

**North Maharashtra University, Jalgaon**  
**Class: T. Y. B. Sc. (Semester Pattern)**  
**(W.e.f. June 2009)**

The revised syllabus for T. Y. B. Sc.(Electronics) is finalized in the B.O.S.meeting 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	<b>ELE 311:</b> Semiconductor Physics	52	40	10
	II	<b>ELE 321:</b> Electrodynamics	52	40	10
2	I	<b>ELE 312:</b> Basic Communication Systems	52	40	10
	II	<b>ELE 322:</b> Advance Communication Systems	52	40	10
3	I	<b>ELE 313:</b> Microprocessor I	52	40	10
	II	<b>ELE 323:</b> Microprocessor II	52	40	10
4	I	<b>ELE 314:</b> Programming with C++	52	40	10
	II	<b>ELE 324:</b> Numerical Simulation in Electronics	52	40	10
5	I	<b>ELE 315:</b> Microcontroller 8051	52	40	10
	II	<b>ELE 325:</b> Embedded Systems	52	40	10
6	I	<b>ELE 316:</b> Consumer Electronics	52	40	10
	II	<b>ELE 326:</b> Industrial & Power Electronics	52	40	10
7	Annual	<b>ELE 301:</b> General Lab	104	80	20
8	Annual	<b>ELE 302:</b> Microprocessor, Microcontroller & C++ programming	104	80	20
9	Annual	<b>ELE 303:</b> Project	104	80	20

Chairman, BOS

Dean, Science Faculty

**T. Y. B. Sc. Electronics Paper-I**  
**Semiconductor Physics and Electrodynamics**  
**Semester I    ELE 311: 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**

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. **(12P, 10M)**

**Unit 2: Band Theory of Solids**

Nearly free electron model, origin of energy bands, electronic motion according to the band theory (effective mass), Distinction between metal, semiconductor and insulator, concept of hole. **(10P, 06M)**

**Unit 3: Charge carrier in semiconductor**

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. **(12P, 10M)**

**Unit 4: P-N Junction & Integrated circuits**

Fabrication of P-N junction, mention different methods of fabrication of P-N junction, Diffusion 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. Fabrication of BJT, fabrication of monolithic circuits (introduction) monolithic device elements-merged transistors, MOS transistors (field dropping and channel stops) integration of other

circuit elements- resistors, capacitors.

(18P, 14M)

**Reference Books:**

1. Fundamental of Solid State Physics– By Saxena, Gupta, 13<sup>th</sup> Ed<sup>n</sup> 1994, Pragati Publication
2. Solid State Electronic Devices – By Ben G Streetman, 3<sup>rd</sup> 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 321: Electrodynamics**

**Unit 1: Electrostatics**

Electric field strength, electrostatic potential, Potential and field due to a dipole. Dipole interactions. Gauss law and its applications. Laplace's & Poisson's equations. Electric force acting on charge conductors in semiconductors. **(12P, 08M)**

**Unit 2: Electrostatics in dielectric media**

Dielectrics polarization, relative permittivity electric field in dielectric media,  $\vec{D}$ ,  $\vec{E}$ ,  $\vec{P}$  field vectors and their interrelation. Boundary conditions at the interface of two dielectrics. **(10P, 08M)**

**Unit 3: Magnetostatics and electromagnetic induction**

Magnetic induction, Biot-Savarts law and its applications, Amperes circuital law and its applications. Lorentz force on charges and current carrying conductors. Force between two current carrying coils.  $\vec{B}$ ,  $\vec{M}$ ,  $\vec{H}$  vectors and their interrelation, Boundary conditions on  $\vec{B}$  &  $\vec{H}$  at the interface of two media. Hysteresis- retentivity, cohesive force & applications. Susceptibility of magnetic materials. Faradays & Lenz slaws of electromagnetic induction. **(16P, 10M)**

**Unit 4: Electrodynamics**

Equation of continuity, Displacement current, Maxwells equations in free space, Poyntings vector, Propagation of electromagnetic waves in free space, wave equations in free space, Reflection and refraction of plane electromagnetic waves at non-conducting boundary. **(14P, 14M)**

**Reference Books:**

1. Electrodynamics – By Gupta, Kumar, Singh, 17<sup>th</sup> edition-2003 by (Pragati Heonut)

2. Electromagnetics – By B. B. Laud WEL publication
3. Antenna & wave propagation – By K. D. Prasad, Satya Prakashan
4. Introduction to electromagnetic fields and waves – By Corson & Lorrain- CBS publications
5. Foundation of electromagnetic theory – By Retiz & Milford.

**T. Y. B. Sc. Electronics Paper-II**  
**Basic Communication Systems & Advance Communication Systems**  
**Semester I     ELE 312: Basic Communication Systems**

**Objectives:**

1. To learn the concepts of communication system.
2. To know the various modulations and demodulations techniques.
3. Conceptual study of T.V. system is expected.

**Unit 1: Communication System**

Block diagram of Communication system, Function of each block, Modulation, types of modulation, need of modulation. **(6P, 4M)**

**Unit 2: Amplitude Modulation & Detection**

Principle and mathematical analysis for AM, Modulation index, frequency spectrum, & power spectrum, Transistorized AM modulator, Block diagram of AM Transmitter, AM detector (diode as AM detector), Superhetrodyne Principle, Block diagram of AM Superhetrodyne radio receiver (with waveforms of each block), AM receiver IC-TDA1072A (only features). **(14P, 12M)**

**Unit3: Frequency Modulation & Detection**

Principle and mathematical analysis for FM, FM Modulation index, FM reactance modulator, FM detector (Phase shift discriminator), Block diagram -FM transmitter & receiver, AM/FM Receiver IC -T4258(only features). **(12P, 8M)**

**Unit4: Antenna & Wave propagation**

Definition of antenna parameter, antenna impedance, Directivity, directional gain, radiation pattern, front to back ratio, types of antenna, half wave dipole, Yagi and dish antenna (description & application)

Types of propagation, ground wave propagation, space wave propagation, ionosphere, sky wave propagation. **(12P, 10M)**

**Unit 5: Television Systems**

TV fundamentals, Concept of scanning and its types, Composite video signal, Block diagram of color television system and explanation of each block. **(8P, 6M)**

**References:**

1. Electronic communication – By Roddy & Coolen
2. Electronic communication system – By Kennedy
2. Communication Electronics – By Frensel, McGraw Hill Publication.
3. Antenna and wave propagation – By K. D. Prasad, 3<sup>rd</sup> edn1996, Satya Prakashan.
5. Electronic communication – By Sanjeeva Gupta, 1998, Khanna Publishers.
6. T. V. fundamentals – By Anil Maini.
7. Monochrome and color TV – By R. R. Gulati, 100, New Age International.

**T. Y. B. Sc. Electronics Paper-II**  
**Basic Communication Systems & Advance Communication Systems**  
**Semester II     ELE 322: Advance Communication Systems**

**Objectives:**

1. To learn the Fiber optic and Satellite communications.
2. To learn the modern communication.
3. Introduction to computer network.

**Unit1: Pulse modulation**

Block diagram of Digital communication, Advantages of digital communication, Idea of pulse modulation, Sampling theorem, PAM, PWM, PPM, PCM (Introduction). **(8P, 6M)**

**Unit 2: Fiber Optic Communication**

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 optical fiber communication system, advantages and application of optical fiber cable. **(12P, 10M)**

**Unit 3: Satellite Communication**

Introduction of satellite communication, transponders, idea of nonsynchronous and geosynchronous or geostationary satellites, geostationary orbit, DOMSAT and INTELSAT, applications of satellite communication. **(10P, 8M)**

**Unit 4: Modern Electronic Communication**

Idea of FAX system, working of FAX, MODEM and Internet communication, RADAR – principle & working, types, Pulsed RADAR-working, applications of RADAR. **(10P, 6M)**

**Unit 5: Introduction to Computer Network**

Network, types of network- LAN, WAN, MAN.

Network topology- bus, ring, star, tree.

Network devices- MUX, Hub, Router, Ethernet card **(12P, 10M)**

**References:**

1. Optical Fiber Communication–By Keiser, Tata McGraw-Hill International
2. Optical Fiber Communication – By John Senior, Prentice Hall of India
3. Communication Electronics –By Frenzel, Tata McGraw-Hill
4. Electronic communication -Roddy & Coolen,
5. Electronic communication system -By Kennedy
6. Optic Fiber Communication -ByAnuradha Roy
7. Computer networks – By A. Tanenbaum
8. Data Communication- By U.D. Black

**T. Y. B. Sc. Electronics Paper-III**  
**Microprocessor I & II**  
**Semester I    ELE 313: Microprocessor I**

**Objectives:**

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

**Unit1: The processor 8086** **(14 P, 12 M)**

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: 8086 Instruction set** **(14 P, 12 M)**

Machine language instruction formats, Addressing mode of 8086, Instruction set of 8086:- 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 3: Assembler directives and operators** **(08 P, 04 M)**

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

**Unit 4: Programming with 8086** **(16 P, 12 M)**

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

**References:**

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, Autar singh.
5. Microprocessor and Interfacing Techniques: By A.P.Godse. D.A.Godse. Technical Publication, Pune.



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, Autar singh.
5. Microprocessor and Interfacing Techniques: By A.P.Godse. D.A.Godse. Technical Publication, Pune.

**T. Y. B. Sc. Electronics Paper-IV**  
**Programming with C++ and Numerical Simulation in Electronics**  
**Semester I     ELE 314: Programming with C++**

**Objectives:**

1. To learn the “C++” as high level programming language.
2. Development of simple programs in “C++” language.

**Unit 1: Introduction** **(03P, 04M)**

Algorithm, Flowcharts, Difference between C & C++, The object oriented approach. Basic concepts of object-oriented programming – classes, objects, encapsulation, inheritance, polymorphism.

**Unit 2: Introduction to C ++** **(08P, 06M)**

Tokens, keywords, identifiers & constants, Data Types – (Basic, User-defined, Derived). Symbolic constants, Declaration of variables.

Operators in c ++, I/O operators streams, scope resolution , member, type cast operators, Manipulators, Expressions and their types, Implicit conversions, Control Structures ( if , if-else, switch, do while , while & for )

**Unit3: Functions** **(08 P, 06 M)**

Simple functions, function prototyping, passing arguments to functions, returning values from functions, reference arguments, Function overloading, Inline functions, default arguments, variables & storage classes.

**Unit4: Objects & Classes** **(08 P, 06 M)**

A simple class, Difference between class, structure & union in c ++ , c++ objects, Constructor & Destructor, constant member functions, Objects as function arguments, Returning objects from functions. Classes Objects & memory, static class data.

**Unit 5: Operator overloading** **(06P, 06M)**

Introduction, overloading unary & binary operators, Manipulation of strings using operators. Rules for overloading operators, Data conversion – Between Basic types, Between objects and basic types.

**Unit6: Inheritance****(05 P, 04 M)**

Derived class and Base class, Derived class constructor, class hierarchies, public & private inheritance, Multiple, Multilevel and Hibrid inheritance, Containership.

**Unit 7: Pointers, Virtual functions & Polymorphism****(08P, 04M)**

The delete new operators, pointers to objects, this pointer, An array of pointer to objects. Virtual functions, pure virtual function, friend function, static function, Assignment & copy initialization, The copy constructor.

**Unit 8: Files & Streams****(06P, 04M)**

Streams, string I/O, character I/O, File pointers, Error handling, Redirection, command line arguments, pointer output, overloading the << and >> operators.

**Reference Books:**

1. Object-oriented programming with c ++ -By E Balagurusamy.
2. Object-oriented programming in Turbo c ++ -By Robert Lafore
3. The C++ Programming Language – By Stroustrup B, Addison Wesley.

**T. Y. B. Sc. Electronics Paper-IV**  
**Programming with C++ and Numerical Simulation in Electronics**  
**Semester II      ELE 324: 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** **(06P, 04M)**

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

**Unit 2: Numerical Integration** **(06P, 04M)**

Trapezoidal Rule, Simpson's  $1/3^{\text{rd}}$  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, Second Derivative Formula from Taylor Series, Euler's and Range Kutta Method, Problems based on these methods.

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

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

**Unit 5: Numerical Simulation of Simple Circuits** **(12P, 08M)**

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)

**T. Y. B. Sc. Electronics Paper-V**  
**Microcontroller 8051 & Embedded Systems**  
**Semester I     ELE 315: 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** **(04P, 04M)**

Block diagram of microcomputer (CPU, memory, I/O devices, Buses), Block diagram of microcontroller, Comparison between microprocessor and microcontroller, Microcontroller survey.

**Unit 2: Architecture of 8051 Microcontroller** **(18P, 12M)**

8051 microcontroller –Block diagram, Features, Pin out diagram, CPU registers, Flags and Program Status Word, Program Counter, Data Pointer, Special Function Registers, Stack & Stack Pointers, Internal RAM /ROM, Oscillator & Clock, External memory, Ports and circuits-Port-0,1,2 & 3,Counter and Timers, Serial data input / output transfers, Interrupts

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

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

**Unit 4: 8051 Microcontrollers Programming** **(12P, 10M)**

Editor, Assembler, Linker, Instruction syntax, Data types & directive, assembly language programming—simple data transfer, arithmetic, logical, looping, and code conversion programming.

**References:**

1. The 8051 Microcontroller Architecture, Programming, & Applications-  
By Kenneth J. Ayala.
2. The 8051 Microcontroller and Embedded Systems-  
By Muhammad Ali Mazidi, Janice Gillispie Mazidi

**T. Y. B. Sc. Electronics Paper-V**  
**Microcontroller 8051 & Embedded Systems**  
**Semester II     ELE 325: Embedded Systems**

**Objectives:**

1. To learn the 8 bit microcontroller Interfacing.
2. Understanding of basics of PLC & Its programming.

**Unit 1: Advanced Microcontroller Programming** **(20P, 15M)**

**Single bit instruction programming**

**Timer and Counter Programming:** Timer modes, Timer Counter registers, Programming the timers in various modes (Mode 1 and Mode2), Counter Programming.

**Serial Port Programming:** 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, SBUF register, SCON registers, Programming the 8051 to transfer and to receive data serially, Importance of TI and RI flags, Baud rate and Baud rate doubling.

**Interrupts Programming:** Interrupts in 8051, enabling and disabling the interrupts, Programming timer interrupts, Programming external hardware interrupts, Level and edge triggered interrupts. TCON register, interrupt priority, IP register.

**Unit 2: Real world Interfacing using 8051** **(20P, 15M)**

Introduction, Interfacing-keyboard (matrix), Displays (seven segment & LCD), stepper motor, ADC, DAC, Temperature Sensor.

**Unit 3: 8051 Interfacing to External Memory** **(05P, 04M)**

Semiconductor memory, memory address decoding, interfacing with external ROM.

**Unit 4: Programmable Logic Controller (PLC)**

**(07P, 06M)**

Introduction, PLC system, internal architecture of PLC (CPU, Bus, Memory, I/O Unit), PLC Programming- Ladder diagram, ladder programming, logic functions, latching, ladder program, instruction lists, Boolean algebra, functional block diagrams, programming examples.

**References:**

1. The 8051 Microcontroller Architecture, Programming, & Applications- By Kenneth J. Ayala.
2. The 8051 Microcontroller and Embedded Systems-By Muhammad Ali Mazidi, Janice Gillispie Mazidi.
3. The 8051 Microcontroller and Embedded Systems Using Assembly & C-By Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D Mckinlay.
4. Programmable Logic Controllers An Introduction- By W. Bolton



**Washing Machines** - Operating principle, Block diagram, fuzzy logic, washing machine with fuzzy logic, features.

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

**Electronic Weighing Systems** - Operating principle, Block diagram, features /specifications.

**References:**

1. Mobile cellular communication- By William C. Y. Lee, 2<sup>nd</sup> ed<sup>n</sup> 1985, McGraw Hill Publication.
2. Electrical and electronics measurements and instrumentation- By A.K.Sawhney.
3. Audio and Video systems- By R.G.Gupta, 1988, TMH Publications
4. Modern sound reproduction- By Olson
5. Mobile cellular telecommunications analog and digital system- By Lee.
6. Television- By Gulati, New Age International.
7. Consumer Electronics –By J.S. Chitode, Technical Publications.
8. Modern CD player servicing manual- By Manahar Lotia,BPB Publication.
9. Modern telephone and cordless servicing- By Manahar Lotia, 1<sup>st</sup> ed<sup>n</sup> 1997, BPB

**T. Y. B. Sc. Electronics Paper-VI**  
**Consumer Electronics and Industrial & Power Electronics**  
**Semester II      ELE 326: Industrial and Power Electronics**

**Objectives:**

1. To have an idea about Industrial Applications of Semiconductor Devices.
2. To develop the ideas how the semiconductor devices can be used to control various operations in industries as well as the domestic applications.

**Unit1: Power Semiconductor Devices** **(12P, 10M)**

Construction details, symbols, working, principle, I-V Characteristics of following devices: SCR, Diac, Triac, GTO, Light activated Silicon Controlled Rectifier, PUT, Silicon Controlled Switch (SCS), List of applications of SCR.

Ratings: Latching Current, Holding Current,  $dv/dt$  &  $di/dt$  rating,  $I^2t$  rating, surge current rating.

**Unit 2: Turn On and Turn Off circuits for SCR** **(10P, 06M)**

Introduction to methods of Triggering (Gate triggering, Voltage triggering), Triggering of SCR using UJT, BJT.

Introduction to 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** **(08P, 06M)**

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

**Unit 5: Industrial Applications of SCR** **(10P, 08M)**

Uninterruptible power supplies, over voltage protection, simple battery charger, automatic battery charger, fan regulator using Triac, Emergency light system.

**References:**

1. A Text Book on Power Electronics-By H.C. Rai Galgotia Publication,
2. Power Electronics- By H.C. Rai, 3<sup>rd</sup> ed<sup>n</sup> 1999 Galgotia Publication
3. Industrial Electronics – By G.K.Mithal, 18<sup>th</sup> ed<sup>n</sup> 1998, Khanna Publishers
4. Text Book of Industrial Electronics- By Joshi, Rao, Sutrave, 2<sup>nd</sup> ed<sup>n</sup> 1998, Nirali Prakashan.
5. Thyristor & Their Applications- By M. Ramamoorthy, 2<sup>nd</sup> ed<sup>n</sup> 1999, EWP.

**T. Y. B. Sc. Electronics Paper-VII**  
**Practical Course**  
**ELE 301: General Lab**

**Group A: (Perform any eight experiments)**

1. To study digital multiplexing using IC 555 and IC 7400.
2. To determine the conductivity of a given sample using Four-Probe Method.
3. To determine the energy Gap of a semiconductor diode.
4. Build and test DC to DC converter using transistors/ICS.
5. Built and test SMPS.
6. Determine the Hall coefficient of a given Sample.
7. Design and built T to F converter using IC 555 / IC 741.
8. Design, built and test Pulse Amplitude Modulation (PAM) using IC 555, IC 741 and diode.
9. Study of Public Address System and directional characteristics of Microphone.
10. Study of directional characteristics of antenna.
11. Study of Diode characteristics using PSPICE.
12. Study of Transistor characteristics using PSPICE.

**Group B: (Perform any eight experiments)**

1. To study a Triac / SCR power control circuit used to control speed of a Fan or Dimmer.
2. Built and study Time Delay circuit using SCR and UJT.
3. Built and study over voltage protection circuit for a given voltage.
4. Study of use of LDR to trigger SCR.
5. To study Amplitude Modulation and Detection using diode.
6. Built and test PWM and PPM using IC 555
7. To study FM modulation.
8. To study Instrumentation amplifier using IC 741.
9. To study characteristic of photodiode.
10. To determine the temperature coefficient of thermistor.
11. Study of transistor characteristics using PSPICE.
12. Study characteristics of Integrator/ Differentiator using Op-Amp Using PSPICE.

**T. Y. B. Sc. Electronics Paper-VIII****Practical Course****ELE 302: Microprocessor, Microcontroller & C++ programming****A) Microprocessor Practical (Perform any eight Practical)**

1. To display A to Z with one space and ten character in one line.
2. To display A to Z on one line 0 to 9 on next lines.
3. To display complete character set with 25 character on one line.
4. To change upper case to lower case/ lower case to upper case.
5. To reverse input string of character.
6. To find largest / smallest number from asset of entered numbers.
7. Find sum of entered numbers.
8. To read single digit hexadecimal number and multiply it by 8 without MUL instruction.
9. Line drawing on a screen
10. To arrange entered numbers in ascending/ descending order.
11. To generate 'n' Fibonacci numbers.
12. To find factorial of a given number.
13. Interfacing of stepper motor.
14. Interfacing of relay.

**B) Microcontroller Practical (Perform any four Practical)**

1. Write a program of addition /subtraction of two 8-bit nos. and store the result.
2. Write a program of multiplication/ division of two 8-bit nos. and store the result in AX register.
3. Write a program to add string of byte and stored in memory.
4. Write a program to count no. of character stored in string which is terminated by escape character.
5. Write a program to convert 8-bit decimal no. into hexadecimal form.
6. Write a program to convert 8-bit hexadecimal no. into BCD from.

**Interfacing:**

1. Write a program to ON OFF simple switch continuously.

2. Write a program to make LED ON and OFF continuously.
3. Write a program to drive stepper motor continuously.
4. Write a program to generate square wave.

**C) C ++ Practical (Perform any four Practical)**

1. Write program to find roots of equation  $f(x) = 0$  using Bisection/Newton Raphson.
2. Write program to find out integration of given function Simpson's 1/3 OR 3/8 Rule.
3. Write program to find derivative of function using Euler's / Runge Kutta method.
4. Write program to find out average value of current which is varying in triangular form.
5. Write program to find out average value of current in half/ full wave rectifier.
6. Write program for Arithmetic operation over complex class (addition, subtraction & multiplication).
7. Write program to implement distance class, where the distance value in feet's & inches.
8. Write program to implement time class / date class.

**T. Y. B. Sc. Electronics Paper-IX****ELE 303: 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.	Duration	10M
2.	Library work	20M
3.	Experimental skill & theoretical understanding	20M
4.	Presentation & Project report	20M
5.	Oral	10M
	<b>Total</b>	<b>80M</b>