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09

North Maharashtra University, Jalgaon

Syllabus for M.Sc.Part-I. (Semester I & II)

ELECTRONICS

W.E.From June, 2003

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NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus for M.Sc. Electronics.

(Sem. I and II)

(W. E. From July, 2003)

1. Objectives :

Department of Electronics, North Maharashtra University, Jalgaon has been established with a goal to impart high quality education which meet the need of country's requirement of advanced technologies in the front areas. The department is having advanced facilities to design and fabricate the semiconductor devices required for communication and VLSI Technologies. The objectives of this course are to inculcate the professionalism among the Master students in order to take the challenges of modern technology. The course structure of the first year has been designed to make a wide platform in order to give exposure of basic requirement in modern technologies. The third semester courses are application oriented which will train the students at advanced level. The fourth semester has been designed so that students could learn the implementation of the knowledge gained in three semesters. The students will also write the thesis and technical project report of the work carried through out the semesters. A student after learning the above course structure is expected to be a successful professional or entrepreneur.

2. Course Highlights

The course is broadly divided into following categories.

1. Fundamentals of Electronics,
2. Physics of Semiconducting materials and devices,
3. Instrumentation and automation,
4. Applications of Electronics in communication, VLSI technology, Optoelectronics, Instrumentation and Automation.
5. Professionalism and entrepreneurship
6. Seminar presentation and Tutorials,
7. Research/ Industrial professionalism for Six months.

3. Course Structure

Semester	Theory/Practical	No of Papers	Duration for each Paper	Max Marks for each	Total Marks
I	Theory	04	04 Hours	100	400
	Practical*	01	04 Hours	100	100
II	Theory	04	04 Hours	100	400
	Practical*	01	04 Hours	100	100
III	Theory	03	04 Hours	100	300
	Practical*	01	04 Hours	100	100
	Project	01	04 Hours	100	100
IV	Theory**	06 (Elective)	04 Hours	100	100
	Practical*	01	04 Hours	100	100
	Research Project II	01	04 Hours	100	100
	Research Project III	01	04 Hours	100	100
	Industrial Project Report	01	04 Hours	100	100

* Distribution of marks for practical would be as below

Experiment performance	=> 40	Marks
Record / Journal	=> 10	Marks
Viva-Voce	=> 20	Marks
Attendance	=> 10	Marks
Sessional	=> 20	Marks
	100	Marks

** A student has option to choose any five papers in fourth semester including minimum one practical and one project respectively.

4. Weekly teaching Scheme (Work Load)

Semester	Theory/Practical	No of papers	No of hrs per paper / week	Total Hours
I	Theory	04	04	16
	Practical*	01	08	08
	Seminar/ Tutorial	04	01	04
II	Theory	04	04	16
	Practical*	01	08	08
	Seminar/ Tutorial	05	01	05
III	Theory	03	04	12
	Practical*	01	08	08
	Project-I	01	half an hour/ student	
	Seminar/tutorials	05	01	05
IV**	Theory	06	04	08
	Practical*	01	08	
	Project-II	01	half an hour/ student	
	Project-III	01	half an hour/ student	
	Industrial Project Report	01	04	04
	Seminar/tutorials	05	01	05

* It indicates the workload for one batch. One practical batch will Consist of maximum 08 students.

** A student has option to choose any five papers in fourth semester including minimum one practical and one project respectively.

M.Sc. (Electronics)
Syllabus of the Course For M Sc- I

Semester	Course	Title of the Paper	Marks	Hours per week
I	EL 101	Semiconductor Devices	100	04
	EL 102	VLSI Design Tools and Techniques	100	04
	EL 103	Analog Circuit Design Techniques	100	04
	EL 104	Planning and Management of Electronic Industries	100	04
	EL 105	Practicals	100	08
II	EL 201	Optoelectronics	100	04
	EL 202	Numerical Methods in Electronics	100	04
	EL 203	Digital Circuits Analysis and DSP	100	04
	EL 204	Advanced Microprocessors and their applications	100	04
	EL 205	Practical	100	08

- Total Marks (Theory and Practical) => 800 + 200 => 1000

Sixty percent and forty percent weightage will be given to external and internal assessments respectively. Internal assessment should consist of 25% weightage for seminar/tutorial assessment.

Syllabus of the Course For M. Sc.-II

Semester	Course	Title of the Paper	Marks	Hours per week
III	EL 301	Automatic Process Control and Systems	100	04
	EL 302	Micro controllers and applications	100	04
	EL 303	Advanced Communication Systems	100	04
	EL 304	Practical	100	08
	EL 305	Project	100	
IV	EL 401	Modeling and Simulation Techniques	100	04
	EL 402	Device Fabrication Techniques	100	04
	EL 403	VLSI Design Methods for ASICS	100	04
	EL 404	Foreign trade of electronics products	100	04
	EL 405	Imports and buyback management of Electronic products	100	04
	EL 406	Medical Electronics	100	08
	EL-407	Practicals	100	
	EL-408	Project-II	100	
	EL-409	Project-III	100	04
	EL-410	Industrial Project Report \Vriting		

- A student has option to choose any five papers in fourth semester including minimum one practical and one project respectively.
- Sixty percent and forty percent weightage will be given to external and internal assessment respectively. Internal assessment consisting of seminar/tutorial assessment will have 25% weightage.

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NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus for M.Sc. Electronics.

(Sem. I and II)

(W. E. From July, 2003)

EL-101 : SEMICONDUCTOR DEVICES.

1. Properties of Semiconductors:

Properties of direct and indirect semiconductors with their applications, energy band diagrams of compounds semiconductors (III-V and II-VI group), diffusion of carriers and Einstein's relation, properties of degenerate and non-degenerate semiconductors and their applications. **[5]**

2. Measurement of Semiconductor Properties:

Measurement of effective mass of carriers by using cyclotron resonance experiment, measurement of energy gap, measurement of carrier lifetime, resistivity measurement of semiconductor by using four probe method, measurement of carrier concentration, carrier types by Hall effect and measurement of mobility by Hynes-Shockley experiment. **[8]**

3. Junction Devices:

P-N junction diode and its current-voltage characteristics, Design of abrupt and graded p-n junction diode structures, breakdown mechanisms in p-n junction diode, Junction and diffusion capacitance of a p-n junction diode. **P-I-N diode:** Intrinsic layer, principle of operation and behaviour of forward and reverse bias, equivalent circuit of a P-I-N diode, applications of P-I-N diode. **Zener Diode:** Phenomenon of reverse bias breakdown, principle of operation, and Applications. **Varactor Diode:** Structure, principal of operation, equivalent circuit, power relation, and applications of Varactor Diode. **Tunnel diodes**: Principles of operation, structure and applications. **[09]**

4. Bipolar Junction Transistors and Power Semiconductor Devices:

Fabrication, working principles and applications of microwave transistor, power transistor, switching transistor and unijunction transistor. Heterostructure transistors and their applications, principle, fabrication and applications of SCR and Insulated Gate Bipolar Transistor (IGBT). **[07]**

5. Metal Semiconductor Junction Diodes:

Metal–semiconductor junctions, energy band diagram, I-V characteristics and operation principle of rectifying ($W_m > W_s$ and $W_m < W_s$), and Ohmic metal–semiconductor junctions, barrier formation, principle and operation of Schottky barrier diode, current transport theory for Schottky barrier diode. Operational characteristics, I-V characteristics, principle of operation, fabrication, Drain current and pinch-off voltage of JFET & MESFET. **[06]**

6. MOS Devices:

Energy band diagram, accumulation mode, depletion mode, inversion mode and C-V characteristics of MOS capacitor, constructional details, I-V characteristics, and principle of operation of depletion-type & enhancement-type MOSFET, equivalent circuit of MOSFET, short channel and narrow width effect, MOSFET scaling and hot electron effects, charge coupled devices (CCD), types of charge coupled devices (SCCD & BCCD), applications of charge coupled devices. **[06]**

7. High Frequency Solid-State Devices:

Frequency dependence of power gain and noise in BJT, Transit time effects in BJT, Transit time effects in FET's, and Transit time effects in MESFET, structures, principle of

operation and applications of High electron mobility transistors (HEMT), principle of operation and applications of Ballistic transistors. **[07]**

8. Negative Conductance Microwave Devices:

Construction, principle of operation and applications of Impact Avalanche Transit Time (IMPATT) Diode and TRAPATT diode, Gunn effect, the transferred electron mechanism, domain formation and various operating modes of Gunn diode. **[07]**

Tutorials and Seminars:

Crystal structure and energy bands of Ge, Si, semiconductors, band theory of solids, E-k diagrams, effective mass, concept of hole, charge carriers and life-time, intrinsic and extrinsic semiconductors, position of Fermi energy level, minority and majority charge carriers, recombination of charge carriers, diffusion length, Geometry of p-n junction diode, p-n junction diode in equilibrium, forward and reverse biasing of p-n junction diode, structure and working principle of bipolar junction transistors, Terminal currents of BJT, current gain of BJT, small signal equivalent circuit of BJT, Ebers–Moll Model, voltage and power rating of transistor, structure, working principle and applications of SCR, DIAC and TRIAC.

References:

1. **Solid State Electronic Devices,**
   B. G. Streetman and Sanjay Banerjee, IVth Edition, Prentice-Hall of India,Pvt. Ltd., New Delhi
2. **Solid State and Electron Devices,**
   Altan M. Ferendeci, McGRAW-HILL International Editions, Electrical Engg. Series.
3. **Semiconductor and Electronic Devices,**
   Adhir Bar–Lev, Prentice-Hall of India Pvt. Ltd., New Delhi
4. **Physics of Semiconductor Device,**
   S. M. Sze, Wiley Eastern Ltd.
5. **Semiconductor Devices, Basic Principles,**
   Jasprit Singh, John Wiley & Sons, Inc., New York, 2001
6. **Physics of Microwave Semiconductor Devices and their application**
   W. A. Watson
7. **Electrical Properties of Materials,**
   L. Solymer and D. Walsh, VI th Edition, Oxford Science Publications-**1998**
8. **Physics of Semiconductor Devices,**
   Michael Sure, Prentice-Hall of India Pvt. **Ltd. New Delhi-1995**
9. **Semiconductor Devices and Circuits,**
   Henry Zanger, John Wiley and Sons
10. **Solid State Physical Electronics,**
    Van der Ziel, Second Edition, Prentice- Hall, Inc., Englewood Cliffs, N. J.

EL-102 : VLSI DESIGN : TOOLS AND TECHNIQUES

1. Basic IC components and their performance estimation

Resistance estimation, resistance of nonrectangular regions, Capacitance estimation, MOS capacitor characteristics, MOS devices capacitances, Diffusion capacitance, routing capacitance, distributed RC effects, capacitance design guide, wire length design guide, switching characteristics, fall time determination, rise time, delay time, CMOS gate transistor sizing, determination of conductor size, power consumption, static dissipation, dynamic dissipation, charge sharing, Yield. **[09]**

2. MOS Transistor Theory

Metal Oxide Semiconductor (MOS) and Related VLSI technology, Basic MOS transistors, Enhancement and depletion mode transistor action, Threshold voltage,V_{th} adjustment, Body effect, MOS device design equations, MOS Transistors, MOS switches **[07]**

3. **Basic electrical properties of MOS circuits**
Drain to source current I_{ds} versus voltage V_{ds} relationships, Aspects of MOS transistor threshold voltage V_t, Transconductance g_m and output conductance g_{ds}, MOS transistor figure of merit, The pass transistor, The nMOS inverter, determination of pull-up to pull-down ratio for an nMOS inverter driven by another nMOS inverter, determination of pull-up to pull-down ratio for an nMOS inverter driven by one or more pass transistors. Alternative forms of pull up, MOS transistor circuit model. **[10]**

4. **Study for CMOS circuits**
The CMOS inverter, DC characteristics, influence of β ratio on transfer characteristics, Noise margin, transmission gate-DC characteristics, Latch-up in CMOS circuits, CMOS logic: The inverter, combinational logic, NAND gate, NOR gate, Ex-OR gate, complex gate, Compound gates, multiplexers, Memory. **[09]**

5. **Optimization techniques of CMOS parameters:**
Silicon semiconductor technology-wafer technology, Oxidation, Selective diffusion, lithography, positive & negative photo-resist, Mask preparation, the silicon gate process, CMOS technologies: The p-well process, The n-well process, The twin tub process, The twin tub process, Silicon on insulator. **[07]**

6. **MOS circuit design process:**
MOS layers, stick diagrams, nMOS design style, CMOS design style, Design rules and layout, λ-based design rules, contact cuts, Double metal MOS process rules, A double metal-single poly CMOS rules, floor planning, Layout diagram-a brief introduction. **[08]**

Tutorials and seminars

1) BiCMOS technology
2) VHDL /Verilog,
3) Theory of basic IC components
4) Digital circuit design techniques
5) Subsystem design

Introduction, Switch logic, Gate (Restoring) logic, example of structured design (combinational logic), multiplexers & gray to binary converter, Some clocked sequential circuits, Other system consideration: Bipolar driver for bus lines, basic arrangement for bus lines, the percharged bus concept, current limitations for V_{DD} and GND (V_{SS}) rails. Ground rules for system and subsystem design.

Reference Books

1) **Principles of CMOS VLSI design**: A system perspective by Neil H. E. Weste and Kamran Eshraghian
2) **Basic VLSI Design : Systems and Circuits by** Douglas A. Pucknell and Kamran Eshraghian, PHI, Pvt. Ltd. New Delhi.
3) **Introduction to VLSI Systems by** C. Mead and L. Conway, Addison Wesley Publication Co., 1985
4) **Introduction to NMOS and VLSI Systems Design** A. Mukharjee, Prentice Hall, 1986

EL-103: Analog Circuit Design Techniques

1. **Bipolar Junction Transistor Circuits:**
Common Emitter configuration, Significance of input, output and transfer characteristics, load line concept, direct current and alternating current load line, Quiescent point, fixed bias, emitter bias, voltage divider bias and collector feedback bias, maximum power dissipation in each bias. **[07]**

2. **Analysis and applications of transistor amplifier circuits:**
Analysis of transistor amplifier, trans-conductance, small signal resistances, hybrid parameter analysis, current gain, voltage gain and power gain of an amplifier, switching characteristics and applications, circuits to improve switching time of transistor, applications. **[07]**

3. Frequency response of amplifier and applications :-

Actual midband current gain of an amplifier, selection criteria for coupling capacitor and bypass capacitors, low frequency response, midband frequency response and high frequency response of CE amplifier, effect of source resistance on degradation of gain of an amplifier, reasons for degradation of gain at low and high frequencies, tuned amplifier, synchronous and stagger tuning, **[09]**

4. Field effect transistor circuit and applications :-

Output and transfer characteristics of field effect transistor, its significance, biasing techniques: self bias, gate bias and voltage divider bias, FET as an amplifier MOSFET enhancement mode operation, depletion enhancement mode operation, output and transfer charac. of MOSFET, its significance, biasing methods for MOSFET. **[07]**

5. Feedback amplifiers and oscillators :-

Concept of feedback and types of feedback configuration and corresponding analog circuits, effect of negative feedback on gain, input impedance, output impedance and bandwidth. Frequency response of feedback amplifier, single pole and double pole response, Oscillators: classification, phase shift oscillator, analysis, wein bridge oscillator, analysis, crystal oscillator. **[09]**

6. Operational Amplifier Circuits and Applications:-

Differential amplifier, instrumentation amplifier, compensated integrator and differentiator, analog computation, Quadrature oscillator, active filters: first and second order low pass and high pass active filters, transfer function, band pass and band reject filters, phase shifters, voltage-controlled oscillator, phase locked loop. **[11]**

Tutorials and seminar

1. **Wave Shaping Circuits and applications:** clipping circuits- one level clipping, two level clipping, unbiased clipping and biased clipping circuits, Clamping circuits, Sine, Square and Triangular wave generator **[10]**
2. **Multivibrator Circuits and applications:** monostable, astable and bitable circuits using operational amplifier and their applications. **[08]**
3. **Semiconductor diode and Zener diode applications.** **[05]**
4. **555 Timer and its applications.** **[05]**
5. **Regulated power supply and its components.** **[08]**

References:

1. Integrated Electronics - Millman Halkias
2. Microelectronics - Milliman
3. Electronics Circuits - Mottershed
4. Operational Amplifiers - Clayton
5. Electronics for Scientist - Brophy

EL- 104 : Planning and Management of Electronics Industries

1. Data Processing in Electronics Industry

Need and utility of market research for the electronics products, Data types: Primary and Secondary, Data collection methods: Dictated material, Questionnaire, Observation and Interview, telephone messages, Source document, Sampling techniques, Data Analysis techniques, Classifying information: alphabetically, Numerically, Chronologically, by subject, department or product. **[10]**

2. Project planning:

Setting up new project, Generation of alternative solutions, Evaluating the proposal, Feasibility report, Defining a project plan, project report, registration procedure, Various catalyst organizations, Raising finance, Sources of finance, finance proposal, assistance through SIDBI, state government, IDBI etc, Strategic planning, System strategy, equipment acquisition, developing the infrastructure, upgrading existing system. **[07]**

3. Planning of new electronic industry
Management Concepts, Planning, Organizing, Staffing, direction, co-ordination, control as applied to electronics industry, environmental effects. Financial crises and their remedies, sales crises and remedies, report preparation, importance of codification, Types of codes, management report preparation, input and output forms, validation and data dictionary. **[08]**

4. Marketing Strategy and Management
Marketing and its strategy, Product, packaging, new product development, and pricing methods, Promotion through Advertising, Sales promotion, personal selling, Publicity, Distribution network for industrial products. Export planning and management of electronics products. **[07]**

5. Quality Management in electronic industry
ISO certification Series, TQM, Kaizen, Modern concepts of quality Management – Customer Satisfaction, Productivity, etc. **[06]**

6. Optimization Techniques: Assignment problems, transportation problems, optimal solutions, simplex method, minimization and maximization by simplex method, critical path method and PERT. **[12]**

Tutorials and Seminars

Data Collection and analysis, feasibility of software and hardware industries, Taxation, innovative products ideas and survey of electronic industries and products.

References:-

1. **Principle and Practices of Management**
2. **Entrepreneurship and small scale industries**
3. **Marking Management**
4. **Research Methodology**
5. **Operation Research**

EL-105 Practicals

[A]

1. Determination of Hall coefficient using Hall method.
2. Measurement of Eg of semiconductor.
3. Measurement of resistivity of samples at various temperatures by four probe method.
4. Measurement of threshold voltage in linear and saturation region of MOSFET.
5. Switching characteristics of diode and transistor
6. Measurement of c-v characteristics of MOS capacitor.

[B]

7. Study of f to V/ V to f converter.
8. Study of sample and hold circuit
9. Study of PLL circuit
10. Design of Schmitt trigger circuit
11. Design of second order filters using operational amplifier.
12. To study the high impedance characteristics of Instrumentation amplifier to amplify differential signal from transducers.

[C]

13. Synthesis and analysis of adders and substractors using VHDL.
14. Synthesis and analysis of multiplexers and demultiplexers using VHDL
15. Design of memory cell using VHDL.
16. Synthesis and analysis of counters using VHDL
17. Synthesis and analysis of shift registers using VHDL.
18. Test all above entities using test benches.

[D]

- Special training on writing of industrial project report.

- **Note:** Students are expected to perform at least four experiments from A, B and C groups respectively. D group will have 20% weightage in examination through project report and viva.

EL – 201: OPTO-ELECTRONICS

1. **LASERS:**
LASER as an amplifier of light, necessary condition for amplification, special properties of LASER, Study of three and four level LASERs, study of tunable and semiconductor LASER, applications of LASER. **[07]**

2. **p-n JUNCTION AND HETEROJUNCTION**
Junction Capacitance, Heterojunction, Light – Current relationships in spontaneous emission, Stimulated emission and gain, Optical gain in direct band gap semiconductor, the Febry-Perot cavity and threshold condition **[07]**

3. **ELECTRICAL AND OPTICAL PROPERTIES OF LASER DIODES**
Carrier confinement and injected carrier ballization, threshold current density and differential quantum efficiency, Temperature dependence of I_{th}, optical anomalies and radiation confinement loss in asymmetrical heterojunction lasers. **[06]**

4. **LIGHT DETECTORS**
Idea of light detectors, Natural and specalized light detectors, Types of special light detectors – thermal and quantum detectors, Types of quantum photo detectors – Photo resistive, Photovoltaic and Photoelectric cell, photo multiplier tube, Important characteristics of light detectors – spectral response, efficiency material used for photo detectors. **[07]**

5. **OPTICAL DISPLAY**
Necessity of optical displays, Different categories of optical displays – indictors, numeric, alphanumeric and special function displays, characteristics of displays – view ability, response time, power dynamic, static and field effect LCDs, Dynamic display – necessity and principle of operation, Contrast improvance ratio, Consideration of displays. **[08]**

6. **OPTICAL FIBER: THEORY AND APPLICATION**
Action of optical fiber as a waveguide, Advantage of optical fiber communications, Necessity conditions for waveguiding mechanism of optical fiber, Construction of a fiber, Materials used for optical fibers, Construction of a optical fiber cable, Role of strength materials, Types of optical fibers, step index and graded index fibers, comparison of waveguiding actions, Numerical aperture, Time dispersion, splicing and fiber connectors, Requirement and practical methods of splicing, optical fiber connectors, Losses in optical fiber communication, fiber losses, Intrinsic and extrinsic losses, comparison between losses, Modes of transmission and dispersion in optical fibers, Double crucible and chemical deposition methods of manufacturing optical fiber, Application of optical fiber. **[15]**

Tutorials and Seminars

Optical memories, Optocouplers, Optical computing, Holography, Optical networking

References:

1. **An Introduction of Optical Fiber** — Cherin A. H., Mc.Graw Hill, Int. Student Ed.
2. **Optical Fiber Communication** — Keiser G., Mc.Graw Hill, Int. Student Ed.
3. **Introduction of optical Electronics** — K. A. Jones, Harper and Row
4. **Optical Communication System** — John Gower, Prentice Hall, India.
5. **The Laser** — Hecht, Mc. Graw Hill

EL- 202: Numerical Methods In Electronics

1. **Fundamentals of C** **[05]**

1. **Iterative Methods**

Introduction, Beginning an iterative methods, the method of successive bisection, the method of false position, Newton- Raphson iterative methods, secant method, comparison of iterative methods, implementation strategies. **[07]**

3. **Solution of Simultaneous Equations**

Introduction, Existence of solutions, solution by elimination, the Gauss elimination method, pivotal condensation, Ill conditioned equations, Gauss-Seidel iterative method, Gauss-Jordan method, Matrix Method, Gauss-Jordan Matrix inversion, Implementation strategies. **[08]**

4. **Interpolation**

Introduction, Linear interpolation, Polynomial interpolation, Lagrange interpolation, Newton interpolation, difference tables, truncation errors in interpolation, implementation strategies. **[08]**

5. **Numerical Integration**

Introduction, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Newtons's 3/8 rule, gaussian quadrature, implementation strategies. **[06]**

6. **Numerical Differentiations**

Introduction, Differentiation by polynomial fit, higher order Derivatives, Errors in Numerical Differentiation, implementation strategies. **[04]**

7. **Solution of Differential Equations**

Introduction, Solution by Taylor's Series, Euler's Method, Modified Euler's Method, Predictor-Corrector Method, Runge-Kutta Method, Implementation strategies **[06]**

References:

1. **Introduction Methods of Numerical Analysis**
   S S Sastry, PHI Publications
2. **Computer Oriented Numerical methods**
   V Rajaraman, PHI Publication
3. **Computer Oriented Statistical and Numerical Methods**
   E Balagurusamy, Macmillan India Ltd

EL – 203 : Digital Circuits Analysis & Digital Signal Processing

1. **Boolean Algebra and K-map**
Postulates, identities, De-Morgan's Theorem, Simplification of some logical expression using Boolean algebra, Deriving Boolean expression from given circuit, Literal, minterm, maxterm, standard product of sum & sum of product. Three four & four to five variable k-map and simplification. Numericals POS & SOP obtaining logic systems from K- map Arithmetic & code converters circuits. **[12]**

2. **Sequential and Combinational Logic Circuits**
Different types of FFs, Designing of synchronous & Asynchronous counters, Natural & trancated counters, regular & irregular counters, Design of counters using chips, Designing of presettable counters, Serial to parallel converter & Parallel to serial converter using registers, Multiplexer & Demultiplexer & their applications. **[12]**

3. **Digital Applications**
Decimal counting, Multiplexed display, Dynamic display, frequency measurement using counter, speed measurement, Digital voltmeter, sound recording & Play back system. **[06]**

4. **Digital Signal Processing (DSP)**
Advantages of DSP, application areas, Basics of DSP operations, convolutions, correlation, digital filtering, discrete transformation & modulation DSP chips, real world applications of DSP, e.g. Audio application, telecommunication application, Biomedical applications **[07]**

5. **Analog Interfacing using Digital Signal Processing**
Block diagram of real time system, Sampling of low pass & band pass signals, Uniform & non-uniform quantizaion and encoding, over sampling in A/D conversion, D/A conversion process, Anti-imaging filtering, over sampling in D/A conversion, limitations of real time signal processing with analog input/output signals, Application **[07]**

6. **Digital Signal Processing Applications**
Digital Audio Mixing, Speech synthesis and recognition, Compact Disk Audio system, Digital Cellular Mobile Telephone, Set-top box for Digital Television Reception, Fetal EGC monitoring, DSP base closed loop controlled anesthesia. **[07]**

Tutorials and Seminars

i. **Discrete Transformation**
Introduction, Fourier series, Fourier Transformation, DFT & its inverse, Properties of DFT, Computational complexity of DFT, the decimation in time fast fourier transformation algorithm, Inverse fast fourier transform, Implementation of FFT, other discrete transforms, An application of the DCT.

ii. **The Z- transform and its applications in signal processing.**
Discrete time signals and systems, the z- transform, the inverse Z- transform, properties of Z- transform, applications of Z- transform in signal processing.

Reference Books :

1. **Digital signal processing (IInd Edition)** - Emmanuel C. Ifeachor & Barriew. Jervis, Pearson Education, Asia
2. **Digital Electronics & logic Design**- N. G. palan, Technova Publications
3. **Digital Design** -M. Morris Mano, Pearson Education, Asia
4. **Text Book of Logic Design**- S. Ravishankar
5. **Digital Electronics**-D. C. Green, Pearson Education, Asia

EL-204 :ADVANCED MICROPROCESSORS and THEIR APPLICATIONS

1. **Introduction**
Historical background, Architecture of 8-bit, 16-bit and 32 bit Intel microprocessors, segmentation, bus interface unit, execution unit, management unit, decoding unit, operating modes, and comparative study. **[07]**

2. **Addressing Modes and Assembler directives**
Addressing modes of 8086, Data and branch type addressing modes, immediate, register, direct, register indirect, register relative, base indexed, relative base indexed, intra segment, inter segment, Addressing modes in advance processor, Data and branch addressing modes, Directives and operators, EQU, ORG, DB, DW, DD, DQ & DT, Attributes and value returning operators, structures and records, segment definition and related directives. **[06]**

3. **Instruction set and programming**
Instruction set of 8086, and its comparison with advanced microprocessors, data transfer, arithmetic, logical, flag manipulation, packed BCD, Unpacked BCD, branch, stack, input/output, miscellaneous, assembler instruction format, label field, op-code, operands, comment, simple programs, arithmetic programs, code conversion, stack related programs, procedures, nested and recursive procedures, macros and use of repeat prefix for string processing, use of interrupts. **[15]**

4. **Interfacing applications with computer**
Interfacing of I/O devices and decoding techniques, interfacing of keyboards, displays, printers, stepper motors, data acquisition and processing, digital data transmission using MODEM and standard phone lines, Hardware and software debugging techniques, flowchart for the program development. **[11]**

5. Co-processors

8087 math co-processors, its need, data types - integer, word integer, short and long integer, packed decimal, short real, long real and temporary real , instruction set – data transfer, arithmetic, processor control, trigonometric, constant load, compare group, its co-operation with main processor, interconnection and signals and its applications. **[06]**

6. Robotics

Introduction, physical configurations, Cartesian co-ordinate, polar co-ordinate, cylindrical and body and arm configuration, technical features, robotics motion, body and arm motions, wrist motions, programming robot, walk through, lead through, manual, off line programming, programming languages, victors assembly language and machine control language, work cell control and interlocks, robotics sensors – vision sensors, touch sensors and voice sensors. **[07]**

7. Robotics applications:

Need of robotics in Industries, material transfer, machine loading, spray painting, welding, processing operation, assembly and inspection. **[03]**

Tutorial and Seminars

Interfacing Chips :

Programmable peripheral Interface (IC-8255), Programmable Interval timer (IC-8253), Programmable interrupt controller (IC-8259), Keyboard display controller (IC-8279), programmable DMA controller (IC-8257), programmable communication Interface (IC-8251)

References:

1. **Microprocessor and interfacing programming and hardware**
   Douglas Hall, Mc. Graw Hill
2. **Microcomputer systems – The 8086/8088 family, architecture, programming and Design**
   Yu-Cheng Liu, Glenn A Gibson, PHI, New Delhi
3. **Microprocessor based process control**
   C.D. Johnson, PHI, New Delhi
4. **CAD/CAM – Computer Aided Design and Manufacturing**
   M. P. Grover and E. W. Zimmers, Jr, PHI, New Delhi
5. **Microprocessors with application in process control**
   S. I. Ahson, TMH Co. Ltd.
6. **Computer controlled Industrial machines : process and Robots**
   Gupton, PHI, New Delhi
7. **Microprocessor and Microcomputer based system Design**
   Mohamed Rafiquzzaman, Universal Book Stall, New Delhi

EL-205 Practicals

[A]

1. Measurement of threshold current of semiconductor laser
2. Characterization of photodiode/phototransistor.
3. Measurement of attenuation in optical fiber
4. Measurement of numerical aperture for an optical fiber.
5. To study temperature dependent characteristics of semiconductor laser.

[B]

6. Implementation of successive bisection iterative method using C/MATLAB.
7. Implementation of Newton's forward interpolation technique using C/MATLAB.
8. To find out integration of function using simpson 1/3 rule using C/MATLAB
9. To solve simultaneous equations using Guass elimination method using C/MATLAB
10. Solve differential equation using Runge-Kutta method using C/MATLAB

[C]

11. Designing of 5-bit adder/substractor.
12. To study state diagram of presettable counters.
13. Design application circuits using multiplexer/demultiplxer
14. Design of logic system.
15. To study PLA/PLC circuits.

[D]

16. Writing arithmetic programs using 8086 assembly language MACRO/ procedures/ recursive procedures.
17. Writing code conversion programs using 8086 assembly language ACRO/ procedures/ recursive procedures.
18. Study of data acquisition system using computer to monitor and control physical parameters.
19. Interfacing of stepper motor to 8086.
20. Interfacing matrix keyboard and display to 8086.

- Special Training on VLSI tools

Note: Students are expected to perform **at least three** experiments from each group.