North Maharashtra University, Jalgaon.

'A' Grade NAAC Re-Accredited
(3rd Cycle)

Bachelor of Science in Electronics
B. Sc. (Electronics)

Syllabus

Third Year Degree Course
(T. Y. B. Sc.)
Semester CGPA Pattern

(w. e. f. June - 2017)

North Maharashtra University, Jalgaon.
T. Y. B. Sc. (Semester CGPA Pattern)
(w. e. f. June – 2017)

(ELE- Electronics, Int.- Internal, Ext.- External, Y-Year, S-Semester & C-Course number)

Paper	Semester	Course Code & Title	Marks		
			Periods	Int.	Ext.
1	I	ELE 351: Semiconductor Physics	60	40	60
	II	ELE 361: Electrodynamics	60	40	60
2	I	ELE 352: Basic Communication Systems	60	40	60
	II	ELE 362: Advanced Communication Systems	60	40	60
3	I	ELE 353: 8086 Microprocessor	60	40	60
	II	ELE 363: Microprocessor Interfacing Techniques and Advanced Microprocessors	60	40	60
4	I	ELE 354: The C Programming Language	60	40	60
	II	ELE 364: Numerical Simulation in Electronics	60	40	60
5	I	ELE 355: Microcontroller 8051	60	40	60
	II	ELE 365: Embedded Systems	60	40	60
6	I	ELE 356: Advanced Digital System Design	60	40	60
	II	ELE 366: Industrial and Power Electronics	60	40	60
7	I	ELE 357: General Lab – I Semiconductor Physics, Basic Communication, SPICE & VHDL	60	40	60
	II	ELE 367: General Lab - II Advanced Communication, Power and Industrial Electronics	60	40	60
8	I	ELE 358: µP, µC and C/MATLAB Lab – I Microprocessor, Microcontroller & C	60	40	60
	II	ELE 368: µP, µC and C/MATLAB Lab – II Microprocessor, Microcontroller & C	60	40	60
9	I	ELE 359: Project Part-I (Guidelines are provided in syllabus)	60	40	60
	II	ELE 369: Project Part-II (Guidelines are provided in syllabus)	60	40	60

Note:
1. **Each course is having a weightage of four periods per week.**
2. **Each practical course is having a weightage of four periods per week.**
3. **Examination of practical course and project shall be conducted semester wise.**

Chairman, BOS   Dean, Science Faculty

T. Y. B. Sc. Electronics
Semester I: Paper I
ELE 351: Semiconductor Physics

Objectives:

1. To enrich the understanding of fundamentals of semiconductor devices.
2. To have an awareness of IC fabrication techniques.

Unit 1: Crystal Structure (Ref. 1 to 3)   (12P, 12M)

Lattice, Basis and Crystal Structure, Translational Vectors, Unit cell, Primitive Translational Vectors for SC, BCC and FCC. Co-ordination number, Atomic radii, Packing for SC, BCC and FCC structure, Miller indices, Inter planer distances, Reciprocal lattice and its properties, Reciprocal lattice of SC, BCC and FCC.

Unit 2: Energy Bands   (12P, 12M)

Bonding forces in solids, Energy bands, Metals, Semiconductor and Insulator, Variation of energy bands with alloy, Electrons and holes, Effective mass, Intrinsic material, Extrinsic material, The Fermi level, Electrons and holes concentration at equilibrium.

Unit 3: Field Induced Mobility of Charge Carriers   (10P, 12M)

Semiconductor material (Elemental and Compound), Direct and Indirect band gap semiconductors, Intrinsic and Extrinsic semiconductor, Carrier concentration-Fermi level and Electron-hole concentration at equilibrium, Conductivity and mobility, Hall effect.

Unit 4: P-N Junction & Devices   (14P, 12M)

Fabrication of P-N junction: mention different methods of fabrication of p-n junction, Diffused method, Equilibrium conditions: contact potential, space charge at junction, forward and reverse bias junction: Qualitative description of current flow at a junction, Reverse-bias break down: Zener and avalanche breakdown. Introduction to fabrication of BJT and MOS transistors.

Unit 5: Integrated Circuits (IC) Fabrication (Ref. 5 to 7)   (12P, 12M)

Introduction and classification of ICs, Advantages and disadvantages of ICs over discrete components, Manufacturing process of monolithic ICs, Construction and fabrication of monolithic BJT and MOS transistors, Fabrication of discrete devices – Monolithic fabrication of diode, Integrated Resistors, Capacitors and Inductors.

Reference Books:

1. "Introduction to Solid State Physics", Charles Kittle, John Wiley and Sons.
2. "Solid State Electronic Devices", Ben G. Streetman and Sanjay Kumar Banergee, PHI Publication.
3. "Principle of Electronic Materials and Devices", S O Kasap, McGra Hill Education.
4. "Physics of Semiconductor Devices", S. M. Sze and Kwok K. Ng, Wiley Student Edition.
5. "Linear Integrated Circuits", D. Roy Choudhury and Sahil B. Jain, New Age International Publisher.
6. "Linear Integrated Circuits", U. A. Bakshi, A. P. Godse, A. V. Bakshi, Technical Publications, Pune.
7. CMOS VLSI Design By Neil H. E. Weste, David Harris and Ayan Banergee, Pearson Education.

T. Y. B. Sc. Electronics
Semester II: Paper I
ELE 361: Electrodynamics

Objectives:

1. To enrich the understanding of fundamentals concepts of electrodynamics and electromagnetics.
2. To have basic knowledge of electromagnetic waves and their propagation.

Unit 1: Electrostatics (12P, 12M)

Electric Field, electric flux, Gauss' Law (integral form, for an internal & external point), application of Gauss' Law (field due to spherically symmetric charge distribution), electrostatic potential, relation between electric field and electrostatic potential, electrostatic Energy.

Unit 2: Boundary Value Problems in Electrostatic Field (10P, 09M)

Poisson's and Laplace Equation, solution of Laplace's equation in rectangular coordinate, Laplace's equation in spherical polar coordinates, electrostatic images, point charge and conducting sphere.

Unit 3: Magnetostatics (10P, 12M)

Introduction, electric current, Ohm's law, electrical conductivity, calculation of resistance, current density, magnetic induction, force on a current element Amper's force law, Lorentz force and force on a current, Biot-Savart's law.

Unit 4: Electromagnetic Induction (16P, 15M)

Electromotive force, Faraday's Law of electromagnetic induction, Lenz law, integral and differential form of Faraday's law, equation of continuity, displacement current, Maxwell's Equations (differential form), derivation of Maxwell's equations, Maxwell's equation in integral form and its derivation, Maxwell's equation in free space, linear isotropic media and varying fields, energy in electromagnetic fields: Poynting theorem.

Unit 5: Electromagnetic Wave and its Propagation (12P, 12M)

Physical significance of wave equations for free space conditions and plane electromagnetic waves in free space (Cover figure of EM wave and E-H parameter on the basis of last equation, No derivation expected), plane electromagnetic wave propagation in isotropic dielectric (non conducting media), polarization of electromagnetic wave, reflection and refraction of EM wave at non conducting boundaries.

Reference Books:

1. "Electrodynamics" Dr. Gupta, Dr. Kumar, Singh, Pragati Prakashan.
2. "Electromagnetics", B. B. Laud, Wiley Eastern Limited.
3. "Foundations of Electromagnetic Theory", John Reits, Narosa Publishing House.
4. "Classical Electrodynamics", John David Jackson, Wiley Student Education.
5. "Introduction to Electrodynamics", David J. Griffiths, Pearson Education India.
6. "Classical Electrodynamics", S. P. Puri, Tata McGraw Hill Publishing.

T. Y. B. Sc. Electronics
Semester I: Paper II
ELE 352: Basic Communication Systems

Objectives:

1. To learn the concepts of communication system.
2. To know the various modulations and demodulation techniques.
3. To learn the radio wave propagation.

Unit 1: Fundamentals of Communication   **(12P, 12M)**

Importance of communication, Block diagram of communication system. Types of Electronic Communication systems: Simplex and Duplex, Analog and Digital Signals, baseband signals. Applications of electronic communications, Electromagnetic spectrum (ELF to UHF).Noise in communication and types of noise (External and internal).Noise voltage, S/N ratio Modulation, need and types of modulation.

Unit 2: Amplitude Modulation and Demodulation   **(14P, 12M)**

Modulating signal, need of carrier signal, modulation index, and percentage modulation, Spectrum Analysis of amplitude modulated wave, power relations, forms of amplitude (DSB-SC, SSB-TC, SSB-SC, VSB) modulation, Block diagram of AM Transmitter, Transistorized AM Modulator, limitations of AM. Demodulation- AM Diode detector. Super heterodyne Receiver: Block diagram and explanation of each block.

Unit 3: Frequency Modulation and Demodulation   **(12P, 12M)**

Frequency modulation principle, modulation index, frequency deviation, carrier swing, deviation ratio, FM Side bands, mathematical expressions for FM, Difference between AM and FM. Varactor Frequency Modulator, FM modulator using VCO. Block diagram of FM receiver, Basic FM Demodulator-ratio detector,

Unit 4: Antenna and RADAR   **(12P, 12M)**

Antenna parameters, Types of antennas, Half wave dipole and dish antenna and their applications. Radio wave propagation – Ground wave propagation, Sky wave propagation and Space wavepropagation. Ionosphere, importance features and effects of ionosphere on radio waves. Concept of Skip-distance. Principal & working of RADAR, types, Pulsed RADAR-working, Applications of RADAR

Unit 5: Satellite Communication   **(10P, 12M)**

Introduction of satellite communication, transponders, idea of nonsynchronous and geosynchronous or geostationary satellites, geostationary orbit, DOMSAT and INTELSAT, applications of satellite communication.

Reference Books

1. "Communication Electronics" Louis Frenzel, Tata McGraw Hill.
2. "Electronic Communication", George Kennedy, Bernhard Davis, S R M Prasanna, Tata McGraw Hill.
3. "Electronic Communication System", Dennis Roddy, John Coolen, Pearson Education.
4. "Antenna and Wave propagation", K. A. Bakshi, A. V. Bakhi, U. A Bakshi, Technical Publications.
5. "Antenna and Wave propagation", K. D. Prasad, Satya Prakashan.
6. "Principles of Communication Engineering", Anokh Singh, S. Chand, New Delhi.

T. Y. B. Sc. Electronics
Semester II: Paper II
ELE 362: Advanced Communication Systems

Objectives:

1. To learn the digital communication.
2. To learn the telephony systems
3. To learn the Fiber optic communications.
4. Introduction to computer network and security.

Unit1: Digital Communication   **(10P, 12M)**

Block diagram of Digital communication, channel capacity, channel noise and its effect, Advantages and disadvantages of digital communication, Pulse Communication: Sampling theorem, Nyquist rate, natural and flat sampling PAM, PWM, PPM: Definition, waveforms and comparison PCM: Block diagram of PCM transmitter and receiver, sampling quantization, quantization error.

Unit 2: Data Transmission and Wireless Communication   **(08P, 10M)**

Introduction to MODEM, ASK, FSK, and PSK, Introduction to Wireless data communication- WiFi, Microwave and Cellular Communication.

Unit 3: Computer Communication   **(12P, 12M)**

Introduction, Components, Data representation, Data flow. Networks: Network criteria, type of connection, network topology, categories of network (LAN, WAN, MAN), Interconnection of networks-Internet, Protocols and Standard. Connecting devices-Hubs, Bridge, Routers, Switches.

Unit 4: Fiber Optic Communication   **(15P, 14M)**

Ray theory transmission-Total internal reflection, acceptance angle, Numerical Aperture(Concept only), Optical fiber- Structure, types-Multimode step index fiber, multimode graded index fiber, single mode step index fiber, optical fiber loss-attenuation, dispersion, bending loss (no mathematical treatment), splicing techniques & connectors(no construction diagrams), Block diagram of fiber optic communication system, Advantages, Sources and detectors(List only).

Unit 5: Network Security   **(15P, 12M)**

Security Services: Message Confidentiality, Message Integrity, Message Authentication, Digital Signature, Comparison, Need for Keys, Process, Services, Signature Schemes. Entity Authentication, Passwords, Key Management, Symmetric-Key Distribution, Public-Key Distribution, Security in the Internet: IPSec, SSUFLS, PGP, VPN and Firewalls.

Reference Books:

1. "Electronic Communication System", Dennis Roddy, John Coolen, Pearson Education.
2. "Communication Electronics" Louis Frenzel, Tata McGraw Hill.
3. "Principles of Communication Engineering", Anokh Singh, S. Chand, New Delhi.
4. "Electronic Communication System", Sanjeeva Gupta, Khanna Publisher.
5. "Electronic Communication: Digital, Analog and wireless", Sanjeeva Gupta, Khanna Publisher.
6. "Analog and Digital Communication Systems", Martin S. Roden, SPD Publication.
7. "Data Communications", V. S. Bagad, I. A. Dotre, Technical Publications.
8. "Digital and Data Communications", Martin S. Roden, Prentice Hall India.
9. "Optical Fiber Communication", Gerd Keiser, McGraw Hill Education.
10. "Fiber Optic Communication System", Govind P Agrawal, Wiley Student Edition.
11. "Optical Fiber Communications", John M Senior, Pearson Prentice Hall.
12. "Data Communication & Networking", Behrouz Forouzan, McGraw Hill Companies.
13. "Cryptography and Network Security", William Stallings, Pearson Education.

T. Y. B. Sc. Electronics
Semester I: Paper III
ELE 353: 8086 Microprocessor

Objectives:

1. To learn the architecture of 8086.
2. To learn the assembly language programming of 16 bit microprocessor.

Unit1: The Processor 8086   **(14P, 14M)**

Register organization of 8086, Architecture, Pin diagram and its functions, Signal Descriptions of 8086, Physical memory organization, General bus operation, I/O addressing capability, activities, concept of stack.

Unit 2: Basic 8086 Configurations   **(08P, 08M)**

Minimum and Maximum mode 8086, System Bus Timing.

Unit 3: 8086 Instruction Set   **(14P, 14M)**

Machine language instruction formats, Addressing mode of 8086, Instruction set of8086**:-** Data Copy / Transfer Instructions, Arithmetic and Logical Instructions, Branch Instructions, Loop Instructions, Machine control Instructions, Flag Manipulation Instructions, Shift and Rotate Instructions, String Instructions.

Unit 4: Assembler Directives and Operators   **(10P, 10M)**

Data Definition and Storage Allocation, Structures, Records, Assigning Names to Expressions, Segment Definition, Program Termination, Alignment Directives, Value-Returning Attribute Operators.

Unit 5: Programming with 8086   **(14P, 14M)**

Simple assembly language program, Loop program and String processing program.

Reference Books:

1. "Advanced microprocessor and peripherals (Architecture Programming and Interfacing)", A. K. Ray, K. M. Bhurchandi, TMH Publication.
2. "Microprocessor system: 8086/8088 family (Architecture Programming and design)", Yu Cheng Liu and G.A.Gibson, PHI Publication.
3. "Microprocessor and Interfacing", D. Hall 1995, TMH Publication.
4. "The 8088 and 8086 microprocessor (Programming, Interfacing, Software, Hardware and applications)", Walter A. Triebel, Autarsingh.
5. "Microprocessor and Interfacing Techniques", A. P. Godse. D. A. Godse, Technical Publication, Pune.

T. Y. B. Sc. Electronics
Semester II: Paper III
ELE 363: Microprocessor Interfacing Techniques and Advanced Microprocessors

Objectives:

1. To learn the interfacing of I/O devices with microprocessor.
2. To learn interfacing techniques.
3. Introduction to Advance Microprocessors.

Unit 1: Special Architectural Features and Related Programming (12P, 12M)

Interrupts and interrupt service routines, interrupt cycle of 8086, NMI and maskable interrupt, interrupt Programming, Macros. Programming using Dos Interrupt: INT 21H (Function 01H, 02H, 09H, 4CH, 10H).

Unit 2: I/O Programming and Interfacing (12P, 12M)

Fundamental I/O Considerations, Programmed I/O, Interrupt I/O, Interfacing in I/O Mapped I/O, Interfacing in Memory Mapped I/O, DMA Controller.

Unit 3: I/O Interfacing Devices and Techniques (12P, 14M)

Serial Communication interface, Asynchronous and synchronous communication, Parallel communication interface, Programmable communication interface 8251, PPI (Programmable Peripheral interface) 8255, ADC -0808 interfacing.

Unit 4: 80186/80188, 80286, 80386 and 80486 Microprocessors (12P, 12M)

80186/80188 basic block diagram and basic features, Introduction to 80286, 80386 and 80486 hardware features and basic features, additional instructions of 80286.

Unit 5: Pentium and Core2 Microprocessors (12P, 10M)

Introduction to Pentium microprocessor, Special Pentium registers: Pentium control register and EFLAG register, New Pentium Instructions, Basic and additional features of Pentium Pro, Pentium II, Pentium III, Pentium IV and Core2 microprocessors.

Reference Books:

1. "Advanced microprocessor and peripherals (Architecture Programming and Interfacing)", A. K. Ray, K. M. Bhurchandi, TMH Publication.
2. "Microprocessor System: 8086/8088 family (Architecture Programming and design)", Yu Cheng Liu and G. A. Gibson, PHI Publication.
3. "Microprocessor and Interfacing Techniques", A. P. Godse. D. A. Godse. Technical Publication, Pune.
4. "The 8088 and 8086 Microprocessor (Programming, Interfacing, Software, Hardware and applications)", Walter A. Triebel, Autarsingh.
5. "Microprocessors and Interfacing", Douglas V Hall Revised Second Edition, McGraw Hill Publication.
6. "The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions", 8th Edition , Barry B. Brey , Pearson Education.

T. Y. B. Sc. Electronics
Semester I: Paper IV
ELE 354: The C Programming Language

Objectives:

1. To learn the basics of "C" programming language
2. Development of programming skill to write simple "C" programs.

Unit 1: Fundamentals of C (12P, 12M)

Basic structure of C program, Character set, C tokens, Keywords and Identifiers, Constraints, Variables, Data Types, Declaration of variables, Assigning values to variables, Operators - arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise, special operators, Evaluation of Arithmetic expressions, Operator precedence and Associativity, I\O statements: Reading and writing a single character, Standard and Formatted Input and Output statements, Preprocessor Directives (#define & #include), Simple programming exercises

Unit 2: Decision making, Branching and Looping (14P, 12M)

Statements – if, if-else, Nesting of if-else, else-if Ladder, switch, break, ?: Operator, goto, Entry and Exit controlled loops, Statements – while, do-while, for, Features of for loops, Nesting of for loops, Jumping out of a loop, Skipping a part of a loop - Use of continue statement, Simple programming exercises

Unit 3: Arrays and Character strings (12P, 14M)

One-dimensional array – Declaration and Initialization, Introduction to two and multi -dimensional arrays, Declaring and Initializing string variables, Reading strings from terminal, Writing strings to screen, Simple programming exercises

Unit 4: User Defined Functions (10P, 10M)

Need for user defined functions, Form of C functions, Return values and their types, Calling a function, Category of Functions, Use of keyword –void, Recursion, Functions with arrays, ANSI C function definition and declaration, Simple programming exercises

Unit 5: Structures, Unions and Pointers (12P, 12M)

Structure definition, Use of dot operator(.), Structure Initialization, Arrays of Structures, Arrays Within Structures, Structures within Structures, Structures and Functions, Unions, Simple programming exercises. Understanding pointers, Use of address operator (&), Declaring and Initializing pointers, Use of indirection operator (*), Pointers as Function Arguments (call by value and call by reference), Simple programming exercises

References:

1. "The C- Programming language", Brian Kernigham & Dennis Ritchie, Pearson Education India.
2. "Programming in ANSI C", E. Balagurusamy, Tata McGraw Hill Education.
3. "Let us C", Yashwant P. Kanetkar, BPB Publication.
4. "Programming in C", Stephen G. Kochen, Sams Publishing.

T. Y. B. Sc. Electronics
Semester II: Paper IV
ELE 364: Numerical Simulation in Electronics

Objectives:
1. To learn the different numerical methods.
2. To study application of numerical methods to electronic circuits.

Unit 1: Roots of Equations (10P, 12M)

Bisection method, Newton Raphson Method ,Secant Method, Problems Based on these methods.

Unit 2: Numerical Integration (10P, 12M)

Trapezoidal Rule, Simpson's 1/3rd Rule and 3/8 Rule, Problems based on these methods.

Unit 3: Numerical Differentiation (14P, 12M)

First Derivative Formula using Taylor's Series, Finite Difference, Central Difference, Forward Difference and Backward Difference Formula, Euler's method, Runge Kutta Method, Problems based on these methods.

Unit 4: System of Linear Equations (14P, 12M)

Gauss Elimination Method, Gauss Jordon, Jacobi and Gauss Seidal Iteration method, Problems based on these methods.

Unit 5: Numerical Simulation of Simple Circuits (12P, 12M)

RC, RL and RLC circuits using differential and integral methods, Loop current analysis using Gauss Elimination Method, Average and RMS value of current using integral methods.

Reference Books:
1. "Computer Oriented Numerical Methods", V. Rajaraman, Prentice Hall India.
2. "Introduction to Numerical Analysis", S. S. Sastry, Prentice Hall India.
3. "Numerical Methods", S Balachandra Rao, C K Shantha, University Press.
4. "Numerical Methods", Dr. V. N. Vedamurthy, Dr. N.Ch.S.N.Iyenger, Vikas Publishing House Pvt. Ltd.

T. Y. B. Sc. Electronics
Semester I: Paper V
ELE 355: Microcontroller 8051

Objectives:
1. To learn the architecture of 8051 microcontroller.
2. To learn the programming of 8 bit microcontroller

Unit 1: Introduction to Microcontroller   **(06P, 06M)**

Block diagram of microcontroller, Comparison between microprocessor and microcontroller, Brief introduction to RISC & CISC Processor, Von Neumann & Harvard architecture

Unit 2: Architecture of 8051 Microcontroller   **(16P, 16M)**

8051 microcontroller – Block diagram, Pin out diagram, Features, Programming model of 8051, CPU registers, Flags and Program Status Word, Program Counter, Data Pointer, Special Function Registers& their Format, Stack& Stack Pointer, Internal RAM /ROM, Oscillator & Clock, Concept External Memory, Ports-0,1,2 & 3,Counter and Timers, Serial data input / output transfers, Interrupts.

Unit 3: Addressing Modes & Instructions   **(12P, 12M)**

Addressing modes, data moves Instructions, Arithmetic Instructions, Logical Instructions, Jump and Call & Loop Instructions.

Unit 4: Program Development Tools   **(10P, 10M)**

Introduction to Assembly Language Programming, Structure of Assembly Language Programming, Assembling and Executing an Assembly Language Programmes, Editor, Assembler, Compiler, Linker, Instruction syntax, Data types, Assembler directive, Simulator and Concept of Integrated Development Environment (IDE).

Unit 5: 8051 Microcontrollers Programming   **(16P, 16M)**

Assembly language programming- simple data transfer, arithmetic, logical, looping and code conversion programming (packed BCD to ASCII conversion, Binary to ASCII conversion).

Reference Books:
1. "The 8051 Microcontroller and Embedded Systems", Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, Pearson Education.
2. "The 8051 Microcontroller Architecture, Programming, & Applications", Kenneth J. Ayala, Penram International.
3. "The 8051Microcontroller and Embedded System using Assembly and C", K. J. Ayala, D. V. Gadre, Cengage Learning, Indian Edition.
4. "Microcontrollers (Theory and Applications)", Ajay V. Deshmukh, Tata mcgraw Hill.
5. "Using the MCS-51 Microcontrollers", Han Way Huang, Oxford University Press.
6. "Programming and Customizing the 8051 Microcontroller", Myke Predko, Tata McGraw Hill.

T. Y. B. Sc. Electronics
Semester II: Paper V
ELE 365: Embedded Systems

Objectives:

1. To know about advanced microcontroller programming
2. To learn the 8 bit microcontroller interfacing.

Unit 1: Introduction to Embedded System   **(06P, 06M)**

Introduction, General purpose computer system, Embedded System - Needs, Features, Classifications, Advantages and Applications.

Unit 2: Timer and Counter Programming   **(14P, 14M)**

Single bit Programming, Timer modes, Programming the timers in various modes (Mode 1 and Mode2), Counter Programming. To generate delay of milliseconds & square wave.

Unit 3: Serial Port Programming   **(15P, 15M)**

Basic of serial communication (Serial Vs Parallel data Transfer, Simplex, Duplex), Serial port of 8051, RS-232 standard and IC MAX-232, Baud rate in 8051, Programming the 8051 to transfer and to receive data serially, Importance of TI and RI flags, Baud rate doubling.

Unit 4: Interrupts Programming   **(10P, 10M)**

Interrupts in 8051, enabling and disabling the interrupts, Programming timer interrupts, Programming external hardware interrupts, Level and edge triggered interrupts.

Unit 5: 8051 Interfacing   **(15P, 15M)**

Semiconductor memory, memory address decoding, Interfacing with external ROM & RAM. Interfacing of 8255 to 8051 & programming Introduction, Interfacing-keyboard (matrix), Displays (seven segment & LCD), Stepper motor, ADC, DAC (Sine wave & Square wave), Temperature Sensor (LM 35).

Reference Books:

1. "Introduction to Embedded System", Shibu K V, Tata McGraw Hill.
2. "Embedded Systems" Rajkamal, Tata McGraw Hill.
3. The 8051 Microcontroller and Embedded Systems", Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, Pearson Education.
4. "The 8051 Microcontroller Architecture, Programming, & Applications", Kenneth J. Ayala, Penram International.
5. "The 8051Microcontroller and Embedded System using Assembly and C", K. J. Ayala, D. V. Gadre, Cengage Learning, Indian Edition.
6. "Programming and Customizing the 8051 Microcontroller", Myke Predko, Tata McGraw Hill.

T. Y. B. Sc. Electronics
Semester I: Paper VI
ELE 356: Advanced Digital System Design

Objectives:

1. To study the principles required for designing of advanced digital systems.
2. To acquire basic knowledge of Hardware Description Languages (HDL).
3. To know designing of combinational and sequential logic circuits using VHDL.

Unit 1: Combinational Logic Circuits   **(10P, 10M)**

Introduction to combinational circuits, Revision of K-Map, Combinational logic examples (Examples 4.1 to 4.20) Ref. 1. (N. G. Palan)

Idea of seven segment display (Common anode, common cathode) and designing of BCD to seven segment decoder. (Problem No. 4.31) Ref. 1 (N. G. Palan)

Unit 2: Sequential Logic Circuits   **(12P, 12M)**

Introduction to R-S, J-K, T and D flip flops, Excitation table of flip flops, flip flop conversions: R-S to J-K, S-R to T, J-K to D and T to D.

Applications of Flip flops (Page No. 489 to 498) Ref. 2 (A. Anandkumar)

Unit 3:Sequential Logic Design   **(14P, 16M)**

State table, state diagram, state equation and state reduction in sequential logic design, Brief revision of counters:

Design of Asynchronous counters - Design of Mod-6 counter using T flip flop, Design of Mod-10 counter using T flip flop

Design of Synchronous counters- Design of synchronous 3 bit up-down counter using J-K flip flop, Design of synchronous 3 bit up counter, Design of synchronous 3 bit down counter, Design of synchronous Mod-10 bit up-down counter using T flip flop, Design of synchronous modulo 6 Grey code counter.

Unit 4:Introduction to VHDL   **(10P, 10M)**

Introduction, library, entity, architecture, modeling style, concurrent and sequential statements, data object and data types, attributes.

Unit 5: VHDL Programming   **(14P, 12M)**

VHDL Programming: half and full adder, full subractor, four bit binary adder, multiplexer and demultiplexers, Flip flops S-R, D, J-K, J-K master Slave and T, Mod-6 asynchronous counter, 3 bit up-down counter.

References:

1. "Digital Electronics and Logic Design", N. G. Palan, Technova Publications, Pune.
2. "Fundamentals of Digital Circuits", A. Anandkumar, Prentice Hall India.
3. "Digital Logic and Computer Design", M Morris Mano, Prentice Hall India.
4. "Digital Design", M. Morris Mano, Michael D. Ciletti, Pearson India.
5. "Modern Digital Electronics", R. P. Jain, Tata McGraw Hill Publishing.
6. "Digital Circuits and Design", S. Shalivahanan, Vikas Publishing House.
7. "VHDL Primer", J. Bhaskar, Pearson Prentice Hall India.
8. "VHDL Programming by Example", Douglas L Perry, McGraw Hill Professional.
9. "Fundamentals of Digital Logic with VHDL Design", Stephen Brown, Zvonko Vranesic, McGraw Hill Education.
10. "Digital System Design using VHDL", Charles H. Roth, Lizy Kurian John, Nelson Engineering.
11. "Circuit Design and Simulation with VHDL", Volnei A. Pedroni, Prentice Hall India.

T. Y. B. Sc. Electronics
Semester II: Paper VI
ELE 366: Industrial and Power Electronics

Objectives:

1. To know about power semiconductor devices frequently used in industries.
2. To have an idea about the principle and operation of circuits using power semiconductor devices to control various operations in industries.
3. To acquaint with industrial and domestic applications of power semiconductor devices.

Unit1: Power Semiconductor Devices   **(16P, 16M)**

Construction details, symbols, working, principle, I-V Characteristics of following devices: SCR, Diac, Triac, GTO, Light activated Silicon Controlled Rectifier, List of applications of SCR. Ratings: Latching Current, Holding Current, dv/dt & di/dt rating, I$_2$t rating, surge current rating.

Unit 2: Switching circuits for SCR   **(10P, 10M)**

Methods of Triggering: Gate triggering, Voltage triggering, Thermal triggering and Radiation triggering, Triggering of SCR using UJT, Triggering of SCR using BJT.

Turn off circuits- Natural & Forced Commutation, types of forced commutation (all classes).

Unit 3: Inverters and Converters   **(14P, 14M)**

Inverters- Introduction, Industrial applications, types of inverters, Single Phase Bridge inverter, Single Phase Centre Tapped Inverter, Series Inverter.

Converters (choppers) -Introduction, Principle of Step down Chopper (variable frequency and constant frequency control), Step up chopper, Chopper Classification, Chopper Configurations.

Unit 4: High frequency heating   **(10P, 10M)**

Induction heating- principle, theory and applications. Dielectric heating - principle, theory and applications.

Unit 5: Industrial Applications of SCR   **(10P, 10M)**

Uninterruptible power supplies, over voltage protection, simple battery charger, static circuit breaker, fan regulator using Diac and Triac, low voltage flasher.

References Books:

1. "A Text Book on Power Electronics", H.C. Rai, Galgotia Publication,
2. "Power Electronics" H.C. Rai, Galgotia Publication
3. "Industrial Electronics" G. K. Mithal, Khanna Publishers
4. "Thyristor & Their Applications", M. Ramamoorty, EWP.

T.Y.B. Sc. Electronics
Semester V: Paper VII
Practical Course ELE 357: General Lab - I

Section A: Perform any *four* practicals

1. Measurement of Resistivity of a given sample by four probe method.
2. To find Hall coefficient of a given sample using Hall probe.
3. Build and test Amplitude Modulation and Demodulation using transistor/ diode and detector.
4. Study of characteristics of RC integrator/ differentiator circuit using PSPICE.
5. Study of characteristics of diode using PSPICE.
6. Simulation of logic gates using VHDL.

Section B: Perform any *four* practicals

1. Measurement of energy band gap of given diode/ Measurement of energy band gap of given sample using four probe method.
2. Study of FM modulation.
3. Study of characteristics of CE transistor using PSPICE.
4. Study of characteristics of FET using PSPICE.
5. Simulation of half adder using VHDL.
6. Simulation of multiplexer using VHDL.

T.Y.B. Sc. Electronics
Semester VI: Paper VII
Practical Course ELE 367: General Lab - II

Section A: Perform any *four* practicals

1. Study of propagation loss/ bending loss in optical fibers.
2. Study of PAM using diode, IC-555 and IC-741.
3. Build and test PWM and PPM using IC-555.
4. Study of characteristics of SCR / MOSFET.
5. Build and test triggering of SCR using LDR
6. Study of fan regulator/ light dimmer using SCR / TRIAC.

Section B: Perform any *four* practicals

1. Design, build and test digital multiplexing using IC 555 and IC 7400.
2. Measurement of numerical aperture of optical fiber.
3. Study of time delay circuit using SCR and UJT.
4. Build and test DC to DC converter using transistor and IC-555.
5. Study of PWM based DC motor control.
6. Build and test over voltage protection using SCR for a given voltage.

T.Y.B. Sc. Electronics
Semester V: Paper VIII
Practical Course ELE 358: Microprocessor, Microcontroller and C Programming Lab - I

Section A: Microprocessor Practicals (perform *any two* practicals)

1. Write a program to display A to Z with one space and ten characters in one line.
2. Write a program to display A to Z in one line and 0 to 9 in next line.
3. Write a program to display a string.
4. Write a program to change upper case to lower case / lower case to upper case.
5. Write a program to find sum of given numbers.
6. Write a program to find factorial of a given number.

Section B: Microcontroller Practicals (perform *any two* practicals)

1. Write a program for addition / subtraction of two 8 bit numbers and store the results.
2. Write a program for multiplication / division of two 8 bit numbers and store the result in AX register.
3. Write a program to convert 8 bit decimal number into hexadecimal form.
4. Write a program to convert hexadecimal number into BCD form.
5. Write a program to convert a BCD number into hexadecimal number.
6. Write a program to move contents of array from one memory location to another memory location.

Section C: 'The C Programming' Practicals (Perform *any four* practicals)

1. Write a program and function subprogram to sort an array of integers in ascending / ascending order.
2. Write a program to generate the first n Fibonacii numbers using array.
3. Write a program to calculate factorials of positive n integer numbers using recursive function.
4. Write a program (a) to get sum of digits, (b) to reverse digits of given number.
5. Write a program to generate n prime numbers starting from any prime number.
6. Write a program and function subprogram to find GCD of two non-negative integers' m and n.
7. Write a program to find roots of a given quadratic equation.

T.Y.B.SC Electronics
Semester VI: Paper VIII
Practical Course ELE 368: Microprocessor, Microcontroller and C Programming Lab - II

Section A: Microprocessor Practicals (perform *any two* practicals)

1. Write a program to reverse input string of character.

2. Write a program to find largest / smallest number a set of entered numbers.

3. Write a program to arrange given numbers in ascending / descending order.

4. Write a program to display complete character set with 25 characters in one line.

5. Write a program to drive stepper motor.

6. Write a program to interface the relay.

Section B: Microcontroller Practicals (perform *any two* practicals)

1. Write a program to add strings of byte and store in memory.

2. Write a program to count no. of character stored in string which is terminated by escape character.

3. Write a program to ON / OFF simple switch continuously.

4. Write a program to make LED ON and OFF continuously.

5. Write a program to drive stepper motor continuously.

6. Write a program to generate square wave.

Section C: Numerical Practicals using C / MATLAB Programming

(Perform *any four* practicals)

1. Write a program to define structure type personal that would contain person name, date of joining, and salary. Using this structure write a program to read this information for n no, of persons and print the same on the screen.

2. Write a program to enter number of elements in an array. Using pointer, print the value and address of each element. Compute the sum of all elements in an array.

3. Write a program using pointers to determine the length of a character string.

4. Write a program to find roots of equation f(x) = 0 using Bisection/Newton Raphson method.

5. Write a program to find out integration of function Simpson's 1/3 OR 3/8 rule.

6. Write a program to find derivative of function using Euler's / Runge Kutta method.

T. Y. B. Sc. Electronics
Semester I & II: Paper IX
ELE 359 and ELE 369: Project
(Semester wise Evaluation)

Guidelines

During project work, follow the following guidelines –

i. Title of the project must be well defined.
ii. Planning of the project must be specified.
iii. Aim, Objectives, Designing and theoretical background of the work should be specified in detail.
iv. Actual work done must be reported along with experimental procedure.
v. There must be observations, results and conclusions of the project work.
vi. In case of the projects related to the development of computer software algorithm, program strategy, module wise description etc must be provided.
vii. Applications of the work must be specified clearly.
viii. Further extension / future scope of the work may be suggested for better outcome of the project.
ix. References must be specified

Semester wise planning of the project work –

Semester	Course	Work assigned	Marks	Total
V	**ELE 359**	1. Selection of Project and Literature Survey 2. Study Tour: Industrial/Research Lab Visit 3. Presentation of the Project Progress Report	20 20 20	60
VI	**ELE 369**	1. Fabrication and Testing of the Project Circuit 2. Preparation of the Project Report 3. Final Presentation of the Project	20 20 20	60

Student should do a project during two semesters and submit final project report at the end of Semester VI examination.

Career Opportunities to Electronics Graduates (B.Sc.)

Career in Private sector after B.Sc. Electronics

Job opportunities are available in private sector for graduates in B.Sc. Electronics. Jobs are available on both hardware and software fields. Some of the jobs are listed below in private sector.

- Software testing
- Electronic design engineer
- Technical executive
- Chemical administrator
- Technical support associate
- Software developer

They can also opt for many marketing jobs and servicing jobs available in private sector relating to electronics. Private banking sector are also a good option for these graduates.

Government Career after B.Sc. Electronics

Graduates in Electronics can find good jobs in government sector. Various organizations in government sector recruit graduates from electronic background every year. Some of these organizations are given below

- Bharat Sanchar Nigam Limited (BSNL)
- Bharat Heavy Electricals Limited (BHEL)
- Indian Space Research Organization (ISRO)
- National Thermal Power Corporation (NTPC)
- Steel Authority of India Limited (SAIL)
  Graduates from this background can also find good opportunities in various government sectors like Indian Railways, Civil Services, Banking etc.

Career Abroad after B. Sc. Electronics

Graduates from electronics background can also find opportunities in foreign countries. The demand for these graduates is high in mainly networking field. But for grabbing these opportunities they need to have a certification in networking.
Lots of certification in networking is available in India. Some of them are given below.

- Cisco Certified Network Associate (CCNA)
- Microsoft Certified Professional (MCP)
- Cisco Certified Design Associate (CCDA)
- Cisco Certified Network Professional (CCNP)
  Graduates with any of these certifications can look for a promising career in foreign countries.

Higher Studies Options after B.Sc. in Electronics

Below is the list of higher studies one can pursue after successfully completing B.Sc. in Electronics.

- Master of Science in Electronics
- Master of Science in Electronics and Communication
- Master of Science in Applied Electronics
- Master of Science in Electronics Science
- Master of Science in Electronics and Instrumentation
- Master of Philosophy in Electronics
- Master of Business Administration

- Doctor of Philosophy in Electronics
- Doctor of Philosophy in Electronics Science
- Doctor of Philosophy in Quantum Electronics

Apart from higher studies, they can get in to the roles of Technical Lead, Electronic designer, Broadcast Technician, etc in electronics as well as IT firms. National Thermal Power Corporation, Indian Space Research Organization, Oracle, Wipro, etc are the firms where B.Sc. degree holders in Electronics can search for job opportunities.