North Maharashtra University, Jalgaon

T.Y.B.Sc.
(Semester Pattern)

ELECTRONICS
(With effect from June 2014)

North Maharashtra University, Jalgaon
Class: T.Y.B.Sc. (Semester Pattern)
(With effect from June 2014)

In the joint meeting of chairman BOS in all subjects of Science faculty chaired by Hon'ble Dean of Science faculty is held on 15/5/ 2014 the revised syllabus for T.Y.B.Sc.(Electronics) is accepted and finalized as per guidelines of Academic Council & with reference to UGC model curriculum. The nomenclature accepted is as follows.

(ELE YSC: Y-Year, S-Semester & C-Course number)

Paper	Semester	Course Code & Title	Periods	Marks	
				Ext.	Int.
1	I	ELE 351: Semiconductor Physics	60	40	10
	II	ELE 361: Electrodynamics	60	40	10
2	I	ELE 352: Basic Communication Systems	60	40	10
	II	ELE 362: Advance Communication System	60	40	10
3	I	ELE 353: Microprocessor I	60	40	10
		ELE 363: Microprocessor II	60	40	10
4	I	ELE 354: Programming in 'C'	60	40	10
	II	ELE 364: Numerical Simulation in Electronics	60	40	10
5	I	ELE 355: Microcontrller 8051	60	40	10
	II	ELE 365: Embedded Systems	60	40	10
6	I	ELE 356: Consumer Electronics	60	40	10
	II	ELE 366: Industrial & Power Electrnonics	60	40	10
7	Annual	ELE 357 and 367: General Lab	60	80	20
8	Annual	ELE 358 and 368: Microprocessor, Microcontroller, C	60	80	20
9	Annual	ELE 359 and 369: Project	60	80	20

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 shall be held at end of the academic year.**

Chairman, BOS **Dean, Science Faculty**

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

Objectives:

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

Unit 1: Crystal structure **(12P, 08M)**

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 lattice.

Unit 2: Energy bands **(8P, 04M)**

Bonding forces in solids, energy bands, metals, semiconductor and insulator, variation of energy bands with alloy.

Unit 3: Charge carrier and carrier concentration of semiconductor **(10P, 08M)**

Electrons and holes, effective mass, intrinsic material, extrinsic material, the Fermi level, electrons and holes concentration at equilibrium.

Unit 4: Drift of carriers in electronic and magnetic field **(10P, 08M)**

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, Drift of carriers in electronic and magnetic fields-conductivity and mobility, Hall effect.

Unit 5: P-N Junction & Integrated circuits **(20P, 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. BJT Fabrication: fabrication of monolithic circuits (introduction) monolithic device elements-merged transistors, MOS transistors (field dropping and channel stops) integration of other circuit elements- resistors, capacitors.

Reference Books:

1. Fundamental of Solid State Physics– By Saxena, Gupta, 13th Edn 1994, Pragati Publication
2. Solid State Electronic Devices – By Ben G Streetman, 3rd edn 1995, PHI Publication
3. Physics of Electronic Materials – By Kassap
4. Solid State Physics– By S.O. Pillai

T. Y. B. Sc. Electronics Paper-I
Semiconductor Physics and Electrodynamics
Semester II ELE 361: Electrodynamics

Unit 1. Electrostatics (12p, 08m)

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, 06m)

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, 08m)

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, 10m)

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, 08m)

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 by Dr. Gupta, Dr. Kumar, Singh, Pragati Prakashan
2. Electromagnetics by B. B. Laud, Wiley Eastern Limited.
3. Foundations of Electromagnetic Theory by John Reits, Narosa Publishing House.

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

Objectives:

1. To learn the concepts of communication system.
2. To know the various modulations and demodulations
3. To learn the radio wave propagation.
4. To learn about the Television and recent technology of TV

Unit 1: Fundamentals of Communication (12P 08M)

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 (13P 10M)

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 (15P 10M)

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 Radio wave Propagation (10P,06M)

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.

Unit - 5 Television (10P,06M)

Scanning Process, scanning frequency, Interlaced scanning TV Broadcasting Systems B/W TV transmitter, Composite video signal, Channel bandwidth, VSB transmission.
TV Receivers : Color TV receiver : Block diagram and explanation of each block.
Concept of LCD, LED & Plasma TV.

Reference Books

1. Communication Electronics-Frenzel, TMH
2. Electronic Communication-Kennedy, TMH
3. Electronic Communication System -Dennis Roddy,John Coolen,, PHI
4. Monochrome and Colour TV – Gulati
5. Television – Dhake (TMH)
6. Antenna and Wave propagation - K.D. Prasad

T.Y.B.Sc. Electronics Paper II
Basic Communication Systems & Advance Communication Systems
Semester II ELE 362: Advance Communication Systems

Objectives:

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

Unit1: Digital communication (14P, 10M)

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: Fiber Optic Communication (15P, 10M)

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

Unit 3: Satellite Communication (10P, 06M)

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

Unit 4: RADAR (06P, 04M)

Principal & working, types, Pulsed RADAR-working, Applications of RADAR.

Unit 5:Computer Communication (15P,10M)

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.

Reference Books:

1. Electronic Communications – Roddy and Colin, PHI
2. Communication Electronics – Frenzel (TMGH)
3. Principles of Communications – (New Editions)- Anokh Singh
4. Electronics and Communication Engineering – Gupta and Soni
5. Communication – Sanjeev Gupta
6. Analog and Digital Communication Systems – Martin S. Roden
7. Digital and Data Communications – Martin (PHI)
8. Optical Fiber – Geigal
9. Data Communication & Networking – Behrouz Forouzan (4th Edn McGraw Hill Companies)

T. Y. B. Sc. Electronics Paper-III
8086 Microprocessor & Microprocessor Interfacing Techniques
Semester I 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, 10M)**
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 **(8P, 6M)**
Minimum and Maximum mode 8086, System Bus Timing.

Unit 3: 8086 Instruction set **(14P, 10M)**
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, 4M)**
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, 10M)**
Simple assembly language program, Loop program and String processing program.

Reference Books:

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

T. Y. B. Sc. Electronics Paper-III
8086 Microprocessor & Microprocessor Interfacing Techniques
Semester II ELE 363: Microprocessor Interfacing Techniques

Objectives:
1. To learn the interfacing of I/O devices with microprocessor.

Unit 1: Special Architectural features and related programming (14P, 10M)
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 (8P, 4M)
Fundamental I/O Considerations, Programmed I/O, Interrupt I/O, Block transfers.

Unit 3: I/O interfaces (14P, 10M)
Serial Communication interface, Asynchronous and synchronous communication, Parallel communication interface, ADC interfacing -0808 Programmable communication interface 8251, 8255 PPI (Programmable Peripheral interface)

Unit 4: Keyboard and Display Interface Using 8279 (12P, 8M)
Features of 8279, Pin Description, Block Diagram, Operating Modes, 8279 Commands,

Unit 5: Interfacing (12P, 8M)
Interfacing in I/O Mapped I/O, Interfacing in Memory Mapped I/O,DMA Controller.

Reference Books:

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

T.Y.B.Sc. Electronics Paper IV
Programming in 'C' and Numerical Simulation in Electronics
Semester I ELE 354: 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 - (10P, 5M)

Basic structure of C programe, 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

Unit 2 : - Input/Output and Preprocessor Directives – (5P, 3M)

Reading and writing a single character, Standard and Formatted Input and Output statements, Preprocessor Directives (#define & #include)

Unit3:-Decision making, Branching and Looping – (12P, 8M)

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 4 : - Arrays and Character strings - (6P, 4M)

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

Unit 5 : - User defined Functions - (10P, 8M)

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 exercices

Unit 6 : - Structures and Unions - (10P, 8M)

Structure definition, Use of dot operator(.), Structure Initialization, Arrays of Structures, Arrays within Structures, Structures within Structures, Structures and Functions, Unions, Simple programming exercises.

Unit 7 : - Pointers – (7P,4M)

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)

References:-

1. Programming in ANSI C - E. Balagurusamy (second edition)
2. Let us C– Yashwant P. Kanetkar – BPB Publication.
3. C Programming – Denis Ritchie
4. Programming with C – Byron Gottfried (TataMcGRAW-Hill)
5. Understanding pointers in "C" – Yashwant P. Kanetkar (BPB publication)
6. Programming in C – Stephen Kochen.
7. The C- Programming language – Berningham & Ritchie.

T.Y.B.Sc. Electronics Paper IV
Programming in 'C' and Numerical Simulation in Electronics
Semester II ELE 364: Numerical Simulation in Electronics

Objectives:

1. To learn the different Numerical methods.
2. Application of numerical methods to electronic circuits.

Unit 1: Roots of Equations **(10P, 8M)**

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

Unit 2: Numerical Integration **(10P, 8M)**

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

Unit 3: Numerical Differentiation **(14P, 8M)**

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, 8M)**

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

Unit 5: Numerical Simulation of Simple Circuits **(12P, 8M)**

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 –By V. Rajaraman
2. Introduction to Numerical Analysis- By S. S. Sastry
3. Numerical Methods- By 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 Paper-V
Microcontroller 8051 & Embedded Systems
Semester I 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 (6P, 4M)

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 . (18P, 12M)

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 ExternalMemory, Ports-0,1,2 & 3,Counter and Timers, Serial data input / output transfers,Interrupts.

Unit 3: Addressing Modes & Instructions (18P, 14M)

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

Unit 4: 8051 Microcontrollers Programming (18P, 10M)

Editor, Assembler, Linker, Instruction syntax, Data types & directive. 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-
By Muhammad Ali Mazidi, *Janice GillispieMazidi*,Pearson Education.
2. The 8051 Microcontroller Architecture, Programming, & Applications-
By Kenneth J. Ayala., Penram International.
3. Microcontrollers[Theory and Appications] *By Ajay V. Deshmukh*Tata mcgraw Hill.

T. Y. B. Sc. Electronics Paper-V
Microcontroller 8051 & Embedded Systems
Semester II ELE 365: Embedded Systems

Objectives:

1. To know about Advanced Microcontroller Programming
2. To learn the 8 bit microcontroller interfacing.

Unit 1: Timer and Counter Programming: (20P, 10M)

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

Unit2: Serial Port Programming: (15P, 10M)

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 3: 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 4: 8051 Interfacing (15P, 10M)

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. The 8051 Microcontroller and Embedded Systems-
By Muhammad Ali Mazidi, *Janice GillispieMazidi* , Pearson Education

2. The 8051 Microcontroller Architecture, Programming, & Applications-
By Kenneth J. Ayala. , Penram International

T. Y. B. Sc. Electronics Paper-VI
Consumer Electronics and Industrial & Power Electronics
Semester I ELE 356: Consumer Electronics

Objectives: 1. To study the principles required for designing of consumer products.
2. To acquaint with the principle and operation of modern home appliances.
3. To know about equipments, their principle and operation used in advanced communication systems.

Unit1: Microphone, Loudspeaker and Music System (14P, 10M)

Microphone: Characteristics of microphone, different types of microphone, Electret & carbon microphones (principle, construction, working and characteristics).

Special Microphones: Lavalier microphone, Tie-clip microphone, Radio microphone and Noise cancelling microphone.

Loudspeaker: Characteristics of Loudspeaker, Horn type, Multiway speaker system (Woofers & Tweeters).

C.D. Player: Block diagram of CD player and function of each block.

Unit 2: P.A. System (12P, 6M)

Block diagram of P.A. system, requirements of P A system, typical P.A. Installation planning (P.A. system for a public meeting in Public Park and P.A. System for an auditorium having large capacity)

Unit 3: Telephone System (14P, 10M)

Telephone set, working , telephone exchange, Initiating call, calling a no., pulse dialing and tone dialing, signal to /from exchange, dial tone, dial back and engage signals, making connection, answering call, conversion , ending call, Modems, telex, PBX, PABX, transmitter and receiver.

Unit 4: Modern Home appliances (20P, 14M)

Microwave Oven – Principle of Operation, Block Diagram, features and specifications

Washing Machine - Principle of Operation, fuzzy logic, Washing machine with fuzzy logic, Block Diagram, features and specifications.

Remote Control: Operating Principle, Block Diagram, Operation and features.

Cordless Phones: Principle of operation Block diagram of the base unit, Block diagram of the Handset, Features and specifications.

Cellular Phones - Operating principle, the cell approach, Block diagram, Functions performed by cell phones, features/ specifications.

Electronic Weighing Systems - Operating principle, Block diagram, features.

Reference Books:

1. Audio and Video systems by R.G. Gupta
2. Modern CD player servicing Manual by Manahar Lotiya
3. Modern Sound Reproduction by Olson
4. Modern Telephone and cordless servicing by Manahar Lotiya
5. Consumer Electronics by J. S. Chitode
6. Television- By Gulati, New Age International. 7. Mobile cellular telecommunications analog and digital system- By Lee.
8. Mobile cellular communication- By William C. Y. Lee, 2nd edn 1985, McGraw Hill Publication.

T. Y. B. Sc. Electronics Paper-VI
Consumer Electronics and Industrial & Power Electronics
Semester II 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 (14P, 10M)

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^2t rating, surge current rating.

Unit 2: Switching circuits for SCR (12P, 6M)

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 (12P, 10M)

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, 6M)

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

Unit 5: Industrial Applications of SCR (12P, 8M)

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-By H.C. Rai Galgotia Publication,
2. Power Electronics- By H.C. Rai, 3rd edn 1999 Galgotia Publication
3. Industrial Electronics – By G.K.Mithal, 18th edn 1998, Khanna Publishers
4. Thyristor & Their Applications- By M. Ramamoorty, 2nd edn 1999, EWP.

T.Y.B.SC Electronics Paper-VII
Practical Course ELE 357: General Electronics

Semester V

Perform any *eight* practicals

1. Study of characteristics of a photodiode /phototransistor.
2. Design, build and test half and full wave precision rectifier circuits.
3. Build and test an instrumentation amplifier using three op-amps.
4. Study of function generator using IC 8038/2206.
5. Build and test V-F and F-V convertor.
6. To find Hall coefficient of a given sample using Hall probe.
7. Measurement of Resistivity of a given sample by four probe method.
8. Measurement of energy band gap of given diode/ Measurement of energy band gap of given sample using four probe method.
9. Build and test Amplitude Modulation and Demodulation using transistor/ diode and detector.
10. Build and test PWM and PPM using IC-555.
11. Study of PAM using diode, IC-555 and IC-741.
12. Study of characteristics of RC integrator/ differentiator circuit using PSPICE.
13. Study of characteristics of diode using PSPICE.

T.Y.B.SC Electronics Paper-VII
Practical Course ELE 367: General Electronics

Semester VI

Perform any *eight* practicals

1. Build and test DC to DC converter using transistor and IC-555.
2. Study of characteristics of SCR and MOSFET.
3. Study of fan regulator/ light dimmer using SCR and TRIAC.
4. Study of time delay circuit using SCR and UJT.
5. Build and test over voltage protection using SCR for a given voltage.
6. Build and test triggering of SCR using LDR
7. Study of PWM based DC motor control.
8. Study of propagation loss/ bending loss in optical fibers.
9. Measurement of numerical aperture of optical fiber.
10. Study of FM modulation.
11. Design, build and test digital multiplexing using IC 555 and IC 7400.
12. Study of characteristics of CE transistor using PSPICE.
13. Study of characteristics of FET using PSPICE.

T.Y.B.SC Electronics Paper-VIII
Practical Course ELE 358: Microprocessor, Microcontroller and C programming

(Semester V)

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.

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.

C) '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 Paper-VIII
Practical Course ELE 368: Microprocessor, Microcontroller and C programming

(Semester VI)

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.

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.

C) 'C programming' Practicals (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.
7. Write a program to generate the first n Fibonacii numbers using array.

T. Y. B. Sc. Electronics Paper-IX
ELE 359 and ELE 369: Project

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
V	**ELE- 359**	**1.** Selection of the Project **2.** Library work **3.** Presentation of the work
VI	**ELE- 369**	**1.** Fabrication of Project Circuit **2.** Testing of the Project **3.** Preparation of the Project Report **4.** Final Presentation of the Project

Student should do a project during the year and submit project report at the time of examination. The distribution of marks is as follows:

1. Library Work 20 M
2. Experimental skill and theoretical understanding 20 M
3. Presentation and Project report 20 M
4. Viva-voce 20 M

Total Marks 80 M

Openings 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. holders in Electronics can search for job opportunities.