Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: M.Sc. Electronics

Name of the Course: M.Com.- I (Sem. I & II)

(Syllabus to be implemented w.e.f. June 2020-21)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Sc.- I Electronics

Choice Based Credit System (CBCS)

(w.e.f. June 2020-21)

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, MicroSemi USA and ARM University London the laboratories for respective specialization are established. Therefore, the student can realize the state- of art of the technological designing and development. The Choice Based Credit System (CBCS) 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 expose the students to the industrial environment a on job training and internship may be provided
   - To empower the students to achieve the success in the NET/GATE/SET etc. examinations.
   - To expose the students to on-line short term certificate courses such as MOOC/SWAYAM/NPTEL, etc.

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. Sc. Physics with Electronics subject at subsidiary Level.
- B.C.S.(ECS)

6. **Duration:**
   2 Years – 4 Semesters

7. The Choice Based Credit System (CBCS):

A Choice based credit system (CBCS) is implemented for this course. According to this system, choice is given to the students. In fact, the department offers three specializations Embedded System and Instrumentation, Communication Electronics and VLSI design. Students can opt any one out of three at Semester-III and IV. Moreover, each specialization has three papers for semester –III and IV. The choice is given to the students to select two papers out of three. Two papers for Semester –III and IV are compulsory. Thus, Papers XI, XII, XV and XVI are elective papers of respective specialization.

8. The Credit and Grading System (CGPA):

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 20 marks and External Evaluation (University Exam) for 80 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:** The nature of question paper shall be as per time to time decided by the university authorities. It comprises with five questions having objective type questions, short type question and long type questions.

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 80 marks paper of the External Examination (University 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)

9. 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 for Choice Based Credit System (CBCS)

M.Sc.-I Electronics, Semester I & II

With effect from 2020-21

Paper No.	Code	Title of the Paper	Semester Examination			L	T	P	Credits
			UA	IA	Total				
Semester-I									
	Hard Core								
I	HCT1.1	Numerical Methods	80	20	100	4	-	-	4
II	HCT1.2	Instrumentation Design	80	20	100	4	-	-	4
III	HCT1.3	Power Electronics	80	20	100	4	-	-	4
	Soft core (Any One)						-	-	
IV	SCT1.1	Advanced Microcontrollers	80	20	100	4	-	-	4
	SCT1.2	Virtual Instrumentation	80	20	100	4			4
		Seminar/Tutorial/ Industrial Visit/ Field Tour	-	25	25	-	1	-	1
	HCP1.1	Practical	40	10	50	-	-	3	2
	HCP1.2	Practical	40	10	50	-	-	3	2
	HCP1.3	Practical	40	10	50	-	-	3	2
	SCP1.1/1.2	Practical	40	10	50	-	-	3	2
		Total for Semester-I	**480**	**145**	**625**				**25**
Semester-II									
	Hard Core								
V	HCT2.1	Control theory	80	20	100	4	-	-	4
VI	HCT2.2	Real Time Operating System	80	20	100	4	-	-	4
	Soft core (Any One)								
VII	SCT2.1	Opto Electronics	80	20	100	4	-	-	4
	SCT2.2	Agro Instrumentation	80	20	100	4	-	-	4
	Open Elective (Any One)								
VIII	OET2.1	Signals and Systems	80	20	100	4	-	-	4
	OET2.2	Cellular and Mobile communication	80	20	100	4	-	-	4
		Seminar/Tutorial/ Industrial Visit/ Field Tour	-	25	25	-	1	-	1
	HCP2.1	Practical	40	10	50	-	-	3	2
	HCP2.2	Practical	40	10	50	-	-	3	2
	SCP2.1/2.2	Practical	40	10	50	-	-	3	2
	OEP2.1/2.2	Practical	40	10	50	-	-	3	2
		Total for Semester-II	**480**	**125**	**625**	**-**	**-**	**-**	**25**

HCT=Hard Core Theory, HCP=Hard Core Practical, SCT=Soft Core Theory, OET=Open Elective Theory, UA=University Assessment, IA=Internal Assessment, SCP=Soft Core Practical, L=Lecture, T=Tutorials, P=Practical

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-I, Semester : I
Subject : Electronics
Paper Code : HCT1.1

Paper-I Numerical Methods

Unit-I 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-II 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.
(Numerical Analysis on electrical and electronic problems)

Unit-III Curve Fitting **10**

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-IV Numerical Differentiation and Integration **08**

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

Unit-V 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 Code : HCT1.2

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..

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) **05**

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

Unit 5:Case Studies **05**

· Designing of instrumentation for measurement of
  a) Temperature
  b) Humidity
· 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 Code : HCT1.3

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 Code : SCT1.1

Paper IV Advanced Microcontrollers

Unit – I PIC Microcontrollers **12**

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 **06**

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.

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 **05**

Study of development tools of ATMEL AVR microcontrollers, ATMEL AVR Studio, WinAVR and Codevision

Unit – V Programming and interfacing with AVR & PIC **10**

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 and 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.
4. Microcontrollers Theory and Application – Ajay V. Deshmukh TMH New Delhi
5. Embedded C Programming and the Atmel AVR, R. H. Banett, S. 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 : I
Subject : Electronics
Paper Code : SCT1.2

Paper-IV Virtual Instrumentation

Unit 1 Fundamentals of Virtual Instrumentation. 10

Historical perspectives, Basic concept of Virtual Instrumentation, Block diagram and architecture of Virtual Instrumentation, data- flow techniques, graphical programming in data flow, Comparison between Virtual instrumentation and Traditional Instrumentation, Advantages of Virtual Instrumentation. Development of VI using GUI.

Unit 2 PC communication Ports 12

Introduction to Centronics parallel ports, Serial COM1/COM2, RS232 standards, Current loop,RS232/RS485,GPIB, Bus Interface: USB, PCI. Networking for office & Industrial applications VISA and IVI .

Unit 3 Add on Peripheral cards 08

Selection & applications , ADC, DAC, DIO, DMM, Waveform Generator.

Unit 4 LABVIEW based Virtual Instrumentation 10

Introduction to LABVIEW the virtual Instrumentation software, Virtual Instrumentation programming techniques, "G" Programming Language, VI and sub-VI loops, charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file IO

Unit 5 Case studies 05

Designing of Virtual Instrumentation using LABVIEW for

a. Data Acquisition Systems for Measurement of physical parameters
b. Temperature controlling
c. Biomedical Instrumentation.

Reference Books:

1. LABVIEW Graphical programming Gary Johnson, 2nd Edition, MGH, 1997.
2. LABVIEW for everyone –Lisa K wells and Jeffery Travis PHI 1997.
3. Basic concept of LABVIEW 4-Skoff-PHI 1998.
4. "PC Interfacing for Data Acquisition and process control-S. Gupta & Joseph John A-2nd Edn.1994

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Class : M. Sc.-I, Semester : II
Subject : Electronics
Paper Code : HCT2.1

Paper-V Control Theory

Unit 1: Fundamentals of Control Systems **06**

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

Unit 2: Feedback characteristics of control system **08**

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 3: Time domain analysis and Stability **10**

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 4: Root locus techniques **06**

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

Unit 5: Frequency domain analysis and stability **07**

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 6: 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.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-I, Semester : II
Subject : Electronics
Paper Code : HCT2.2

Paper-VI Real Time Operating System

Unit 1: Overview of 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 08

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,
c) **Mutexes :** Concept of mutex, mutex management.
d) **Intertask communication:** Intertask Communication, Messages, Queues, Mailboxes.

Unit:4 The RTOS Kernel MicroC/OS-II 05

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

Unit:5 The RTOS RTLinux 08

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-I, Semester : II
Subject : Electronics
Paper Code : SCT2.1

Paper VII- Optoelectronics

Unit 1. Optical fibers **06**

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 **06**

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 **09**

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, P

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Class : M. Sc.-I, Semester : II
Subject : Electronics
Paper Code : SCT2.2

Paper-VII Agro Instrumentation

Unit 1. Fundamentals of Agricultural Instrumentation. 10

Necessity of instrumentation for high tech Agriculture. Definition of parameters involved in Agriculture: Environmental & Soil parameters Humidity, pH, light intensity, pest concentration, physiological effects, soil parameters, Soil moisture, conductivity..

Unit 2. Sensors for Agricultural Parameters 14

Sensors for measurement of temperature, Humidity, pH, conductivity, soil, moisture, salinity, etc. CO2, O2 etc. gas sensors. Study of SY-HS-220, DHT 11, IR based sensors, Figaro TGS 813.

Unit 3. Instrumentations to Control the Polyhouse Environment 12

Development of Electronics system for Measurement and control of Humidity and Temperature of polyhouse. PC Based Instrumentation. Application of Wired Network for Greenhouse. Introduction to Wireless sensor and its application to polyhouse monitoring system.

Unit 4. Instrumentations to measure and control soil parameters 09

Instrumentation for measurement of pH, Conductivity, salinity and nutrients of the Soil.

Reference books

1. Instrumentation hand book : Process & Control- B. G. Liptak
2. Process control & Instrumentation technology C. D. Johnson
3. Instrumental methods of chemical Analysis –williard mertte & dean
4. Industrial Instrumentation & control- S. K. singh 2edn. TMH

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-I, Semester : II
Subject : Electronics
Paper Code : OET2.1

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 nonsinusoidal 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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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PAPER-VIII Cellular and Mobile Communication

1. Cellular Radio System Design & Specifications of Analog System **08**

A basic cellular system, Performance criteria, Uniqueness of Mobile radio environment, Operation of cellular systems, Definitions of terms and functions of analog system, Specification of Mobile station & Land station, Different specification of the analog cellular system.

2. Cell Coverage & Antennas **12**

Cell coverage- Introduction, Point-to-point model, Foliage loss, Propagation- over flat open area, Near distance, Long distance, Mobile-to-mobile, Cell-site antenna height & signal coverage cells.

Antennas- Cell site antennas, Unique situation of cell-site antennas, Mobile antennas, Design of an Omnidirectional & Directional antenna system

Interference: A) Cochannel interference- Cochannel interference area, Real-time cochannel interference, reduction of cochannel interference B) Nonchannel interference-Adjacent channel interference, Near-end-far-end interference & avoidance of interference, Effect of cell site components

3. Frequency Management & Channel Assignment **10**

Frequency management- Frequency spectrum utilization, Set-up channels, Definition of channel assignment, Fixed channel assignment, Nonfixed channel assignment, Operating with additional spectrum, Traffic and channel assignment.

Handoffs & Dropped calls- Value of implementing handoffs, Initiating handoffs, Delaying a handoffs, Forced handoffs, Queuing of handoffs, Power difference handoffs, Mobile assisted handoffs & soft handoffs, Intersystem handoffs, Introduction to dropped call rate, Formula of dropped call rate.

4. Operational Techniques & Switching **08**

Adjusting the parameters of the system, Hole filler, Leaky feeder, Cell splitting, Microcells. Concept of switching, Analog & Digital switching equipment, Features for handling traffic, MTSO interconnection

5. Digital Cellular Communication 09

Introduction to digital technology, ARQ techniques, Digital mobile telephony, GSM, Intelligent cell concept, Applications of intelligent micro-cell system

Reference Books:

1. Mobile Cellular Telecommunications Analog Digital System by W.C.Y. Lee, MGH 2nd Ed.
2. Mobile Communication Engineering Theroy & Applications by W.C.Y. Lee, MGH 2nd Ed.