SYLLABUS FOR

M.Sc. (ELECTRONICS)

(Effective from June 2016)

DEPARTMENT OF ELECTRONICS

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SAURASHTRA UNIVERSITY

DEPARTMENT OF ELECTRONICS

M.Sc. (ELECTRONICS) SYLLABUS

SEMESTER I

SEMESTER I **(24 Credits)**

Paper 1: Fundamental of electronics technology	**(4 Credits)**
Paper 2: Foundation of communication electronics	**(4 Credits)**
Paper 3: Electromagnetics	**(4 Credits)**
Paper 4: Computer hardware	**(4 Credits)**
Practical's	**(8 Credits)**

Paper 1: Fundamental of Electronics Technology

Credit: 04
Total Marks: 100 (70 External+30 Internal)
Total Hours requires: 60 Hrs.

Unit 1: Basic concepts of circuit analysis:

Circuit fundamental: zero reference level, chassis ground, Ohm's law, formula variations of Ohm's law, graphical representation of Ohm's law, linear resistor, Non-linear resistor, cells in series and parallel--Resistive circuits: series circuit, characteristics of series circuit, the case of zero IRE drop, polarity of IR drops, total power, series aiding and series opposing voltages, proportional voltage formula in a series circuit, series voltage divider, opens in a series circuit, shorts in series circuit, parallel circuits, laws of parallel circuits, special case of equal resistances in all branches, special case of only two branches, any branch resistance, proportional current formula, opens in a parallel circuit, shorts in parallel circuits, series-parallel circuits, opens in series-parallel circuits, shorts in series-parallel circuits, voltage division in a complex series-parallel circuit--Kirchoff's laws: Kirchoff's current and voltage laws, determination of algebraic sign, assumed direction of current flow--Network theorems: superposition theorem, ideal constant-voltage source, ideal constant-current source, Thevenin's theorem, How to Thevenize a circuit?, Norton's theorem, how to Nortonize a given circuit?, maximum power transfer theorem

Unit 2: Basic electronic devices:

Resistors: definition, types, characteristic and colour codes—capacitors: definition, types, charging and discharging of capacitor, testing of capacitor and colour codes—inductors: definition, types, different parts of inductor, properties of core-need and type of shielding, testing--Diodes: definition, I-V characteristics, types of diodes, biasing of diodes--Transistors: definition, construction of transistor, biasing of transistors, different configuration of transistors, I-V characteristics--UJT: definition, construction of UJT, biasing of UJT, I-V characteristics--FET: definition, construction, biasing, I-V characteristic--SCR: definition, construction, biasing, I-V characteristic

Unit 3: Basic digital electronics:

Number system: Number of systems—the decimal system—binary system—binary-to-decimal conversion—binary fractions—double-dadd method—decimal-to-binary conversion—shifting the place point—binary operations—binary addition—binary subtraction—complement of a number—1's complemental subtraction—

2's complemental subtraction—binary multiplication—binary division—shifting a number to left or right—representation of binary numbers as electrical signals—octal number system—octal-to-decimal conversion—decimal-to-octal conversion—binary-to-octal conversion--octal-to-binary conversion—advantages of octal number system—hexadecimal number system—how to count beyond F in Hex number system—binary-to-hexadecimal conversion—hexadecimal-to-binary conversion--Logic gates: positive and negative logic—the OR gate—equivalent relay circuit of an OR gate—diode OR gate—transistor OR gate—OR gate symbolizes logic addition—three input OR gate—exclusive OR gate—the AND gate—equivalent relay circuit of an AND gate—diode AND gate—transistor AND gate—AND gate symbolizes logic multiplication—the NOT gate—equivalent circuit of NOT gate—the NOT operation—bubbled gates—The NOR gate—NOR gate is universal gate—the NAND gate—the NAND gate is universal gate—the XNOR gate—logic gates at a glance—adders and subtractors—half adder—full adder—parallel binary adder—half subtractor—full subtractor--Boolean algebra: unique features of Boolean algebra—laws of Boolean algebra—equivalent switching circuits—De-Morgan's theorems—duals

Unit 4: Electronics instruments:

Analog and digital instruments—functions of instruments—electronics versus electrical instruments—essentials of an electronic instrument—measurement standards—the basic meter movement—characteristics of moving coil meter movement—variations of basic meter movement—converting basic meter to DC ammeter—multi-range meter—measurement of current—converting basic meter to DC voltmeter—multi-range DC voltmeter—loading effect of voltmeter—ohmmeter—the multimeter—rectifier type ac meter—electronic voltmeter—the direct current VTVM—comparison of VOM and VTVM—direct current FET VM—electronic voltmeter for alternating currents—the digital voltmenter—cathode ray oscilloscope(CRO)—cathode ray tube(CRT)—deflection sensitivity of a CRT—normal operation of CRO—triggered and non-triggered scopes—dual trace CRO—dual beam CRO—storage oscilloscope—sampling CRO—digital readout CRO—lissajous figures—frequecy determination with Lissajous figures—applications of a CRO—the Q-meter

Recommended books:

1. Basic electronics: Solid state
   B.L. Thereja
   S. Chand & CO.

Reference books:

1. Electronic devices and circuit theory
   Robert L. Boylestad and Louis Nashelsky
   Pearson (Xth edition)
2. Electronics devices and circuits
   J.B. Gupta
   Katson Education series
   S.K. Kataria& sons
   New Delhi
3. Digital Electronics: Principles & Integrated Circuits by Anil K. Maini
   Wiley India Pvt. Ltd. 1st Edition
4. Fundamentals of digital electronics by Prof. Barry Paton
   Delhousie University March 1998 Edition
   National Instruments Corporation

Paper 2: Foundation of communication electronics

Credit: 04
Total Marks: 100 (70 External+30 Internal)
Total Hours requires: 60 Hrs.

Unit 1: Amplitude modulation, methods of amplitude modulation,SSB transmission, generation of SSBSC waves :

What is modulation?-- other necessity of modulation—basic methods of analog modulation—Means of message carriers— Major factor affecting modulation—modulation of techniques—An expression and waveforms for AM DSBFC wave—Expression for modulation index for measurement—non-linear AM process—Frequency spectrum in AM wave—vector representation of AM wave—limitations of AM--Linear modulation—Non-linear modulation—Mixer—Basic requirement of AM wave generation—Base modulation: Van Der Bijl modulation—emitter modulation and voltage gain—collector modulation—balanced modulator(DSBFC)—double side band suppress carrier balanced modulator—balanced bridge modulator—balanced ring modulator(balanced lattice modulator)--AM signal spectra—pilot carrier—frequency spectrum—fading and selecting fading—advantages—AM independent sideband (ISB)--Generation of SSB-SC waves—phase shift method/phase discrimination method—third method—comparison of three systems

Unit 2: AM VSB transmission, frequency modulation, phase modulation, generation of FM waves:

A.M. vestigial sideband(VSB) and frequency spectra—SSB-SC transmission of voice frequency—VSB TV signal transmission—comparison of various AM systems—quadrature amplitude modulation—quadrature amplitude demodulation--General FM wave equation—modulation index—deviation ratio(δ)—ideal FM modulator characteristics—frequency spectrum of FM wave—percentage modulation—spectrograms of FM wave—significance of B.W., f_m , and f_d –observations :from Bessel coefficients—Carson's rule for B.W. calculation—B.W. using universal curve method—wideband FM—narrow band FM—comparison between FM and AM method--General expression for phase deviation—standard and equivalent FM method—Bessel function equation for PM wave—carrier behavior in PM method—frequency deviation in PM wave—measurement of frequency deviation and phase deviation--Generation of FM—Armstrong method—pre-emphasis and De-emphasis—comparison of PM and FM

Unit 3: Amplitude demodulators, FM detectors or discriminators, AM transmitters and FM transmitter:

Demodulation-introduction—principle of AM detection—classification of AM—shunt diode detector—square law detector—synchronous detector—principle of demodulation of SSB—VSB demodulator--Amplitude-frequency characteristic or tuned circuit characteristic—principle of an FM demodulator—FM detectors--Transmitter-introduction—general block diagram of transmitter—AM broadcast transmitter—transmitter requirements—modulation techniques—frequency converter—SSB transmitter using Filter method—independent sideband transmitter--FM transmitter block diagram and working of each stage—indirect FM transmitter—FM stereo transmitter

Unit 4: AM receivers, FM receivers, receiver characteristics:

Receivers—tuner—delayed AGC—tone compensated volume control—tuning control—band-spread tunig—diversity reception--Block diagram and working of each stage—SNR and bandwidth of FM—automatic frequency control system—devices employed in RF amplifier—FM broadcasting systems—FM stereo receiver--Sensitivity—selectivity—fidelity—double spotting—image signal—choice of IF—automatic frequency control(AFC)—choice of local oscillator frequency—tracking error—channel selectivity—double superheterodyne receiver—a SSB HF receiver—SSB pilot carrier radio transmitter—SSB pilot carrier radio receiver—independent side band(ISB)—SSB receiver for pilot carrier—independent SB (ISB) receiver—AM receiver using phase locked loop(PLL)

Recommended Books:

1. Fundamentals of basic analog(CW) communication systems
   K.K. Shah
   Dhanpat Rai publishing company
   New Delhi

Reference books:

1. Electronic communication: analog, digital and wireless
   Sanjeeva Gupta
   Khanna publishers
   New Delhi
2. Basics of electronic communications
   NIIT
   Prenice-Hall of India
   New Delhi
3. Modern digital and analog communication systems
   B.P. Lathi
   Oxford Uinversity press
   New Delhi
4. Electronic communication systems
   Blake
   Thomson-Delmar

Paper 3: Electromagnetics

Credit: 04
Total Marks: 100 (70 External+30 Internal)
Total Hours requires: 60 Hrs.

Unit 1: Vector analysis and mathematical preliminaries:

Vector algebra(vector operations—vector algebra: component form—triple products—position, displacement and separation vectors—how vectors transform)—differential calculus(ordinary derivatives—gradient—the operator ∇ --the divergence—the curl—product rules—second derivatives)—integral calculus(line, surface and volume integrals—the fundamental theorem of calculus—the fundamental theorem for gradients—the fundamental theorem for divergences—the fundamental theorem for curls—integration by parts)—curvilinear coordinates(spherical polar coordinates—cylindrical coordinates)—the Dirac-Delta function(the divergence of $\hat{\boldsymbol{r}}/r^2$—the one dimensional Dirac-Delta function—the three dimensional Dirac-Delta function)—the theory of vector fields(the Helmholtz fields—potentials)—Decible and Neper concepts—complex numbers—logarithmic series and identities—quadratic equations—cubic equations—determinants—matirces—factorials—permutatins—combinations—basic series—exponential series—sine and cosine series—sinh and cosh series—hyperbolic functions—sine, cosine, tan and cot functions—radian and steradian integral theorems

Unit 2: Electrostatic fields:

Applications of electrostatic fields—different types of charge distributions—Coulomb's low—applications of Coulomb's low—limitation of Coulomb's law—electric strength due to point charge—salient features of electric intensity—electric field due to line charge density—electric field strength due to infinite line charge—field due to surface charge density, ρ_s $(\frac{C}{m^2})$—field due to volume charge density, ρ_v $(\frac{C}{m^3})$—potential—potential at a point—potential difference—salient features of potential difference—potential gradient—salient features of potential gradient—equipotential surface—potential due to electric dipole—electric flux—salient features of electric flux—Faraday's experiment to define flux—electric flux density—salient features of electric flux density, D—Gauss's law and applications—proof of Gauss's law (on arbitrary surface)—Gauss's law in point form—divergence of a vector, electric flux density-applications of Gauss's law—limitations of Gauss's law—salient features of Gauss'a law—Poisson's and Laplace's equations—applications of Poisson's and Laplace's equations—uniqueness theorem—boundary conditions on E and D—proof of boundary conditions—conductors in electric field—properties of conductors—electric current—current densities—equation of continuity—relaxation time (T_r)—relation between current density and volume charge density—dielectric materials in electric field—properties of dielectric materials—dipole moment, P—polarization, P—capacitance of different configurations—energy stored in electrostatic field—energy in a capacitor

Unit 3: Steady magnetic fields:

Applications of magnetostatic fields—fundamental of steady magnetic fields—Faraday's law of induction—magnetic flux density, B (wb/m^2)—Ampere's law for current element or Biot-Savart law—field due to infinitely long current element—field due to a finite current element—Ampere's work law or Ampere's circuit law—Stoke's theorem—force on a moving charge due to electric and magnetic fields—applications of Lorentz force equation—force on a current element in a magnetic field—Ampere's force law—boundary conditions on H and B—scalar magnetic potential—vector magnetic potential—force on a loop or a coil—materials in magnetic fields—magnetism in materials—inductances—standard inductance configurations—energy density in a magnetic field—energy stored

in an inductor—expression for inductance, L, in terms of fundamental parameters—mutual inductance—comparison between electric and magnetic fields/circuits/parameters

Unit 4: Maxwell's equations:

Equation on continuity for time varying fields—Maxwell's equations for time varying fields—meaning of Maxwell's equations—conversion of differential form of Maxwell's equation to integral form—Maxwell's equations for static fields—characteristics of free space—Maxwell's equations for static fields in free space—proof of Maxwell's equations—sinusoidal time varying field—Maxwell's equations in phasor form—influence of medium on the fields—types of media—summary of Maxwell's equations for different cases—conditions at a boundary surface—proof of boundary conditions on E, D, H and B—complete boundary conditions in vector form—time varying potentials—retarded potentials—Maxwell's equations approach to relate potentials, fields and their sources—Helmholtz theorem—Lorentz Gauge condition

Recommended books:

1. Introduction to electrodynamics
   David J. Griffiths
   Prentice-Hall of India
2. Electromagnetic field theory and transmission lines
   G.S.N.Raju
   Pearson

Reference books:

1. Elements of Electromagnetics
   Matthew N. O. Sadiku
   Oxford Publication (3rd edition)
2. Electromagnetic Field Theory Fundamentals
   Bhag Guru
   Cambridge Publication.
3. Electromagnetics Fields
   T.V.S. Arun Murthy
   S.Chand Publications.

Paper 4: Computer hardware

Credit: 04
Total Marks: 100 (70 External+30 Internal)
Total Hours requires: 60 Hrs.

Unit 1: TheVisiblePCandmicroprocessor

TheVisiblePC

HowthePC Works:Input, Processing, Output, Storage, TheArt ofthePCTechnician EssentialToolsoftheTradeandESDAvoidance:ToolsoftheTrade,AvoidingElectrostatic Discharge, Results ofElectrostaticDischarge, Anti-staticTools--RecognizetheMajorComponentsofaPC:CPU,RAM,Motherboard,Case,PowerSupply, FloppyDrive, Hard Drive, and CD-ROM Drive--Connectors:DBConnectors,DINConnectors,CentronicsConnectors,RJConnectors,BNC Connectors, Audio Connectors, USBConnectors,FireWireConnectors--AllKinds ofConnectors:Sound Cards, Video Cards, Network Cards, Keyboard, Mouse, Modem, Printer, Joystick—MicroprocessorsCPUCoreComponents:TheManintheBox,ExternalDataBus,Registers,Clock, Backtothe External DataBus--Memory:MemoryStorageOptions, RAM: Random Access Memory,Address Bus-ModernCPUs:Manufacturers,CPUPackages,ThePentiumCPU:TheEarlyYears,Pentium Pro,Later Pentium-ClassCPUs,PentiumII,PentiumIII,EarlyAMDAthlonCPUs,AMD "Thunderbird"Athlon CPUs, AMD Duron,IntelPentium 4, AMD Athlon XP--SpecialtyProcessors:Intel Xeon Processors, 64-Bit Processing, MobileProcessors--InstallingCPUs:WhyReplaceaCPU?,DeterminingtheRightCPU,BuyingaCPU,Preparing toInstall,InsertingaSlot1/SlotACPU,InsertingaPGA-TypeCPU,TestingYourNewCPU, TheArt ofCooling,Know YourCPUs, Overclocking

Unit 2: RAM,BIOSandCMOSRAM

DRAM: OrganizingDRAM, You AreaByteVictim-RAMSticks,PartI:DIPPs,30-PinSIPPs,30-PinSIMMs,SIMMSticksandParity,Access Speed--RAM Sticks, PartII: 72-Pin SIMMs,Banking, PartI-FillingtheBus, DIMM-ImprovementsinDRAMTechnology:EDO,SDRAM,PC100/133Standards,ECC,Double Pumping, RDRAM, DDR SDRAM, Banking Part II-Dual-Channel, Architecture, Double- Sided SIMMs/DIMMs--InstallingRAM:DoYouNeedRAM?,GettingtheRightRAM,InstallingSIMMs,Installing DIMMsand RIMMs,InstallingSO DIMMs inLaptops, TheRAM Count--TroubleshootingRAM:TestingRAM, MRAM--

BIOSandCMOS
The Function of BIOS:Talking of the Keyboard, BIOS and Its Relation to Memory

Addressing,All HardwareNeedsBIOS--CMOS Setup Utilities: Updating CMOS:The Setup Program, A Quick Tour Through a Typical CMOS Setup Program, And theRest oftheCMOS Settings, Modern CMOS- BIOSand DeviceDrivers: Option ROM, DeviceDrivers,BIOS, BIOS, Everywhere--

Power-OnSelfTest(POST):BeforeandDuringtheVideoTest:TheBeepCodes,TextErrors, POST Cards, TheBoot Process,Boot Configuration

Unit3:ExpansionBusand motherboard

Expansion Bus

Structure andFunction oftheExpansion Bus:PC Bus, 16-BitISA-
System Resources:I/O Addresses, Interrupt Requests, Direct Memory Access (DMA), MemoryAddresses-
Modern Expansion Bus:FalseStarts, PCI-
Installing Expansion Cards:Step 1: Knowledge, Step 2: Physical Installation, Step 3: AssigningResources to theCard, Step 4: DeviceDrivers, Step 5: Verify-
Troubleshooting:Expansion Cards: DeviceManager-
PCI-Xand PCI-Express

Motherboards

HowMotherboards Work-
Types ofMotherboards:AT Motherboards, TheNeed foraNew Form Factor, EnterATX-
Chipset Varieties:Functions, Features, and Expandability-
UpgradingandInstallingMotherboards:ChoosingtheMotherboardandCase,Installingthe Motherboard, Wires, Wires, Wires-
Troubleshooting:Motherboards: Symptoms, Techniques, Options

Unit4: Hard drive technology, CD and DVD media:

How hard drives work: data encoding—moving the arms—geometry, hard drive interfaces: parallel ATA—serial ATA, BIOS support: configuring CMOS and installing drives: CMOS—device drivers—protecting data with RAID, troubleshooting hard drive installation—partitioning and formatting hard drives: partitioning—formatting, Beyond A+: spindle (or rotational) speed—S.M.A.R.T.-
CD media: How CD ROM works—CD-ROM formats—CD-ROM speeds—CD-R—CD-RW—music CDs, DVD Media: DVD video—DVD players—DVD ROM—Recordable DVD, Installing CD and DVD media drives: connections—device drivers—device manager—auto insert notification—applications—booting to CD-ROMs, troubleshooting: installing issues—burning issues—firmware updates—color books

Recommended-Book:

1. "PCHardware"byMichaelMeyers, Scott Jernigan.TMH Edition.

Reference books:

1. "Troubleshooting, Maintaining and RepairingPCs" byStephen J.Bigelow,TMH
2. "PCUpgrade and MaintenanceGuide", Minasi, BPBpublication.

3. “Upgradingand RepairingPCs”byMueller, PHI
4. “HardwareBible”byW.L.Rosch,TechmediaPublication.