Solapur University, Solapur
B.Sc. III (Sem-V&VI)-Electronics
(CGPA Pattern)
To be implemented from Academic Year 2016-17

1. Course Structure:

Sr. No	Semester	Paper No.	Title of Paper	No. of Lectures	UA	CA	Total Marks
1	Semester V	VII	Linear Integrated Circuits and Applications	45	70	30	100
2		VIII	Fundamentals of Communication	45	70	30	100
3		IX	Fundamentals of Microcontroller	45	70	30	100
4		X	Sensors and Instrumentation	45	70	30	100
5	Semester VI	XI	Power Electronics	45	70	30	100
6		XII	Advanced Communication	45	70	30	100
7		XIII	Embedded System Design	45	70	30	100
8		XIV	Measurement Instrumentation and Control System	45	70	30	100
9	Sem-V&VI		Practical Course	(20 Periods per batch per week)	280	120	400

2. Nature of theory question paper
The nature of theory question paper is attached according to the general structure as per CGPA Pattern.
Q. 1 Multiple choice questions (one mark each) : 14
Q. 2 Short answer question (Any Seven, from nine : 14
Q. 3 A Short answer question (Any two, from three): 10
    3. B Short answer question (one compulsory): 04
Q. 4 Short answer question (Any two, from three) :14
Q. 5 Answer question (Any two, from three):14

2. Distribution of Practical Marks (400)
UA:280
1. Practical from group A 50
2. Practical from group B 50
3. Practical from group C 50
4. Practical from group D 50
5. Project Work 60 (Project-30 marks, Report- 20 marks, Oral-10 marks)
6. Seminar 10

7. Industrial visit/ Industrial Case Study /Job training/ Visit to industrial exhibition /Conference/ Workshop 10

CA:120

1. Journal 30 (Certification-20 marks, regularity-10 marks)
2. Circuit diagram test 30 (Test 1-15, Test 2-15)
3. Practical test 60 (Test 1-30, Test 2-30)

Practical Marks may be as given below.
➢ Circuit diagram/Flow Charts 08
➢ Connection /Programming 08
➢ Understanding and Working 08
➢ Observations/ Execution 12
➢ Calculations, graph / printout 04
➢ Result / comment 04
➢ Oral 06

2Project: 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. onany 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-VII
Linear Integrated Circuits and Applications

(45 Periods)

1. Fabrication of IC's   **9**
Advantages of IC's, Epitaxial process, Fabrication of monolithic components: npn and pnp
transistors, diodes, resistors and capacitors.

2.Non linear Application of Op- amp   **8**
Precision full wave rectifier, Active peak detector, Sample and hold circuit, Clipper and Clamper,
Log and Antilog Amplifier.

3.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) andtheir comparison, Second order Butterworth Low
pass and High pass filters, Band pass, Band stop filters (narrow and wide).

4. Regulated Power Supply   **8**
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.

5. Phase Locked Loop   **12**
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.
V to F converter and F to V converter (LM 331)

Reference Books:
1. Linear Integrated Circuit – D Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)
2. Op-Amps and Linear Integrated Circuits – RamakantGaikwad (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)

(45 Periods)

1. Introduction to Communication System   06
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, PCM] ASK, FSK ,FDM & TDM

3. Antenna and Radio Wave Propagation   09
Principle of antenna, Concept of radiation pattern, Antenna parameters,Evaluation of (λ/2) antenna (without mathematical treatment).
Types of antenna:Yagi andParabolicantennas (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: Concept and block diagram of Black and White television transmission and reception, TV interlace scanning, Picture qualities(aspect ratio, viewing distance, brightness, contrast, hue, saturation), Band requirement, VSB, Composite video signal, Introduction to Colour TV.

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

(45 Periods)
1) Architecture of microcontroller   (14)
Overview and features of MCS Family, comparison of microprocessor and microcontroller,
Salient features and block diagram of 8051, Pin description, internal memory, Registers and
SFRs, Port structure, Timer/counter, serial port, Interrupts, Clock and Reset circuit.

2) Instruction set of 8051   (12)
Addressing modes, Instruction set, execution of instruction,
Classification of instruction - Data transfer, Arithmetic, Logical, Boolean Program
Branching.

3) Assembly language programming with 8051   (8)
Algorithm, flow chart, format of Assembly Language programming.
Arithmetic, Logical, Boolean operations programs.
Branching, looping, concept of subroutine, time delay subroutine .

4) Assembly Language Programming (I/O and Timers)   (7)
 Programming of I/O Ports,   Bit manipulation, square wave generation
Programming with Timer, Modes of timer, generation of time delay, configuration of the
timer as timer mode and counter mode.
Basics of serial communication, programming for serial data transmission and reception.
5) Memory and IO Expansion   (4)
Need of memory and I/O expansion. Interfacing EPROM (2764) and RAM (6264) to
Microcontroller.

REFERENCE BOOKS
1The 8051 microcontroller and Embedded system M.M. Mazidi, J.C. Mazidi, R.D. Mckinlay
2.The 8051 microcontroller Architecture, programming and application by Kenneth J. Ayala
3.Microcontroller by Ajay Deshmukh

Solapur University, Solapur
B.Sc. III Electronics
Semester -V
Paper-X
Sensors and Instrumentation

(45 Periods)

1 Basics of Measurements   **06**
Block diagram of measurement system Performance Characteristics, static characteristics, dynamic characteristics and response, Errors in measurement,Types of Error, sources of error Standards in measurements**.**

2 Sensors and Transducers   **14**
Basic sensors: Need of sensors, Definition, Types of sensors, Classification, Principle, Specification and performance parameters, Selection criterion,

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
Chemical Sensor: gas sensor
(Principle, Construction, operation and applications)

3 Actuators and Recorders   **06**
Electromagnetic relay, Solenoid, stepper motor, LCD display, LED display,
(Principle, Construction, specification and applications)
X-T and X-Y Recorder

4. Signal Conditioning   **10**
Block diagram of dc and ac signal conditioning techniques, Bridge amplifier, Instrumentation amplifier, chopped and modulated amplifier, lock-in amplifier
Compensating techniques, Grounding, Shielding and Isolation techniques.
Case study of analog weighing scale.

5. Data Acquisition system: Introduction, signal conditioning of inputs, single channel DAS, Multi-channel DAS, Data loggers.   **09**

Reference Books
1. Electronic Instrumentation byK.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 NakaraChoudhary(TMH)
8. Transducers and Interfacing by Sheingold

(45 Periods)

1. Power Devices   **08**
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**
Introduction to SCR, 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, concept of dv/dt and di/dt
Series and Parallel connections of SCR.
PUT and GTO (construction, working and characteristics), Thermal considerations and heat sink
for power devices.

3. Controlled Rectifier   **09**
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 and Choppers   **10**
Classification of inverters, Transistor inverter, Principle and working of series and parallel
invertors using SCR, Mc-Murray Bedford inverter (without mathematical treatment)
Basic chopper circuit, Step down and step up chopper using SCR, Jones chopper.

5. Applications of Power devices   **06**
Principle of ac and dc motor and its control circuits.
Uninterrupted power supply, Switched mode power supply

Reference Books
1. Power Electronics-M.H.Rashid (PHI)
2. Power Electronics-Dr.P.S.Bimbra, (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)

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

(45 Periods)

1. Fiber Optic Communication 09
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 08
Satellite Orbits, Satellite Communication System, Earth Station, Transponders,
Application ofSatellite 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 ofQPSK and QAM
Protocols.
Computer Networks: LAN, MAN, WAN. Network Topologies (Star, Ring, Bus)
Concept of Internet, Bluetooth and Wi-Fi.
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-XIII
Embedded System Design

(45 Periods)

1. Fundamentals of Embedded Systems design **(8)**
Definition of an embedded system, Basic architecture of embedded system, characteristics of embedded systems.
Salient features and block diagram of Microcontroller 89V51, Minimum system development with 89V51 , In-System Programming (ISP),

3. Embedded C Programming
a. Introduction to C programming **(12)**
Structure of C program, character set, keywords and
identifiers, constants and variables, data types and data ranges, expressions and operators. Study of IO statements, Steps involved in C programing
   b. Structure of Embedded C
Structure of embedded C program, Need of OS, Concept of Super loop.
   c. Time delay program using timer, square wave generation, I/O port programming,
   d. Serial Port Programming in C

3. Interfacing of devices and Programming **(14)**

Need of Interfacing, Interfacing Techniques,
Interfacing and programming for – Switches, Relays, LEDs, Transistor, Opto-coupler, Seven Segment Display, 16 X 2 LCD, ADC 0804/0809 and DAC 0808.

4. Development tools for Embedded System **(06)**
Introduction to Kiel Microvision, Steps involved in Programming with Kiel MicroVision simulation. Introduction to Flash magic, Steps involved in programming of the microcontroller.
5. Designing of an Embedded System **(05)**
Designing of microcontroller based embedded system for Measurement of Temperature and DC motor control using PWM
(Flowchart of the necessary embedded software is expected only)

Reference Books: -
1. Embedded C - Michael J Point
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 Microcontroller By Ajay Deshmukh
4 Let us C by Yashwant Kanetkar
5Programming with ANSII- C by Balguruswami

Measurement Instrumentation and Control System

(45 Periods)

1.Test and Measuring Instruments   **10**
Digital multimeter (DMM), Function generator, Analog CRO, Digital Storage
Oscilloscope, , Digital Tachometer, PH Meter, Conductivity meter, LCR Q Meter
(Principle, Block diagram and working)

10

2. Biomedical Instrumentation:
Introduction, origin of bioelectric signals, Resting and action potential,
Functional block diagram and working of medical equipments: ECG, EEG, EMG, heart beat
monitor, Ultrasonic imaging system, pulse oximeter.

10

4. Control Systems : Basic control action, automatic control system, open loop and closed
   loop control system, advantages and disadvantages, characteristics of control system.
   ON-OFF control, PI, PD, PID Control (Block diagram)

06

5. Case study: study of servo-motor control, Temperature control and robotic arm control.

09

5. PLC : Introduction to Digital Controllers, Introduction to Programmable Logic Controller
(PLC), salient features, architecture, operation. Concept of ladder programming.

1. Electronic Instrumentation byK.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 NakaraChoudhary(TMH)
8. Transducers and Interfacing by Sheingold

B.Sc. III Practicals

List of Experiments

Group A
1. Op. amp band pass / band stop filter
2. Application of PLL (Frequency Multiplication)
3 Regulated Power Supply using IC LM317/337)
4. Log amplifier
5. F to V converter / V to F converter (LM331)

6. SCR firing by UJT
7 Full Wave Controlled Rectifier
8. Light Dimmer using Triac
9. AC motor control using SCR
10 SMPS / Study of Chopper ckts (Step- Up)

Group B
1. Tuned RF / IF amplifier
2. Study of amplitude modulation and demodulation
3. Study of FSK modulation
4. Study of PWM/ PPM
5. Data communication using OFC
6. Internet
7. Frequency Modulation
8. Time Division Multiplexing /DTMF decoder
9. Study of Mixer
10 Study of AGC ckts

Group C
1) Data transfer operations using microcontroller
2) Arithmetic operations using microcontroller
3) Logical operations using microcontroller
4) Thumb Wheel and seven segment display using microcontroller
5) Interfacing of stepper motor with μC microcontroller
6) Square wave generator with Timer Using embedded C
7) Interfacing of ADC/ DAC Using embedded C
8) Interfacing of 16×2 LCD display Using embedded C
9) Serial communication with PC Using embedded C
10) DC motor control with PWM Using embedded C

Group D

1. Programmable gain amplifier (AD 620/AD 595)
2. Instrumentation Amplifier (LM324/TL084)
3. Study of strain gauge (load cell)
4. Light activated turn ON/OFF ckts
5. On-off temperature controller
6 Study of LVDT
7. Study of offset voltage compensation circuit
8. Function Generator (IC 8038)
9. Study of low pass/high pass filter using simulation IDE
10. Study of op.amp. inverting amplifier using simulation IDE

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