of a PCB line on a transmission line. Differential line drivers and receivers,Power and ground problem. Interfacing of different logic families. Monostables. Duty cycle Limitations.Monostable oscillator,Schmitt oscillator.

- Unit-III** : Standard TTL integrated circuit packages. The 7400 series Objectives of digital systems design, packaging of digital system design. Packaging of digital circuits, General digital system. Design specification, Traditional TTL design, Combinatioal Vs. sequential circuits design of a BCD to 7 Segement driver Machanlsing logic circuits.
- Unit-IV** : Applications of Veith diagram. NAND examples, mixing of logic types. Use of multiplexer in logic functions. Multiplexer,Multiplexer tree,decoding trees. Multidimenational addressing. ROMS, ROM-PROM simplification. PLAs.
- Unit-V** : Sequential logic design, Design of counters with flipflops Modulus counters. Defination of controlled state counters, application to data transmission other MSI sequential applications ,race condition and hang ups asynchronous and synchronous counting, clock defects. Hangs up state ..

Books Recommeded:

1. Modern Digital Electronics: R.P.Jain
2. Digital Fundamentals:T.L.Floyd
3. Digital Principles:R.L.Tokhem
4. Digital Electronics:Taub Schiling

Practical-III:Atleast 8 Experiments based on Paper-V & VI

Practical-IV:Atleast 8 Experiments based on Paper-VII & VIII

M.Sc. Part-II Semester-III

Electronics (Instrumentation)

Paper-IX

Linear Integrated Circuits

- Unit-I** : **Integrated Circuit Fabrication :**
Introduction, integrated circuit, scale of Integration, classification of ICs, monolithic ICs, thin & thick film ICs, Hybrid ICs, Linear ICs, Non-Linear ICs, IC Technology, advantage of IC, IC Terminology, fabrication of monolithic ICs, fabrication of IC component.
- Unit-II** : **Basic Circuits for Linear ICs :**
Biasing circuits, current sources, voltage sources, voltage reference, DC level shifter, Drift in D.C. Amplifier, difference amplifier, Dual input, balanced output, BJT difference amplifier, difference amplifier with constant current source, JFET difference amplifiers.

Unit-III : Comparators and Converters :

Introduction, Basic Concepts, Parameters of a Comparator, Characteristics of a Comparator, Limitations of an op-amp as a Comparator, Monolithic Voltage Comparator, Basic Voltage Comparators, Applications of Comparators, Zero-Crossing Detector, Tape Reader, Digital Interfacing, Electrical Isolator, Window Detector, Level Detector, Voltage Limiters, Sine-to-Square Converter, Trigger Pulse Generator, Phase Detector, Peak Detectors, Regenerative Comparator, Clipping Circuits, Clamping Circuits.

Unit-IV : Phase Locked Loops :

Introduction, Basic Principle of PLL, Transfer Characteristics of PLL, Applications of PLL, Frequency Multiplier, Frequency Translator, AM Detector, FM Detector, FSK Demodulator, Monolithic PLL ICs, IC565 As FM Demodulator, IC565 As Frequency Multiplier.

Electronic Timer :

Introduction, IC 555 Timer, Applications of IC 555 Timer, Mono stable Multivibrator, Astable Multivibrator, Bia stable Multivibrator, Schmitt Trigger, Voltage Controlled Oscillator, Linear Ramp Generator, Pulse Width Modulator.

Unit-V : Active Filters :

Introduction, Necessity of Active Filters, Advantages of Active Filters, Limitations of Active Filters, Characteristics of Active Filters, Low Pass Butterworth Filter, High Pass Butterworth Filter, Band Pass Filter, Band Stop Filter, Comparison between Passive and Active Filters.

Books Recommended:

1. Op Amps&Linear Ics:Ramakant Gayakwad
2. Micro Electronics:Milliman
3. Op Amps&Linear Ics: R.F.Coughline
4. Art of electronics:Horowitz & Hill

M.Sc. part-II**Paper-X****Microwave-Communication and Antena****Unit-I : Microwave Integrated Circuits :**

Materials used for MMIC's fabrication : Substrate material, conductor materials, Dielectric Materials, Resistance material.

Thin Film Devices : Planner resister film, planner inductor film, planar capacitor film.

Planer Transmission Lines : Strip lines, Microwave lines & types.

Hybrid Integrated circuit : Fabrication.

GaAs Fabrication Technology.

Unit-II : Microwave Components Using Strip Line :

Microstrip lines advantages and disadvantages, design considerations of a microstrip line, methods of Analysis of Microstrip Antennas, Microstrip arrays, Design & Development of Microstrip Antenna, Selection of a feed, Determining the path length, path width, future, Scenario of microstrip antenna.

Unit-III : Microwave Communication System :

Propogation mode, Microwave Communication System, Analog Microwave Communication, LOS Microwave, OTH Microwave Systems, Transmission, interference and Signal Damping, field strength of tropospheric wave, duct propogation, fading & its effect in troposphere.

Satellite Communication :

Satellite Orbits, Satellite frequencies, Satellite altitude, / station keeping, transmission path, link calculations, Noise consideration, factors affecting Satellite Communication.

Unit-IV : Digital Microwave Communication :

Digital Hierarchies, Digital Microwave System, Bandwidth efficiency, Hybrid Microwave Systems.

Microwave Antenna :

Horn Antenna, Microwave Dish Antenna, Lens Antenna, Slot Antenna, Microstrip antenna.

Unit-V : Radars :

Block Diagram of Simple Radars, Classification, Free Space Radars Range Equation, Factors affecting range of Radar, Max. unambiguous Range, Pulsed Radar System, Radar Receivers, Modulators, Radar displays, Scanning & Tracking with Radar, doppler effect, CW Doppler Radar, moving target indicator, Blind speeds, Radio Navigation Aids, Radar Antennas.

Books

- (1) Microwave Radar Engineering : M. Kulkarni
- (2) Digital&data communications: Vincents&woyane(Prentice)

Sensors, Transducers & Actuator for Instrumentation

- Unit-I** : Transducers Transducer classifications requirements, basic physics, design considerations, practical difficulties associated with the fabrication of sensors, technologies such as thin/thick films, silicon micro machining, SAW used in different domains.
- Unit-II** : Mechanical, thermal, optical, electrical, magnetic, chemical sensors, displacement, strain, vibration, pressure, flow, force and torque, temperature transducers.
- Unit-III** : Actuators, electromechanical, electro thermal, electro optical and electrochemical actuators, working principles, specifications and application examples, relays, motors, heaters.
- Unit-IV** : Electronic components, specifications of commercially available components, modern package like SMDs, application circuits of sensors with electronic components, Signal conditioning circuits.
- Unit-V** : Transducer Performance :
Electrical tests, measurement units, measurement of voltage, current, frequency, impedance, noise, loading errors, resolution and threshold tests, calibration dynamic tests, environmental test, life test.

Reference Books :-

- (1) Rangan, Mani Sharma : Instrumentation Devices and Systems.
- (2) Nakara, Chaudhari : Instrumentation, Measurement and Analysis.
- (3) E.O.Doeblin : Measurement Systems
- (4) B.G.Liptak : Instrumentation and process control Handbook.
- (5) H.N.Norton : Handbook of Transducers
- (6) C.D.Johnson : Process Control Instrumentation Technology

Microprocessor, Microcontroller & Interfacing-I

- UNIT I** : **Microprocessor 8085&8086:**
Evolution, General Register organization, Architectures, signals, memory organization, buses, I/O addressing, addressing & operating modes, instructions, assembly level programming. I/O Interface, data transfer scheme, Interrupts, DMA. Differences Between 8086&8088.
- UNIT II** : **8085&8086 Basic Interfacing:**

Concept, absolute & linear select decoding , memory mapped I/O, I/O mapped I/O, Interfacing of Keyboards & displays, memory interfacing & bus contention, interfacing chips (8255,8237,8257,8253)

UNIT III : 8051 MICROCONTROLLERS:

Micro controllers and Embedded Processors, Overview of the 8051 Family, 8051 ASSEMBLY LANGUAGE PROGRAMMING, Inside the 8051, Introduction to 8051 Assembly Programming, Assembling and Running an 8051 Program, The Program Counter and ROM Space in the 8051.

Data Types and Directives, 8051 Flag Bits and the PSW Register, 8051 register Banks and Stack.

UNIT IV : JUMP, LOOP, AND CALL INSTRUCTIONS:

Loop and Jump Instructions, Call Instructions, Time Delay generation and Calculation

I/O PORT PROGRAMMING:

Pin Description of the 8051, I/O Programming; Bit Manipulation

UNIT V : 8051 ADDRESSING MODES

Immediate and Register Addressing Modes, Accessing Memory Using Various Addressing Modes.

ARITHMETIC INSTRUCTIONS AND PROGRAMS;

Unsigned, Addition, subtraction, Unsigned Multiplication & Division, Signed number Concepts and Arithmetic Operations.

Books Recommended:

- 2 Microprocessor Theory and Application (revised edition) - M.Raffiquellazammam
- 3 Microprocessor & interfacing : D.V.Hal!
- 4 Advanced Microprocessors and Peripherals :- Ray & Bhurchandi.
- 5 Intel Microprocessor's (fourth edition) : Barry Brey.
- 6 Fundamentals of Embedded Software: Lewis Pearson
- 7 An Embedded Software Primer: Simon Pearson
- 8 Microcontroller and Embedded System: Mazidi & Mazidi

Practical-V : Atleast 8 Experiments based on Paper-IX and Paper-X

Practical VI : Atleast 8 Experiments based on Paper-XI and Paper-XII

**M.Sc. Part-II Semester-IV
Electronics (Instrumentation)
Paper XIII**

Microprocessor & Microcontroller & Interfacing-II

- UNIT I : LOGIC INSTRUCTIONS AND PROGRAMS:**
Logic and Compare Instructions, Rotate & Swap Instructions, BCD and ASCII Application Programs
SINGLE-BIT INSTRUCTIONS AND PROGRAMMING;
Single-Bit Instruction Programming, Single-Bit Operations with CY, Reading Input Pins vs. Port Latch
- UNIT II : TIMER/COUNTER PROGRAMMING IN THE 8051:**
Programming 8051 Timers, Counter Programming.
8051 SERIAL COMMUNICATION;
Basics of Serial Communication, 8051 Connection to RS232, 8051 Serial Communication Programming.
- UNIT III : INTERRUPTS PROGRAMMING**
8051 Interrupts, Programming Timer Interrupts, Programming External Hardware, Interrupts
Programming the Serial Communication Interrupt, Interrupt Priority in the 8051.
- UNIT IV : REAL-WORLD INTERFACING I (LCD, ADC & SENSORS):**
Interfacing an LCD to the 8051, 8051 Interfacing to ADC, Sensors.
REAL-WORLD INTERFACING II (STEPPER MOTOR, KEYBOARD & DAC):
Interfacing a Stepper Motor, 8051 Interfacing to the Keyboard, Interfacing a DAC to the 8051
- UNIT V : 8051/31 INTERFACING TO EXTERNAL MEMORY**
Semiconductor Memory, Memory Address Decoding, 8031/53 Interfacing with External ROM, Data Memory Space
8031/51 INTERFACING TO THE 8255:
Programming the 8255, 8255 Interfacing, Other Modes of the 8255.

Books Recommended:

1. Fundamentals of Embedded Software: Lewis Pearson
2. An Embedded Software Primer: Simon Pearson
3. Microcontroller and Embedded System: Mazidi & Mazidi

**M.Sc. Part-II
Paper-XIV**

Cellular and Mobile Communication

- Unit-I : Introduction to Cellular Networks:**
Introduction, cellular systems, paging systems, cordless and cellular telephone system, cellular capacity and various strategies of channel assignment.
- Unit-II : Mobile Communication:**
Mobile radio propagation, small scale and large scale path loss, reflection, diffraction, scattering, outdoor path loss and indoor propagation model, multi-path channels, fading & propagation.
- Unit-III : Modulation :**
Amplitude, Angle, Digital, Linear and constant envelope modulation, spread spectrum, channel coding : SDMA, FDMA, TDMA, CDMA. Overview of linear and non-linear equalizers.
- Unit-IV : Wireless Networking :**
Difference between wireless and fixed telephone networks, 1G, 2G, 3G wireless networks. Traffic routing in wireless networks, wireless data services, personal communications networks, network databases.
Wireless Systems and Standards :
Fundamental of GSM, Mobile services, system architecture, radio interface, protocols, localization and calling handover, security.
- Unit-V : Digital Enhanced Cordless Communication :**
System architecture and protocol architecture, TETRA, ETACS, U.S. Digital cellular (IS-54), CDMA digital cellular standards, cordless telephone standards CT2.
Mobility :
File systems, wireless application protocol : Architecture, wireless data-gram protocol, wireless transport layer security, wireless transaction protocol, wireless session protocol, wireless application environment, wireless markup language, push architecture. Push/pull services, example stacks.

Text Books :

- (1) Wireless Communication : T.S.Rappaport : PHI
- (2) Mobile Communications : Jochen Schiller, Pearson Education.

VLSI and Embedded System Design

Unit-I : Introduction :

Introduction to MOS and CMOS Circuits, MOS Device Design Equations. The Complimentary CMOS, Inverter-DC Characteristics, Static Load MOS Inverters, The differential Inverter, The Transmission Gate, The Tri State Inverter, Bipolar Devices.

Circuit Characterization and Performance Estimation :

Resistance and Capacitance Estimation, Inductance, Switching Characteristics, CMOS-Gate Transistor Sizing, Power Dissipation, Routing Conductors, Design Margining, and Reliability.

Unit-II : CMOS Circuit and Logic Design :

Basic Physical Design of Simple Gate, CMOS Logic Structures, Clocking Strategies, I/O Structures, Low Power Design, Design Strategies, CMOS chip Design Options, Design Methods, Design Capture and Verification Tools.

CMOS Testing :

Test Principles and Design Strategies for Test, Chip Level Test Techniques, System Level Test Techniques, Layout Design for Improved Testability.

Unit-III : Embedded Systems :

An Embedded System and Characteristics of Embedded Systems, Software Embedded into a system; Real Time Definitions, Events and Determinism, Synchronous and Asynchronous Events, Determinism, Time-Loading, Real-Time Design Issues.

Unit-IV : RTOS & Its Overview :

Real Time Operating System : Task and Task States, tasks and data, semaphores and shared Data Operating System Services - Message queues - Timer Function - Events, Memory Management, Interrupt Routines in an RTOS environment, basic design using RTOS.

Embedded Micro controller Cores and Architecture :

8051 micro controller, architecture; instruction sets; Assembly language programming; I/O port programming; timer / counter programming; serial communication; interrupts programming.

Unit-V : Embedded System Development :

Embedded system evolution trends. Round-Robin, robin with interrupts, function-one-Scheduling Architecture,

Algorithms, Introduction to - assembler-compiler-cross compilers and Integrated Development Environment (IDE). Object Oriented Interfacing, Recursion, Debugging Strategies, Simulators.

Text Books :

- (1) Principles of CMOS VLSI Design : N.Weste and K.Eshranghian - Addison Wesley.
- (2) The Design and Analysis of VLSI, Circuits : J.Cker, H.Li and D.Boyee - PHI.
- (3) Embedded Systems Architecture : Programming and Design : Rajkamal - TMH
- (4) Real-Time Systems Design and Analysis : P.A.Laplante - Wiley-IEEE Press.

Reference Books :

- (1) Introduction to VLSI Systems : C.Mead and L.Conway - McGraw Hill.
- (2) Real Time Systems : C.M.Krishna, K.G.Shin - McGraw Hill.
- (3) The 8051 Microcontroller and Embedded Systems : M.A.Mazidi, etal; Pearson Education.
- (4) An Embedded software primer : D.E.Simon - Addison Wesley.

Embedded Programming

Unit-I : Embedded Systems:

Introduction, Design goals, real time multitasking, embedded processors, languages, kernel building, embedded application & proforms.

Introduction to C :

Introduction, Simple C program, character set, Keywords, Identifier, Variables, Data types operators, Expressions, Statements, Functions.

Unit-II : Conditional statements, Loops & functions :

Relational operators, Logical operators, Conditional branching statements, conditional operators, Loops, Jumping functions, Anatomy of functions, Writing own functions, Function call.

Unit-III : Arrays, Structures & Pointers :

Declaring & initialising arrays, Accessing array elements, Single dimensional array, 2-D arrays,

Introduction to structures Pointers.

Unit-IV : Advance C:

Storage class specifiers : Auto Register, Static, External. C preprocessor. Conditional compilation.

Using assembly language in C : Clear Screen program for C, Compilation & Linking, Passing multiple parameters, summary on writing C procedures in assembly. Writing in-line assembly code in C, Summary on in-line assembly in C.

Unit-V : C language with ALP using BIOS & DOS functions :

Procedures examples. Setting cursor. Clearing screen, Screen & K./B operation, Display on the screen.

Display ASCII character set, Accepting input from K/B Display name. Using debug for ALP.

Books Recommended :

1. Programming & problem solving through "C": Kanetkar.
2. ALP for PC : John Jocha, Peter Norton.
3. IBM PC ALP: Peter Abel "
4. IBM PC Assembly Language & Programming : Peter Abel.

Practical-VII : Atleast 8 Experiments based on Paper-XIII and PaperXIV

Project Work : Based on Advance topics in the field of Electronics.

INDEX

**M.Sc.Part-I & Part-II (Semester I to IV) Examinations in
Electronics Instrumentation
(Prospectus No.20091215)**

| Sr.No. | Paper | Page Nos. |
|-------------------------------------|--|-----------|
| 1. | Special Note | 1 |
| 2. | Ordinance No. 4 of 2008 | 3 |
| M.Sc. Part-I Semester I | | |
| 1 | I : Physics of Electronic materials and Semiconductors Devices | 3 |
| 2. | II : Mathematical and Computational Methods in Electronics: | 4 |
| 3 | III : Advanced Electronics Design | 5 |
| 4 | IV : Scientific Instrumentation | 5 |
| M.Sc. Part-I Semester-II : | | |
| 5 | V : Physics of Semiconductor Devices & Microwave Principles | 6 |
| 6 | VI : Power Electronics | 7 |
| 7 | VII : Electronic Communication | 8 |
| 8 | VIII: Digital Electronic Design | 9 |
| M.Sc. Part-II Semester-III : | | |
| 9 | IX: Linear Integrated Circuits | 10 |
| 10 | X : Microwave-Communication and Antena | 11 |
| 11 | XI : Sensors, Transducers & Actuator for Instrumentation | 13 |
| 12 | XII: Microprocessor, Microcontroller & Interfacing-I | 13 |
| M.Sc. Part-II Semester-IV : | | |
| 13 | XIII: Microprocessors, Microcontroller & Interfacing.II | 15 |
| 14 | XIV: Cellular and Mobile Communication | 16 |
| 15 | XV : VLSI and Embedded System Design | 17 |
| 16 | XVI: Embedded Programming | 18 |