SOLAPUR UNIVERSITY, SOLAPUR

M.Sc. Electronics

Choice Based Credit System

(w.e.f. June 2015-16)

Solapur University, Solapur
M.Sc. Electronics
(w.e.f. June, 2015-16)

1. **Title of the Course:** M.Sc.- Electronics

2. **Introduction:**

Master of Science (M.Sc.) in Electronics is a programme running at Post Graduate Department of Electronics, Shankarrao Mohite Mahavidyalaya, Akluj Dist Solapur from June 2006 and disseminating knowledge of the subject from fundamental concepts to State-of- technologies. With the view to provide exposure to the recent technologies of various sectors of the Electronics and to empower the students to make them competent for industrial needs, R & D sectors and self employment as well the curriculum is framed. Indeed, the curriculum encompasses knowledge of Embedded System and Instrumentation, Communication Electronics and VLSI design and technologies. On collaboration with American companies, the Cypress Semiconductor USA and MicroSemi USA, the laboratories for respective specialization are established. Therefore, the student can realize the state- of art of the technological designing and development. The credit and grading system of evaluation is implemented for this course. In addition to M. Sc.-Electronics, the research programmes M.Phil. as well as Ph.D. are also going on.

3. Objectives of the course:

Following are objectives of the course.

- To provide exposure to the students to the recent technologies.
- To provide the knowledge of design and implementation of instrumentation of significant preciseness.
- To inculcate awareness among the student to perform the projects of industrial standards, which could also, ensures the interdisciplinary approach.
- To empower the students to cater the needs of industrial sectors. It is also attempted to expose the students to the research activities and to inculcate the research awareness.
- To empower the students to achieve the success in the NET/GATE/SET etc examinations.

4) Advantages of the Course:

Electronics is the subject, which ensures wide application potential in diverse sectors. Along with the basic sciences, it bears the knowledge of technology as well. Therefore, it depicts the tremendous opportunities in the electronic industrial sectors. It ensures well confluence of Science and Technology. Therefore, the course helps to achieve all round development. Moreover, the students can also opt for education field for their career. The students of M. Sc.- Electronics can opt one of the three specializations for part- II.

5) Eligibility of the Course

- B. Sc. with Electronics subject at Principal / Interdisciplinary /Allied/ Applied/ Subsidiary level.
- B.C.S.(ECS)

6) Duration:

2 Years – 4 Semesters

7) The Credit and Grading System :

Credit is a numerical value that indicates student's work load (lectures, lab work, seminars, tutorial, field work, etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. As per the present norms there are 4 contact hours per paper per subject per week, which works out to be 60 contact hours per paper per subject per semester or 120 contact hours in annual pattern. By converting these contact hours into credit at the rate of 15 contact hours for one credit, there will be 04 credits per paper per subject per semester and 08 credits in annual pattern. There are four papers at PG level. The PG student must complete minimum of 16 credits (maximum 160 credit points) in each semester.

a) Conversion of marks into Grades :

A table for the conversion of the marks obtained by a student in each paper (out of 100) to grade and grade points is given below.

Sr. No	Range of Marks	Grade	Grade Point
1.	80-100	O	10
2.	70-79	A+	9
3.	60-69	A	8
4.	55-59	B+	7
5.	50-54	B	6
6.	45-49	C+	5
7.	40-44	C	4
8.	<39	FC	0 (Failed in Term Exam)
9.	<39	FR	0 (Failed in Internal Assesment)

1. **Grade Point Average at the end of the Semester (SGPA**)

$$SGPA = \frac{(G_1 x C_1)+(G_2 x C_2)+\ldots\ldots}{\Sigma Ci}$$

(ΣCi- The total number of credits offered by the student during a semester)

2. **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{(G_1 x C_1)+(G_2 x C_2)+\ldots\ldots}{\Sigma Ci}$$

Σ Ci - the total number of credits offered by the student upto and including the semester for which CGPA is calculated.)

3. **Final Grade Point Average (FGPA)** will be calculated in the similar manner for the total number of credits offered for completion of the said course.

Where: Ci: Credits allocated for the ith course

Gi: Grade point scored in ith paper

b) Scheme of evaluation:

The candidate has to appear for internal evaluation of 30 marks and external evaluation (University Exam) for 70 marks for each paper/practical. The nature of internal evaluation will be decided by the Post Graduate Department of Electronics. The internal evaluation comprises unit tests, tutorials, seminars, Group discussion, oral etc, which ensures a process of continuous assessment.

c) Nature of Question Papers

There shall be seven questions out of which the candidate has to solve five questions. Each question will carry 14 marks. Following is the nature of Question paper.

Q. NO. 1 : (Objective type) Compulsory

Q. No. 2 : (Short Answer) Compulsory

Q. No. 3 to 7 (Any three)

d) Passing Standard

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper A student who secures less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper (subject) and shall be required to reappear for respective paper. A student who failed in Term End Examination (Theory) & passed in Internal assessment of a paper (subject) shall be given FC Grade. Such student will have to appear for Term End Examination only. A student who fails in Internal assessment and passed in Term End examination (Theory) shall be given FR Grade. Such student will have to appear for Term End examination as well as internal assessment. In case of year down candidates from the mark scheme the candidates shall appear for the same 70 marks paper of the external examination and his performance shall be scaled to 100 marks.

e) ATKT

A student who fails in one fourth (25%) or less papers of the total papers offered in the 1st and 2nd semester will be allowed for admission to second year (Sem. III-IV)

8) Structure of the Course:

The Course Structure of M.Sc. Electronics is as depicted in the table. It is integrated course of 2 years i.e. 4 semesters. For, M. Sc. I, each semester bears four compulsory theory papers and Two practical papers. Moreover, for M.Sc.-II two papers are compulsory for each semester and two papers are elective. There are following three specializations and student has to opt one of it.

Specializations :

a. Embedded System and Instrumentation (ESI)

b. Communication Electronics (CE)

c. VLSI Design (VD)

The course structure

(M.Sc. Electronics)

Paper No.	Title of the course	Credit	Teaching (H/W)	Marking Scheme		
				University Exam.	Internal Evaluation	Total
M. Sc.-I Semester – I						
I	Numerical Methods	4	4	70	30	100
II	Instrumentation Design	4	4	70	30	100
III	Power Electronics	4	4	70	30	100
IV	Advanced Microcontrollers	4	4	70	30	100
Pr-I	Practical - I	4	12	70	30	100
Pr-II	Practical – II	4	12	70	30	100
Seminar-I	Seminar - I	1	-	-	25	25
M. Sc.-I Semester-II						
V	Control theory	4	4	70	30	100
VI	Real Time Operating System	4	4	70	30	100
VII	Opto Electronics	4	4	70	30	100
VIII	Signals and Systems	4	4	70	30	100
Pr-III	Practical – III	4	12	70	30	100
Pr-IV	Practical – IV	4	12	70	30	100
Seminar-II	Seminar - II	1	-	-	25	25
M. Sc.-II Semester-III						
IX	Digital Signal Processing	4	4	70	30	100
X	Advanced Digital Design with VHDL	4	4	70	30	100
XI	Elective - I	4	4	70	30	100
XII	Elective - II	4	4	70	30	100
Pr-V	Practical – V	4	12	70	30	100
Pr-VI	Practical – VI	4	12	70	30	100
Seminar-III	Seminar - III	1	-	-	25	25
M. Sc.-II Semester-IV						
XIII	Microwave devices, Antennas and Measurements	4	4	70	30	100
XIV	Networking and data communications	4	4	70	30	100
XV	Elective - III	4	4	70	30	100
XVI	Elective-IV	4	4	70	30	100
Pr-VII	Project	4	12	70	30	100
Pr-VIII	Project	4	12	70	30	100
Seminar-IV	Seminar - IV	1	-	-	25	25

M. Sc. Electronics

Semester – I

I : Numerical Methods
II : Instrumentation Design
III : Power Electronics
IV : Advanced Microcontrollers

Semester – II

V : Control theory
VI : Real Time Operating System
VII: Opto Electronics
VIII : Signals and Systems

Solapur University, Solapur

Class : M. Sc.-I
Semester : I
Subject : Electronics
Paper : I **No.of Lectures: 45**

Paper-I Numerical Methods

Unit-I Numerical Representation : 06

Numerical Algorithm, Floating Point representation, Taylor`s Series representation, Errors, Absolute Error, Relative error, Round-off error, Concept of convergence,

Unit-II System of Linear Algebraic Equations: 12

a) Formulation of system of linear algebraic equations using matrix and vector notations. Matrix transformations, adjoint and co-factors, Determinant of matrix, Inverse of matrix, Identification of square, Singular, upper-triangular(U), lower triangular(L), tri-diagonal, matrices, Fundamentals of Eigen Value Problem.

b) **Direct methods :** Forward and Backward Substitution, Gauss Jordan elimination method, Gaussian Elimination method and LU factorization method . Introduction to Iterative method**.**

c) **Case Study** : Study of R-2R ladder network using tri-diagonal system

Unit-III Laplace Transform: 10

a) Introduction to Integral transform Laplace transform and its importance to study electrical circuits.

b) Laplace transform of standard functions, properties of Laplace transform, Laplace transform of periodic functions,

c) Inverse Laplace transform, Partial fraction rule.

d) Study of RL, RC, RLC circuits using Laplace transform.

Unit-IV Curve Fitting 07

a) **Curve fitting :**Introduction to curve fitting. Empirical relation and actual relation.

b) **Least Squares method of curve fitting :** Straight line fitting, Second order polynomial fitting.

c) **Interpolation :** Difference between interpolation and extrapolation. Piecewise Linear interpolation, Newton's forward difference formula for interpolation, Newton's backward difference formula for interpolation, Cubic splines approximation. Divided differences for unequal intervals, Lagrangian interpolating polynomials

Unit-V(A) Numerical Differentiation and Integration 05

a) **Numerical Differentiation :** Introduction, Forward, central and backward formulae for differentiation,

b) Numerical Integration : Introduction, Newton-Cotes Quadrature formula, Trapezoidal rule, Simpson 1/3 rule and 3/8 rule of numerical integration

c) Case Study : Study of RC differentiator and integrator circuits

(B) Solution of Ordinary Differentiation Equation 05

a) Introduction, Initial value problem and boundary value problem.

b) Taylor series method, Euler`s method , Runge Kutta method.

Reference Books:

1. Circuit and Network analysis and synthesis by A. Sudhakar and S. P. Shammohan 2nd Edition, TMH,
2. Numerical Method with programming in C 2nd Edition, by T. Veerarajan and T. Ramchandran, TMH, New Delhi.
3. Applied Numerical Methods for Engineer, using MATLAB and C, Robert J Schilling and Sandra L Harries, Thompson publishers, 1999.
4. Numerical Methods for scientific and Engineering computation by M. K. Jain, S. R. K. Iyengar and R. K. Jain 5th Edn. New Age International, New Delhi.
5. A first Course in Numerical Methods by U. M. Ascher and Chen Greif, PHI, New Delhi, 2013.

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Class : M. Sc.-I
Semester : I
Subject : Electronics
Paper : II **No.of Lectures: 45**

Paper-II INSTRUMENTATION DESIGN

Unit 1: Transducer and its interfacing (10)

a) **Sensors:** Sensors and Transducers, Active and Passive sensors, characteristics of sensors, static and dynamic characteristics, Accuracy and precision, Linearity, hysteresis, loading effects, threshold and stiffness.
Thermocouples, Thermistors, RTD, PT 100, Semiconductor temperature transducers, AD590, LM35, LM135, LM235, LM335. Their types, characteristics, specifications. Designing of simple interfacing circuits.
Strain-gauge, load cell, piezo-electric, LVDT . Force, flow, level, displacement transducers, Designing of simple interfacing circuits.
Hall effect and IR transducers and their interfacing

b) **Actuators:** Electromagnetic relay, Limit switch, Proximity sensor, Inductive, Capacitive, IR proximity sensor.

Unit 2: Instrumentation: 15

a) General block diagram of instrument design for measurement. Minimum requirements, AC and DC bridges, Excitation, Grounding and electromagnetic and electrostatic shielding. Readout, Need of display system in instrumentation. Digital and Analog display, LCD (16 x 2 line), Recorders, plotters etc.

b) Signal conditioners, Designing of pre-amplifiers, Instrumentation and chopper Amplifiers, Instrumentation amplifier, Signal conditioner (2B30), Programmable Excitation device (2B35) Programmable instrumentation amplifier 2B31, AD524, AD620, AD594/595, Isolation amplifier (Model 289)

Unit 3:Signal transformation 10

Signal transmission, 4-20mA current, Characteristics of 4-20mA current loop, programmable 4-20mA current drivers. F-V & V-F, V-I & I-V converters.

Unit 4:Data acquisition system(DAS) 5

Need of DAS, Single channel data acquisition system, Multi-channel DAS, data loggers, basic Operation of data loggers, compact data loggers. Microcontroller based minimum system for data acquisition **(5)**

Unit 5:Case Studies

- Designing of instrumentation for measurement of
  a) Temperature
  b) Humidity
  c) Gas concentration
- Interfacing of PIR and ultrasonic sensor modules

Reference Books:

1. Transducer Interfacing Handbook- A guide to analog signal conditioning- Daniel H Sheingold, Analog Devices, Massachusetts
2. Electronic instruments –K.S.Kalsi, Tata MC-Graw Hill.
3. Instrumentation, measurements and analysis-B.S.Nakara, Chaudhari, TMH.
4. Instrumentation measurement - Moorthy, Prentice Hall of India.
5. Industrial Electronics, Circuits, Instruments and control techniques, - Terry Bartelt- Delmer - Cengage

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Class : M. Sc.-I
Semester : I
Subject : Electronics
Paper : III **No.of Lectures: 45**

Paper-III: POWER ELECTRONICS

Unit 1: Controlled Rectifier: (12)

a) Concept of uncontrolled and controller rectifiers.
b) Single phase circuits: Half & Fully controlled bridge rectifier with resistive R & R-L load with and without freewheeling diode, series & dual converter, power factor improvement.
c) Three phase circuits: Half controlled rectifier, Half controlled Bridge rectifier, Fully controlled Bridge rectifier with R & R-L load, three phase dual converter.

Unit 2: AC Voltage Controllers: (08)

a) Introduction to AC Voltage controllers AC On / Off control, Effect of duty cycle.
b) Concept of Phase control, Single Phase Uni-directional and bidirectional controllers with resistive & inductive loads.
c) Three phase half & full wave controllers with resistive & inductive loads.

Unit 3: Inverters: (08)

a) Operating principle. Single phase bridge inverter, steady state analysis. Mcmurray half and full bridge inverter, McMurray-Bedford half and full bridge inverter
b) Three phase inverter, PWM inverters, single phase PWM and Multiphase PWM inverters. Reduction of harmonics.
c) Current source inverters single phase current source inverters with R load.

Unit 4: Choppers: (07)

a) Operating principle, control strategies, time ratio control, step –up and step down chopper with R load, Class A, B, C, D, E Choppers
b) Multiphase choppers and AC choppers. .

Unit 5: Cycloconverter: (10)

a) Introduction to cycloconverter, types of cycloconverter.
b) Single Phase Cycloconverter, Mid point cycloconverter, Bridge type cycloconverter, step up cycloconverter.
c) Three phase cycloconverters. Three phase to single phase, three phase to three phase. Reduction of output harmonics.
d) Microcontroller based firing schemes.

Reference Books:

1. Power Electronics – M.H. Rashid, PHI.
2. Power Electronics –Singh – Kanchandani- TMH
3. Industrial and Power Electronics – Deodatta Shingare Electrotech publication,
4. Power Electronics – P. S. Bhimra Khanna publisher, New Delhi.

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Class : M. Sc.-I
Semester : I
Subject : Electronics
Paper : IV

Paper IV: Advanced Microcontrollers

Unit – I PIC Microcontrollers 10

- **Introduction:** Advantages of PIC microcontrollers over MCS-51 series. PIC microcontroller features, Architecture of PIC microcontrollers, Pin Description, 16CXX series. Architecture of 16F877. Memory structure, Resisters, Register file structure, Register banks, program and data memory, Use of EEPROM, SFRs, W-register, Status register, Option register etc. Interrupts in PIC microcontrollers, IO ports of 16F877. Timers of PIC Microcontrollers, Compare capture mode, PWM mode, I2C bus , On Chip ADC and DAC facility. USART the serial IO, watchdog timer, Power up timer, Sleep mode, Reset, and clock circuits, types of the RESET. Interrupt vector table. Introduction of 18FXX series.
- **Instruction Set :** Instruction set, instruction format, byte oriented instruction, bit oriented instruction, literal instruction, flow control instruction. Addressing modes

Unit – II

Integrated Development Tools for PIC: Overview of MPLAB the IDE for Assembly language. Micro C the IDE for embedded C programming. Developing, compiling, and programming the microcontroller, Some programs on IO port, timer and serial IO programming. **10**

Unit – III AVR Microcontrollers 12

- **Introduction to AVR**: General architecture of AVR microcontroller family. Salient features, AVR Series .
- **Architecture:** Architecture and hardware resources of AVR ATMega 8L, The arithmetic logic unit, program memory & data memory, Downloadable Flash program memory, SRAM data memory, General- purpose register file, SFRs, I/O register, EEPROM data memory, IO port structure, Peripherals, timer and counters, watchdog timer, Serial Peripheral interface, universal asynchronous receiver and transmitter, Analog comparator, reset and interrupt, interrupt vector table, reset sources. On chip ADC and DAC , Reset circuit and clock circuit.
- **Instruction set:** Instruction set, Memory addressing modes, Register direct addressing, I/O direct addressing, SRAM direct addressing, SRAM indirect addressing constant addressing using the LPM instruction , Arithmetic instruction, Logical and bit wise instructions, Jumps and calls, instruction set, reset and interrupt handling, watchdog handling , stack, program constructs, conditional branches, program loops , refreshing port pins and important register, polling inputs.

Unit –IV

Integrated Development Tools for AVR: Study of development tools of ATMEL AVR microcontrollers, ATMEL AVR Studio, WinAVR and Codevision **05**

Unit – V Programming and interfacing with AVR & PIC 08

- **Interfacing with AVR and PIC mecrocontrollers:** Interfacing of IO devices to the ports. Memory interface I/O Interface Interfacing smart LCD, relay, opto-coupler, Interfacing ADC & DAC, firing of thyristor,.
- **Development of embedded system for**
    a. Temperature controlling
    b. Measurement of pH
    c. DC Motor controlling by using PWM techniques.

Reference Books:

1. PIC Microcontrollers and Embedded systems using Assembly and C for PIC18 – M.A. Mazidi, R. D. Mckinlay and D. Causey - Pearson Education, New Delhi- 2009.
2. Embedded design with PIC18F452, John B.Peatman
3. Embedded C programming and the Microchip PIC – Richard Barnet, L.O.Cull and S. Cox Delmer.-2004.
4. Microcontrollers Theory and Application – Ajay V. Deshmukh TMH New Delhi
5. Embedded C Programming and the Atmel AVR, Richard H. Banett, Sarah A. Cox, Larry D. O'Cull, Thomson.
6. Programming and customizing The AVR Microcontroller, Dhananjay Gadre, TMH.

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Class : M. Sc.-I
Semester : II
Subject : Electronics
Paper : V **No.of Lectures: 45**

Paper -V CONTROL THEORY

Unit 1: Fundamentals of Control Systems : (11)

Introduction The control system , basic definitions, close and open loop system and their comparison, block diagrams, block diagram reduction techniques. Transfer functions and signal flow graphs

Feedback characteristics of control system:

Feedback and Non feedback system, Reduction of parameter variation using feedback, Control of system dynamics, Control of the effects of disturbance signals using feedback, Regenerative feedback

Unit 2: Time domain analysis and Stability : (09)

Standard test signals, Time domain performance of control systems, Transient response of the first, the second and the higher order systems, Steady state errors, Effect of adding zero to the system, Design specification of second order system. Concept of poles and zeros. The concept of stability, Necessary conditions for stability Routh stability criterion.

Unit 3: Root locus techniques: . (08)

The Root locus concept, construction of root loci, Root contours, system transportation lag

Unit 4: Frequency domain analysis and stability: (09)

Correlation between time and frequency response, Polar plots, Bode plots, all pass and minimum phase system, experimental determination of transfer function, log magnitude verses phase plots, Nyquist stability criteria, Assessment of sensitivity analysis in frequency domain.

Unit 5: Control actions and industrial process control: (08)

Introduction, Process control system, Roll of controllers in process industry, Concept of sequencing and modulating controllers,

Control actions, Discontinuous (ON-OFF) and Continuous control modes, Proportional (P), Derivative (D) and Integral (I) controller, Composite (PI, PD, PID) controllers, their performance and characteristics.

Reference Books

1. Control system Engineering-J.J.Nagrath, M. Gopal, 2nd Edition, Wiley Eastern Ltd.
2. Modern control Engineering-K. Ogata, Prentice Hall of India.
3. Automatic control systems-B.C. Kuo, Prentice Hall of India.
4. Control system –Smarajit Ghosh, Pearson Education (Singapore). Ltd.

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Class : M. Sc.-I
Semester : II
Subject : Electronics
Paper : VI **No.of Lectures: 45**

Paper - VI Real Time Operating System

Unit 1: Embedded system design with AVR microcontrollers: (14)

a) **Introduction:** Concept of embedded system, structure of embedded system, characteristics of embedded system, types of embedded system,
b) **Microcontroller based embedded system:** Minimum requirement. Microcontroller, Clock circuit, Reset circuit, In system programming (ISP)
c) **Embedded system design** : Designing of AVR ATmega8L microcontroller based embedded systems for Measurement of pH, Humidity, wind velocity, temperature etc.

Unit 2: Fundamentals of Real Time Operating System (10)

a) **Introduction:** Concept of Real Time, Real Time operating System, Characteristics of Real-Time operation system, Hard and Soft Real Time Systems.
b) **Structure of RTOS:** Structure of RTOS, RTOS Kernel, Kernel Objects, Services of Scheduler.
c) **Task :** Task, Task structure, Creation of task, types of task, Task Control block, context, States of task and FSM, idle task, Priority, Static and dynamic priority, Resources, Sharing of resources, ISR, Task Management.
d) **Scheduling Algorithm :** Task scheduling Algorithm, preemption, FIFO, Round Robin scheduling, priority based preemptive scheduling. Priority Inversion, Software and hardware time Ticks, context switching.
e) Simple programs based on Tiny RTOS kernel.

Unit:3 Task Synchronization and Intertask communication: (8)

a) **Synchronization of task :** Concept of Sharing of resources, Race condition, Critical condition, deadlocks, spinlocks,
b) **Semaphores and mutexes :** Concept of semaphore, Binary semaphore, Counting semaphore, Semaphore management, **Mutexes :** Concept of mutex, mutex management.
c) **Intertask communication:** Intertask Communication, Messages, Queues, Mailboxes.

Unit:4 The RTOS Kernel MicroC/OS-II : (5)

MicroC/OS-II kernel, creation of task, task management, Simple programs on creation of task.

Unit:5 The RTOS RTLinux: (8)

RTLinux Kernel, POSIX Pthreads, Processes and Threads, Thread Basics, Process management, semaphores, mutexes. Simple programs on creation of threads.

Reference Books:

1. Embedded C - Michael J Pont
2. Embedded C Programming and the Atmel AVR - R. H. Barnett, S. Cox and L. O'Cull
3. Embedded C Programming and the Microchip PIC - R. H. Barnett, S. Cox and L. O'Cull
4. *Operating Systems – A.S. Godbole*
5. Real-Time Systems – C.M. Krishna and K.G. Shin
6. Embedded / Real Time Systems – Concepts design – programming- KVVK Prasad.
7. MicroC/OS-II, The Real Time Kernel, - J.J. Labrosse, 2nd Edn. (2006) CMP Books

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Class : M. Sc.-I
Semester : II
Subject : Electronics
Paper : VII **No.of Lectures: 45**

PAPER VII- OPTOELECTRONICS

Unit 1. Optical fibers: **(6)**

Construction and working principle of optical fiber, Types of optical fiber, Numerical aperture, Pulse spread due to material dispersion, loss mechanism, modes in steps and grade index fiber.

Unit 2. Optical Sources: **(6)**

Optical sources, LED, He-Ne laser, working principle spectral and spatial characterization.

Unit 3. Optical detectors: **10**

Types of detectors, Thermal detectors, semiconductor detectors, Photodiodes, APD, PIN photodiodes, photo transistors, working principle and characteristics.

Unit 4. Modulation of light. **14**

Concept of Intensity Modulation, Birefringence, Quarter wave plate, linear Electro optic(EO) effect, working of pocket cell as modulator and deflector, Kerr modulators, Magneto optic devices, Faraday effect, Acoustic optic(AO) devices, AO working principles, AO modulator

Unit 5. Fiber Optics Technology **(9)**

Glass fiber fabrication, Introduction to cable design, coupling, splicing and connectors, splicing methods, types fiber measurements (NA, Loss measurement, connector & splice loss, dispersion)

Reference Books:

1. Optical Fiber Communication by A. Selvarajan and etal TMH, 2002.
2. Optical Fiber Communication by Gerd Keiser , MGH , 1998.
3. Optical Electronics, 4th Edition by A. Yariv, HRW publication, 1991.
4. OPTOELECTRONICS: An introduction By J.Wilson and J.F.B.Hawkes, PHI 1983

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Class : M. Sc.-I
Semester : II
Subject : Electronics
Paper : VIII **No.of Lectures: 45**

PAPER VIII- SIGNALS AND SYSTEMS

Unit 1 Introduction to Signals 12

A Signals, Typical Examples on Signals and systems, classification of signals, continuous-time/discrete-time, deterministic/non-deterministic, periodic, Non-periodic, even-odd, energy-power signals, elementary signals, exponential, sinusoidal, impulse, unit step, ramp, parabolic, Triangular, Rectangular Signals. Basic operations on signals, Time shifting, scaling, Time Reversal, signal addition and signal multiplication.

Unit 2 Introduction to system 12

A System, classification of System, continuous-time and discrete-time system, static and dynamic, linear and non-linear, time-invariant and variant, deterministic and random (stochastic), causal and non-causal, stable and unstable. Linear Time Invariant (LTI) systems, impulse response, convolution integral, convolution sum, condition for BIBO stability for CT and DT signals in terms of impulse response.

Unit 3 Fourier series 11

The Periodic signal, Fourier series Representation of periodic signals, Dirichlet Conditions, Evaluation of Fourier coefficients, symmetry conditions, Half symmetry, amplitude & phase spectrum, Exponential Fourier series, Continuous-time Fourier series (CTFS), properties of CTFS – Parserval's theorem for power signals, power spectral density.

Unit 4 Analysis of Signals and Systems 10

Basic Structure of Matlab, File types, Matlab commands,, tool boxes, Looping and conditioning commands and operators, Matlab command for signals and system problems. Steady state solution of electric circuits with non-sinusoidal periodic inputs using Fourier series – effective values of voltages and currents – power due to non-sinusoidal voltages and currents.

Reference Books:

1. Signals and systems by P. Ramesh Babu, and R Anandanatarajan, SCItech
2. Signal and systems, I J Nagarath , S. N. Shraran and Rakesh Ranjan, TMH 2010
3. Fundamentals of Signals and System, M, J, Robert TMH, 2010
4. Signals and Systems, Richard Buranik