

REVISED CURRICULUM OF ELECTRONICS

Curriculum Development Project
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Islamabad



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CURRICULUM DIVISION, UGC

Prof. Dr. Altaf Ali G. Shaikh
Mr. Muhammad Younus
Malik Ghulam Abbas
Miss Ghayyur Fatima
Mr. Zaheer Ahmad Awan
Mr. M. Tahir Ali Shah
Miss Noshaba Jamil

Director General (C&T)
Director Curriculum
Deputy Director
Research Associate
Education Officer
Assistant Director
Assistant Director

Composed by Nadeem A. Janjua, UGC, Head Office, Islamabad

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PREFACE

Curriculum of a subject is said to be the throbbing pulse of a nation. By looking at the curriculum of a subject, one can judge the state of intellectual development and the state of progress of a nation. The world has turned into a global village, new ideas and information are pouring in a constant stream. It is, therefore, imperative to update our curricula by introducing the recent developments in the relevant fields of knowledge.

In exercise of the powers conferred by Sub-section (1) of section 3 of the Federal Supervision of Curricula Textbooks and Maintenance of Standards of Education Act 1976, the Federal Government vide Notification No.D773/76-JEA (Cur.), dated December 4, 1976, appointed University Grants Commission as the Competent Authority to look after the Curriculum Revision Work beyond Class XII at Bachelor level and onwards to all Degrees, Certificates and Diplomas awarded by Degree Colleges, Universities and other Institutions of higher education.

In pursuance of the above decisions and directives, the Commission is continually performing curriculum revision in collaboration with the Universities. According to the decision of the 44th Vice-Chancellors' Committee, curriculum of a subject must be reviewed after every 3 years. For the purpose, various Committees are constituted at the national level comprising senior teachers nominated by the Universities. Teachers from local degree colleges and experts from user organizations, where required, are also included in these Committees.

The National Curriculum Revision Committee on Electronics in its meeting held in April, 2002 at the U.G.C. Regional Centre, Karachi finalized the draft curriculum after due consideration of the comments and suggestions received from the Universities and Colleges where the subject under consideration is taught.

The Final draft prepared by the Curriculum Revision Committee duly approved by competent authority is being circulated for implementation by the Universities.

(PROF. DR. ALTAF ALI G. SHAIKH)
ADVISER (C&T)

June 2002

INTRODUCTION

A meeting of National Curriculum Revision Committee (NCRC) on Electronics was held during 16-18 April 2002 in the Regional Office of U.G.C., Karachi. The meeting chaired by Dr. Abdul Qadeer of Karachi University as Chairman of NCRC and Dr. Muhammad Maroof Khushk of University of Sindh, Jamshoro as Secretary. Following attended the meetings.

1. Prof. Dr. Abdul Qadeer, Chairman
Deptt. of Electronics,
University of Karachi,
Karachi.
2. Prof. Dr. Nazir Shah Khattak, Member
Professor/Chairman,
Department of Electronics,
University of Peshawar,
Peshawar.
3. Dr. M. Azhar Iqbal, Member
Assistant Professor,
Department of Physics,
University of the Punjab,
Lahore.
4. Mr. Saiful Islam Qureshi, Member
Principal Research Officer,
National Institute of Electronics,
Ministry of Science & Technology,
Islamabad.
5. Mr. Muhammad Riaz, Member
Chief Scientific Officer,
Head Electronic Division,
Pakistan Institute of Science & Technology,
(PINSTECH), P.O. Nilore,
Islamabad.
6. Dr. Saqib Anjum, Member
Assistant Professor,
Department of Physics,
Govt. Superior Science College,
Shah Faisal Colony,
Karachi.

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|----|---------------------------------------------------------------------------------------------------------------------|-----------|
| 7. | Dr. Najeeb Siddiqui,
Department of Applied Physics,
University of Karachi,
Karachi | Member |
| 8. | Dr. Muhammad Maroof Khushk,
Professor & Chairman,
Department of Physics,
University of Sindh,
Jamshoro. | Secretary |

The committee members' deliberated on the proposed revised syllabi for two years B.Sc. and two years M.Sc degree programmes and the introduction of four years B.S. professional degree programme. The committee members developed outlines for 50 courses related to electronics and allied subjects for the B.S. programme. A list of 100 experiments is also proposed.

CURRICULUM FOR B.Sc. (ELECTRONICS)

COURSE OUTLINE FOR ELECTRONICS AT B.SC. LEVEL

- I. **Circuit Theory**
- II. **Electronic Devices**
- III. **Digital Electronics I**
- IV. **Electronic Communication**

PAPER -I: CIRCUIT THEORY

Course Objective:

After doing this course, the students will be able to understand the difference between different types of resistance network. Their use and the transformation from one network into the other network.

The students would be able to understand energy storage in inductors and capacitors and able to apply these concepts to analyse the passive circuits. Student should be able to design LRC circuit and be able to calculate power, phase voltage and currents.

Circuits with constant voltages and currents:

Conventions for voltage and current, units, Ohm's Law, Kirchoff's Laws and applications to combining resistances in series and parallel, ideal voltage and current sources; technique of circuit analysis using nodal voltages; modeling of real devices with ideal elements, equivalence of voltage and current sources; Thevenin's Theorem, Norton's Theorem; technique of circuit analysis using mesh currents; power, power transfer from a source to a load; linearity, superposition; star-delta and delta-star transformations.

Transient effects in electrical circuits:

Energy storage elements: inductance and capacitance, units; types of time-varying excitation in electrical circuits, transients in circuits with a first-order response by analytic solution of a differential equation, exponential rise and decay, time constant in R-C and R-L circuits; initial conditions, effect of initial

condition on response, establishing initial and final conditions in higher-order circuits; energy storage in capacitors and inductors.

Circuits with steady-state sinusoidal excitation:

Concepts of frequency, angular frequency, phase shift, amplitude, peak, peak-to-peak, and root-mean-square values; introduction to the j operator and its application in circuit analysis; complex impedance, admittance, resistance, reactance, conductance and susceptance; complex impedances of ideal circuit elements, solution of simple circuits by combining impedances in series and parallel; phasor representation of alternating voltages and currents, phasor diagrams as an aid to understanding; general circuit analysis using j notation (nodal voltage and mesh current)

Resonance:

Analysis and applications of series and parallel resonant circuits, bandwidth and Q factor. Relationships between power, reactive power and VA, power factor, principle of conservation of power and reactive power, reactive power absorbed by capacitors and inductors, power factor correction, complex power in terms of phasor voltages and currents.

BOOKS RECOMMENDED:

1. Roland E. Thomas & Albert J. Rosa, The Analysis and Design of Linear Circuits, 3e, John Wiley & Sons, 2001
2. Smith, R. J. , and Dorf, R.C., 'Circuits, Devices and system 5th edition, Wiley
3. Cunningham, D.R. and Stuller, J.A., "Circuit Analysis." Houghton Mifflin.
4. James W. Nilsson & Susan A. Riedel, Electric Circuit, 5e, Addison Wesley, 1996

Paper II: ELECTRONIC DEVICES:

Course Objective:

The objective of this course is to understand the concept, working and application of various electronic devices. The students should be able to use these devices for designing different circuits/products such as power supplies, amplifiers, oscillators and analyzers.

Electrons and holes in semiconductor, p and n type semiconductors, the P-n junction. Characteristics of p-n junction diode, Zener diode, bipolar transistor, Field effect transistor, MOS diode, MOSFET , Tunnel diode and Light emitting diodes. Characteristics and applications of thyristors and triacs,

Rectifiers: half wave, full wave and bridge rectifier, ripple factor, voltage regulation, construction of regulated power supplies.

Amplifiers: Common base, common emitter and common collector amplifiers. Voltage current and power amplification. Positive and negative feed back,

Oscillators: Hartley, Colpitt and Crystal Oscillators

The Operational Amplifiers:

Introduction, operational amplifier characteristics, open-loop gain, bandwidth, effect of negative feedback on gain and bandwidth, Practical operational amplifier circuits, inverting and non-inverting amplifiers, the unity gain buffer, the summing amplifier, differential amplifier. Op-amp specification (CMRR, slew rate, input offset voltage and current, PSRR), Selection criteria of an op-amp.

BOOKS RECOMMENDED

1. Grob Bernard, " Basic Electronics", McGraw Hill, 1995.
2. Robert Boylested and Louis Nashelsby, " Electronics Devices and Circuit Theory", 7th Edition, Prcentage Hall

PAPER III DIGITAL ELECTRONICS -I

Course Objective:

After doing this course the students would be able to understand the basic concepts of digital electronics, basic concept of logic gates, should be able to make small combination logic circuit. The student should be able to make small counters and shift register and should be able to design the circuits containing gates and memory elements.

Combinational logic:

Binary number representation; 2's complement and 1's complement, basic logic gates AND, OR, NOT, EX-OR/NOR; universal logic gates NAND/NOR; Karnaugh mapping for logical statement minimization; identification of static hazard conditions.

Combinational logic applications:

Full adder/ subtractor; carry look ahead; simple encoders; parity checking; use of digital simulator.

Sequential logic:

Derivation of the basic RS latch; design of T, D, JK flipflops, including truth tables, characteristic equations, master-slave operation/edge triggering; brief discussion of race conditions.

Sequential logic applications:

Design of counters; operation of parallel/serial input/output shift register; design of simple multiplexer, feedback shift register circuits.

Switching/logic circuits:

Switching properties of BJT, FET; basic circuit operation of BJT and MOS gates; comparison of common logic families and identification of their interfacing requirements. Introduction to Microcomputers, I/Os, Buses, Microprocessors, Memories and Storage Devices.

BOOKS RECOMMENDED:

1. Floyd "Fundamental of Digital Electronics", 7th Edition, Prentice Hall
2. A.Paul Malvino & Donald P. Leach, Digital Principles & Applications, McGraw Hill Co. 5th edition.1992

PAPER IV: ELECTRONIC COMMUNICATION:

Course Objective:

Objective of this course is to introduce basic concepts of communication electronics. The students should be able to understand amplitude and frequency modulation techniques. They must be able to explain how signal is detected and reproduced in original form

Amplitude Modulation Principles: Modulation, AM, FM, pulse Modulation, Power Relationships, Assignable Frequency Spectrum, Band Selection.

AM Transmitters: Circuits, High Level Modulation, Double Modulation, AM with Pulse Width Modulation, Low Level Modulation.

AM Radio Receivers and Transmitters: Superheterodyne Receiver, Double Conversion Receivers, Receiver Circuits: The Front End, IF Amplifiers, AM

Detectors, Automatic Gain Control, Audio Amplifiers, Squelch, Receiver Schematics, Loudspeakers, AM Stereo.

Frequency Modulation Principles: Modulated Wave, FM Radio Frequency Band, Direct and Indirect Frequency Modulation (Phase Modulation), Carrier Phase in the Frequency-Modulated Wave.

FM Detectors, Stereo FM, FM Receiver

Television: Scanning Principles, Deflection Systems, Video Camera Tubes, Video Picture Signal, Vestigial Sideband Transmission, TV Receiver Front END, Color TV Receivers.

Optical communication:

Introduction of Optical Fibers, Optical sources and detection optical modulation techniques

BOOKS RECOMMENDED:

1. Kennedy George, "Electronic Communication ", McGraw Hill, 1992.
2. Thomas L. Floyd, Electronic Fundamentals,x 2nd. Ed., Maxwell-Macmillan, New York, 1991
3. M. Slurzberg and W. Osterfield, Essential Of Communication Electronics, National Book Foundation, Islamabad, 1991
4. M. C. Kelly and B. Nichols, Introduction to Linear Electrical Circuits and Electronics, John Wiley, New York,1988
5. Michael Tooley, Electronic Circuits Handbook, BPB Publications, New Delhi, 1994
6. F. H. Mitchell Jr. and Mitchell Sr., Introduction to Electronic Design, Prentice Hall, London, 1988
7. A. P. Malvino and D. P. Leach, Digital Principles and Applications, 4th Ed., McGraw Hill, New York, 1986
8. C. E. Strangio, Digital Electronics, Prentice Hall, London, Latest Edition
9. Malvino A. P. and Brown J.A., Digital Computer Electronics, McGraw Hill School Publishing Company , 1993,Electronics for Today by Tom Duncan, Oxford University Press,

LIST OF EXPERIMENTS OF B.SC.(ELECTRONICS):

1. Circuit Theory
 - a) Parallel resistance network
 - b) Impedance matching
 - c) Observation time constant, Resistance, Capacitance
2. Junction diode characteristics
3. Clippers and Clampers
4. Rectification and power supplies
 - a) Half wave, Full wave rectification
 - b) Average Values
 - c) Arm values, Peak Values
 - d) Filters
5. Bipolar junction Transistor characteristics
6. Transistor Configurations
7. Load line analysis and Large Signal Amplifiers
8. Coupled Amplifiers
9. Push Pull Amplifiers
10. Junction Field Effect Transistor
11. Transistor Voltage Regulators
12. Sinusoidal Oscillators
13. Multivibrators
 - a) Astable
 - b) Mono-stable
 - c) Bi-stable
14. Differential Amplifiers
15. Operational Amplifiers characteristics
16. Mathematical Operations of Operational Amplifiers
17. Non-Linear OP-AMP circuits
18. Active Filters
19. Oscillators and Function Generators
20. Timers and VCOs
21. Amplitude Modulation and Demodulation
 - a) Amplitude Modulation
 - b) Frequency Modulation
 - c) Phase Modulation
22. Phase Locked Loop
23. Logic Gates and Logic Inverters
 - a) Inverter
 - b) OR Gate
 - c) NOR Gate
 - d) AND Gate
 - e) X-OR-Gate

24. Boolean Algebra
25. Shift Registers and Shift Counters
26. Binary Counters
27. MUX, Dmux, Decoders and display
28. Semiconductor Memories
29. Frequency Counters
30. DAC and ADC

**CURRICULUM
FOR
M.Sc.(ELECTRONICS)**

COURSE PLAN FOR M. Sc. ELECTRONICS

SEMESTER-I

1. Applied Mathematics
 2. Circuit Analysis & Synthesis
 3. Solid State Electronics
 4. Analog Electronics.
 5. Introduction to Computer Languages
- Lab-I Circuit Analysis
Lab-II Digital Logic Circuits

SEMESTER-II

6. Signals and Systems Analysis
 7. Electromagnetics
 8. Digital Logic Design
 9. Electronics Communication
 10. Mathematical and Computational Methods
- Lab-I Linear Electronic Circuits
Lab-II Analog Electronics

SEMESTER-III

11. Microprocessors & Micro-controllers
 12. Communication Systems
 13. Photonics and Opto-electronics
 14. Industrial Electronics and Robotics
 15. Advanced Instrumentation
- Lab-I Microprocessors
Lab-II Communication Systems

SEMESTER-IV

16. Data Communication Networks
 17. Microprocessor Interfacing
 18. Control Systems
 19. Telecommunication Systems
 20. Digital Signals Processing
- Project/Comprehensive Viva-voce
Lab-I Interfacing
Lab-II Data Communication./Robotics/Telecommunication..

PROPOSED OUTLINE OF CORE COURSES FOR M. SC. (ELECTRONICS)

SEMESTER-I

1. Applied Mathematics:

Standard Functions and Techniques, Taylor Series and Approximations, Complex Numbers, Matrix Algebra, Linear Equations, Anti differentiation and Area, The Definite and Indefinite Integral, Systematic Techniques for Integration, Homogenous and inhomogeneous Linear Differential Equations with Constant Coefficients, Harmonic Functions and the Harmonic Oscillator, Steady Forced Oscillations: Phasors, Impedance, Transfer Functions, Graphical, Numerical and Other Aspects of First-Order Equations, Introduction to the Phase Plane, Line Integrals, Sets, Boolean Algebra: Logic Gates and Switching Functions, Graph Theory: Circuit Analysis and Signal Flow, Difference Equations, graph theory and its applications.

BOOKS RECOMMENDED:

1. D. W. Jordan and P. Smith, Mathematical Techniques, Oxford University Press, 1994
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley, New York, 1991
3. Peter B. Khan, Mathematical Methods for Scientists and Engineers, John Wiley, New York, 1990
4. Mary L. Boas, Mathematical Methods in Physical Sciences, John Wiley, New York, 1989

2. Circuits Analysis and Synthesis:

Basic Definitions and Laws: Fundamentals of Lumped Networks, Circuit Elements and Power, Kirchhoff's Laws, Conservation of Power, Controlled Voltage and Current Sources, Analysis of Simple Circuits, Source Transformations, Analysis of Circuits Containing Controlled Sources, The Operational Amplifier.

Basic Circuit Analysis Techniques, Equivalent Circuits, Systematic Circuit Equation Formulation and Solution, The 2b Circuit Equations, The Circuit Graph,

Introduction to the SPICE Circuit Analysis Program.

Additional Analysis Methods: Linearity and the Principle of Superposition, Thevenin and Norton Equivalent Circuits, The Cutset Voltage Method, The Loop-current Method, The Node Voltage Method, The Mesh Current Method.

Circuits with Memory Elements:

The Capacitor, Inductor, Mutual Inductance, Superposition and the 2b Circuit Equations for Circuits Containing Memory Elements, Response of the Energy Storage Elements to DC Sources.

Sinusoidal Excitation of Circuits:

The Sinusoidal Source, Complex Numbers and Complex Algebra, Use of the Complex Exponential Source, the Phasor Concept, Time Domain Versus the Frequency Domain Analysis of Circuits, Use of SPICE in Solving Phasor Circuits, Power Relations for Resistors, Inductors, and Capacitors, Maximum Power Transfer, Average Power in AC Circuits, Effective Values of Periodic Signals, Phasor Diagrams, Three-Phase Circuits, Use of SPICE in Solving Three-Phase Circuits,

BOOKS RECOMMENDED:

1. Irwin, Basic Engineering Circuit Analysis, 7th Edition 2002
2. Charles J. Monier Electric Circuit Analysis, 1/e 2001 / Prentice Hall
3. Charles J. Monier OrCAD PSpice and Circuit Analysis, 4/e 2001 / Prentice Hall
4. The Analysis and Design of Linear Circuits, 3e, Roland E. Thomas & Albert J. Rosa, John Wiley & Sons, 2001
5. L. Floyd, Principles of Electric Circuits: Conventional Current Version, 7/e/ 2000 Prentice Hall
6. Smith, R. J. , and Dorf, R.C., 'Circuits, Devices and system 5th edition,' Wiley
7. Cunningham, D.R. and Stuller, J.A., "Circuit Analysis." Houghton Mifflin. Thomas James W. Nilsson & Susan A. Riedel, Electric Circuit, 5e, Addison Waseley, 1996
8. Clayton R. Paul, Analysis of Linear Circuits, McGraw Hill, 1989.
9. Roland E. Thomas & Albert J. Rosa, Circuits and Signals: An Introduction to Linear Interface Circuits, John Wiley, 1984.
10. Leonard S. Bobrow, Elementary Linear Circuit Analysis, Holt Saunders Int. Edition, 1981.
11. Lan Sinclair, PC Assisted Linear Circuit Analysis and Design, Newness, 1993
12. M. C. Kelley and B. Nichols, Introduction to Linear Electrical Circuits for Electronics, John Wiley, New York, 1988
13. E. J. Mastascusa, Computer Assisted Networks and System Analysis, John Wiley, New York, 1988

3. Solid State Electronics:

Introduction to Basic Quantum Mechanics, Particle in a box, Kronning-Penning Model and Energy Bands in Solids, Semiconductors Statistics, Intrinsic and Extrinsic Semiconductors, Shallow and Deep Impurities, Non-Degenerate and Degenerate Semiconductors, Calculation of Doping Densities and the Fermi Level, Mobility, Conductivity and Life Time of Carriers.

The PN Junction: Homo and Hetero-Junction Devices, Abrupt and Linearly Graded PN Junctions, Current Transport in the PN Junction. PIN Diodes, SCR's, DIAC's & TRIAC's.

Transistors: Bi-polar Junctions Transistors, Modes of Operations, Injections Efficiency, Gain etc., Transistors Modeling, Frequency Performance, HF Transistors. Metal Semiconductor Contacts, Field Effect Transistors, JFET, MESFET, MOS Diode, MOSFETS Structures, Frequency Performance of Devices, MOD FET, HJ Devices, Nano structures, Quantum Well, Quantum Wires, Quantum dot.

Introduction to Fabrication of Semiconductor Devices and Integrated Circuits.

BOOKS RECOMMENDED:

1. Sigh, Semiconductor Devices: Basic Principles, 2001
2. Neaman, Semiconductor Physics and Devices: Basic Principles, 1997
3. Shur, Introduction to Electronic Devices, 1996
4. Donard De Cogan MacMillan, Solid State Devices, London, 1987.
5. G. Schultz, Electronic Devices, MacMillan, 1994
6. Wolfe, Holonyak & Stillman, Physical Properties of Semiconductors, Prentice Hall Cliffs. 1988.
7. M S Tyagi, Introduction Semiconductor Materials and Devices, Wiley New York, 1991.

4. Analog Electronics:

A Review of DC and AC Circuit Analysis, Sinusoidal Signals, Frequency, Amplitude, Phase, Power Factor, Filters, Differentiators, Integrators, Transient Circuits, Complex Waveforms, Impedance, Complex Impedance, Resonance Circuits, Bridge Circuits, Transformers.

Rectifier: Half Wave Rectifiers, Full Wave Rectifiers, Voltage Regulator Circuits, Current Regulator Circuits, Filters, Power Supplies, Integrated Circuit regulators.

Amplifiers: Amplifier Configurations Load Lines, Coupling of Amplifiers, Feedback Amplifiers, Small Signal Amplifiers, Large Signal Amplifiers, Pulse Amplifiers, DC Amplifiers, Differential Amplifiers, Darlington Amplifiers, Low Noise Amplifiers.

Oscillators: Principles, Sinusoidal Oscillators, Various Types of Oscillator Circuits, Resonance Circuits Oscillators, Non sinusoidal Oscillators, Relaxation Oscillators, Blocking Oscillators, Multi Vibrators.

Linear Circuit IC's, Operational Amplifiers, Timers, Phase Locked Loops, Design of Active Filters Using Operational Amplifiers.

BOOKS RECOMMENDED:

1. Tom Floyd, Dave Buchla, Fundamental of Analog Circuits, 2nd Edition, 2002, Prentice Hall
2. Robert F. Coughlin, Operational Amplifiers and Linear Integrated Circuits, 6th Edition, Fredrick F. Driscoll, 2001, Prentice Hall
3. Gray, Hurst, Lewis, Meyer, Analysis and Design of Analog Integrated Circuits, 4th Edition, 2001, Prentice Hall
4. J. Micheal Jacob, Analog Integrated Circuits Applications, 2000, Prentice Hall
5. Johns, Martin, Analog Integrated Circuits, 1997
6. Thomas L. Floyd, Electronics Fundamentals, Maxwell Macmillan International, 1991.
7. Michael Toolay, Electronic Circuits Handbook, 2nd Ed. , Newness, 1995
8. Essential of Communication Electronics by Morris Sluzberg, William Osterheld, McGraw Hill Publishing Co., 1989.
9. A.W. Scott, Application Design with Analogue Integrated Circuits, 1993
10. J. Y. Wait, Introduction to Operational Amplifiers, McGraw Hill, 1992

5. Introduction to Computer Languages:

Introduction to Computer hardware and Software organization. Operating System concepts, DOS, LINUX/UNIX Operating Systems, Introduction to Windows, Environment, Local Area Networks and Internet, Computer Security.

Fundamentals of Programming: High Level Languages, Problem Analysis and Algorithm Development, Flow charting, Sequential Flow, Conditional Flow, Repetitive Flow, Algorithm Logic.

Introduction to C-language: Program structures, Pre-processor declaration, Looping and Flow Control in C, Functions and Structured Programming, standard data types, Branching and Nested Flow of Control, Arrays and Strings, Pointers, Structure data types and Union , Input / Output, Filling System in C, Graphics programming, Objects Oriented Programming, Introduction to JAVA.

BOOKS RECOMMENDED:

1. Tucker Noonan, Programming Languages: Principles and Paradigms, 2002, McGraw Hill
2. C++ Program Design, 3rd Edition, 2002, McGraw Hill
3. Cormen et.al., Introduction to Algorithms, 2nd Edition, 2002, McGraw Hill
4. Wu, An Introduction to Object Oriented Approach with C++,1998, McGraw Hill
5. Francis Scheid, Schaum's Outline Series, Computers and Programming, 1983.
6. C Programming using Turbo C, Robert Lafore Howard & W. Sams Co., 1990.
7. L. H. Miller and A. E. Quilici, Joy of C, John Wiley, New York, 1993
8. Microsoft Disk Operating Systems Manual
9. Anthony Rudd, C++ Complete, John Wiley, New York, 1994
10. Jones, Understanding UNIX, Que. Books, 1990.
11. W. Stallings, Computer Organization and Architecture, Maxwell-Macmillan, New York, 1990.

SEMESTER-II

6. Signals and System Analysis:

Signal and System Characteristics and Models, Linear Systems, Continuous Discrete Time Systems, Time Domain Analysis of Continuous Time Systems, Convolution and Impulse Response, Spectral Analysis of Continuous Time Systems, Fourier Series, Fourier Transforms, Analysis of Continuous Time Systems using the Laplace Transform application and Laplace Transform, State Variable for Continuous Time Systems, principles of filter design, Time Domain Analysis of Discrete Time Systems, Introduction to Z-Transforms.

BOOKS RECOMMENDED:

1. John D. Sherrick, Concepts in Systems and Signals, Prentice Hall 2001
2. Taan S. ElAli & Muhammad A.Karim, Continuous Signals and Systems with MATLAB, CRC Press, 2001signals and Systems with MATLAB Applications, Steven T. Karris, Orchard Publications, 2001
3. Douglas K. Linder, Introduction to Signals and Systems, McGraw Hill, 1999
4. Simon Haykin & Barry Van Veen, Signals and Systems, John Wiley & Sons, 1999
5. Gordon E. Carlson, Signal and Linear System Analysis, John Wiley, 1992.

6. McGillem Cooper, Continuous and Discrete Signal and System Analysis, CBS Pub. Japan, 1986.
7. Robert A. Gabel, Richard A. Roberts, Signals and Linear Systems, 3rd Ed. John Wiley, Singapore, 1995.
8. E. J. Mastascusa, Computer Assisted Networks and System Analysis, John Wiley, New York, 1988
9. H. Kwarkernak, Modern Signals and Systems, Prentice Hall, 1991
10. B.P.Lathi, Linear Systems and Signals, Berkeley, Cambridge Press, 1992
11. Rodger E. Ziemer & William H. Tranter, Signals & Systems: Continuous and Discrete, 4e, Prentice Hall, 1998
12. Alan V. Oppenheim, Alan S. Willsky & S. Hamid Nawab, Signals and Systems, 2e, Prentice Hall, 1997

7. Electromagnetics:

Electromagnetic Waves. The Homogeneous Wave Equation, Plane Waves in three Dimensions, Radiation from Elementary Electric Dipoles, Current Distributions and Arrays, Diffraction and Interference, Waves on Continuous Transmission Lines, Periodic Structures, and Dielectric and Metallic Wave guides, Propagation and Evanescence, Energy Flow and Impedance Matching. Phase and Group Velocity. Natural Frequencies and Modes of Closed Electromagnetic Structures, Coupling to Resonant Structures.

BOOKS RECOMMENDED:

1. Hayt, Jr and Buck, Engineering Electromagnetics, 6th Edition, 2001, McGraw Hill
2. Simon Ramo, J, R. Whinnery and T. Van Duzer, Fields and Waves in Communication Electronics, John Wiley, 1994
3. C. A. Balanis, Advanced Engineering Electromagnetics, John Wiley, New York, 1989
4. Kraus, Fleisch, Electromagnetics with Applications, 3rd Edition, 1988, McGraw Hill
5. C. R. Paul and S. A. Nasar, Introduction to Electromagnetic Fields, McGraw Hill, 1987
6. Introduction to Electromagnetic Fields and Waves, D. R. Corson and Paul Lorain, Freeman & Co., 1975 or Latest Addition

8. Digital Logic Design:

Fundamental Concepts in Digital Electronics, Binary Systems, Boolean Algebra and Logic Gates, Simplification of Boolean Functions, Combinational Logic Design: Universal Gates, Analysis and Design of Combinational Logic, Karnaugh Maps, Tabular Methods, Combinational Logic With MSI & LSI. DIGITAL CODES, Encoders & Decoders. Arithmetic Logic Function: Half and Full Adders and

Subtractors, Parallel Adders and Subtractors, Process of Division and Multiplication in Arithmetic Circuits. Integrated Circuit Technologies & Families,

Flip Flops & Sequential Logic Design: Latches, Gated Edge Triggered, Pulse Triggered and Data Lock out Type Flip Flops, Registers, Counters, and Memory Unit, Register Transfer Logic, Design of Sequential Circuit, State Diagram Transition Table, Cascaded Counters With Truncated Sequence. Introduction to State Machines.

Multiplexing: Basic concepts of MVX & MUX, Application of MUX and DMUX in Digital Communication, Freq. Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing. A/D and D/A Converters.

BOOKS RECOMMENDED:

1. William Kleitz, Digital Electronics,; A Practical Approach, 6th Edition, 2002, Prentice Hall
2. Terry L.M. Barlet, Digital Electronics, An Integrated Lab Approach, 2002, Prentice Hall
3. Robert D. Thompson, Digital Electronics, A Simplified Approach, 2001, Prentice Hall
4. Ronald J. Tocci, Neal S. Widmer, Digital Systems: Principles and Applications, 8th Edition, 2001, Prentice Hall
5. Brown, Varanesic, Fundamentals of Digital Logic with VHDL Design, 2000, McGraw Hill
6. A. Paul Malvino & Donald P. Leach, Digital Principles & Applications, McGraw Hill Company. (5th Ed.) 1992.
7. William Stallings, Data & Computer Communication (4th Ed.), Macmillan Publishing Company, 1991.
8. Microprocessor Based Design, Michael Slater Mayfiled Publishing Company, CA. 1989.
9. M. M. Mano, Digital Logic and Computer Design, Prentice Hall, 1989
10. Hill, Digital Systems:(Hardware Organizations Design) 3rd Ed.,1987

9. Electronics Communication:

Basic Communication Systems; Introduction to Communication Systems, Elements of a Communication System, Time and Frequency Domains, Noise and Communications.

Radio Frequency Circuits; High Frequency Effects, Radio Frequency Amplifiers, Radio Frequency Oscillators, Mixers.

Amplitude Modulation; Time Domain Analysis, AM in the Frequency Domain, RMS and Peak Voltages and Currents, Quadrature AM and AM Stereo.

AM Transmitters; Transmitter Requirements, Typical Transmitter Topologies, Transmitter Stages, Out put Impedence Matching

AM Receivers; AM Demodulation, Receiver Types, Receiver Characteristics, Transceivers.

Suppressed-Carrier AM Systems; Single-sideband Transmitters, Balanced Modulators for Double-sideband Suppressed Carrier, Single sideband Receivers, single sideband Transceivers.

Angle Modulation; Frequency Modulation, Phase Modulation, The Angle Modulation Spectrum, FM and Noise, FM Stereo.

FM Equipment; FM Transmitters, FM Receivers, FM transceivers, FM Stereo Transceivers and Receivers.

Television; Baseband Video Signal, Television Broadcasting, Television Receivers, Cable Television, High Definition Television.

The Telephone System; The Structure of a Switched Network, Signals and Noise in the Telephone System, In-Channel and Common-Channel Signaling, Frequency Division Multiplexing.

BOOKS RECOMMENDED:

1. Roy Blake, Electronic Communication Systems, 2nd Edition, 2002
2. William Schweber, Electronic Communication Systems: A Complete Course, 4th Edition, 2002, Prentice Hall
3. Leon W. Couch II, Digital and Analog Communication Systems, 6th Edition, 2001, Prentice Hall
4. Mattew M. Radmanesh, Radio Frequency and Microwave Electronics, 2001, Prentice Hall
5. Kennedy, Electronic Communication, McGraw Hill, 1992.
6. J. Dunlop and D.G. Smith, Telecommunication Engineering, 3rd. ed., Chapman and Hall, London, 1994
7. Robert J. Schoenbeck, Electronic Communication, Maxwell Macmillan International, 1992.
8. W. Tomasi, Advanced Electronic Communication Systems, 3rd. Ed., Prentice Hall, 1994
9. Sol Lapatine, Electronics in Communication, John Wiley, New York, 1986
10. G. M. Miller, Modern Electronic Communication, Prantice Hall, New York, 1993.

10. Mathematical and Computational Methods:

Introduction to Mathematical Modeling of Physical System,. Fundamentals of Numerical Methods, Basic Recursion Formulae and Successive Approximation, Number Representation, Floating Point Arithmetic, Errors in Numerical Computation.

Solution of Linear System of Equations with Application to Network Analysis , Evaluation of Determinants and Inversion of Matrices, Iterative Methods of Solution. Solution of Non linear Algebraic Equations, Matrix Equations, Eigenvalues and Eigenvectors. Application Eigenvalue Problem to Electronic Systems, Numerical Interpolation and Data Analysis, Numerical Differentiation and Integration, Numerical Methods for Ordinary Differential Equations.

Probability: Modeling, Quantification and Analysis of Uncertainty, Formulation and Solution in Sample Space, Random Variables, Transform Techniques, Simple Random Processes and their Probability Distributions, Processes, Limit Theorems, Elements of Statistical Inference.

BOOKS RECOMMENDED:

1. Epperson, An Introduction to Numerical Methods and Analysis, 2001, John Wiley & Sons
2. Graham de Vahl Davis, Allen and Unwin, Numerical Methods in Engineering & Science, London, 1986.
3. Kendall E. Atkinson, An Introduction to Numerical Analysis, John Wiley and Sons, New York, 1989.
4. T.R. McCalla, Introduction to Numerical Methods and Fortran Programming, John Wiley and Sons, New York, 1967.
5. C.F. Gerald and P.O.Wheatley, Applied Numerical Analysis, 5th Ed., Addison-Wesley, Reading, 1994
6. M. L. James, G. M. Smith and J.C. Wolford, Applied Numerical Methods for Digital Computers, Harper & Row, New York.

SEMESTER-III

11. Microprocessors and Microcontrollers:

Basic Microprocessor Architectural Concepts, Microprocessor Architecture-Families, Intel Microprocessors an Introduction, Pinout and Instruction set, Assembly Language Programming, Assembly Language Programming Techniques, IF-THEN-ELSE Structures, Procedures and Macros, Instruction Descriptions and Assembler Directives, Communicating with Microprocessors, Microprocessor I/O, Operating System and System Software, 32/64 bit Microprocessors, Architecture and Instruction set, Memory and Task

Management Hardware Features, Coprocessors and Other Advance Microprocessors, Microcontrollers, Architecture of Microcontrollers, Instruction sets. Application of Microcontrollers. Introduction to Transputers.

Pre-requisite: Digital Logic Design

NOTE: Any one of the commercially aviates Micro controller, Micro processor may be chosen for specific examples and application.

BOOKS RECOMMENDED:

1. Daniel Tabak, Advanced Microprocessor, 2nd Ed. McGraw Hill, New York, 1995
2. Douglas V. Hall, Microprocessors and Interfacing, 2nd Ed. McGraw Hill International Editions, 1990.
3. Charles M. Gilmore, Microprocessors, Principles and Applications, McGraw Hill International Editions, 1989.
4. Robert Grossblatt, 8088 Project Book, TAB Books Inc. USA, 1989.
5. William Stallings, Computer Organization and Architecture, Maxwell MacMillan International Editions. USA.
6. Muhammad Rafiq-uz-Zaman, Microprocessors and MicroComputers Based System Design, 2nd Edition,
7. The 80186 IBM PC and Compatible Computers (Vol. I and II), Assembly Language, Design and Interfacing 2nd Edition, Prentice Hall.
8. Scott Mackenzie, The 8051 u Controller, 2nd Edition, Prentice Hall.
9. Michael Thorne, Computer Orientation and Assembly Language, Performing or IBM PC and Compatible, 2nd Edition,

12. Communication Systems:

Introduction to Communication Systems, A Review Continuous Wave Modulation, Amplitude, Frequency, Angle Modulation, Vestigial Sideband and Single Sideband Modulation, Phase-locked Loop, Probability Theory and Random Processes, Noises in CW Modulation System, Information Theory, Error Control Coding, Optimal Signal Detection, Pulse Modulation, Baseband Pulse Transmission, Digital Communication, Digital Passband Transmission, Spread Spectrum Communication Systems, Satellite Communication, Optical Communication, Mobile Wireless Communication System.

Pre-requisite: Communication Electronics

BOOKS RECOMMENDED:

1. Roy Blake, Electronic Communication Systems, 2e, Delmar, 2002
2. Martin S. Roden, Analog and Digital Communication Systems, 4e, Discovery Press, 2001
3. Simon Haykin, Communication Systems, 4e, John Wiley & Sons, 2001

4. Jack Kurzweil, An Introduction to Digital Communications, John Wiley & Sons 2000
5. George Kennedy, Communication Systems, McGraw Hill, 1994.
6. J. Proakis and Masoud Salehi, Communication Systems Engineering, Prentice Hall, New Jersey, 1994
7. Martin S. Roden, Analog and Digital Communication Systems, Prentice Hall Int. Ed., London, 1991
8. B. P. Lathi, Holt Rinehart and Winston, Modern Digital and Analog Communication Systems, 1983.
9. Paul L Young, Electronic Communication, Maxwell Macmillan, 1990.
10. Simon Haykin, Communication Systems, 3rd. Ed. John Wiley and Sons, New York, 1994
11. G. R. Cooper and C. D. McGillem, Modern Communications and Spread Spectrum, McGraw Hill, New York, 1986

13. Photonics and Opto-Electronics:

Light Sources, LEDs and Semiconductor Lasers, Light Detectors, Electro-Optics Devices, Modulation of Light, Optical Fiber Waveguides, Optical Fiber Transmission, Optical Fiber Measurement, Optical Time Domain Reflectometry, Passive Components for Optical Coupling, Optical Interconnections, Optical Bistable Devices, Optoelectronic Integrated Circuits. Fiber Optic Communication Systems, Optical Fiber Sensor Technology, Optical Signals Processing, Optical Information Processing, Optical Computing.

Perquisite: Lasers & Applied Optics

BOOKS RECOMMENDED:

1. Gerd Keiser, Optical Fiber Communication, 3rd Edition, McGraw Hill, 2000
2. Davis, Laser and Electro-Optics, C.C. Cambridge University Press, 1996
3. Ed.P.K.Cheo, Fiber Optics and Optoelectronics, 2nd Edition, Prentice Hall, 1990
4. J. Wilson and F. B. Hawkes, Optoelectronics, Prentice Hall, New York, 1997
5. P. Das, Springer-Verlag, Lasers and Optical Engineering, New York, 1991.
6. B. E. A. Saleh and M. C. Teich, Fundamental Of Photonics, John Wiley, New York, 1991
7. Chinlon Lin, Optoelectronic Technology and Light wave Communication Systems, Van Nostrand Reinhold, New York, 1989.
8. F.T.S.YU and I. C. Khoo, Principles of Optical Engineering, John Wiley & Sons, New York, 1990.
9. M. A. Karim and A. A. Awwal, Optical Computing, John Wiley & Sons, 1992.

10. G. P. Agarwal, Fiber Optic Communication Systems, John Wiley & Sons, New York, 1992
11. Gerd Keiser, Optical Fiber Communications, McGraw Hill International Ed. , New York, 1991.

14. Industrial Electronics and Robotics:

Revision and discussion of semiconductor devices such as diodes, transistors, power transistors with reference to their terminal characteristics.

Switches: Manually, Mechanically, Electromechanically (such as Relays and solenoids) and Electronically operated switches.

Electronic Switches; Shockley diodes, Diac, SCR, Triac, SBS, SUS etc.

Time Delay Circuits: Passive and active time delay circuits.

Phase Shift Control: SCR and Triac circuits for phase shift control.

Motor and Motor Control: DC, Stepper, AC and Servo Motors construction characteristics and parameters, methods of Electronic Motor control.

Transducers: Temperature, Humidity, Pressure, Displacement, Flow and Level.

Process Control: Process characteristics, On-Off, Proportional, Integral, Differential and PID controllers.

Programmable Logic Controllers (PLC): Symbolic representation of various switches and sensors in control systems. Design of sequential control using Ladder Logic. Architecture of PLC, Comparison between general purpose computer and PLC, Instruction Set, Languages such as Statement List (STL), Functional Block Diagrams (FBD) and Graphical Flow.

Robotics: Classification, Characteristics, work envelope etc

BOOKS RECOMMENDED:

1. Timothy J. Maloney, Modern Industrial Electronics, 4th Edition, 2001, Prentice Hall
2. Colin D. Simpson, Industrial Electronics, 1 Edition, x 1996, Prentice Hall
3. Edition, James W. Maas, Industrial Electronics, x1995, Prentice Hall
4. James T. Humphires and Leslie P. Sheets, Industrial Electronics. 3rd Edition, Delmer Publishers, 1989.
5. Charles A. Schuler, W.L. McNamee, Modern Industrial Electronics. 2nd Edition, McGraw Hill, 1993.
6. John Webb, Industrial Electronics, Maxwell Macmillan.
7. Chute and Chute, Industrial Electronics, McGraw Hill.

8. John Webb, Programmable Logic Controllers, Principles and Applications. 2nd Edition, Maxwell Macmillan.
9. G. B. Rutkowski, Modern Industrial Electronics, John Wiley, 1993
10. Thomas, Rectifier, Converters and AC Controllers, Oxford Univ., 1994
11. Mohan, Undeland and Robbins, Power Electronics, John Wiley, 1994
12. Charles A. Davis, Industrial Electronics Design and Applications, Charles Merrill Co. 1973.
13. James T. Humpheries and Leslie P. Sheets, Industrial Electronics, Delmar Pub. Co. (USA) 1989.
14. C. A. Schuler and W. L. McNamee, Modern Industrial Electronics, McGraw Hill, New York, 1993
15. Charles A. Schuler and William L. McNamee, Industrial Electronics and Robotics, McGraw Hill, 1986.
16. J. L. Fuller, Robotics, Maxell & Macmillan, New York, 1991

15. Advanced Instrumentation:

Measurement Principles, Noise Sources, Detection and Noise Removal, Quality Control: Definition and purpose of Instruments, Data analysis, Data presentation (graphing techniques), Curve fitting, Type of Errors, Estimation of Errors using Statistical techniques.

Measurement System: Block Diagram of Functional Elements of a typical Instrument. Model relating Input and Output. Effect of interfacing inputs on output and its correction methods.

Generalized Performance Evaluation of Instruments: STATIC: Sensitivity, Linearity, Range, Resolution, Hysteresis Threshold and Dead Span. Calibration.

Dynamic: Design Criteria, Mathematical Modeling, Determination of Parameters by applying Step, Ramp, Impulse and Sinusoidal wavelet inputs to models. Experimental methods of parameters evaluation.

Noise: Basic definition, Intrinsic noises, Extrinsic noise coupling such as Conductive, Capacitive, Magnetic and Electromagnetic. Noise protection methods such as Shielding and Grounding. Safety Grounding and Signal Grounding. Noise in Digital Systems.

Signal Recovery Techniques: Spectral contents of Noise, Statistical Methods of describing Stochastic signals. Elimination of Noise by Cross Correlation, Autocorrelation, Examples of use of these techniques in instruments such as Lock-In Amplifier and Frequency Response Amplifier (FRA).

Biomedical Instrumentation: basic Biophysics: Flux Effluence, Drift and Diffusion of Particles, Brownian movement, Cells, Membrane, Nernst Equation, Axon and Muscles. Electrical Properties of Biological systems. Action potential. ECG and EEG signals.

Radiation Effects on Biological systems and Related Instrumentation: Sonic (Ultrasounds), RF (MRI) and Heating, Infrared (Diathermy), Optical (Laser surgery), Ultraviolet (Diathermy), X-rays (general X-ray, CT Scanning).

Clinical Instrumentation: Biological Signal detection, Electrodes and Transducers. ECG machine construction. PH measuring system, Photometers, Colorimeters, Blood Cell Counters.

BOOKS RECOMMENDED:

1. Johnson, Curtis D., Process Control Instrumentation Technology, Prentice Hall, 2002
2. Instrumentation Fundamentals for Process Control, Desa, Douglas O.J., Taylor and Francis Group, 2001
3. J.G. Webster, Medical Instrumentation: Application and Design, 3e, John Wiley, 1998
4. Ernest O. Doebelin, Measurement Systems, Application and Design, McGraw Hill, 1990
5. David Buchla and Wayne McLachlan, Applied Electronic Instrumentation & Measurement, Maxwell Macmillan.
6. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Longman 1995.
7. James W. Dally, William F. Riley and Kenneth G. McConnell, Instrumentation for Engineering Measurements, 2nd Edition, John Willey & Sons Inc. 1993.
8. L. Schnell, Technology of Electrical Measurements. Edited, x 1993, John Willey
9. David Buchia and Wayne McLachlan, Applied Electronic Instrumentation and Measurement, Macmillan, 1992.
10. Larry D. Jones and A. Foster Chin, Electronic Instruments and Measurements, Prentice Hall Inc. 1991.
11. Albert D. Helfrick and William D. Cooler, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall, 1990.
12. T H Willmshurst, Signal Recovery (From Noise in Electronic Instrumentation 2nd Ed.), Adam Hilger Press, 1990.

SEMESTER-IV

16. Data Communication Networks:

Introduction; Data Communication Networking, Protocol and Protocol Architecture, Standards OSI/TCP/IP.

Data Transmissions, Transmission Media; Guided Transmission Media, Wireless Transmission, Data Encoding, Digital Data, Digital Signals, Digital Data, Analog Signals, Analog Data, Digital Signals, Analog Data, Analog Signals, Spread

Spectrum, Data Communication Interface, Asynchronous and Synchronous Transmission, Interfacing, Data Link Control, Flow Control, Error Detection, Error Control, High Level Data Link Control (HDLC), Other Data Link Control Protocols, Multiplexing, Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing. Circuit Switching, Switched Networks, Routing in Circuit-Switched Networks. Packet Switching, Packet Switching Principles, Routing, Congestion Control, X.25 282. Frame Relay, Asynchronous Transfer Mode (ATM, LAN Technology, LAN Architecture, Bus/Tree LANs, Ring LANs, Star LANs, Wireless LANs, LAN Systems, Ethernet and Fast Ethernet (CSMA/CD), Token Ring and FDDI, ATM LANs, Wireless LANs.

BOOK RECOMMENDED:

1. Local Area Networks, 2nd Edition, 2002
2. Proakis, Digital Communications, , John Wiley & Sons 2001
3. Forouzan, Data Communication and Networking, , McGraw Hill 2001
4. James H. Hardy, Inside Networks, 1 Edition, Prentice Hall 1995
5. W. Stallings, Data and Computer Communications, Macmillan, New York, 6th Edition
6. T. N. Saadawi and M. H. Ammar, Fundamentals of Data Communication Networks, John Wiley, New York,1994
7. P. Perlman, Addison Wesley, Reading, Mass., Interconnection: Bridges and Routers, 1993
8. A. S. Acampora, Plenum Press, Introduction to Broadband Networks,x New York, 1994
9. J. N. Daigle, Queuing Theory for Telecommunications, Addison Wesley, Reading,1992
10. J. E. McNamara, Technical Aspects of Data Communications, Digital Equipment, 1988
11. J. M. Miller and S. V. Ahmad, Digital Transmission, Systems and Networks, Computer Science Press, Rockville, 1987
12. W. Stallings, Macmillan, Data and Computer Communications, New York, 1994

17. Microprocessor Interfacing:

The 8088/8086 Microprocessors: Pin outs and the Pin Functions, Clock Circuitry, Bus Buffering and Latching, Bus Timing, Ready and the Wait State, Minimum Mode Versus Maximum Mode.

Memory Interfacing: Memory Devices, Address Decoding, 8088/8086 Memory Interface, Dynamic RAM Controllers, Memory Testing.

Basic I/O Interface Circuits: Basic I/O Interface, I/O Port Address Decoding, The 8255A Programmable Peripheral Interface, The 8279 Programmable Keyboard /Display Interface, 8254 Programmable Interval Timer.

Interrupts: Basic Interrupt Processing, Hardware Interrupts, Expanding the Interrupt Structure, 8259A Programmable Interrupt Controller.

Direct Memory Access: Introduction to DMA, The 8257-5 DMA Controller, DMA Processed Printer Interface.

Data Acquisition Systems: Introduction, Analog to Digital Conversion Basics, Major Considerations for Data Acquisitions systems, Analog to Digital Converters, ADC Performance Parameters, ADC Code, Sample & Hold Circuits, Analog Multiplexes, Analog Signal Isolation, Designing of a Data Acquisition system.

μ -processor Based Communications: Introduction to Digital Communications, Serial Communications Interface Adapters, VART, The 8251A Communications Interface Adapter, The RS-232C Interface Standard, Current Loops, Data Transmission Methods, Modems, IEEE-488 General Purpose Instrumentation Bus (GPIB), NEC 7210 GPIB Communication Interface.

Prerequisite: Micro controller & Microprocessor.

BOOKS RECOMMENDED:

1. J. E. Cooling, Real Time Interfacing: Engineering Aspects of μ -processor Peripheral Systems, Van Nostrand Reinhold Co., 1986.
2. Ronald L. Krutz, Interfacing Techniques in Digital Design With Emphasis on Microprocessors, John Wiley, 1988.
3. Douglas V. Hall, μ -Processor and Interfacing, Programming and Hardware, McGraw Hill Co., 1986.
4. B. Barry, The Intel μ -Processors: Architecture, Programming, and Interfacing, Macmillan Publishing Co., 1991.
5. M. Spinks, Micro Processor System Design, Newness, Oxford, 1992

18. Control Systems:

Mathematical Models of Physical Systems, Reviewing of Laplace Transform, Transfer Functions and System Response, First order and Second order systems, Higher order systems, Feedback Control Systems, Routh's Method, Root Locus Analysis and Design, Frequency Response Analysis and Design, Nyquist diagram and stability criterion, Bode Diagrams and analysis, State Space Analysis and Design, Analogue Control Systems, Digital Control Systems, Digital Control Using Microprocessors and DSP Processors, Computer Controlled Systems.

Pre-requisite: Systems and Signals Analysis

BOOKS RECOMMENDED:

1. Dorsey, Control and Discrete Control Systems, MacGraw Hill 2002
2. John Van De Vegte, Feedback Control Systems, 3rd. Ed., Prentice-Hall, London, 1994.
3. R. J. Vaccaro, Digital Control: A State Space Approach, McGraw Hill, 1995
4. Ernest O. Doebelin, Control System; Principle and Design, John Wiley & Sons, New York, 1985.
5. N. K. Sinha, Control Systems, CBS Publishing Japan Ltd., New York, 1986.
6. Morris Driels, Linear Control Systems Engineering, McGraw Hill, New York, 1996
7. Charles L. Phillips and H. Troy Nagle, Digital Control System Analysis and Design, 3e, Prentice Hall, 1995
8. Stanley M. Shinnars, Advanced Modern Control System Theory and Design, John Wiley & Sons, 1998
9. Chi Tsong Chen, Analog and Digital Control system Design: Transfer Function, State Space and Algebraic Methods, Oxford University Press, 1993
10. Theodore E. Djaferis, Automatic Control: The Power of Feedback Using MATLAB, Brooks/Cole Publishing Co., 2000
11. Benjamin C. Kuo, Automatic Control Systems, 7e, John Wiley & Sons, 1995

19. Telecommunication Systems:

Introduction to Telecommunications

Sources and measurement of noise in Telecommunication

Amplitude Modulation Techniques: Power Distribution in the AM Waveform, Amplitude Modulation with Signals other than a Sine Wave, Single Sideband

Frequency Modulation: Frequency Analysis of the FM Wave, Power in the FM Wave, FM Noise, FM Generation

Pulse Modulation and Encoding: Pulse Code Modulation, Pulse Amplitude Modulation, Regenerative Repeater, Distortion in a PCM Signal, Pulse Width Modulation, Pulse position Modulation, Delta Modulation, Encoding Techniques: Uni-polar Versus Bipolar Encoding, Nonreturn to Zero, Nonreturn to Zero Invert, Return to Zero, Self Clocking Codes

Transmission Codes: Binary Coded Decimal, Excess-3 Code, Gray Code, Morse Code, Baudot, EBCDIC, ASCII.

The UART Interface: Interfacing the USART, Block Diagram and Pin Configuration, Initializing the 8251A USART for Communication

Error Detection, Correction and Control: Parity, Parity Generating and Checking Circuits, The Disadvantage with Parity, Vertical and Longitudinal Redundancy Check

The Telephone Set and Subscriber Loop Interface: Basic Functions of the Telephone Set, Rotary Dialing with the Bell 500 Type Telephone, Electronic Pulse Dialing Telephone, Dual Tone Multifrequency, The Local Loop, Line Characteristics, Line Conditioning

The Telephone Network: The Public Switched Telephone Network, Transmission Media for Trunks, Central Office Switching Systems, Multiplexing, North American Digital Multiplexing Hierarchy.

Modems: Modem Features, Interface Techniques, Modulation Techniques, Modem Transmission Modes, The Bell Family of Modems, ITU-TS Modems and Recommendations, ISDN Modem, Cable Modem, Analog Loop back TEST, digital Loop back Test, Modem Synchronization, Scrambling and De-scrambling, Modem File Transfer Protocols, Improving Modem Performance, Modem Error Control, Throughput, Data Compression.

Synchronous Protocols: Standards Organization for Data Communications, ISO-Open Systems Interconnect Seven-Layer Model, Bit-Oriented Protocols Versus Byte-Oriented Protocols, BISYNC, Telecommunications Switching Facilities, High Level Data Link Control.

Local Area Networks: LAN Topology, Channel Access, LAN Transmission Media, LAN Connectors, Base band Versus Broad Band Transmission, Ethernet, IEEE 802.3 10 Base 5 (Thick net) Specification, IEEE 802.3a 10 Base 2 Specification, IEEE 802.3i 10 Base T Specification, Introduction to Token Ring, The LAN Environment, Internetworking the LAN.

The Internet and Emerging Technologies: Introduction to the Internet, The Evolution of the Internet, Internet Search Tools, Domain Name System, Electronic Mail, The World Wide Web, Connecting to the Internet, Introduction to TCP/IP, Internets, Emerging Technologies.

Wireless Communications: Personal Communication Service, Cellular Telephony, Mobile Telephony, The Cordless Telephone, Pagers, The Wireless LAN.

BOOKS RECOMMENDED:

1. Ronald Kitchen, RF and Microwave Radiation Safety Handbook, Newness; An Imperial of Butterwish Heinimann (2001).
2. John D. Spragins, Telecommunications; Protocols and Design, Addison Wesley Publishing Co. (1994).
3. John C. Freeman, Fundamentals of Microwave Transformation Lines,x John Willey and Sons Inc. (1996).
4. David M. Pozar, Microwave and RK Design of Wireless Systems, John Willey and Sons Inc (2001).
5. Bud Bates, Wireless Networked Communications, McGraw Hill Inc.(1995).
6. David Stamper, Essentials of Data Communications, , Addison Wisely Publishing Co. (1997).
7. Seichi Samper, Applications of Digital Wireless Technologies to Global Wireless Communications, Prentice Hall PTR (1997).
8. Roy Blake, Comprehension Electronics Communication, West Publishing Co. (1997).

20. Digital Signals Processing:

Introduction to Digital disease and discrete time Signals, Discrete time Systems, Convolution, Correlation and Filtering, Processing of Random Signals, Signals Recovery, Conditioning Detection and Prediction, A/D and D/A Conversion Sampling, Interpolation and Sampling Theorem, Windows and Windowing, Analogue Filters, Elliptical Filters, Frequency band Transformation, Bilinear Transformation, Frequency and Time Multiplexing.

The Z-Transform and Its Application to Discrete Time Systems, Realization of Linear Digital Systems, IIR and FIR Digital Filter Design, The Discrete Fourier Transform (DFT), Frequency Response Characteristics, Sampling and Generalized , Convolution, Weighting functions, Whittaker's Reconstruction Fast Fourier Transform (FFT), FFT using Time Decomposition , FFT Using Frequency Decomposition, FFT Error Analysis. Linear Prediction Coefficients (LPC).

Signal Processing System Design, Adaptive Filters.

Pre-requisite: Systems and Signals Analysis

BOOKS RECOMMENDED:

1. Andrew Bateman & Lain Paterson-Stephens, The DSP Handbook: Algorithms, Applications and Design Techniques, Prentice Hall 2002
2. Naseer Kehtarnavaz & Mansour Keramat, DSP System Design: Using the TMS320C6000, Prentice Hall, 2001
3. Vinay K. Ingle & John G. Proakis, Digital Signal Processing Using MATLAB, Brooks/Cole Publishing Co., 2000

4. A.V. Oppenheim and R.W. Schaffer, Discrete-Time Signal Processing, 2e, x Prentice Hall, 1999
5. J. G. Proakis, Digital Signals Processing, 2nd Ed. Macmillan, 1992
6. D. J. DeFatta, J.G. Lucas, W. S. Hodgkiss, Digital Signals Processing, John Wiley & Sons, New York, 1995.
7. L. C. Ludeman, Fundamentals of Digital Signals Processing, John Wiley & Sons, New York, 1987.
8. R. A. Roberts and C.T. Mullis, Digital Signal Processing, Addison-Wesley, Reading, 1987.
9. S.D. Stears and D. R. Hush, Digital Signal Analysis, Prentice Hall, London, 1990.
10. A. Bateman and W. Yates, Digital Signals Processing Design, Pitman, London, 1988
11. Pual A Lynn, Macmillan, The Analysis and Processing of Signals, Houndsmill, 1989.
12. C. E. Reid, Signals Processing in C, John Wiley, 1992
13. Sophocles J. Orfanidis, Introduction to Signal Processing, Prentice Hall, 1996
14. Boaz Porat, A Course in Digital Signal Processing, John Wiley & Sons, 1997
15. Henrik V. Sorensen & Jianping Chen, A Digital Signal Processing Laboratory Using the TMS320C30, Prentice Hall, 1997
16. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms & Applications, 3e
17. James H. McClellan, Computer based Exercises for Signal Processing using MATLAB,

OUTLINE OF OPTIONAL COURSES FOR M. SC. (ELECTRONICS)

1. Lasers and Applied Optics:

Introduction to Modern Optics: Principles of Optical Design, Matrix Formulation of Geometrical Optics, Image Formation, Radiometry and Photometry, Modern Theory of Diffraction and Interference, Fourier Optics, Coherence and Statistical Optics, Polarization.

Introduction to Lasers: Light Amplification, Population Inversion, Amplifier Nonlinearity and Gain saturation, Theory of Laser Oscillation, Optical Resonators, Rate Dynamics of Three Level and Four Level Lasers, Q-Switching and Mode Locking, Solid State Lasers, Gas lasers, Noble Gas Ion Lasers, Semiconductor Lasers, Dye Lasers, Excimers.

Application of Lasers: Spatial Filtering, Holography, Laser Remote Sensing, Laser Spectroscopy, Industrial Applications, Application in Medicine and Chemistry.

BOOKS RECOMMENDED:

1. Gerd Keiser, Optical Fiber Communication, 3rd Edition, McGraw Hill, 2000
2. C.C. Davis, Laser and Electro-Optics, Cambridge University Press, 1996
3. P. P. Banerjee and Ting-Chung Poon, Principles of Applied Optics, IRWIN Inc, Boston, 1991.
4. K. D .Moller, Optics, University Science Books, California, 1988.
5. J.T. Verdeyen, Laser Electronics, Prentice Hall, London, 1995.
6. P. Das, Springer-Verlag, Lasers and Optical Engineering, New York, 1991.
7. P.W. Milonni and J. Heberlyl, Lasers, Wiley, New York, 1988.
8. K. A. Jones, Harper & Row, Introduction to Optical Electronics, 1987.
9. A. Yariv, Optical Electronics, Harcourt Brace Jovanovich College Publishers, New York, 1991.
10. M. Young, Optics and Lasers, Springer-Verlag, Berlin, 1992.

2. Power Electronics:

Introduction to Power Electronics, Diode Circuits and Rectifiers, Controlled Rectifiers, Power Semiconductor Switches, AC Voltage Controllers, Power Electronic Converters, DC Choppers, Inverters and Power Supplies, Switching DC Power Supplies, Power Conditioners and Uninterrupted Power Supplies, DC Drives, Induction Motor Drives, Synchronous Motor Derives, Stepper Motor

Derives, Power Semiconductor Diodes, Power Transistors, Snubber Circuits, Power MOSFETS, Thyristors, Insulated Gate Bipolar Transistors, Protection of Devices and Circuits

BOOKS RECOMMENDED:

1. Muhammad Harunur Rashid, Power Electronics Circuits, Devices, and Applications, Prentice Hall , 1988.
2. Mohan, Undeland and Robbins, Power Electronics: Converters Applications and Design, John Wiley, 1994
3. B. A. Bradley, Power Electronics, Chapman and Hall, 1995
4. C. A. Schuler and W. L. McNamee, Modern Industrial Electronics, McGraw Hill, New York, 1993
5. J. Webb and K. GreShock, Industrial Control Electronics,x Merrill, Singapore, 1992

3. Microwave Electronics:

Review of Electromagnetic Wave Theory.

TRANSMISSIONS LINES: Fundamentals of transmission lines, Field Analysis of Transmission Lines, Impudence Loss in transmission Lines, Smith's Transmission Line Charts, Standing Waves, Quarter and Half Wave length lines, Transmission Line Components.

Transmission Lines and Wave guides, Types of wave guides, Microstrips, Microwave Signal Amplification and Generation, Frequency Analysis and Spectrum Analyzers, Microwave Networks and Bridges, Impedance Matching and Tuning, Microwave Tubes and Circuits, Microwave filters, Power Dividers and Directional Couplers, Microwave Resonators , Multi cavity Klystron and Magnetron, TWT.

Microwave antennas: Antenna Coupling, Directional High Frequency Antennas, Microwave Antennas, Horn Antennas, Lens Antennas, wide band Antennas, Helical Antenna, Loop Antennas, Phased Arrays Antennas.

Radar Systems: Principles, Performance Factors, Pulsed systems, Antennas and Scanning, display methods, Moving Target Indication, Radar beacons, CW Doppler Radar, FM CW Radar, Phased Array Radar , Planar Array Radar .

BOOKS RECOMMENDED:

1. Matthew M. Radmanesh, Radio Frequency and Microwave Electronics, Prentice Hall, 2001
2. 1e, Georgios B. Giannakis, Peter Stoica, In Channel Estimation and Equalization, Prentice Hall, 2001

3. Georgios B. Giannakis, Peter Stoica, Signal Processing Advances in Wireless and Mobile Communications, Vol.2, Trends in Single and Multi User Systems, 1/e Prentice Hall, 2001
4. 1e, Carl J. Weisman, Essential Guide to RF and Wireless, Prentice Hall, 2000
5. Edgar Hund, Microwave Communications Components and Circuits, McGraw Hill , New York, 1989.
6. David M. Pozar, Microwave Engineering,x Addison Wesley, Reading, 1990
7. Theodore S. Saad, Microwaves Engineers Hand Book, Artech House, Dedham, USA, 1971
8. Simon Ramo, J, R. Whinnery and T. Vam Duzer, Fields and Waves in Communication Electronics,x John Wiley, 1994
9. Adam Stephan, Microwave Theory and Applications, Prentice Hall, 1989
10. P. F. Combes and J. Francois Sautereau, Microwave Components, Devices and Active Circuits, John Wiley, 1989
11. 1e, Thomas S. Laverghetta, Signal Processing Advances in Wireless and Mobile Communications, Vol.1, Trends, Practical Microwaves, Prentice Hall, 1996

4. Remote Sensing and Image Interpretation:

Introduction To Remote Sensing, Physical Bases of Remote Sensing. Aerial Sensor Imagery, Microwave sensing, Satellite Sensor Imagery, Image Interpretation and Terrain Evaluation, Methodology And Requirements of Remote Sensing Data Collection, spectro-radiometry of Imaging Systems, Spectral Signatures And Their Correction For Atmosphere And Noise Effects. Electro-optical Detectors And Systems, Space Remote Sensing Systems, Introduction to Pattern Recognition.

Pre- requisite: Signals Processing

BOOKS RECOMMENDED:

1. Philips N. Slater, Remote Sensing, Optical and Optical Systems, Addison-Wesley Publishing Company London, 1980.
2. T. Lillesand and R. Keifer, Remote Sensing and Image Interpretation, John Wiley New York. 1987.
3. Paul J Curran, Principles of Remote Sensing, Longman Ltd. 1985.
4. Philips N Swain Sirley. M.Davies, Remote Sensing (The Qualitative Approach), McGraw Hill. 1986.
5. Eric Barret, Environmental Remote Sensing (Application and Achievements), Edeard Arnold Ltd., 1987.
6. E. C. Barretad L. F. Curties, Introduction to Environmental Remote Sensing, Chapman and Hall Ltd., 1986.

7. Ralph Bernstein, Digital Image Processing for Remote Sensing, John Wiley and Sons. 1989.
8. Ray Harris. Routledge and Kegan Paul London, Satellite Remote Sensing, New York. 1989.

5. Image Processing and Computer Vision:

Introduction, Digital Image Fundamentals, Image Transforms, Image Enhancement, Image Encoding. Image Segmentation, Image Representation and Description, Image Compression and Different Techniques of Image Recognition, Survey of Optical And Digital Image Processing For Machine Aided Analyses, Image Processing Applications.

Introduction to Computer Vision, Integrating Vision Techniques in Menu Driven Interactive Environment, Bayes Nets for Selective Perception and Data Fusion, Endoscope Control and Navigation Using Machine Vision, Shape from Intensity, Recovering Heading in the Processing of Moving Objects, Automated Contour Extraction Using Multiscale Approach, Heterogeneous Computing for Machine Vision, A Frame Work for Detecting and Analyzing Human Faces,

BOOKS RECOMMENDED:

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing,2e, Prentice Hall, 2002
2. Rafael and Paul Wurtz, Digital Image Analysis, Addison-Wesley Publishing Comp. Inc. N.Y. 1987.
3. Robert J. Schalkoff, Digital Image Processing and Computer –Vision, John-Wiley & Sons INC. N.Y.1989.
4. S. Levialdi, Digital Image Analysis, Ittman Publications Ltd. London, Massachusetts. 1984.
5. W. E. Gardner, Machine Aided Image Analysis, Institute of Physics Pub. Technology. 1989.
6. G. M. Hunter, Computer Graphics Image Processing, Pittman Pub. INC. London. 1987.
7. Bayer, K. and Sarkar S. Computing Perceptual Organization in Computer Vision, World Scientific Book Co. ,1994
8. Khan G.N., and Gilles, A Highly Parallel Shaded Image Segmentation Method in Parallel Processing for Computer Vision and Display, Addison Wesley, England, 1989.
9. Ayache, N., Artificial Vision for Mobile Robots, Stereo Vision and Multisensory Perception, MIT Press. U.S.A.,1991

6. Parallel Processing:

Introduction to Parallel Processing, Structures and Algorithm for Array Processors, Multiprocessor, Architecture and Programming, Data Flow Computers and VSLI Computations.

Parallel Processing and Transputers, Overview of Basic Architecture of Transputers (With Reference to IMS T800 Transputers), Multitransputer Networks, Multitransputer Programming, Links, Process Control, Process Selection, Process Timing, Internal & External Channel Communications, Fundamentals of OCCAM Language (Native Language of Transputers), Arrays in OCCAM, Channel Communication, Characters and Strings, Replicators, Real-Time Programming in OCCAM, Configuration, Terminating Concurrent Programs, OCCAM Programming Style., Transputer Development System (PC Based), The Editing Environment, Folding Editor, Compiling and Linking OCCAM Programs, Downloading and running OCCAM Programs into Transputer Based System.

BOOKS RECOMMENDED:

1. Transputer Data Book From INOMS, (INAMOS Limited, 1000 Aztec West, Almondsbury, Bristol BS12 4SQ, U.K.)
2. Dick Pountain and David May. A tutorial, Introduction to OCCAM Programming,
3. Geraint Jones, Michael Goldsmith, Programming in OCCAM 2, Prentice Hall International, Series in Computer Science
4. Faye A. Briggs and Kai Hwang, Computer Architecture and Parallel Processing, McGraw Hill Book Company, New York, 1985
5. Yau, S. S., and Fung. H.S., Associative Processor Architecture, McGraw Hill, 1987
6. R. Paige, J. Reif and R. Wachter, Kluwer, Hingham, Parallel Algorithm Derivation and Program Transformation, U.S.A., 1993

The course outline for optional subjects Medical Electronics, VLSI design and Fault Tolerant Systems is being prepared by experts in the fields. These courses will be sent as soon as they are available.

List of Experiments:

1. Circuit Analysis (Kirchoff's Law, Thevenin and Nortons Theorems)
2. Junction diode's characteristics and use as a clipper and clamper
3. Rectifier and filters (half wave and bridge)
4. Transistor Familiarization and its use as a voltage regulator
5. Transistor configuration (CE.CB.CC)
6. Power Amplifiers (class A.B.C)
7. JFET characteristics and Amplifier
8. Sinusoidal Oscillators (Heartly-colpits)
9. Multivibrators (a stable, mono stable and bistable)
10. Differential Amplifier
11. OP-AMP characteristics
12. Linear & Non Linear Amplifications of operational amplifier
13. Active filters (first order, second order and state variable)
14. OP-AMP Oscillator
15. The 555 timer
16. Logic Inverter
17. OR Gates & AND Gates
18. NOR Gates
19. NAND Gates
20. Boolean Algebra & Fundamental Operations
21. Boolean Algebra & Theories
22. 4-Input Multiplexer
23. 1 of 4 Decoder
24. BCD to Decimal Decoder Driver
25. Seven Segment LED and Decoder Drivers
26. Exclusive OR Gates
27. Binary Numbers
28. Priority Numbers
29. Adders
30. Multiplexer Adder-Subtractor
31. 4-bit Arithmetic Logic Unit
32. Flip-Flops
33. Digital clock Oscillator
34. 4-phase clock
35. A stable Multivibrator
36. Mono stable Multivibrator
37. Shift Register
38. A shift Register Ring Counter
39. Binary Counter
40. Up-Down Counter
41. Preset table Counter
42. Shift Counter
43. Random Access Memory (RAM)
44. Binary Ladder (DAC)
45. Four Digit Frequency Counter

46. To develop understanding about the digital to analog (D/A) and analog to digital (A/D) conversion techniques
47. To demonstrate use of LM-566 as voltage to frequency converter and a frequency modulator
48. To build circuits to generate pulse amplitude modulation (PAM) and demonstration
49. To build pulse width modulator (using LM-555)
50. To build and determine characteristics of a digital phase generator and an exclusive OR phase detector
51. To study the characteristics of phase-locked loop (PLL) circuit
52. To study RC phase shift (0-90 and 0-180) circuit and Ramp and pedestal circuit
53. To design relaxation oscillator using UIT and PUT
54. To construct and study time delay circuits
55. To understand frequency shift keying (FSK) principle by building a generator & demodulator
56. Control of power through load using thyristors (SCR, TRIACS)
57. Study cosine-wave, Ramp-Comparator and digital triggering circuits for thyristors
58. Study series inverter and chopper circuits
59. Study principles of synchronization by building sweep generator and digital phase shift controller
60. Manual and electronic control of DC and stepper motors
61. Study ON-OFF proportional and proportional integrated process control
62. Build and perform a closed loop temperature controller using DM-35 temperature sensor
63. Interface reset and clock circuit with the MCS 8031/AT89C51 Micro Controller. Also test the circuit constructed by checking signal at pin-30(ALE)
64. Interface demultiplexing and decoding circuit to the MCS-8031/AT89C5 controller
65. Learn use of EPROM programmer and eraser by writing a test program should generate a square wave at the port P2.0 (pin)
66. Interface volatile RAM and EPROM to controller 8031/AT89C51. Check RAM and EPROM by appropriate software in assembly language
67. Interface 8155 programmable peripheral interface to controller
68. Interface intelligent LCD matrix display module based on display control HD 44780
69. Interface Hex Matrix key board to the controller
70. Write appropriate software to control a traffic signal system (Model)
71. Write appropriate software to control DC motor
72. Write appropriate software to control stepper motor
73. Write appropriate software to control A/D and D/A conversion
74. Write a programme to control temperature of an oven.

CURRICULUM FOR FOUR YEARS DEGREE IN ELECTRONICS

Recommendation for four years professional degree in Electronics

The NCRC committee recommends introduction of four years professional degree programme in the Universities. The programme should be offered in semester system. The total credit hours for this programme should be at least 132 spread over eight semesters. The prerequisite for admission to this programme will be higher secondary education certificate with pre engineering group. Each student must research and development project in his final year. The project will carry six credits. The proposed scheme of the course of scheme is given under:

<u>Semester-I</u>	<u>Credit Hours</u>
1. Islamiat Courses approved by the university to B.A/B.Sc./B.Com. etc. will be adopted	2
2. Linear Algebra	3
3. Introduction to Computer and Programming Language	2+1
4. Basic Electronics	3+1
5. Physics-I	2+1
Total Credit	15

<u>Semester-II</u>	<u>Credit Hours</u>
6. English Courses approved by the university to B.A/B.Sc./B.Com. etc. will be adopted	2
7. Calculus	3
8. Data Structures and Algorithms	2+1
9. Circuit Theory	2+2
10. Physics-II	2+1
Total Credit	15

<u>Semester-III</u>	<u>Credit Hours</u>
11. Pakistan Studies Courses approved by the university to B.A/B.Sc./B.Com. etc.will be adopted.	2
12. Advance Calculus	3
13. Computational Methods in Electronics	2+1

14.	Electronic Devices	2+1
15.	Electromagnetic Theory	2+1
16.	Optional (from Arts/Commerce)	3
	Courses approved by the university to B.A/B.Sc./B.Com. etc. will be adopted	
	Total Credit	17

Semester-IV

17.	Urdu / Sindhi	2
	Courses approved by the university to B.A/B.Sc./B.Com. etc. will be adopted	
18.	Linear Integrated Circuits	2+1
19.	Digital Electronics	2+2
20.	Optics and Modern Physics	3
21.	Electronic Communications	2+1
	Total Credit	15

Semester-V

22.	Micro processor and Programming	2+1
23.	Solid State Electronics	3
24.	Communication Systems	3
25.	Signals and Systems	3
26.	Experimental Electronics	0+3
27.	Optional (Arts/Commerce/Management)	3
	Courses approved by the university to B.A/B.Sc./B.Com. etc. will be adopted.	
	Total Credit	18

Semester-VI

28.	Micro Processor Interfacing Technologies	3
	Courses approved by the university to B.A/B.Sc./B.Com. etc. will be adopted	
29.	Industrial Electronics and Robotics	2+2
30.	Microwave Electronics	3
31.	Laser and Applied Optics	3
32.	Experimental Electronics-II (Microprocessor Based)	0+3
	Total Credit	16

Semester-VII

33.	Digital Signals Processing	3
34.	Opto Electronics	2+1
35.	Data Communications and Networks	3
36.	Control System	3
37.	Experimental Electronics-III (DSP Based)	3
	Project-I	3
	Total Credit	18

Semester-VIII

39.	VLSI Design	3
40.	Optical and Wireless System	3
41.	Information Theory	3
42.	Advance Instrumentation	3
43.	Experimental Electronics-IV (Electronic System Design and implementations)	3
44.	Project-II	3
	Total Credit	18
	Grand Total	132 Credit Hours

Optional Electronics Subjects:

1. Remote Sensing and Image Interpretation
2. Fault Tolerant System
3. Medical Electronics
4. Parallel Processing
5. Biomedical Instrumentation
6. Environmental Science
7. GIS / GPS System
8. Power Electronics
9. Image Processing
10. Embedded Systems Design

SEMESTER –I

2. Linear Algebra:

Relations And Mappings. Equivalence relations and application. Binary Operations. Groups, sub-groups, cyclic groups, permutation groups. Rings, Fields and Vector Spaces. Linear combinations, independence and dependence, spanning sets and Basis. Linear Transformations and matrices. Matrix Algebra and its application in solving Linear systems. Determination. Eigen-value problems.

Ordinary differential equations. First order linear, Variable separable, Homogeneous, Exact and Non-Exact differential equations. Higher Order linear differential equations. Application to various areas, Ecology, medicine, Mathematical modelling etc.

BOOKS RECOMMENDED:

1. M. Sullivan, College Algebra, 6th Edition Prentice Hall, 2001
2. Kim, Clark, Exploration in College Algebra, 2nd Edition 2001
3. Anton, Rorres, Elementary Linear Algebra, 8th Edition, John Wiley & Sons, 2000
4. Lawson, Linear Algebra John Wiley & Sons, 1996

3. Introduction to Computer and Programming Languages:

Introduction to Computer hardware and Software organization. Operating System concepts, DOS, LINUX/UNIX Operating Systems, Introduction to Windows, Environment, Local Area Networks and Internet, Computer Security.

Fundamentals of Programming: High Level Languages, Problem Analysis and Algorithm Development, Flow charting, Sequential Flow, Conditional Flow, Repetitive Flow, Algorithm Logic.

Introduction to C-language: Program structures, Pre-processor declaration, Looping and Flow Control in C, Functions and Structured Programming, standard data types, Branching and Nested Flow of Control, Arrays and Strings, Pointers, Structure data types and Union, Input / Output, Filling System in C, Graphics programming, Objects Oriented Programming, Introduction to JAVA.

BOOKS RECOMMENDED:

1. Computers and Programming by Francis Scheid, Schaum's Outline Series, 1983.
2. C Programming using Turbo C by Robert Lafore Howard & W. Sams Co., 1990.
3. Joy of C by L. H. Miller and A. E. Quilici, John Wiley, New York, 1993
4. Microsoft Disk Operating Systems Manual
5. C++ Complete by Anthony Rudd, John Wiley, New York, 1994
6. Understanding UNIX by Jones, Que. Books, 1990.
7. Computer Organization and Architecture by W. Stallings, Maxwell-Macmillan, New York, 1990.

4. Basic Electronics:

Basic of Electricity: Coulomb law, Charge, Current, Voltage.

Electrical Components and Measurements: Resistors, Capacitors, Inductors, Ohm's law, Series and Parallel Circuits, Multimeter.

Magnetism and Electromagnetism: Conductor and Insulators, Electromagnetic induction. Capacitive and Inductive reactance, Resonance, filters, complex branch and impedance.

Sources of Electrical energy:

Alternating –Current Electricity:

Electrical Energy Conversion:

Electrical Instruments:

Type of Wave forms(Phase, Frequency, Amplitude)

Electronic Basics

Electronic Diodes

Electronic Power Supplies

Transistors

Amplification

Amplifying Systems

Operational Amplifier (Introduction only)

Oscillators

Communication Systems

Digital Electronic Systems

Electronic Power Control

BOOKS RECOMMENDED:

1. Dale R. Patrick, Steven W. Fardo, Electricity and Electronics: A Survey, 5/e Prentice Hall, 2002

2. Robert L. Boylestad, Louis Nashelsky, Introduction to Electricity, Electronics, and Electromagnetics, 5/e Prentice Hall, 2002
3. B. Grob, Basic Electronics, Latest Edition

5. Physics-I

Measurements and Physical quantities. International system of units. Scalars and vectors. Newton's Laws of motion. Work and Energy. Centre of mass and translational motion. Rotational Kinematics and Dynamics. Simple harmonic motion.

Waves and particles. Waves in a stretched string. Wave and frequency. Speed of travelling waves. Principle of superposition. Energy and power in travelling waves. Interference of waves. Beats. Doppler effect.

Heat, Laws of thermodynamics. Reversible and irreversible processes. The Carnot cycle and entropy.

BOOKS RECOMMENDED:

1. David Halliday, Robert Resnick and K.S.Krane, Physics, 4th Ed. Vol. 1&2

SEMESTER II

7. Calculus-I

Elementary Concepts: Real numbers and its subsets. Distance Inequalities involving real numbers and absolute values. Straight line. Circle, parabola ellipse and hyperbola. Bounded sets and limit point of a set. Functions and Continuity: Binary relations and functions. Algebra of functions. Graphs of functions. Limits, one-sided and two sides. Some special limits. Continuity. Properties of limits of functions and of continuous functions. Inverse functions. Differentiation: Tangent lines and rates of changes. Derivable function, derivative. Techniques of differentiation. The Chain Rule and implicit, differentiation. Differentials, Higher order derivatives, Leibnitz Rule. Application of differentiation: Increasing and decreasing functions, Local or relative Extrema, First and second derivative test, Sketching of graphs. Newton's Method of root finding. Rolle's Theorem. Taylor's and Maclaurin's expansion. Techniques of Integration: The anti-derivative. Basic Integration Formulae/Techniques. Integration by 7 parts. Various substitutions. Integration of rational and irrational functions. Numerical integrations, Simpson's Rule.

BOOKS RECOMMENDED:

1. C. H. Edwards & D. E. Panny, Calculus 6th Edition, 2003 Prentice Hall.
2. M. J. Strauss & G. L. Bredly, Calculus 3rd Edition, 2002 Prentice Hall
3. Anton, Calculus with Analytic Geometry, 1994, John Wiley & Sons. New York
4. Salas, Santunino L, Hille, Einer: Etgen, Garrett, Calculus One: Single Variable. 7th Ed. 1995, John Willey & Sons. New York.

8. Data Structure and Algorithms:

Overview of C and C++ Programming, Analysis of Algorithm, data types, arrays, strings, structures, classes, Stacks, queues and linked lists, Sequences, Trees, Priority queues, Sorting algorithm, Graphs.

BOOKS RECOMMENDED:

1. Cormen Etrall, An Introduction to Algorithm, McGraw Hill.
2. Shani, Data Structure and Algrithem in C++, 1998, McGraw Hill.

9. Circuit Theory

After doing this course, the students will be able to understands the difference between different types of resistance network. Their use and the transformation from one network into the other network.

The students would be able to understand energy storage in inductors and capacitors and able to apply there concepts to analyse the passive circuits. Student should be able to design LRC circuit and be able to calculate power, phase voltage and currents.

Circuits with constant voltages and currents:

Conventions for voltage and current, units, Ohm's Law, Kirchoff's Laws and applications to combining resistances in series and parallel, ideal voltage and current sources; technique of circuit analysis using nodal voltages; modeling of real devices with ideal elements, equivalence of voltage and current sources; Thevenin's Theorem, Norton's Theorem; technique of circuit analysis using

mesh currents; power, power transfer from a source to a load; linearity, superposition; star-delta and delta-star transformations.

Transient effects in electrical circuits:

Energy storage elements: inductance and capacitance, units; types of time-varying excitation in electrical circuits, transients in circuits with a first-order response by analytic solution of a differential equation, exponential rise and decay, time constant in R-C and R-L circuits; initial conditions, effect of initial condition on response, establishing initial and final conditions in higher-order circuits; energy storage in capacitors and inductors.

Circuits with steady-state sinusoidal excitation:

Concepts of frequency, angular frequency, phase shift, amplitude, peak, peak-to-peak, and root-mean-square values; introduction to the j operator and its application in circuit analysis; complex impedance, admittance, resistance, reactance, conductance and susceptance; complex impedances of ideal circuit elements, solution of simple circuits by combining impedances in series and parallel; phasor representation of alternating voltages and currents, phasor diagrams as an aid to understanding; general circuit analysis using j notation (nodal voltage and mesh current)

Resonance:

Analysis and applications of series and parallel resonant circuits, bandwidth and Q factor. Relationships between power, reactive power and VA, power factor, principle of conservation of power and reactive power, reactive power absorbed by capacitors and inductors, power factor correction, complex power in terms of phasor voltages and currents.

RECOMMENDED BOOKS:

1. Charles J. Monier Electric Circuit Analysis, 1/e 2001 / Prentice Hall
2. Charles J. Monier, OrCAD PSpice and Circuit Analysis, 4/e 2001 / Prentice Hall
3. Roland E. Thomas & Albert J. Rosa, The Analysis and Design of Linear Circuits, 3e, John Wiley & Sons, 2001
4. Floyd, Principles of Electric Circuits: Conventional Current Version, 7/e/ 2000 Prentice Hall
5. Smith, R. J. , and Dorf, R.C., Circuits, Devices and system 5th edition, Wiley
6. Cunningham, D.R. and Stuller, J.A., "Circuit Analysis." Houghton Mifflin. Thomas L. Electric Circuit, 5e, James W. Nilsson & Susan A. Riedel, Addison Waseley, 1996
7. Artice M. Davis, Linear Circuit Analysis, PWS Publishing Co., 1998

8. Linear Circuit Analysis: Time Domain, Phasor and Laplace Transform Approaches, 2e,

10. Physics

Electric charge and Coulomb law, Electric field, Gauss's Law, Capacitors. Current, Resistance, Resistivity and Conductivity, Ohm's Law, Microscopic models of resistance. Combination of resistances. Voltage and EMF. Magnetic field, Lometz force, Biot-Savart Law, Ampere's Law, Gauss law for Magnetism, Magnetic materials, Inductance, Reactance and impedance, Transformer.

Galvanometer, Ammeter, Voltmeter, Cathode ray Oscilloscope.

BOOKS RECOMMENDED:

1. David Halliday, Robert Resnick and K.S.Krane, Physics, 4th Ed. Vol 1&2

SEMESTER-III

12. Advance Calculus:

Theory of Integration and integration as a sum. Riemannian Integration. Fundamental theorem of Integral Calculus. First and Second Mean Value theorems of Integral Calculus. Functions of more than one variable, their continuity, differentiability. Curves and Surfaces in three and higher dimensions. Vector valued functions and Gradient, Divergence and Curl. The line integral, surface and volume integrals. The theorems of Gauss, Green and Stokes. Application of integral calculus in computational techniques, length of curve, areas odd surfaces, volumes of solids, various techniques.

BOOKS RECOMMENDED:

1. C.H.Edwards & D.E.Panny, Calculus 6th Edition, 2002 Prentice Hall.
2. M.J.Strauss & G.L.Bredly, Calculus 3rd Edition 2002, Prentice Hall
3. William E. Boyce, Elementary Differential Equations and Boundary Value Problems. John Wiley, Singapore 1997
4. Boyce W. and Diprima, R.C.(1994) Elementary Differential Equations. 5th Ed. John Wiley, Singapore.
5. Anton, Calculus with Analytic Geometry, 1994, John Wiley & Sons. New York.
6. Salas, Santunino L, Hille, Einer: Etgen, Garrett (1995). Calculus One: Single Variable. 7th Ed. John Willey & Sons. New York.

13. Computational Methods in Electronics:

Introduction to Mathematical Modeling of Physical System, Fundamentals of Numerical Methods, Basic Recursion Formulae and Successive Approximation, Number Representation, Floating Point Arithmetic, Errors in Numerical Computation.

Introduction to Matlab using Matlab to solve mathematical problems.

Solution of Linear System of Equations with Application to Network Analysis, Evaluation of Determinants and Inversion of Matrices, Iterative Methods of Solution. Solution of Non linear Algebraic Equations, Matrix Equations, Eigen-values and Eigenvectors. Application Eigen-value Problem to Electronic Systems, Numerical Interpolation and Data Analysis, Numerical Differentiation and Integration, Numerical Methods for Ordinary Differential Equations.

Probability: Modeling, Quantification and Analysis of Uncertainty, Formulation and Solution in Sample Space, Random Variables, Transform Techniques, Simple Random Processes and their Probability Distributions, Processes, Limit Theorems, Elements of Statistical Inference.

Note:- Student would write programs in MATLAB.

BOOKS RECOMMENDED:

1. Graham de Vahl Davis, Allen and Unwin, Numerical Methods in Engineering & Science, London. Latest Edition
2. Kendall E. Atkinson, An Introduction to Numerical Analysis, John Wiley and Sons, New York. Latest Edition
3. T.R. McCalla, Introduction to Numerical Methods and Fortran Programming, John Wiley and Sons, New York. Latest Edition
4. C.F. Gerald and P.O.Wheatley, Applied Numerical Analysis, 5th Ed., Addison-Wesley, Reading. Latest Edition
5. M. L. James, G. M. Smith and J.C. Wolford, Applied Numerical Methods for Digital Computers, Harper & Row, New York.

14. Electronics Devices:

Introduction to Electronic, Applications of Electronic Circuits, Amplifier Models and Frequency Response, Modelling and the Operational Amplifier, The Semiconductor Diodes and Non-linear Modelling, The MOSFET, The BJT, Integrated Circuit Design, Integrated Circuit Design with the MOSFET, Integrated Circuit Design with the BJT, The Differential Amplifier, Feedback Amplifier, Large-Signal Circuits, Basic CMOS Logic Circuits.

BOOKS RECOMMENDED:

1. Thomas L. Floyd, Electronic Devices (Conventional Flow Version), 6/e 2002 Prentice Hall
2. Robert L. Boylestad, Electronic Devices and Circuit Theory, 8/e 2002 Prentice Hall
3. Theodore F. Bogart, Jeffrey S. Beasley, Electronic Devices and Circuits, 5/e 2001 Prentice Hall
4. Denton J. Dailey, Electronic Devices and Circuits: Discrete and Integrated, 1/e 2001 Prentice Hall
5. Robert F. Pierret, Semiconductor Device Fundamentals, Addison-wesley, 1996

15. Electromagnetic Theory:

Vector Analysis: The Cartesian Coordinate System, The Vector Field, The Dot and Cross Production, The Spherical Coordinate System

Coulomb's Law and Electric Field Intensity: Field Due to a Continuous Volume Charge, Line charge and Sheet Charge distribution.

Electric Flux Density, Gauss Law and Divergence: Applications of Gauss Law: Symmetrical Charge Distributions, Divergence, Maxwell's First Equation (Electrostatics), The Vector Operator and the Divergence Theorem.

Energy and Potential, Potential change in Electrical field, The Potential Field of a System of Charges, Conservative Property, Potential Gradient, The Dipole, Energy Density in the Electric Field.

Conductors and Dielectrics, Capacitance, Current and Current Density, Continuity of Current, Semiconductors, The Nature of Dielectric Materials, Boundary Conditions for Perfect Dielectric Materials, Capacitance.

Poisson's and Laplace's Equations: Uniqueness Theorem, Solutions of Laplace's Equation, Poisson's Equation.

The Steady Magnetic Field: Biot-Savart Law, Ampere's Circuital Law, Curl, Stocks Theorem, Magnetic Flux and Magnetic Flux Density, The Scalar and Vector Magnetic Potentials, Derivation of the Steady-Magnetic-Field Law.

Magnetic Forces, Materials and Inductance: Force on a Moving Charge, Force and Torque on a Closed Circuit, The Nature of Magnetic Materials, Magnetization and Permeability, Magnetic Boundary Conditions, Potential Energy and Forces on Magnetic Materials, Inductance and Mutual Inductance.

Time-Varying Fields and Maxwell's Equations: Faraday's Law, Displacement Current, Maxwell's Equation in Point Form, Maxwell's Equation in Integral Form.

The Uniform Plane Wave: Wave Propagation in Free Space, Wave Propagation in Dielectrics, The Poynting Vector and Power Considerations, Propagation in Good Conductors, Skin Effect, Wave Polarization.

BOOKS RECOMMENDED:

1. Hayt, Jr./Buck, Engineering Electromagnetics 6e ,McGraw Hill 2001
2. Arthur F. Kip, Electricity and Magnetism,
3. Kraus/Fleisch, Electromagnetics with Applications 5/e, McGraw Hill,1998

SEMESTER-IV

18. Linear Integrated Circuits:

Analog Integrated Circuits, Basic specification and requirements; Packaging, Amplifiers and Feedback Operations, Power Supplies and Integrated Circuit Regulators, Operation Amplifiers Characteristics and Design. Wave form generators; square wave generators, Ramp generators, Sine wave generators, Function generators, Digitally Controlled Frequency Synthesizer PLL Synthesizer, Active filters; Characteristics and frequency response, Active versus Passive filters, First Order Low pass Filter, High pass Active Filters, Band pass Filters, State Variable Filters, Notch Filters etc.

BOOKS RECOMMENDED:

1. William D. Stanley, Operational Amplifiers with Linear Integrated Circuits, 4th Edition 2002
2. Robert F. Coughlin, Fredrick F. Driscoll, Operational Amplifiers with Linear Integrated Circuits, 6th Edition, 2001, Prentice Hall
3. Thomas, Rosa, The Analysis and Design of Linear Circuits, 3rd Edition 2001
4. J. Micheal Jacobs, Application and Design with Analog Integrated Circuits, Prentice Hall, 1996.

19. Digital Electronics:

Combinational logic: Binary number representation; 2's complement and 1's complement, basic logic gates AND, OR, NOT, EX-OR/NOR; universal logic gates NAND/NOR; Karnaugh mapping for logical statement minimization; identification of static hazard conditions.

Combinational logic applications: Full adder/subtractor; carry look ahead; simple encoders; parity checking; use of digital simulator.

Sequential logic: Derivation of the basic RS latch; design of T, D, JK flip-flops, including truth tables, characteristic equations, master-slave operation/edge triggering; brief discussion of race conditions.

Sequential logic applications: Design of counters; operation of parallel/serial input/output shift register; design of simple multiplexer, feedback shift register circuits.

Switching/logic circuits: Switching properties of BJT, FET; basic circuit operation of BJT and MOS gates; comparison of common logic families and identification of their interfacing requirements. Introduction to Microcomputers, I/Os, Buses, Microprocessors, Memories and Storage Devices.

BOOKS RECOMMENDED:

1. Steve Waterman, Digital Logic Simulation and CPLD Programming with VHDL, 1/e 2002 / Prentice Hall
2. William Kleitz, Digital Electronics: A Practical Approach, 6/e, 2002 / Prentice Hall
3. Nigel P. Cook, Digital Electronics with PLD Integration, 1/e 2001 / Prentice Hall
4. Thomas L. Floyd, Digital Fundamentals, 8th Edition, Prentice Hall, 2001.
5. Ronald J. Tocci, Digital Systems: Principles and Applications, 8/e 2001 / Prentice Hall
6. Digital Principles by A. Paul Malvino & Donald P. Leach. McGraw Hill Co. 5th edition. 1992

20. Optics and Modern Physics:

Geometric Optics, Physical Optics, Paraxial Theory, Lenses, Mirrors, Prism, Fiber-optics, Analytical way tracing, Superposition of Waves, Polarization, Interference, Diffraction, Coherence Theory, Particle properties of waves, Wave properties of Particles, atomic Structure, Bohr Model of the Atom, Schrodinger's Equation, Atomic Spectra, Molecular Spectra, Quantum Statistics, Applications of Quantum Mechanics.

BOOKS RECOMMENDED

1. Robert Guenther, Modern Optics, John Wiley & Sons, 1990 or Later Edition
2. Arthur Beiser, Perspectives of Modern Physics, McGraw Hill Book Co. 1990 or Later Edition
3. Hecht, Addison, Optics, Wesley Publishing Co. 1990 or Later Edition
4. Jenkins and White, Fundamentals of Optics, McGraw Hill Book Co. Later Edition
5. Hans C. Ohanian, Principles of Quantum Mechanics, Prentice Hall 1990 or Later Edition

21. Electronic Communication:

Amplitude Modulation Principles: Modulation, AM, FM, pulse Modulation, Power Relationships, Assignable Frequency Spectrum, Band Selection.

AM Transmitters: Circuits, High Level Modulation, Double Modulation, AM with Pulse Width Modulation, Low Level Modulation.

AM Radio Receivers and Transmitters: Superheterodyne Receiver, Double Conversion Receivers, Receiver Circuits: The Front End, IF Amplifiers, AM Detectors, Automatic Gain Control, Audio Amplifiers, Squelch, Receiver Schematics, Loudspeakers, AM Stereo.

Frequency Modulation Principles: Modulated Wave, FM Radio Frequency Band, Direct and Indirect Frequency Modulation (Phase Modulation), Carrier Phase in the Frequency-Modulated Wave.

FM Detectors, Stereo FM, FM Receiver

Television: Scanning Principles, Deflection Systems, Video Camera Tubes, Video Picture

Signal, Vestigial Sideband Transmission, TV Receiver Front END, Color TV Receivers.

Optical communication: Introduction of Optical Fibers, Optical sources and detection optical modulation techniques

BOOKS RECOMMENDED

1. Roy Blake, Electronic Communication Systems, 2e, Delmar, 2002
2. Martin S. Roden, Analog and Digital Communication Systems, 4e, Discovery Press, 2001
3. Simon Haykin, Communication Systems, 4e, John Wiley & Sons, 2001
4. Jack Kurzweil, An Introduction to Digital Communications, John Wiley & Sons 2000
5. Kennedy George, Electronic Communication, McGraw Hill, 1992.
6. Thomas L. Floyd, Electronic Fundamentals, 2nd. Ed., Maxwell-Macmillan, New York, 1991
7. M. Slurzberg and W. Osterfield, Essential of Communication Electronics, National Book Foundation, Islamabad, 1991
8. M. C. Kelly and B. Nichols, Introduction to Linear Electrical Circuits and Electronics, John Wiley, New York, 1988
9. Michael Tooley, Electronic Circuits Handbook, BPB Publications, New Delhi, 1994
10. F. H. Mitchell Jr. and Mitchell Sr., Introduction to Electronic Design, Prentice Hall, London, 1988.
11. P. Malvino and D. P. Leach, Digital Principles and Applications, 4th Ed., McGraw Hill, New York, 1986.
12. E. Strangio, Digital Electronics, Prentice Hall, London, Latest Edition
13. Malvino A. P. and Brown J.A., Digital Computer Electronics, McGraw Hill School Publishing Company, 1993, Electronics for Today by Tom Duncan, Oxford University Press.

SEMESTER-V

22. Microprocessors and Programming:

Basic Microprocessor Architectural Concepts, Microprocessor Architecture-Families, Intel Microprocessors an Introduction, Pinout and Instruction set, Assembly Language Programming, Assembly Language Programming Techniques, IF-THEN-ELSE Structures, Procedures and Macros, Instruction Descriptions and Assembler Directives, Communicating with Microprocessors, Microprocessor I/O, Operating System and System Software, 32/64 bit Microprocessors, Architecture and Instruction set, Memory and Task Management Hardware Features, Coprocessors and Other Advance Microprocessors, Microcontrollers, Architecture of Microcontrollers, Instruction sets. Application of Microcontrollers. Introduction to Transputers.

Pre-requisite: Digital Logic Design

NOTE: Any one of the commercially available Micro controller, Micro processor may be chosen for specific examples and application.

BOOKS RECOMMENDED:

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, 5th edition, 2000, Prentice Hall.
2. Kenneth Kleitz, 80251 Micro-controller, 2000, Prentice Hall.
3. Daniel Tabak, Advanced Microprocessor, 2nd Ed. McGraw Hill, New York, 1995
4. Daniel Tabak, Microprocessors and Interfacing, Daniel Tabak, 2nd Ed. McGraw Hill International Editions, 1990.
5. Charles M. Gilmore, Microprocessors, Principles and Applications, McGraw Hill International Editions, 1989.
6. Robert Grossblatt, 8088 Project Book, TAB Books Inc. USA, 1989.
7. Lance Leventhal, 80386 Programming Guide, Bantam Books, USA, 1988.
8. J. B. Peatman, Design With Microcontrollers, McGraw Hill, New York, 1988
9. William Stallings, Computer Organization and Architecture, Maxwell MacMillan International Editions. USA, 1990.

23. Solid State Electronics:

Introduction to Basic Quantum Mechanics, Particle in a box, Kronning-Penning Model and Energy Bands in Solids, Semiconductors Statistics, Intrinsic and Extrinsic Semiconductors, Shallow and Deep Impurities, Non-Degenerate and Degenerate Semiconductors, Calculation of Doping Densities and the Fermi Level, Mobility, Conductivity and Life Time of Carriers.

The PN Junction: Homo and Hetero-Junction Devices, Abrupt and Linearly Graded PN Junctions, Current Transport in the PN Junction. PIN Diodes, SCR's, DIAC's & TRIAC's.

Transistors: Bi-polar Junctions Transistors, Modes of Operations, Injections Efficiency, Gain etc., Transistors Modeling, Frequency Performance, HF Transistors. Metal Semiconductor Contacts, Field Effect Transistors, JFET, MESFET, MOS Diode, MOSFETS Structures, Frequency Performance of Devices, MOD FET, HJ Devices, Nano structures, Quantum Well, Quantum Wires, Quantum dot.

Introduction to Fabrication of Semiconductor Devices and Integrated Circuits.

BOOKS RECOMMENDED:

1. Robert F. Pierret, Semiconductor Device Fundamentals, Addison Wasely, 1996
2. Semiconductor Physics and Devices, Basic Principles, Neamen, 1997
3. A S Grove, Physics & Technology of Semiconductor Devices, Wiley, New York, 1967.
4. Donard De Cogan, Solid State Devices, MacMillan London, 1987.
5. G. Schultz, Electronic Devices, MacMillan, 1994
6. Wolfe, Holonyak & Stillman, Physical Properties of Semiconductors, Prentice Hall Cliffs., 1988.
7. S M Sze, Physics and Technology of Semiconductor Devices, Wiley, 1985.
8. A Barliev, Solid State Electronics, Prentice Hall, 1985.
9. M S Tyagi Introduction Semiconductor Materials and Devices, Wiley New York, 1991.

24. Communication Systems:

Introduction to Communication Systems, A Review Continuous Wave Modulation, Amplitude, Frequency, Angle Modulation, Vestigial Sideband and Single Sideband Modulation, Phase-locked Loop, Probability Theory and Random Processes, Noises in CW Modulation System, Information Theory, Error Control Coding, Optimal Signal Detection, Pulse Modulation, Baseband Pulse Transmission, Digital Communication, Digital Passband Transmission, Spread Spectrum Communication Systems, Satellite Communication, Optical Communication, Mobile Wireless Communication System.

Pre-requisite: Communication Electronics

BOOKS RECOMMENDED:

1. Leon W. Couch II, Digital and Analog Communications Systems, 6th Edition, Prentice Hall.
2. Roy Blake, Electronic Communication Systems, Delmar, 2002
3. William Schweber, Electronic Communication Systems: A Complete Course, 4th Edition, 2002, Prentice Hall.
4. Simon Haykin, Communication Systems, 4th Edition, John Wiley & Sons Inc. 2001
5. Wayne Tomasi, Advanced Electronic Communication Systems, 2001, Prentice Hall.
6. Wayne Tomasi, Electronic Communication Systems: Fundamentals through Advanced, 4th Edition, 2001, Prentice Hall.
7. Wayne Tomasi, Fundamentals of Electronic Communication Systems, 2nd Edition, 1994, Prentice Hall
8. George Kennedy, Communication Systems, McGraw Hill, 1994.

9. J. Proakis and Masoud Salehi, Communication Systems Engineering, Prentice Hall, New Jersey, 1994
10. Simon Haykin, Communication Systems, 3rd. Ed. John Wiley and Sons, New York, 1994

25. Signals and System Analysis:

Signal and System Characteristics and Models, Linear Systems, Continuous Discrete Time Systems, Time Domain Analysis of Continuous Time Systems, Convolution and Impulse Response, Spectral Analysis of Continuous Time Systems, Fourier Series, Fourier Transforms, Analysis of Continuous Time Systems using the Laplace Transform application and Laplace Transform, State Variable for Continuous Time Systems, principles of filter design, Time Domain Analysis of Discrete Time Systems, Introduction to Z-Transforms.

BOOKS RECOMMENDED:

1. Steven T. Karris, Signals and Systems with MATLAB Applications, Orchard Publications, 2001
2. Taan S. El Ali & Muhammad A. Karim, Continuous Signals and Systems with MATLAB, CRC Press, Inc. 2001
3. John D. Sharrick, Concepts in Systems and Signals, Prentice Hall, 2001
4. Douglas K. Lindner, Introduction to Signals and Systems. McGraw Hill, 1999
5. Ashoke Ambardar, Analog and Digital Signal Processing, Brooks/Cole Publishing Co., 1999
6. Simon Haykin & Barry Van Veen, Signals and Systems, John Wiley & Sons, 1999
7. Douglas K. Linder, Introduction to Signals and Systems, McGraw Hill, 1999
8. Robert A. Gabel, Richard A. Roberts, Signals and Linear Systems, 3rd Ed. John Wiley, Singapore, 1995.
9. B.P.Lathi, Berkeley, Linear Systems and Signals, Cambridge Press, 1992 or Later Edition.
10. Rodger E. Ziemer & William H. Tranter, Signals & Systems: Continous and Discrete, 4e, Printice Hall, 1998
11. Alan V. Oppenheim, Alan S. Willsky & S. Hamid Nawab, Signals and Systems, 2e, Prentice Hall, 1997

26. Experimental Electronics:

Fifteen Experiments relating Electronic and Communication from the list of experiment attached can be chosen for this course.

SEMESTER-VI

28. Microprocessor Interfacing Technologies:

The 8088/8086 Microprocessors: Pin outs and the Pin Functions, Clock Circuitry, Bus Buffering and Latching, Bus Timing, Ready and the Wait State, Minimum Mode Versus Maximum Mode.

Memory Interfacing: Memory Devices, Address Decoding, 8088/8086 Memory Interface, Dynamic RAM Controllers, Memory Testing.

Basic I/O Interface Circuits: Basic I/O Interface, I/O Port Address Decoding, The 8255A Programmable Peripheral Interface, The 8279 Programmable Keyboard /Display Interface, 8254 Programmable Interval Timer.

Interrupts: Basic Interrupt Processing, Hardware Interrupts, Expanding the Interrupt Structure, 8259A Programmable Interrupt Controller.

Direct Memory Access: Introduction to DMA, The 8257-5 DMA Controller, DMA Processed Printer Interface.

Data Acquisition Systems: Introduction, Analog to Digital Conversion Basics, Major Considerations for Data Acquisitions systems, Analog to Digital Converters, ADC Performance Parameters, ADC Code, Sample & Hold Circuits, Analog Multiplexes, Analog Signal Isolation, Designing of a Data Acquisition system.

μ -processor Based Communications: Introduction to Digital Communications, Serial Communications Interface Adapters, VART, The 8251A Communications Interface Adapter, The RS-232C Interface Standard, Current Loops, Data Transmission Methods, Modems, IEEE-488 General Purpose Instrumentation Bus (GPIB), NEC 7210 GPIB Communication Interface.

Perquisite: Micro-controller & Microprocessor.

BOOKS RECOMMENDED:

1. J. E. Cooling, Real Time Interfacing: Engineering Aspects of μ -processor Peripheral Systems, Van Nostrand Reinhold Co., 1986.
2. Ronald L. Krutz, Interfacing Techniques in Digital Design With Emphasis on Microprocessors, John Wiley, 1988.
3. Douglas V. Hall, μ -Processor and Interfacing, Programming and Hardware, McGraw Hill Co., 1986.
4. B. Barry, The Intel μ -Processors: Architecture, Programming, and Interfacing, Macmillan Publishing Co., 1991.
5. M. Spinks, Newnes, Micro Processor System Design, Oxford, 1992

29. Industrial Electronics and Robotics:

Revision and discussion of semiconductor devices such as diodes, transistors, power transistors with reference to their terminal characteristics.

Switches: Manually, Mechanically, Electromechanically (such as Relays and solenoids) and Electronically operated switches.

Electronic Switches; Shockley diodes, Diac, SCR, Triacs, SBS, SUS etc.

Time Delay Circuits: Passive and active time delay circuits.

Phase Shift Control: SCR and Triac circuits for phase shift control.

Motor and Motor Control: DC, Stepper, AC and Servo Motors construction characteristics and parameters, methods of Electronic Motor control.

Transducers: Temperature, Humidity, Pressure, Displacement, Flow and Level.

Process Control: Process characteristics, On-Off, Proportional, Integral, Differential and PID controllers.

Programmable Logic Controllers (PLC): Symbolic representation of various switches and sensors in control systems. Design of sequential control using Ladder Logic. Architecture of PLC, Comparison between general purpose computer and PLC, Instruction Set, Languages such as Statement List (STL), Functional Block Diagrams (FBD) and Graphical Flow.

Robotics: Classification, Characteristics, work envelope etc

BOOKS RECOMMENDED:

1. Timothy J. Maloney, Modern Industrial Electronics, 4th Edition, 2001, Prentice Hall
2. Colin D. Simpson, Industrial Electronics, 1 Edition, 1996, Prentice Hall
3. James W. Maas, Industrial Electronics, Edition, 1995, Prentice Hall
4. James T. Humphires and Leslie P. Sheets, Industrial Electronics. 3rd Edition, Delmer Publishers, 1989.
5. Charles A. Schuler, W.L. McNamee, Modern Industrial Electronics. 2nd Edition, McGraw Hill, 1993.
6. John Webb, Industrial Electronics, Maxwell Macmillan.
7. Chute and Chute, Industrial Electronics, McGraw Hill.
8. John Webb, Programmable Logic Controllers, Principles and Applications. 2nd Edition, Maxwell Macmillan.

9. G. B. Rutkowski, Modern Industrial Electronics, ,John Wiley, 1993
10. Thomas, Rectifier, Converters and AC Controllers, Oxford Univ., 1994
11. Mohan, Undeland and Robbins, Power Electronics, John Wiley, 1994
12. Charles A.Davis, Industrial Electronics Design and Applications, Charles Merrill Co. 1973.
13. James T. Humpherries and Leslie P. Sheets, Industrial Electronics, Delmar Pub. Co. (USA) 1989.
14. C. A. Schuler and W. L. McNamee, Modern Industrial Electronics, McGraw Hill, New York, 1993
15. Charles A. Schuler and William L. McNamee, Industrial Electronics and Robotics, McGraw Hill, 1986.
16. J. L. Fuller, Robotics, Maxell & Macmillan, New York, 1991

30. Microwave Electronics:

Review of Electromagnetic Wave Theory.

TRANSMISSIONS LINES: Fundamentals of transmission lines, Field Analysis of Transmission Lines, Impudence Loss in transmission Lines, Smith's Transmission Line Charts, Standing Waves, Quarter and Half Wave length lines, Transmission Line Components.

Transmission Lines and Wave guides, Types of wave guides, Microstrips, Microwave Signal Amplification and Generation, Frequency Analysis and Spectrum Analyzers, Microwave Networks and Bridges, Impedance Matching and Tuning, Microwave Tubes and Circuits, Microwave filters, Power Dividers and Directional Couplers, Microwave Resonators , Multi cavity Klystron and Magnetron, TWT.

Microwave antennas: Antenna Coupling, Directional High Frequency Antennas, Microwave Antennas, Horn Antennas, Lens Antennas, wide band Antennas, Helical Antenna, Loop Antennas, Phased Arrays Antennas.

Radar Systems: Principles, Performance Factors, Pulsed systems, Antennas and Scanning, display methods, Moving Target Indication, Radar beacons, CW Doppler Radar, FM CW Radar, Phased Array Radar , Planar Array Radar .

BOOKS RECOMMENDED:

1. Pozar, Microwave and RF Design of Wireless Systems, 2001
2. Matthew M. Radmanesh, Radio Frequency and Microwave Electronics, Prentice Hall, 2001
3. 1e, Georgios B. Giannakis, Peter Stoica, Signal Processing Advances in Wireless and Mobile Communications, Vol.1, Trends in Channel Estimation and Equalization, Prentice Hall, 2001

4. Georgios B. Giannakis, Peter Stoica, Signal Processing Advances in Wireless and Mobile Communications, Vol.2, Trends in Single and Multi User Systems, 1/e, Prentice Hall, 2001
5. 1e, Carl J. Weisman, Essential Guide to RF and Wireless, Prentice Hall, 2000
6. Edgar Hund, Microwave Communications Components and Circuits, McGraw Hill , New York, 1989.
7. David M. Pozar, Microwave Engineering, Addison Wesley, Reading, 1990
8. Theodore S. Saad, Microwaves Engineers Hand Book, Artech House, Dedham, USA, 1971
9. Simon Ramo, J, R. Whinnery and T. Vam Duzer, Fields and Waves in Communication Electronics, John Wiley, 1994
10. Adam Stephan, Microwave Theory and Applications, Prentice Hall, 1989
11. P. F. Combes and J. Francois Sautereau, Microwave Components, Devices and Active Circuits, John Wiley, 1989
12. 1e, Thomas S. Laverghetta, Practical Microwaves, Prentice Hall, 1996

31. Lasers and Applied Optics:

Introduction to Modern Optics: Principles of Optical Design, Matrix Formulation of Geometrical Optics, Image Formation, Radiometry and Photometry, Modern Theory of Diffraction and Interference, Fourier Optics, Coherence and Statistical Optics, Polarization.

Introduction to Lasers: Light Amplification, Population Inversion, Amplifier Nonlinearity and Gain saturation, Theory of Laser Oscillation, Optical Resonators, Rate Dynamics of Three Level and Four Level Lasers, Q-Switching and Mode Locking, Solid State Lasers, Gas lasers, Noble Gas Ion Lasers, Semiconductor Lasers, Dye Lasers, Excimers.

Application of Lasers: Spatial Filtering, Holography, Laser Remote Sensing, Laser Spectroscopy, Industrial Applications, Application in Medicine and Chemistry.

BOOKS RECOMMENDED:

1. Gerd Keiser, Optical Fiber Communication, 3rd Edition, McGraw Hill, 2000
2. C.C. Davis, Laser and Electro-Optics, Cambridge University Press, 1996
3. Ed.P.K.Cheo, Fiber Optics and Optoelectronics, 2nd Edition, Prentice Hall, 1990
4. P. P. Banerjee and Ting-Chung Poon, Principles of Applied Optics, IRWIN Inc, Boston, 1991.

5. K. D .Moller, Optics, University Science Books, California, 1988.
6. J.T. Verdeyen, Laser Electronics, Prentice Hall, London, 1995.
7. P. Das, Springer-Verlag, Lasers and Optical Engineering, New York, 1991.
8. P.W. Milonni and J. Heberlyl, Lasers, Wiley, New York, 1988.
9. K. A. Jones, Harper & Row, Introduction to Optical Electronics, 1987.
10. A. Yariv, Optical Electronics, Harcourt Brace Jovanovich College Publishers, New York, 1991.
11. M. Young, Optics and Lasers, Springer-Verlag, Berlin, 1992.

32. Experimental Electronics-II

Fifteen Experiments relating to Microprocessor/Microcomputer Interfacing and Optical Communication can be chosen the list attached.

SEMESTER-VII

33. Digital Signals Processing:

Introduction to Digital discrete and discrete time Signals, Discrete time Systems, Convolution, Correlation and Filtering, Processing of Random Signals, Signals Recovery, Conditioning Detection and Prediction, A/D and D/A Conversion, Sampling, Interpolation and Sampling Theorem, Windows and Windowing, Analogue Filters, Elliptical Filters, Frequency band Transformation, Bilinear Transformation, Frequency and Time Multiplexing.

The Z-Transform and Its Application to Discrete Time Systems, Realization of Linear Digital Systems, IIR and FIR Digital Filter Design, The Discrete Fourier Transform (DFT), Frequency Response Characteristics, Sampling and Generalized , Convolution, Weighting functions, Whittaker's Reconstruction Fast Fourier Transform (FFT), FFT using Time Decomposition , FFT Using Frequency Decomposition, FFT Error Analysis. Linear Prediction Coefficients (LPC).

Signal Processing System Design, Adaptive Filters.

Pre-requisite: Systems and Signals Analysis

BOOKS RECOMMENDED:

1. Andrew Bateman & Lain Paterson-Stephens, The DSP Handbook: Algorithms, Applications and Design Techniques, Prentice Hall 2002
2. Naseer Kehtarnavaz & Mansour Keramat, DSP System Design: Using the TMS320C6000, Prentice Hall, 2001

3. Vinay K. Ingle & John G. Proakis, Digital Signal Processing Using MATLAB, Brooks/Cole Publishing Co., 2000
4. J. G. Proakis, Digital Signals Processing, 3rd Ed. Macmillan, 1992
5. D. J. DeFatta, J.G. Lucas, W. S. Hodgkiss, Digital Signals Processing, John Wiley & Sons, New York, Latest Edition
6. L. C. Ludeman, Fundamentals of Digital Signals Processing, John Wiley & Sons, New York, 1987.
7. R. A. Roberts and C.T. Mullis, Digital Signal Processing, Addison-Wesley, Reading, 1987.
8. S.D. Stears and D. R. Hush, Digital Signal Analysis , Prentice Hall, London, 1990.
9. A. Bateman and W. Yates, Digital Signals Processing Design, Pitman, London, 1988
10. Pual A Lynn, Macmillan, The Analysis and Processing of Signals, Houndsmill, 1989.
11. C. E. Reid, Signals Processing in C, John Wiley, 1992
12. Sophocles J. Orfanidis, Introduction to Signal Processing, Prentice Hall, 1996
13. Boaz Porat, A Course in Digital Signal Processing, John Wiley & Sons, 1997
14. Henrik V. Sorensen & Jianping Chen, A Digital Signal Processing Laboratory Using the TMS320C30, Prentice Hall, 1997
15. A.V. Oppenheim and R.W. Schafer, Discrete-Time Signal Processing, 2e, Prentice Hall, 1999
16. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms & Applications, 3e
17. James H. McClellan
18. Computer based Exercises for Signal Processing using MATLAB

34. Opto Electronics:

Light Sources, LEDs and Semiconductor Lasers, Light Detectors, Electro-Optics Devices, Modulation of Light, Optical Fiber Waveguides, Optical Fiber Transmission, Optical Fiber Measurement, Optical Time Domain Reflectometry, Passive Components for Optical Coupling, Optical Interconnections, Optical Bistable Devices, Optoelectronic Integrated Circuits. Fiber Optic Communication Systems, Optical Fiber Sensor Technology, Optical Signals Processing, Optical Information Processing, Optical Computing.

Perquisite: Lasers & Applied Optics

BOOKS RECOMMENDED:

1. Gerd Keiser, Optical Fiber Communication, 3rd Edition, McGraw Hill, 2000
2. C.C. Davis, Laser and Electro-Optics, Cambridge University Press, 1996

3. Ed.P.K.Cheo, Fiber Optics and Optoelectronics, 2nd Edition, Prentice Hall, 1990
4. J. Wilson and F. B. Hawkes, Optoelectronics, Prentice Hall, New York, 1989.
5. P. Das, Springer-Verlag, Lasers and Optical Engineering, New York, 1991.
6. B. E. A. Saleh and M. C. Teich, Fundamental Of Photonics, John Wiley, New York, 1991
7. Chinlon Lin, Van Nostrand Reinhold, Optoelectronic Technology and Light wave Communication Systems, New York, 1989.
8. F.T.S.YU and I. C. Khoo, Principles of Optical Engineering, John Wiley & Sons, New York, 1990.
9. M. A. Karim and A. A. Awwal, Optical Computing, John Wiley & Sons, 1992.
10. G. P. Agarwal, Fiber Optic Communication Systems, John Wiley & Sons, New York, 1992
11. Gerd Keiser, Optical Fiber Communications, McGraw Hill International Ed. , New York, 1991.

35. Data Communication Networks:

Introduction; Data Communication Networking, Protocol and Protocol Architecture, Standards OSI/TCP/IP.

Data Transmissions, Transmission Media; Guided Transmission Media, Wireless Transmission, Data Encoding, Digital Data, Digital Signals, Digital Data, Analog Signals, Analog Data, Digital Signals, Analog Data, Analog Signals, Spread Spectrum, Data Communication Interface, Asynchronous and Synchronous Transmission, Interfacing, Data Link Control, Flow Control, Error Detection, Error Control, High Level Data Link Control (HDLC), Other Data Link Control Protocols, Multiplexing, Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing. Circuit Switching, Switched Networks, Routing in Circuit-Switched Networks. Packet Switching, Packet Switching Principles, Routing, Congestion Control, X.25 282. Frame Relay, Asynchronous Transfer Mode (ATM, LAN Technology, LAN Architecture, Bus/Tree LANs, Ring LANs, Star LANs, Wireless LANs, LAN Systems, Ethernet and Fast Ethernet (CSMA/CD), Token Ring and FDDI, ATM LANs, Wireless LANs.

BOOK RECOMMENDED:

1. Local Area Networks, 2nd Edition, 2002
2. James H. Hardy, Inside Networks Edition, 1995, Prentice Hall
3. W. Stallings, Data and Computer Communications, Macmillan, New York, 6th Edition

4. T. N. Saadawi and M. H. Ammar, Fundamentals of Data Communication Networks, John Wiley, New York, 1994
5. P. Perlman, Interconnection: Bridges and Routers, Addison Wesley, Reading, Mass., 1993
6. A. S. Acampora, Introduction to Broadband Networks, Plenum Press, New York, 1994
7. J. N. Daigle, Queuing Theory for Telecommunications, Addison Wesley, Reading, 1992
8. J. E. McNamara, Technical Aspects of Data Communications, Digital Equipment, 1988
9. M. Miller and S. V. Ahmad, Digital Transmission, Systems and Networks, Computer Science Press, Rockville, 1987

36. Control Systems:

Mathematical Models of Physical Systems, Reviewing of Laplace Transform, Transfer Functions and System Response, First order and Second order systems, Higher order systems, Feedback Control Systems, Routh's Method, Root Locus Analysis and Design, Frequency Response Analysis and Design, Nyquist diagram and stability criterion, Bode Diagrams and analysis, State Space Analysis and Design, Analogue Control Systems, Digital Control Systems, Digital Control Using Microprocessors and DSP Processors, Computer Controlled Systems.

Pre-requisite: Systems and Signals Analysis

BOOKS RECOMMENDED:

1. Dorsey, Continuous and Discrete Control Systems, McGraw Hill 2002
2. Curtis J. Johnson, Heidaer Malki, Control Systems Technology, 1 Edition, Prentice Hall 2001
3. Theodore E. Djaferis, Automatic Control: The Power of Feedback Using MATLAB, Brooks/Cole Publishing Co., 2000
4. John Van De Vegte, Feedback Control Systems, 3rd. Ed., Prentice-Hall, London, 1994.
5. R. J. Vaccaro, Digital Control: A State Space Approach, McGraw Hill, 1995
6. Ernest O. Doebelin, Control System; Principle and Design, John Wiley & Sons, New York, 1985.
7. K.L. Astrom, B. Wittenmark, Computer Controlled Systems, Prentice Hall, Englewood Cliff, 1984.
8. C.D. Johnson, Process Control Instrumentation Technology, John Wiley & Sons. New York, 1982.
9. N. K. Sinha, Control Systems, CBS Publishing Japan Ltd., New York, 1986.
10. Morris Driels, Linear Control Systems Engineering, McGraw Hill, New York, 1996

11. Charles L. Phillips and H. Troy Nagle, Digital Control System Analysis and Design, 3e, Prentice Hall, 1995
12. Stanley M. Shinnars, Advanced Modern Control System Theory and Design, John Wiley & Sons, 1998
13. Chi Tsong Chen, Analog and Digital Control system Design: Transfer Function, State Space and Algebraic Methods, Oxford University Press, 1993
14. Benjamin C. Kuo, Automatic Control Systems, 7e, John Wiley & Sons, 1995

37. Experimental Electronics-III

(Experiments on Industrial Electronics and Control System) Programmable Logic Controller may be introduced in this course.

SEMESTER-VIII

39. VLSI Design:

Integrated Circuit Technology; Transistor topology, transistor equations, CMOS process steps, fabrication, yield, design rules for custom layout.

CMOS Logic Design; Complex gates, pseudo NMOS, dynamic logic, dynamic cascaded logic, domino logic, 2 and 4 phase logic, pass transistor logic.

Approaches to System Design; Control and timing, synchronous and asynchronous, self-timed systems, multiphase clocks, register to register transfer, examples of ALU, shifters and registers.

Design Implementation; Layout, hand layout, graphical layout, low level language, design rule checking, stick diagrams, placement of cells, simulation of design, function generation from masks, test pattern generation, high level languages, structured design methodology for VLSI, hierarchical design techniques and examples.

Digital and Analogue Architectures; Serial addition, bit-serial multipliers, systolic arrays, analogue voltage dividers, current mirrors, differential amplifiers, wide range amplifiers.

Future Integrated Circuit Processing; Effects of scaling circuit dimensions, physical limits to device fabrication.

Design Project; Optional extended course work for final year students, using VLSI design software to produce a chip to meet a given specification, the chip may be fabricated if the design is successful.

Cast Study Lecture; Design of a counter using proprietary CAD system, use of circuit description language, layout considerations.

BOOKS RECOMMENDED:

1. Haykin, S. Thomas, Elements of Information Theory, John Wiley & Sons, 2001
2. Principles of CMOS VLSI Design: a Systems Perspective, 2e, N. Weste and K. Eshraghian Addison Waseley, 2000
3. N. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2e, Addison Waseley, 1993
4. Sabih H. Gerez, Algorithms for VLSI Design Automation, John Wiley & Sons, 1998
5. M. Sarrafzadeh and C.K.Wong, An Introduction to VLSI physical Design, McGraw Hill, 1996

40. Optical and Wireless System:

The communication Model, Basic Blocks for Communication, Light sources, LEDs, Laser, Semiconductor Diodes Laser, Optical Fibers.

Communication model in free space.

Light Detection; Quantum efficiency, photo Conductors, Photo diode, Advanced light detection devices; Photo transistors etc. noise in Optical communications, Coherent and incoherent Detection, Time Domain Medium Access, Wavelength Domain Medium Access, Subcarrier Multiplexing, Photonic Switching, Signal Processing in Optical Communication. Classification of wireless systems, Cellular Telephone Systems. Personal Communication Systems, Satellite Systems fore Wireless voice and Data, Global positioning Satellite Systems.

Design and performance issues, wireless System components; Antennas, Filters, Amplifiers, Mixer, Oscillators etc., Propagation for wireless Systems, Modulation Techniques Receiver Design.

BOOKS RECOMMENDED:

1. Matthew M. Radmanesh, Radio Frequency and Microwave Electronics, Prentice Hall, 2001
2. David M. Pozar, Microwave and RF Wireless Systems, John Wiley & Sons Inc. 2001
3. Keiser, Optical Fiber Communications, 3rd Edition, 2000, McGraw Hill.
4. Carl J. Weisman, Redondo Beach, Essential Guide to RF and Wireless, 1 edition, 2000, Prentice Hall
5. Max Ming- Karg Lin, Principles and Applications of Optical Communications, IRWIN Book Co. 1996
6. John Gower, Optical Communication Systems, 1993, Prentice Hall

41. Information Theory:

Introduction and Preview, Entropy, Relative Entropy and Mutual Information, The Asymptotic Equipartition Property, Entropy Rates of a Stochastic Process, data Compression, Channel Capacity, Differential Entropy, Maximum Entropy and Spectral Estimation, Network Information Theory.

BOOKS RECOMMENDED:

1. Haykin, S., Communications Systems, 4th Edition, John Wiley & Sons 2001
2. Van der Lubbe J.C.A, Information Theory, Cambridge University Press, 1997
3. Golomb S.W., Peile R.E. and Scholtz R.A, Basic Concepts of Information Theory and Coding, , Plenum Press, 1994
4. Cover and Thomas, Elements of Information Theory, John Wiley & Sons, 1991

42. Advanced Instrumentation:

Measurement Principles, Noise Sources, Detection and Noise Removal, Quality Control: Definition and purpose of Instruments, Data analysis, Data presentation (graphing techniques), Curve fitting, Type of Errors, Estimation of Errors using Statistical techniques.

Measurement System: Block Diagram of Functional Elements of a typical Instrument. Model relating Input and Output. Effect of interfacing inputs on output and its correction methods.

Generalized Performance Evaluation of Instruments: STATIC: Sensitivity, Linearity, Range, Resolution, Hysteresis Threshold and Dead Span. Calibration.

Dynamic: Design Criteria, Mathematical Modeling, Determination of Parameters by applying Step, Ramp, Impulse and Sinusoidal wavelet inputs to models. Experimental methods of parameters evaluation.

Noise: Basic definition, Intrinsic noises, Extrinsic noise coupling such as Conductive, Capacitive, Magnetic and Electromagnetic. Noise protection methods such as Shielding and Grounding. Safety Grounding and Signal Grounding. Noise in Digital Systems.

Signal Recovery Techniques: Spectral contents of Noise, Statistical Methods of describing Stochastic signals. Elimination of Noise by Cross Correlation, Autocorrelation, Examples of use of these techniques in instruments such as Lock-In Amplifier and Frequency Response Amplifier (FRA).

Biomedical Instrumentation: basic Biophysics: Flux Effluence, Drift and Diffusion of Particles, Brownian movement, Cells, Membrane, Nernst Equation, Axon and Mussels. Electrical Properties of Biological systems. Action potential. ECG and EEG signals.

Radiation Effects on Biological systems and Related Instrumentation: Sonic (Ultrasounds), RF (MRI) and Heating, Infrared (Diathermy), Optical (Laser surgery), Ultraviolet (Diathermy), X-rays (general X-ray, CT Scanning).

Clinical Instrumentation: Biological Signal detection, Electrodes and Transducers. ECG machine construction. PH measuring system, Photometers, Colorimeters, Blood Cell Counters.

BOOKS RECOMMENDED:

1. Curtis D., Process Control Instrumentation Technology, Johnson, Prentice Hall, 2002
2. Desa, Doglas O.J., Instrumentation Fundamentals for Process Control, Taylor and Francis Group, 2001
3. J.G. Webster, Medical Instrumentation: Application and Design, 3e, John Wiley, 1998
4. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Longman 1995.
5. Patrick H. Garret, Advanced Instrumentation and Computer I/O Design, IEEE Press, 1994
6. James W. Dally, William F. Riley and Kenneth G. McConnell, Instrumentation for Engineering Measurements, 2nd Edition, John Willey & Sons Inc. 1993.
7. David Buchla and Wayne McLachlan, Applied Electronic Instrumentation & Measurement, Maxwell Macmillan.
8. L. Schnell, Technology of Electrical Measurements. 1993, John Willey
9. David Buchia and Wayne McLachlan, Applied Electronic Instrumentation and Measurement, Macmillan , 1992.
10. Larry D. Jones and A. Foster Chin, Electronic Instruments and Measurements, Prentice Hall Inc. 1991.
11. Albert D. Helfrick and William D. Cooler, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall, 1990.
12. T. H. Willmshurst, Signal Recovery (From Noise in Electronic Instrumentation 2nd Ed.), Adam Hilger Press, 1990.
13. Ernest O. Doebelin, Measurement Systems, Application and Design, McGraw Hill, 1990

43. Experimental Electronic –IV

Experiments on Electronic System Design and implementations may be introduced in this course.

LIST OF EXPERIMENTS:

1. To evaluate the different characteristics of IRED light emitting diodes.
2. To familiarize with the operation of a light dependent resistor (LDR) or photo resistor.
3. To familiarize with the construction and the operation of a photodetector.
4. Assess the output response between receiver circuit constructed with photo diode and photo resistor.
5. Fiber Ends Preparation.
6. Measure the optical power emitted by LED.
7. Measure the optical loss measurement by using different lengths of fiber.
8. Introduction to development environment (DSK) of TMS320C5x Digital Signal Processor./ To study aliasing effects of A/D converters.
9. Tone Generator using TMS320C5x DSK.
10. To demonstrate the problems of converting an analog signal into a digital representation.
11. To demonstrate digital filters and how a filter can change a signal.
12. Fast Fourier transform of time domain signals.
13. To study the spectral characteristics of human voice signal.
14. Accumulators, Straight Line Programs, Inherent, Immediate and Direct Addressing.
15. The Condition Code Register, Relative Addresses, Branching, Extended Addressing, Multiple Precision and Signed Addition.
16. Multiplication, Division, BCD Numbers, Indexed Addressing Mode, Shift Operations.
17. The Stack, Subroutines, Using the 8051 Micro Controller Cross Assembler and Cross C compiler.
18. Interfacing Parallel I/O ports.
19. Interrupts.
20. A/D Converters.
21. The Programmable Timer.
22. The Serial Communication and Serial Peripheral Interfaces-D/A Converters.
23. Keyboard and LCD display Interface.
24. Stepper Motor Control.
25. DC Motor Digital Speed Control System.
26. Characteristics of Photo resistor, Photo diodes and Photo transistors.
27. Darlington Senses, Avalanche Photo diodes.
28. Optocouplers.

29. The optical logic Controller.
30. Driver and Modulation Circuits for Laser diodes.
31. Laser and optical fiber ---
32. Bar code scanner
33. Modulation of LED and IRED.
34. Optical pulse width modulation and demodulation techniques.
35. Optical Transmission Systems.
36. Video Communications with Microwave links
37. Voice Communications with Microwave links
38. VSWR Measurements and TX Line Impedance
39. Frequency and Wavelength Measurements
40. Power Measurements and Line Attenuation
41. Transmission Line Tuning and Use of the smith chart
42. The Hybrid-T Wave guide
43. The Three port Directional Coupler
44. The Gunn Oscillator
45. Horn Antenna Gain calculations
46. Horn Antenna Gain Measurements
47. Power Gain and beam width Horn measurements
48. Plotting of H and E Plane Patterns
49. Modulation of Microwave Transmitters
50. The Microwave Receiver
51. Time-Division Multiplexing (TDM) of Voice Signals
52. Fiber Optic Interface
53. PCM Interface
54. Circuit Analysis (Kirchoff's Law, Thevenin and Nortons Theorems)
55. Junction diode's characteristics and use as a clipper and clamper
56. Rectifier and filters (half wave and bridge)
57. Transistor Familiarization and its use as a voltage regulator
58. Transistor configuration (CE.CB.CC)
59. Power Amplifiers (class A.B.C)
60. JFET characteristics and Amplifier
61. Sinusoidal Oscillators (Hartley-Colpits)
62. Multivibrators (a stable, mono stable and bistable)
63. Differential Amplifier
64. OP-AMP characteristics
65. Linear & Non Linear Amplifications of operational amplifier
66. Active filters (first order, second order and state variable)
67. OP-AMP Oscillator
68. The 555 timer
69. Logic Inverter
70. OR Gates & AND Gates
71. NOR Gates
72. NAND Gates
73. Boolean Algebra & Fundamental Operations
74. Boolean Algebra & Theories
75. 4-Input Multiplexer

76. 1 of 4 Decoder
77. BCD to Decimal Decoder Driver
78. Seven Segment LED and Decoder Drivers
79. Exclusive OR Gates
80. Binary Numbers
81. Priority Numbers
82. Adders
83. Multiplexer Adder-Subtractor
84. 4-bit Arithmetic Logic Unit
85. Flip-Flops
86. Digital clock Oscillator
87. 4-phase clock
88. A stable Multivibrator
89. Mono stable Multivibrator
90. Shift Register
91. A shift Register Ring Counter
92. Binary Counter
93. Up-Down Counter
94. Preset table Counter
95. Shift Counter
96. Random Access Memory (RAM)
97. Binary Ladder (DAC)
98. Four Digit Frequency Counter
99. To develop understanding about the digital to analog (D/A) and analog to digital (A/D) conversion techniques
100. To demonstrate use of LM-566 as voltage to frequency converter and a frequency modulator
101. To build circuits to generate pulse amplitude modulation (PAM) and demonstration
102. To build pulse width modulator (using LM-555)
103. To build and determine characteristics of a digital phase generator and an exclusive OR phase detector
104. To study the characteristics of phase-locked loop (PLL) circuit
105. To study RC phase shift (0-90 and 0-180) circuit and Ramp and peestal circuit
106. To design relaxation oscillator using UIT and PUT
107. To construct and study time delay circuits
108. To understand frequency shift keeping (FSK) principle by building a generator & demodulator
109. Control of power through load using thyristors (SCR, TRIACS)
110. Study cosine-wave, Ramp-Comparator and digital triggering circuits for thyristors
111. Study series inverter and chopper circuits
112. Study principles of synchronization by building sweep generator and digital phase shift controller
113. Manual and electronic control of DC and stepper motors
114. Study ON-OFF proportional and proportional integrated process control

115. Build and perform a closed loop temperature controller using DM-35 temperature sensor
116. Interface reset and clock circuit with the MCS 8031/AT89C51 Micro Controller. Also test the circuit constructed by checking signal at pin-30(ALE)
117. Interface demultiplexing and decoding circuit to the MCS-8031/AT89C5 controller
118. Learn use of EPROM programmer and eraser by writing a test programmer should generate a square wave at the port P2.0 (pin)
119. Interface volatile RAM and EPROM to controller 8031/AT89C51. Check RAM and EPROM by appropriate software in assembly language
120. Interface 8155 programmable peripheral interface to controller
121. Interface intelligent LCD matrix display module based on display control HD 44780
122. Interface Hex Matrix key board to the controller
123. Write appropriate software to control a traffic signal system (Model)
124. Write appropriate software to control DC motor
125. Write appropriate software to control stepper motor
126. Write appropriate software to control A/D and D/A conversion
127. Write a program to control temperature of an oven.

RECOMMENDATIONS

Following recommendations in addition to recommendations already cited in the proceeding of meetings held during October 29-31, 2001 are:

1. The UGC should be actively involved and participate in the implementation of the recommendations of the National Curriculum Revision Committees.
2. Since the Electronics plays a vital role in the countries defence, industrial development and Information Technology, the funding agencies may be directed to liberally allocate funds for development of electronics in the universities of Pakistan.
3. Two to six months internship at the R&D Organization should be encouraged to facilitate the student enrolled in B.Sc./M.Sc. degree programmes in Electronics. This matter may be taken up at the appropriate Ministries, such as Ministry of Education, Ministry of Science and Technology and Ministry of Industry.
4. The Frequency Allocation Board and Ministry of Defence may facilitate in the national interest to develop departments of Education at various universities, Technical and Financial assistance in the areas like Radars and Wireless System may be provided for professional training in these vital areas of the syllabus.
5. The Ministry of Communication/ Frequency Allocation Board may allocate a small band of frequencies to the universities teaching electronics so that experiments on wireless communication can be conducted.
6. Availability of text book recommended by NCRC must be ensured. The National Book Foundation may take appropriate measures.
7. The electronic courses must be taught using software design and simulation tools so that students are familiarised with current design procedure and methodology hereby acquiring higher technical skills.
8. A small MicroComputer based project spanning over 3-4 weeks at B.Sc. level may be introduced to acquaint students with computer hardware.

9. There should be an opportunity in the course of studies of the universities of Pakistan where a student may opt for four subjects namely (Physics, Electronics, Maths and Computer Science) instead of traditional three subjects.
10. A permanent National review committee be constituted to supervise Curriculum taught at public/private universities and bring them in line with the Curriculum developed by the NCRC on Electronics.
11. Electronic should be given proper weightage in the BCS and MCS programmes of the public/private sector universities of Pakistan.
12. The NCRC on electronics, the NCRC on Mathematics to introduce a course on programming and software development at B.Sc level (This will help students taking Mathematics, Electronics, Chemistry, Economics, Statistics and other Mathematics related subject to adopt emerging technology).
13. The NCRC members are of the opinion that regular meetings of NCRC on Electronics be held preferably every two year to accountable rapid changes in this field.
14. Professionals from public sector engineering universities may also be incorporated in the NCRC on Electronics.

Dr. Muhammad Maroof,
Professor & Chairman,
Deptt. of Physics,
University of Sindh,
Jamshoro

Prof. Dr. Abdul Qadeer,
Professor,
Deptt. of Applied Physics,
University of Karachi,
Karachi.