

Solapur University, Solapur
Syllabus for B.Sc. III Electronics Semester System
To be implemented from Academic Year 2012-13

1. Course Structure:

Sr. No.	Semester	Paper No.	Title	No. of Lectures	Total Marks
1	Semester V	IX	Linear Integrated Circuits and Applications	42	50
2		X	Fundamentals of Communication	42	50
3		XI	Microcontroller and Interfacing	42	50
4		XII	Power Electronics	42	50
5	Semester VI	XIII	Sensors and Instrumentation	42	50
6		XIV	Advanced Communication	42	50
7		XV	Embedded System Design	42	50
8		XVI	Advanced Electronics Technology	42	50
9	At the end of VI Semester		Practical Course		200

2. Nature of theory question paper

The nature of theory question paper is as follows.(Each paper of 50 marks)

Q. 1	Multiple choice questions (one mark each)	10
Q. 2	Short answer question (Any five)	10
Q. 3A	Short answer question (Any two)	06
B	Short answer question (one compulsory)	04
Q. 4	Short answer question (Any two)	10
Q. 5	Answer any one	10

3. Distribution of Practical Marks (200)

1.	Practical from group A	35
2.	Practical from group B	35
3.	Practical from group C	35
4.	Practical from group D	35
5.	Project Work	35
	(Project-20 marks, Report- 10 marks, Oral-05 marks)	
6.	Seminar	05
7.	Industrial visit/ Industrial Case	05
	Study /Job training/ Visit to industrial exhibition / Conference/ Workshop	
8.	Journal	15
	(Certification-10 marks, regularity-05 marks)Practical Marks may be as given below.	
	a) Circuit diagram/ Flow Charts	06
	b) Connection / Programming	06
	c) Understanding and Working	06
	d) Observations/ Execution	08
	e) Calculations, graph / printout	04
	f) Result / comment	02
	g) Oral	03

Project: Every student should take up a project and submit in the report, the work he has carried out. The project work will be assessed independently at the time of practical examination. Maximum two students can perform same project. In exceptional case three students may be allowed.

Seminar: Every student of B.Sc. III, Electronics will have to deliver one seminar of at least 20 min. on any advanced topic in Electronics using ICT (power point presentation) and submit the report in detail at the time of examination. The candidate should show the PPT if the examiner demands.

Industrial visit / Local industry case study / Job training/ Visit to industrial exhibition/ Conference/ Workshop: In order to give the exposure of industry/ Research Institute and advances in the field of Electronics, industrial visit should be arranged and submit the report. OR he should submit the report of the case study of local industry or job training (minimum four days) OR he may visit to an industrial/ Science exhibition OR participate in conference / Seminar / workshop.

Solapur University, Solapur
B.Sc. III Electronics
Semester-V
Paper-IX
Linear Integrated Circuits and Applications

Total Marks 50

- 1. Fabrication of IC's and VLSI Technology** **9**
 Advantages of IC's, Epitaxial process, Fabrication of monolithic components: npn and pnp transistors, diodes, resistors and capacitors.
 Introduction to VLSI design, fabrication of NMOS (Without stick diagram)
- 2. Active Filters** **8**
 Introduction to filters (Passive and Active), Advantage of active filters over passive filters, Classification (low pass, high pass, band pass, band stop and all pass filters), Types of filters (Butterworth and Chebyshev) and their comparison, Second order Butterworth Low pass and High pass filters, Band pass and Band stop filters (narrow and wide).
- 3. Regulated Power Supply** **7**
 Series Op-Amp regulator, Basic block diagram of IC regulator, Protection circuits for IC regulators (over current, over voltage, thermal shutdown) Voltage regulators using IC 78XX, 79XX, LM 317 and LM337.
- 4. Phase Locked Loop** **8**
 VCO, Block diagram of PLL, Principle and working of PLL, Transfer characteristics, Derivation of lock range and capture range, Features of IC 565, Application of PLL as Frequency multiplier, FM demodulator, FSK demodulator using IC 565.
- 5. Data converters and Linear ICs** **10**
 Basic concepts of ADC and DAC, specifications,
 Digital to analog converter: DAC by using R- 2 R ladder,
 Analog to digital converters: Successive approximation and dual slope technique for ADC,
 Study of IC's (Features and applications)
1. ADC (IC 0809)
 2. DAC (IC 0808/1408)
 3. Audio amplifier (LM 386)
 4. Function Generator (IC 8038)

Reference Books:

1. Linear Integrated Circuit – D Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)
2. Op-Amps and Linear Integrated Circuits – Ramakant Gaikwad (PHI)
3. Integrated Circuit (New Edition) – K. R. Botkar
4. Operational Amplifiers and Linear ICs – Caughlin and Driscoll (PHI)
5. Design with Operational Amplifiers and Analog ICs – Franco (Mc-Graw Hill, 2000)
6. Integrated Electronics – Millman and Halkies (MGH)
7. Basic VLSI Design- D. A. Pucknell and K. Eshraghian (PHI)

Solapur University, Solapur
B.Sc. III Electronics
Semester-V
Paper-X
Fundamentals of Communication

Total Marks 50

- 1. Introduction to Communication System** **04**
 Introduction, Need, importance, Elements of electronic communication system, Types of communication system, (simplex, duplex, analog signals, digital signals), Noise in communication (S/N ratio and noise figure).
- 2. Modulation and Demodulation techniques** **12**
 Need, Types of modulation-Analog and digital modulation.
Analog: Amplitude modulation: Principle, mathematical expression, modulation index, Power distribution, frequency spectrum, Concept of DSB, SSB, VSB.
 Frequency modulation: Principle, mathematical expression, modulation index, frequency spectrum, side bands.
 Demodulation of AM and FM (envelop detector & ratio detector).
Digital: Introduction to PAM, PWM, PPM, ASK, FSK and PCM
 FDM & TDM
- 3. Antenna and Radio Wave Propagation** **08**
 Principle of antenna, Concept of radiation pattern, Antenna parameters, Evaluation of ($\lambda/2$) antenna (without mathematical treatment).
 Types of antenna: Yagi and Parabolic antennas (radiation pattern, frequency range, applications).
Radio Wave propagation: Principle, types of radio wave propagation: Ground waves, Space waves, Sky waves, Concept of skip distance and Virtual height.
- 4. Radio receiver and Television** **12**
Radio receiver: Characteristics of receiver, Superheterodyne principle, Block diagram of AM, FM receivers
Television: Basic concept of television transmission and reception, TV interlace scanning, Picture qualities (aspect ratio, viewing distance, brightness, contrast, colour level, hue, saturation), Band requirement, VSB, Composite video signal.
- 5. Telephone System** **06**
 Principle, telephone handset, subscriber local loop, Need of telephone exchange, Electronic telephone exchange, Different tones in telephone, DTMF dialer.

Reference books:

1. Principle of Communication Engineering by AnokhSingh, S.chand and company.
2. Communication electronics: Principles and applications by Frenzl, third edition, TMH.
3. Radio engineering(Applied electronics Vol.-II): by G.K.Mitthal, khanna publication.
4. A text book of communication principles (SYBSC computer science) Electronics, Paper-II, Semester-II by S.R.Choudhari, Isar sheikh, P.B.Buchade, M.L.Dongare(Pune university),Niraliprakashan.
5. Consumer Electronics by Bali

Solapur University, Solapur
B.Sc. III Electronics
Semester-V
Paper-XI
Microcontroller and Interfacing

Unit -1 : Programming of On-Chip Resources of the 89V51 μ C (16)

(Assembly Language Only)

- A) **Programming of the I/O Port:** Programming of the IO Ports of 89V51 μ C, I/O bit manipulation, Reading and Writing parallel ports, square wave generation.
- B) **Programming of the Timers:** - Programming of Timers of 89V51 μ C, timer SFRs, use of GATE input, timer modes, generating time delays, configuration of the timers in timer mode and counter mode.
- C) **Programming of the Serial Port:** - Basics of serial communication, Need of line driver RS232, configuration of SFRs, programming modes, serial data transmission, serial data reception.
- D) **Programming of the Interrupt:** Interrupts of μ C 89V51, Interrupt structure, programming Interrupts, programming external hardware interrupts,

Unit 2: Study of Interfacing techniques: (04)

Need of Interfacing, Interfacing Techniques, Memory Mapped I/O Mode and I/O Mapped I/O Mode. Address decoding.

Unit 3 Study of Interfacing Devices : (09)

Study of Memories chips, EPROM (27XX) and RAM (62XX)
 Study of programmable IO port PPI 8255,
 Study of ADC (0804/0809), DAC (0808),

Unit 4: Interfacing of devices to the μ C 89V51 (09)

Interfacing of the devices : Switches and Relays, LEDs, Transistor, Opto-coupler, Seven Segment Display, Interfacing of 16 X 2 LCD, Interfacing 4 X 4 matrix keyboard. ADC 0804/0809 and DAC 0808, stepper motor control using ULN2003

Unit 5: Expansion of IO and Memory: (04)

Meaning and Need of IO and memory expansion. Interfacing EPROM (2764), and RAM (6264) to 89V51 microcontroller, Interfacing of PPI 8255 for IO expansion.

Recommended Books:

1. The 8051 Microcontroller – Architecture, Programming and Applications 2nd Edition - Kenneth J. Ayala (Penram International)
2. The 8051 Microcontroller and Embedded Systems – Using Assembly and C By Mohammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay 2nd Edition, Pearson Education (Prentice Hall)
3. Microcontroller –Theory and Applications by A. V. Deshmukh (TMH, NewDelhi)

Solapur University, Solapur
B.Sc. III Electronics
Semester -V
Paper-XII
Power Electronics

Total Marks 50

- | | | |
|---|--|-----------|
| 1. Power Diode and Power Transistors | | 6 |
| | Power diode (construction, switching characteristics and ratings), Effect of reverse and forward recovery time. Power transistors: BJT, MOSFET (construction, switching characteristics and ratings), IGBT and SIT (construction and ratings) | |
| 2. Thyristors | | 12 |
| | SCR, construction, working, characteristics and ratings, Triggering circuits: SCR Turn ON methods (R, RC and UJT), Turn OFF methods (Natural and forced), Commutation methods (Class A, Class B, Class C and Class D), Protection circuits, dv/dt and di/dt calculations, Series and Parallel connections of SCR.
Diac, Triac, PUT and GTO (construction, working and characteristics), Thermal considerations and heat sink for power devices. | |
| 3. Controlled Rectifier | | 8 |
| | Phase control, Single phase half wave rectifier with resistive and inductive load, Effect of free-wheeling diode, Single phase full wave rectifier with resistive load.
Three phase full wave rectifier with resistive load (without mathematical treatment). | |
| 4. Invertors | | 6 |
| | Classification of invertors, Transistor inverter, Principle and working of series and parallel invertors using SCR, Mc-Murray Bedford inverter (without mathematical treatment) | |
| 5. Choppers | | 4 |
| | Basic chopper circuit, Step down and step up chopper using SCR, Jones chopper. | |
| 6. Applications | | 6 |
| | Triac as static switch, ac and dc motor control circuits.
Uninterrupted power supply, Switched mode power supply, Servo AC voltage stabilizers (principle, block diagram, working and applications) | |

Reference Books

1. Power Electronics-M.H.Rashid (PHI)
2. Power Electronics-Dr.P.S.Bimbira, (Khanna Publication)
3. Power Electronics-P.C.Sen (TMH)
4. Thyristor Engineering-M.S.Berde (Khanna Publication)
5. Power Electronics Principles and Applications-S.Biswas.(DhanapatRai Publication)
6. Industrial and Power Electronics-Harish Rai(Umesh Publication)
7. Industrial Electronics and Control-S.K. Bhattacharya (TTTI)
8. Power Electronics –K.HariBabu (Scitech Publications)
9. Power Electronics- Alok Jain

Solapur University, Solapur
B.Sc. III Electronics
Semester -VI
Paper-XIII
Sensors and Instrumentation

Total Marks 50

- 1. Sensors and Transducers** **14**
 Electrical transducers and their parameters, Selection criterion, Classification of transducers
 Thermal sensors: Thermistor, Thermocouple, RTD, semiconductor sensor (LM35)
 Pressure sensors: Capacitive, Strain gauge (bounded and unbounded), Load cell, Piezoelectric sensor
 Displacement sensors: Linear (resistive), Angular (capacitive), LVDT.
 Radiation sensors: LDR, Photodiode, Phototransistor, Photovoltaic cell (Solar cell)
 Magnetic sensor: Hall effect sensor
 (Construction, operation and applications)
- 2. Actuators and Display systems** **4**
 Solid state relay, Solenoid, multiplexed LED display, LCD display, XT recorder.
- 3. Signal Conditioning** **8**
 Block diagram of dc and ac signal conditioning techniques, differential amplifier using FET input op-amp, Bridge amplifier, Instrumentation amplifier.
 Compensating techniques, Grounding, Shielding and Isolation techniques
 Generalized system design with signal conditioning circuits for calibration of sensor (output voltage 0 to 2V) for LDR, RTD and Load cell transducers
- 4. Basics of Measurements** **6**
 Performance Characteristics, static characteristics, dynamic characteristics and response, Errors in measurement, Types of Error, sources of error
 Standards in measurements
- 5. Test and Measuring Instruments** **10**
 Digital multimeter (DMM), Function generator, Analog CRO, Digital Storage Oscilloscope, pH meter, ECG, Digital Tachometer (Block diagram and working)

Reference Books

1. Electronic Instrumentation by K.S.Kalsi, TMH Publication.
2. Electronic Measurements by U.A.Bakshi and V.U.Bakshi, Technical Publication.
3. Hand book of Medical Instrumentation by R.S.Khandpur, TMH Publication.
4. Hand book of Analytical Instrumentation by R.S.Khandpur, TMH Publication.
5. Transducers and Display Systems by B.S.Sonde
6. Instruments and Instrumentation Technology by M.M.S.Anand (PHI)
7. Instrumentation Measurement and Analysis by Nakara Choudhary (TMH)
8. Transducers and Interfacing by Sheingold

Solapur University, Solapur
B.Sc. III Electronics
Semester -VI
Paper-XIV
Advanced Communication

Total Marks 50

- | | | |
|---|--|-----------|
| 1. Fiber Optic Communication | | 08 |
| | Need of light wave communication, working principle of fiber optic cable, Definition and terminologies: bit rate, baud rate, bandwidth, channel capacity, power calculation Block diagram of Optical Fiber Communication System, Fiber optic cables, types, Splicer and Connectors. Sources and Detectors; Transmitter and receivers, Applications | |
| 2. Satellite Communication | | 06 |
| | Satellite Orbits, Satellite Communication System, Earth Station, Transponders, Application of Satellite communication system (TV distribution, surveillance and satellite phones) | |
| 3. Mobile Communication | | 08 |
| | Concept, basic cellular system and its operational procedure, Block diagram Transmitter, receiver, Frequency synthesizer, logic unit, control unit. | |
| 4. Microwave and RADAR Communication | | 10 |
| | Basics of microwave communication, advantages, Transmission lines, Waveguides and cavity resonators.
Microwave semiconductor devices (Gunn diode, MESFET), microwave tubes (Klystron).
RADAR: Concept of radar, Pulsed Radar System. | |
| 5. Computer Communication | | 10 |
| | Digital Data Communications Concepts, Modems: Block diagrams of QPSK and QAM Protocols.
Computer Networks: LAN, MAN, WAN. Network Topologies (Star, Ring, Bus)
Concept of Internet. Applications of internet (e-mail, e-business, e-teaching and learning). | |

Reference Books

1. Communication Electronics – Frenzel (TMGH)
2. Analog and Digital Communication Systems – Martin S. Roden
3. Digital and Data Communications – Martin (PHI)
4. Hand Book of Electronic Communications – Miller
5. Optical Fiber Communication - Senior
6. Mobile Communication – Shiller

Solapur University, Solapur
B.Sc.-III (Electronics)
Semester -VI
Paper No.: -XV Embedded System Design

Unit -1 Fundamentals of Embedded Systems (09)

- a. **Fundamentals of Embedded Systems** :Definition of an embedded system, Basic architecture of embedded system, characteristics of embedded systems, classification of embedded system, general applications of embedded system
- b. **Embedded System design: Hardware**
Minimum hardware requirement for embedded system, Microcontroller 89V51, Clock circuit, Reset circuit, In-System Programming (ISP)
- c. **Embedded System design: Software**
Need of embedded software, Need of operating system, Structure of embedded C program, Concept of Superloop.

Unit-2: - Fundamentals of C programming (12)

- a. Introduction to C programming, structure of C program, character set, keywords and identifiers, constants and variables, data types and data ranges, expressions and operators. Study of IO statements.
- b. **Branching and Looping: -**
 - i) Control statements – IF, IF-ELSE, GOTO, BREAK, and CONTINUE
 - ii) Loop: - FOR, WHILE, DO-WHILE
- c. **Array: -** definition, one-dimensional and two-dimensional arrays.
- d. **User defined Functions:** Definition, Global declaration, Call by value, Call by reference, library functions.

Unit-3: Embedded-C Programming for 89V51 Microcontroller (12)

- A) Embedded C programming for Time delay generation, I/O port programming, arithmetic and logical operations and data conversion programs.
- B) **Programming of the Timer** : Time delay program using timer, square wave generation, PWM based DC motor control, frequency measurement using counter.
- C) **Programming Serial Port C:** Serial data transfer from Microcontroller to PC and vice-versa.
- D) **Brief study of Kiel MicroVision4** : Steps involved in Programming with Kiel MicroVision4. Simulation.
- E) **Programming tools** : The flash magic as a programming tool, Steps involved in programming of the microcontroller.

Ch.4: - Designing of an Embedded System (09)

- A) Designing of microcontroller based embedded system for Measurement of Temperature.
- B) Designing microcontroller based embedded systems for Measurement Humidity.
- C) Designing microcontroller based embedded systems to generate variable frequency and variable amplitude square, triangular and sawtooth waveforms using DAC interface to μC 8051.
(Flowchart of the necessary embedded software is expected only)

Reference Books: -

1. Embedded C - Michael J Pont
2. The 8051 Microcontroller and Embedded Systems – Using Assembly and C- Mohammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay 2nd Edition, Pearson Education (Prentice Hall)
3. Let us C by Yeshwant Kanetkar
Programming with ANSI - Balguruswamy

Solapur University, Solapur
B.Sc. III Electronics
Semester-VI
Paper-XVI
Advanced Electronics Technology

Total Marks 50

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|-----------|---|-----------|
| 1. | Introduction to Nanoelectronics | 06 |
| | Importance of nanoelectronics, Top down approach, Bottom up approach, Energy bands in semiconductors, Semiconductor heterostructures (lattice-matched and pseudomorphic heterostructures).
Organic semiconductors, carbon nanomaterials, nanotubes and fullerenes. | |
| 2. | Nanostructured Devices | 08 |
| | Resonant-tunneling diodes, Field effect transistors, Single electron transfer devices, Potential effect transistors, Light emitting diodes and lasers, Nanoelectromechanical system devices, Flash Memory. | |
| 3. | VLSI Devices | 11 |
| | Introduction to reconfigurable logic, Concepts of PLD, SPLD, PAL, CPLD, FPGA | |
| 4. | VHDL Programming | 09 |
| | Introduction, Structure of VHDL program, Features and Capabilities, entity, architecture and levels of abstraction using case study of logic gates and RS Flip-Flop. Modeling of combinational logic circuits with example of multiplexer.
Sequential logic design with example of shift register. | |
| 5. | Virtual Instrumentation | 08 |
| | Introduction: Graphical System Design (GSD) model, Embedded system design flow, Virtual Instrumentation.
LabVIEW: Introduction, advantages, Software environment (front panel & block diagram windows), palettes (tools, control & function) Data types & data flow diagram, | |

Recommended Books:

1. Introduction to Nanoelectronics Science , nanotechnology , Engineering and Applications by Vladimir V. Mitin , Viatcheslav A. Kochelap , Michael A. Strosio, Cambridge University Press 2008
2. Fundamentals of nanoelectronics by George W. Hanson LPE, Pearson Education
3. Solid State Electronic Devices by Ben G. Streetman, Sanjaykumar Banerjee, 6th Edition
4. Semiconductor devices by S.M. Sze
5. VLSI design by G. C. Patil
6. VHDL Design by Bhaskar
7. Fundamental of digital logic with VHDL by Stephen Brown, Zvonko Vranesic
Tata McGraw hill
8. Virtual Instrumentation using LabView by Jovitha Jerome (PHI)
9. Lab VIEW for every one - Graphical programming made easy and fun by Jeffrey Travis

B.Sc. III Practicals**List of Experiments****Group A**

1. Op. amp band pass filter
2. Function Generator (IC 8038)
3. Audio Amplifier (LM386)
4. Characteristics of PLL / Application of PLL (Frequency Multiplication)
5. Regulated Power Supply using IC LM317/337
6. Study of ADC 0808
7. Study of DAC 0808
8. Instrumentation Amplifier (LM324/TL084)
9. Study of LVDT
10. Study of strain gauge (load cell) using bridge amplifier
11. Study of optical sensor
12. On-off temperature controller

Group B

1. Study of amplitude modulation and demodulation
2. Study of frequency modulation
3. Study of FSK modulation
4. Tuned RF amplifier
5. Tuned IF amplifier
6. Super heterodyne receiver (mixer stage)
7. Study of composite video signal using pattern generator/ IC 7611
8. Data communication using OFC
9. Study of PWM
10. Study of PPM
11. Internet - I
12. Internet-II

Group C

1. Square wave generation using timer
2. Serial port programming (PC interface)
3. Interfacing of thumb wheel switch and seven segment display with μ C 8051
4. Interfacing of 16 \times 2 LCD display
5. Interfacing of ADC
6. Interfacing of DAC
7. Interfacing of stepper motor with μ C 8051
8. Ascending and descending order using C.
9. Speed control of DC motor (PWM) using embedded-C
10. Embedded – C program for running LED
11. Embedded system using μ C for temperature
12. Design of object counter by using μ 89V51RD2

Group D

1. SCR firing by UJT
2. Full Wave Controlled Rectifier
3. Light Dimmer using Triac
4. SMPS
5. AC motor control using SCR
6. Inverter using MOSFET
7. VHDL program for Logic gates
8. VHDL program for RS Flip-flop
9. Design of CE amplifier by using simulation IDE.
10. Design of Astable multi vibrator by using simulation IDE.
11. Design of LC Oscillator by using simulation IDE.
12. Design of Inverting & Noninverting ampl. by using simulation IDE.

Minimum eight experiments from each group should be performed by the students.