VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

M.Sc. - II

Electronics

Inforce Fm June -2001.

There will be four papers each of 75 marks (53 ext., 22 int.) and of three hours duration. There will be practical as well as project work and total marks will be 200. Project work will be essentially an industrial an industrial project work.

Paper-1	Section-I Quantum Electronics
	Section-II Opto Electronics
Paper-II	Section-I Integrated Circuits
	Section-II Integrated Circuit Technology
Paper-III	Section-I Microwaves
	Section-II C, and CAD for Technology
Paper-IV	Section-1 : Communication Electronics-ll
	Section-ll Microprocessors
	Practical, Project Work.

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Paper-I

Quantum Electronics and Optoelectronics

Section-I

Quantum Electronics

Quantum theory of the interaction of radiation with matter, state and statistical Ensemble, density matrix, equation for density matrix, Heisenberg and Interaction representations, quantum theory of fields in ideal resonators, waves guides and free space.

Interaction of matter with a field, quantum theory of fields in lossy resonators.

Concept of spontaneous and stimulated emission, theory of spontaneous and stimulated emission in a system of two level molecules, correspondence principle, general expression for the intensities of spontaneous and stimulated emission coherence during spontaneous emission, balance equations and transport equations, radiation from system whose dimension are much larger than the wavelength, emission in a resonator, fundamental equations, stimulated and spontaneous emission in a resonator.

Non-linear effects in optics, two quantum process, Raman effect stimulated and spontaneous emission, propagation of parametrically coupled electromagnetic waves, stimulated Raman emission.

Laser, introduction, Einstein coefficient, light amplification, threshold conditions, laser rate equations, variation of laser power around threshold, optimum out put coupling, modes of rectangular cavity and open planar resonator) the quality factor, ultimate line widths of laser, mode selection, Q-switching, mode locking in lasers, modes of confocal resonator systems, general spherical resonator, higher order modes, types of lasers, ruby laser, semiconductor lasers, laser modulators, holographic data systems, fabrication process, fabrication of fiber guide and semiconductor lasers.

Recommended Books:

1. V.M. Fain" and Ya. I.K. Hanin, Quantum Electronics, Vol. I, II, Persamon Press, 1969.
2. A. Yariv, Quantum Electronics.
3. A Maitland and M H Dann, Laser Physics, Noeth Holand, 1969

Section-1I
Opto Electronics

Basic Parameters of optical radiation, kinds of optical radiation.

Block diagram of optrons, PCP parameters, Basic types of optrons, application of optrons, reliability of optoelectronic devices.

Introduction to Fiber propagation using a Bay Model, material dispersion, the combined effect of material dispersion and multipath dispersion, root mean square pulse width and frequency response. Electromagnetic wave propagation in step index fibers, modes and rays, wave propagations modes in an ideal step-index fiber, weakly guiding solution, time dispersion in step index fibers, single mode fibers, Electromagnetic wave propagation in Graded Index Fibers Modes in graded-index fibers. The equivalence of the WKB approximation and the ray model, intromode dispersion in graded-index fibers, total dispersion in granded-index fibers, Mode coupling. Fiber measurements, Introduction, Transmission loss, measurements scattering and absorption loss, measurements Non-destructive loss measurements delay distertion; Bandwidth measurement.

Fiber End Preparation, Fiber Splicing, Fiber Connectors, Connection Losses, Fiber Couplers. Fiber Materials -Fiber Fabrication, Mechanical Properties of Fibers, Fiber Cables, Fiber Cable Installation.

Applications of Fiber Optics -Long Haul Communication. Local Area Networks, Undersea Communication, Fiber Optic Sensors -Intensity Modulated Sensor, Phase Sensors, Diffraction Grating Sensors (For Measurement of Displacement, Force, Temperature). Medical Applications, Military Applications, Coherent Optical Communication, Integrated Optics.

Recommended Books:

1. A.K. Ghatak and K. Thyagrajan, Optical Electronics, Cambridge University Press, 1990.
2. L. Sharapich, N. Thgov, Optoelectronics, Mirpublications, 1987.
3. J. Gowar, Optical communication systems, PHI, 1987.
4. A.H. Cherir, An Introduction to Optical Fibers, McGrawHill (ISE), 1983.
5. A.K. Ghatcik and K. Thyagrajan, Laser, Macmillan (India) 1984.
6. Fiber Optics-Communication & Other Applications (Unit I to 6) by Henery Zanger and Cynthia Zanger (Maxwell Macmillan International Edition).
7. Fiber Optics in Telecommunications (Unuit 1 to 6) by N Sharma (TMH)

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Electronics

Paper-II

Integrated Circuits and Integrated Circuits Technology

Section-1

Integrated Circuits

Introduction oto operational amplifiers, block diagram, analysis of op-amp equivalent circuit, specifications, open loop op-amp configurations.

Pearking amplifier, scaling and averafing amplifiers, instrumentation amplifier, voltage to current conventer, current to voltage conventer, gurator .

Buffersworth, bandpass, band rejection and all part filter, simulation and design of analog filters (using SPICE).

Zero crossing detector, Schmitt trigger, comparator voltage limiters and window detector, Introduction to AID and D/A convertor, sampling and hold circuits Wien bridge oscillator, square, triangular ad saw tooth generators.

Phase locked loop, IC80 38 function generator, XR2240 programmable timer/ counter

MOS & CMOS inverters and gates, shift registers, MOS and CMOS register stages, static shift register stage, ROM, programmable and erasable ROM, Ram Cells, MOS RAMS, Introduction to ICs 6116,2716,41256.

Different D/A and AID converters (weighted resister, R-2R ladder, current driven, inverted leader, successive approximation and dralslope) Introduction to YC 0880,0808,0809.

Recommended Books:

1. R.A. Gaikwad, Op. Amps and linear Integrated circuits PHI, 1993.
2. R.F. Conghlin and f .f .Orisoll, Op. Amp and Linear Integrated circuits, PHI.
3. S. Michale jacab, Application and Design with Analog Integrated circuit.
4. Gray and Meyer, Analysis and Design of Analog ICS, John Wiley 1984.
5. S. Soelef, Applications of analog integrated circuits, PHI.
6. Laker and Sansen analog Integrated circuits. McGraw Hill. 1993

Section-II
Integrated Circuits Technology

Classification of ICs, Electronics grade, silicon, Czochralski and Flot Zone Crystal Growing Methods, Oxygen and Carbon in silicon, Segregation coefficients, Silicon shaping and wafer preparation, Vapour Phase Epitaxy.

Oxidation -Thermal, Dry & Wet, High Pressure and Plasma Oxiadation, Lithography -Optical Lithography, Photomask, Photo resist and Process, Electron Lithography, X-ray Lithography, Ion Beam Lithography.

Etching -Wet Chemical Etching, Reactive Plasma etching, Impurity Loping -Diffusion, In Implantation, Metallization -Desired Properties, Applications, Ohmic contacts, Choices and Problems. Integrated Elements: Isolation of Circuit elements, Bipolar Technology:

NPN Transistors, PNP Transistors, Integrated Diodes; Semiconductor Resistors, Capacitors and Inductors, MOST Technology: NMOS and CMOS IC Technology.

Design of typical ICs, Back side of preparation, Wafer sort, Device Separation, Die Bonding, Wire Bonding, Package Types and Considerations, Testing of ICs.

Fabrication Facilities and Environment -pure water system, clean room and personnel, Characteristics of VLSI, size and complexcity of integrated circuits, trendsin VLSI design, introduction to computer based VLSL design, Nonsilicon Technology (GAAS ICs) Future trends.

Recommended Books:

I. VLSI Technology by S.M. Sze, Mc-Graw-Hill International Edition.
2. Semi conductor Integrated Circuit Processing Technology by W.R. Wesley and K.E. Bean, Addison -Welley Publishing Co.
3. Modern Semiconductor Fabrication Technology, by Petter Gise & Rechard Blanchard, Reston Book -Prentice Hall.
4. Electronic Materials Science: For Integrated Circuit in Si and GAAS, by James W. Mayer and S.S. Lav Macmillan Publishing Co. New Delhi.
5. Microlithography: Process Technology for IC Fabrication by David I. Elliott, Mc Graw -Hill Book Co.
6. VLSI Design Techniquies for Digital Circuits, Geiger P E

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Paper-III

Microwave and CAD for Electronics

Section-I

Microwaves

Microwave Frequencies, Microwaves transistor, Microwave field effect Transistors, Tunnel Diode, Backward Diode MIS Tunnel Diode, Transferred Electron Devices -Guni Diode.

Avalanche Transit Time Devices -IMP A TT Diode, BARRITT Diode DOVETT Diode, TRAP A TT Diode.

Microwave Integrated Circuits (MICs) Introduction, Circuit Forms, Transmission lines for MICs, Lumped Elements for MICs, Materials, for MICs -substrate, Conductor, Dielectric and Resistive Materials, Fabrication Techniques, Typical Example of fabrication, Hybrid Fabrication.

Circular waveguides, microwaves cavities, microwaves hybrid circuits, directional couplers, circulators and isolators.

Microwaves Tubes -Klystron, Reflex Klystron and Magnetron, Traveling Wave Tubes, Microwave Detection Diodes. Applications of Microwave (a) Electronic Navigation: Overview, DME, TACAN, Instrument Landing System, GCA, Doppler Navigation, Satellite Navigation, Global Positioning System, (b) Microwave Communication, Simplified Microwave system, Microwave Repeaters, Diversity, Microwave Radio Stations (Terminal Station, Repeater Station), System Gain Calculations.

Recommended Books:

1. Physics of Semiconductor Devices (Units 1,2 and 5) by S.M. Sze. (Willy Eastern Limited)
2. Microwave Devices and Circuits (Units 1, 2 and 4) by Samuel. Y. Liao (Prentice -Hall of India Pvt. Ltd.)
3. Practical Microwave Electron Devices, T .K. Ishii, HP
4. Advanced Electronic Communication System by W. Tomasi, Prentice Hall.
5. Foundations of Microwave Engineering by E.Collin, McGraw Hill, (Int. Ed) 1996.

Section-ll
Correspondence and Computer Aided Design in Electronics

Programming, higher level languages, operating systems, compiling programs, writing a programme variables, data types and constants arithmetic expressions the for statement, the while statement, the do statement.

If statement, switch statement, flags, the conditional expression operator, initializing array elements, characters arrays, Multidimensional arrays, strings.

Arguments and local variables, returning fraction results, functions calling top down programming, functions and arrays global variables, automatic and static variables, Recursive functions.

Functions and structures, initializing structures, arrays of structures, structures within structures, structures containing arrays, structure variables.

Pointers and structures, pointers and functions, pointers and arrays, operations, on pointers, pointers to functions, pointers and memory addresses, bit operations, bit fields.

Characters I/0, get char and putchar, formatted 1/0 printf and scanf, file I/0, special functions for handling files. Applying C to circuits, C and electronics circuits, frequency response and modulation.

Fundamentals of CAD, introduction, design process, application o f computers for design, creating the manufacturing the data base, benefits of CAD, examples, hardware in CAD, introduction, design work stations, the graphics terminal operator in out devices, plotters and other output devices, CPU, secondary storage.

Computer graphics software and database, introduction, software configuration of a graphic system, constructing the geometry , transformations, data base structure and content, wire frame versus solid modeling other CAD features.

Recommended Books:

1. S. G. Kochar, Programming in C, CBS Publication, 1991.
2. M. P. Grooverand E.N. Zimmers Jr., Computer Aided Design and Manufacturing, PHI, 1987.
3. C. B. Besant, Computer Aided, Design and Manufacture, Ellis Horwood,

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Paper-IV

Communications-ll and Microprocessors

Section-I

COMMUNICA TIONS-II

Digital Communication systems, digital communication and radio system blocks, conversion of analog signals to their digital forms advantages of the digital communication over analog communication, Pulse code and Delta Modulation and their adaptive modulation techniques, line coding, Pulse shaping Scambling, Vegenrative repeater, Detection error probability .

Digital Carrier Systems, M-ary communication systems, Frequency shift keying, phase shift keying, BPSK, OPSK and their Deferential Encoding techniques; Eight-SPK, 16-PSK Modems, Quadrature Amplitude Modulation, Eight RAM and 16 Ram system with their bandwidth Efficiency and Synchronization.

Digital Multiplexing Techniques, time division multiplexing, TT an CCITT Time Division Multiplexed carrier systems, CODEC and COMBO chips and Digital hierarchy.

Microwave Communication and Antenna -System.

Simplified Microwave systems, Microwave repeaters, Diversity , Protection switching, Microwave radio stations, system gain, Parabolic, Horns and Microwave Antenna systems.

Satellite Communications

History of satellites, Orbital satellites GAO stationary satellites, Orbital patterns, look angles, system link modes, system parameters and system link equation and link budget. Mutlible accessing techniques such as FDMA, TDMA and CDMA. Fiber Optic Communication Systems: Light propagation through an optical fiber, optic fiber configuration, Losses in optical fiber cables, light sources, light detectors, and fiber optical communication systems.

Telephone. Switching: Elem.enta of phne systems, central switching, A simple exchange, Automatic dialing systems, Traffic load and service grade, Hierarchy of switching office. The cress-bar switch, common control, switching

Recommended Books:

1. B. P. LATHI 'Modern Digital and Analog Communication Systems HOLT, RINEHART & WINSTON Ini. IS Edition 1989.
2. TAUB, SCHILLING, Principle of Communication System, McGraw Hill International Edition, 1987.
3. WAYNE TOMASI Advanced Electronics Communication Systems, Prentice Hall Inc. 1987.
4. HYKIN Analog and Digital Communication Systems Wiley Inst. 1989.
5. J. DUNLOP & D. G. SMITH, Telecommunication Engineering VAN NOSTAND RIENOLD, 2nd Edition.

Section - II
Microprocessor

Microprocessors and microcomputers, explanation of terms, evolution of the microprocessor, microcomputer programming languages, typical practical applications,

Basic block of a micro computer, typical microcomputer architecture, single-chip microprocessor, memory (RAM, ROM, ERROM) memory array design and memory interfacing, Programmed and interrupt, I/o, DMA, summary of I/o methods, coprocessor Detials of 8085, Register structure memory , addressing, addressing mode, instruction set
timing methods, CPU pins and associated signals instrumentation timing and execution, programme I/o, interrupt system, DMA, SID and SOD lines, system design using 8085.

Assembly of language programming for 8085, single stepping and single cycle utility routines in microprocessor kits, simple programming techniques like looping, counting, indexing subroutines, parameter passing and software delays.

Block diagram pin configuration and operating modes of 8251, 8254,8255, 8259, 8279 (for their currently available functionally equivalent! upgrade) and

DMA controllers asynchronous receiver/ transmitter (UART) etc ADC and DAC chip 8086 Architecture, addressing mode, instruction set, assemble dependent instructions, programmed I/0 IOP interrupts, DMA, system design using 8086, 8087 processor 8086 family assembly language programming, programme development with assemble and other development tools like compiles, debugger etc. Data transfer instructions, branch instructions, NOP, HL T and flag manipulations instructions, and string instructions, stack manipulations.

Introduction to micro controller, 8031/8051 architecture, instruction set, addressing modes, programming of 8031/8051 Peripheral interfacing, parallel Vs. serial transmissions, synchronous and asynchronous serial data

transmission, DAC and ADC interfacing, DMA controller interfacing, Interface standards, parallel and serial interface, IEEE 488 interface bus, 8-100 bus standard, R8 232C, R8 422, R8 423, current loops, Brief introduction to typical applications of microprocessors.

Recommended Books:

1. M. Rafiquzzaman, Microprocessor, PHI (fifth India reprint) 1999.
2. D.V. Hall Microprocessors and Interfacing, TMH, 1999.
3. R.S. Gaonkar, Microprocessor, Architecture, Programming and Applications with the 8085, Penram Int. 2000.
4. G.A. Gibson and L. Y. Chens, Microcomputer systems, PHI.
5. W .A. Triebel and A. 8ingh, 8088 and 8086 Microprocessors, Programming,

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Laboratory Work

Total Marks for practicals will be 200. 160 marks will be for three experiments at the University evaluation 60 marks will be for internal evaluation consisting of tests and laboratory reports. Each student will have to undergo training in industrial establishment/ research organization for 8 weeks and submit duly certified report on completing the training.

List of Experiments:

1. To design, build and test (i) BCD to Excess-3 code converter (ii) Excess-3 to BCD cod converter .
2. To design, build and test digital comparator.
3. To design build and test parity generator.
4. To design build and test irregular counter using J-K flip flop.
5. Study of the Analog comparator LM-311. Application of an analog comarator as,
   (i) Window detector
   (ii) TTL interface
   (iii) Heat detector
6. To design, build and test analog multiplexer and demultiplexer.
7. Study of an IC NE555. Application of as,
   (i) Square wave generator
   (ii) Duty cycle generator
8. Programming exercise in C and CAD. (At least eight exercise in C programming of reasonable complexing)
9. To design build and test POM Delta Modulator.
10. To design build and test Delta Modulator.
11. To design build and test.a Digital Filter.
12. To design ofB & Wand Colour TV Receiver.
13. Experiments of microwave trainer system.
14. Experiments of laser kit
15. Experiments of fiber optic-kit (setting up analog and digital link etc)
16. Experiments on analog and digital communication trainer last.