Title of Theory papers

Ele(P-V): Linear Integrated circuit and MATLAB

Ele(P-VI): Communication Systems

Ele(P-VII): Advanced Microcontrollers and Embedded C

Ele(P-VIII): Instrumentation and Power Electronics

SHIVAJI UNIVERSITY, KOLHAPUR

B.Sc. (Part III) Electronics

Syllabus (June 2010)

ELE(P-V): Linear Integrated Circuit

(Section – I)

UNIT 1. Fabrication of Linear ICs And Amplifier : [12]

Integrated-Circuit Technology,

Basic Monolithic Integrated Circuits,

Formation of monolithic Transistors, Diodes, Resistors and Capacitors.

LM 331 : V to F converter and F to V converter

LM 311 : Comparator IC

Transistor dc amplifier

Differential amplifier, Emitter coupled differential amplifier, Operations,

characteristics and parameters (Input Impedance, Output Impedance,

Common Mode and Differential Mode Gain, (CMRR),

AC and DC analysis for dual inputs and single ended output

FET differential amplifier, Constant Current Bias and Current Mirror Bias,

Cascaded differential amplifier stages

UNIT 2. Operational Amplifier: [12]

Introduction to Op-Amp, Block diagram of typical Op-Amp,
Offset error voltages and currents, Offset balancing techniques,
Effect of temperature on offset voltages, currents and CMRR, Slew Rate,
Frequency response of Op-Amp.
Study of IC 741 and Comparative study of ICs LM324,LM308, LF 356

UNIT 3. Op-Amp as Analog system Building Blocks: [10]

Inverting and Non-inverting amplifier, Summing amplifier (Adder and Subtractor), voltage-to-current and current-to-voltage amplifier,
DC Voltage Follower, Differential dc amplifier, Bridge amplifier, Stable ac-coupled and ac Voltage Follower, Differentiator and Integrator, Log and Antilog amplifiers

UNIT 4. Active Filters: [8]

Advantages of active filters over passive filters, Study and Design of Low pass, High pass, Band pass, Band stop and all pass filters (up to 2nd order) Butter worth, Chebyschev filters (only low pass types), Elliptic filters

(Section – II)

UNIT 5. Non linear Analog Systems: [10]

Comparators, Sample and Hold circuit, Precision AC/DC converters,
Waveform generators: Square wave generator, Pulse generator, Triangle wave generator, Regenerative Comparator (Schmitt Trigger),
Sine-wave oscillators: Phase-Shift and Wein bridge oscillators,
Precision Rectifier, Peak Detector, Clipping and Clamping circuits

UNIT 6. Phase Locked-Loops (PLL) and power supply : [12]

Theory of VCO, Loop filters, Block diagram of PLL, Calculation of
Capture range, Lock range, Frequency Multiplication, FSK and FM demodulation,

Frequency Synthesizer, Use of IC 565

Frequency Generator (Study of IC 8038)

Study and Applications of ICs:

Applications of 555 Timer: Variable Duty Cycle (10 % to 90 %),

Sequential Timer, Ramp generator,

Regulators using ICs 78 XX, 79XX, LM317,723,

UNIT 7. Introduction to MATLAB

Introduction to MATLAB, Data types,Matrix, Arrays, Functions and files, commands

UNIT 8. Programming techniques & plotting

Programming design and development, relational operators & logical operators and functions. Matrix manipulation, Conditional statements, loops, the switch structure, Debugging MATLAB programming. XY-plotting functions, subplots & overlay plots, special plots types, interactive plotting, function discovery, regression, 3D plots.

Reference Books:

1 Integrated Electronics - Millman-Halkias (MGH)

2 Op-Amps and Linear circuits - Ramakant Gaikwad (PHI)

3 Operational Amplifiers and Linear ICs - Caughlin and Driscoll (PHI)

4 Operational Amplifier with Linear Integrated Circuit – W. D. Stanley

(CBS Publications)

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5 Linear Integrated circuit - D Roy Choudhari, Shail Jain, (Wiley Eastern Ltd)

6 Micro electronics Circuits - Rashid (PWS publication)

7 Integrated circuit (New Edition) – K.R.Botkar

8 Linear ICs - Data Book

9 Op-Amp - G. B. Clayton, Butterworth Publication

10 Design with Operational Amplifiers and Analog ICs - Franco (Mc Graw Hill,

2000)

11. Getting started with MATLAB 7- Rudra Pratap Singh, Oxford publication

Electronics P – VI (Communication Systems)

(Section -I)

Unit - 1 Fundamentals of Communication Systems [5]

Introduction, need and importance of communication, Generalized block diagram of communication system, Role of each block (information source, transmitter, channel, receiver destination).
Types of communication systems – Simplex and Duplex,
Analog and Digital systems. Applications of electronic communications,
Electromagnetic spectrum used in communication and various frequency bands.
Noise in communication and types of noise (External and internal).
Noise voltage, S/N ratio.

Unit -2 Modulation and Demodulation [15]

Need and types of modulations.
Analog Modulation
Amplitude Modulation : Principle, Mathematical Expression,
Modulation Index and percentage of modulation, Side bands and frequency spectrum, Power distribution, DSB and SSB generation
AM Transmitter, Vestigial Side Band (VSB) concepts.
Frequency Modulation
Principle, Side bands and Modulation index.
Merits and Demerits of AM & FM. FM Transmitter.
Demodulation
Amplitude Demodulator (Diode Detector),
Frequency Demodulator: Foster –Seeley Discriminator.
Digital Modulation: Concept of ASK, FSK, PCM and PWM
Concept of FDM and TDM

Unit - 3 Antenna and Radio wave Propagation [6]

Antenna parameters, Types of antennas – Half wave dipole,
Yagi- Uda and dish antenna and their applications.
Radio wave propagation – Ground wave propagation, Sky wave propagation and Space wave propagation. Ionosphere, importance features and

effects of ionosphere on radio waves. Concept of Skip-distance.

Unit - 4 Radio Receivers and Television
[14]

AM Superhet Receiver : Block diagram and explanation of each block, Selection of IF, Receiver Characteristics.
FM Receiver : Block diagram and explanation.
Television
Scanning Process, scanning frequency, Interlaced scanning.
Image Orthicon Camera tube.
Picture formation, Picture tube and
Picture qualities (brightness, aspect ratio, viewing distance, colour level and hue).
TV Broadcasting Systems
B/W TV transmitter, Composite video signal, Channel bandwidth, VSB transmission.
TV Receivers : B/W and Colour TV receiver : Block diagram and explanation of each block.
Colour Picture Tube (Trinitron).

(Section – II)

Unit - 5 Telephone Communication System
[12]

Principle, Telephone instrument, Subscriber's or Local loop.
Different tones in telephone. Pulse and DTMF dialing ,
Need of Exchange. Electronic Exchange, EPBAX,
Concept of various value added services :
(call transfer, call queuing, conference call, priority call).

Unit -6 Modern Communication Systems [12]

FAX, Mobile Communication and Block Schematics,
Cellular phones, picture phone, video conferencing, Concept of ISDN.
Optical Fibre Communication
Block diagram of Optical Fibre Communication System,
Source and Detector. OFC cables. Transmitter and receivers,
Splicer and Connectors, Fibre Optic Data Communication.

Unit-7 Satellite Communication
[6]

Satellite Orbits, Satellite Communication System,
Earth Station. Transponders and applications of
Satellite Communication system in TV distribution and satellite phones.

Unit - 8 Computer Communication [10]

Digital (Data) Communication Concepts,
Block diagram of Digital Communication system.
Modem: block diagram and explanation
Computer Networks – LAN, MAN, WAN.
Network Topologies. Concept of Internet.
Applications of internet – e-mail, e-business,
e-teaching, e-learning and in TV transmission.

Reference Books

1. **Electronic Communications – Roddy and Colin, PHI**
2. **Communication Electronics – Frenzel (TMGH)**
3. **Principles of Communications – (New Editions)- Anokh Singh**
4. **Electronics and Communication Engineering – Gupta and Soni**
5. **Communication – Sanjeev Gupta**
6. **Analog and Digital Communication Systems – Martin S. Roden**
7. **Digital and Data Communications – Martin (PHI)**
8. **Hand Book of Electronic Communications – Miller**
9. **Monochrome and Colour TV – Gulati**
10. **Television – Dhake (TMH)**
11. **Antenna and Wave propagation - K.D. Prasad**
12. **Optical Fiber - Geigal**
13. **Mobile Communication – Shiller**
14. **Communication Systems –NIIT PHI**

Electronics (P-VII): Advanced Microcontrollers and Embedded C

(Section - I)

UNIT 1 Introduction: [10]

Requirement of Microcontrollers, Comparison of Microprocessor and Microcontroller, Feature of modern microcontrollers: WDT (COP), Brownout detector, ISP, I2C bus, SPI bus, Analog I/O Port, PWM, Low voltage devices.

Survey of 4-Bit, 8-Bit, 16-Bit And 32-Bit Microcontrollers and their application areas, Various 8-Bit Microcontrollers and their Comparison, Study of 8051 and its Family (89C51, DS5000, 8031, 8032, 8052, 8751, Phillips RD2, 89C51VRD2)

UNIT 2. Architecture and Instruction Set of 8051: [10]

Block Diagram of 8051 and Study of Internal Blocks, Reset and Clock, Registers, Flags and Internal Memory, SFR, I/O Ports. Study of 8051 Instruction Set and Addressing Modes, Moving the Data (Internal and External), Arithmetic Instructions, Logical Operations, JUMP, Loops and CALL Instructions, Single Bit Instructions, Concept of

Stack, Programs on above instructions, I/O Port Programming, Instruction Execution Cycle

UNIT 3. Interfacing Methods and Applications (PART I) [10]

Demultiplexing AD0-AD7, Interfacing LED , LCD (Alpha Numeric), Switch, Relay and Opto-coupler, memory interface and expansion (RAM 6264 & EPROM 2764,27128), I/O Interface and expansion using 8255

UNIT 4. Interfacing Methods and Applications (PART II) [10]

Stepper Motor Control, Speed Control of DC motor by PWM technique. DAC R-2R ladder, ADC, Dual Slope, Successive Approximation Technique, Study of DAC 0808/1408 and ADC 0804 Chip (Specifications expected), Interfacing to DAC 0808 and A/D Converter ADC0804

SECTION II

(Facility in 8051, Embeded C, PIC)

UNIT 5. 8051 Programming in C [10]

Advantages and disadvantages Program in 8051-C & Assembly Language. Data types and time delay in 8051-C,I/O programming in 8051-C,Accessing SFR addresses in 8051-C,Logical operation in 8051 C. Data conversion programs in 8051 C. Accessing code ROM space in 8051 C.

UNIT 6. Timers and interrupts in 8051 [10]

Timer and Counter: Timer and Counters, Timer modes, Timer Counter registers, Programming the timers in various modes in assembly and C Time delay generation.

Interrupts: Sources of interrupts, enabling and disabling the interrupts, IE, TCON registers, interrupt priority, IP register. Programming external interrupts

(Level and edge triggering)in assembly and C.

UNIT 7. Serial communication in 8051. [10]

Serial Port : Serial port of 8051, RS-232 standard and IC MAX–232, Concept of Baud rate, Baud rate in 8051, Baud rate doubling using crystal frequency and PCON register, SBUF, SCON registers, various modes of serial port, , Importance of TI and RI flags, Programming in mode–1 in assembly language, C program for transmits and receive data serially

UNIT 8. Introduction to PIC [10]

Features of PIC Microcontroller, Block Diagram of 16C6X/7X, FSR, Pin configuration (16C61), Clock And reset circuit, Instruction set, Addressing modes

Reference Books

1 The 8051 Microcontroller -K. J. Ayala, (Penram International)

2 Microcontroller- John Stewart, Psicataway, New Jersey, (PHI)

3 The 8051 Microcontroller and Embedded Systems, M. A. Mazadi,
J. G. Mazadi, Pearson Education, Asia

4 Programming and customizing the 8051 Microcontroller - MYKE Predko
(TMH, New Delhi)

5 Microprocessor and Microcontroller Hand Book - (BPB Publication)

6. C and the 8051: Programming and Multitasking, Schultz, P T R Prentice-Hall, Inc.

7. Embedded C, Michael J. Pont,

8. PIC Microcontroller , By Peatman

9. Microcontroller By Ajay Deshmukh

5. Embedded C, Michael J. Pont,

Electronics (P-VIII)Instrumentation and power Electronics
(Section –I)

UNIT 1 Introduction: [12]

Performance Characteristics, Static characteristics, Errors in measurement, Types of errors, Sources of errors, Dynamic Characteristics and Response, Standard and International standards

Transducers:

Selection factors, Electrical Transducers and their parameters; Types of Transducers, Electro-acoustic transducer: Microphone: Carbon, Piezoelectric, Moving Coil, Loud Speakers: PMMC Loud Speaker,

Force/Pressure transducer: Strain-Gauges, Potentiometer,

Piezo-Electric Transducer, Linear Variable Differential Transducer (LVDT), Capacitive Transducer; Load cell; Photoconductive cells, Photovoltaic Cell; Digital Displacement Transducer,

UNIT 2. Signal Conditioning: [10]

Introduction, Instrumentation Amplifier, Characteristic study of IC LM 725, Strain Gauge, Bridge amplifier, Thermocouple Amplifier, Study of IC AD 594, Thermister Amplifier (IC 5420),

Design of Data Acquisition System for measurements of temperature, pH and Level, Grounding, Shielding and Isolation Techniques

UNIT 3 Display devices and systems: [10]

LED, LCD, Display Technique using LED and LCD, CRT Display

Recorders:

XY and XT Recorders, Oscillo-graphic Recorders,

Digital, Magnetic Tape-Recorders

UNIT 4. Temperature Transducer: [08]

RTD, Thermocouple; IC LM 34/35 ,Thermister

Instruments:

Digital Voltmeter and Multimeters, Digital Tachometer, pH meter,

Electrocardiograph (ECG), Oscilloscope.

(Section-II)

Power Electronics

UNIT 5. Power diodes and transistor : [12]

Construction of the diode (drift layer), conductivity modulation, I-V characteristics, Reverse recovery effect (analysis), types of diode, Spice diode model, series and parallel connections of diode (diodes with RC, RL, LC and RLC loads (analysis expected).

Power transistors:

structure, operation, effect of drift layer. Switching characteristics, specifications. Base drive circuits.

Power MOSFET: MOSFET, structure of MOSFET, characteristics, operation and drive circuits.

IGBT: structure, characteristics, operation and drive circuits comparison of power transistor, MOSFET and IGBT

UNIT 6. Thyristors : [6]

structure, I-V characteristics, two transistor analogy, Turn on and turn off processes. Thyristor rating, concept of di/dt and dv/dt, Triac, different modes of operation, ratings, MOS controlled Thyristors.

UNIT 7. Uncontrolled and Controlled rectifiers:[12]

Uncontrolled rectifier

Basic & three phase supply, phase and line voltage waveforms, three phase half wave rectifier with R and L load, analysis with resistive load, three phase full wave rectifier with resistive and large inductive load, three phase bridge rectifier with resistive and inductive load, analysis with resistive load.

Comparison of HWR, FWR and FWBR.

Controlled rectifier :

Concept of firing angle, synchronization, Half converter with R, L load. Use of freewheeling diode, semi-converter with R, L load. Studies on these circuits with RLE load. Full converter with R and large inductive load. (Analysis of all these circuits with resistive load.)

UNIT 8. Single phase AC voltage controllers:[10]

Principle of ON-OFF control, single-phase bidirectional controller with resistive and inductive load. (Analysis of these circuits.)

Applications of Power Electronics :

SMPS, UPS, Electronic Ballast, power factor correction. Principle of induction and dielectric heating.

Reference Books

(Section – I)

1 Electronic Instruments – K.S.Kalsi, (Tata Mc-Graw Hill)

2 Instrumentation, Measurements and Analysis -B.S. Nakara and VSV Mani (TMH)

3 Instruments and Instrumentation Technology – M.M.S. Anand (PHI)

4 Instrumentation and Measurements -Moorthy, (Prentice Hall India)

5 Instrumentation, Devices and System -C.S. Rangan, G.R. Sharma and VSV Mani (TMH)

6 A course in Electrical and Electronic Measurements and Instrumentation. A .K. Sawheney (Dhanpat Rai and Sons)

7 Transducers and Display systems -B.S. Sonde

(Section – II)

1. Power Electronics - M. H. Rashid (PHI)
2. Power Electronics – Jamil Asghar (PHI)
3. Power Electronics -.P.C. Sen
4. Power Electronics -Samir K. Datta (PHI)
5. Thyristor Engineering – M.S.Berde, Khanna Publications
6. Power Electronics Principles and Applications - S. Biswas (Dhanapat Rai Publication)
7. Electronics In Industry - G. M. Chute and R.D. Chute, (Mc Graw Hill)
8. Linear Integrated circuit - D Roy Choudhari, Shail Jain, (New Age International Pvt Ltd.)
9. Medical Electronics –Khandpur
10. Power Electronics – by Katave.
11. Power Electronics – by Jalnekar. Technical Publication Pune.
12. Power Electronics – by Bhimara.

B.Sc. (Part III) Electronics

Practical Course

(List of Experiments)

[minimum 32 experiments have to be performed by a student out of 40 experiments prescribed]

Group-A

1. LM 317 as a voltage variable
2. Study of Operational Amplifier as an Adder and Subtractor circuit
3. Study of Operational Amplifier as an Integrator and Differentiator
4. Study of Operational Amplifier as Band Pass Filter
5. Wein-Bridge Oscillator by using Operational Amplifier
6. Study of Schmitt Trigger Using Operational Amplifier
7. Study of Function Generator using IC 8038
8. Matrix operation using MATLAB
9. Use of mathematical functions for plotting 2D plots
10. Use of MATLAB for numerical techniques for example Simpsons 1/3 rule.

[Minimum of 8 experiments have to be performed by student]

Group (B)

1. Study of Amplitude Modulation-Demodulation
2. Study of Frequency Modulation/Demodulation
3. Study of FSK Modulator / Demodulator
4. Study of tuned RF amplifier

5. Voice link using optical fiber cable
6. Study of FM receiver
7. Study of Pulse width Modulation
8. Study of Composite Video signal
9. Adjustment and Study of DTH
10. PCB design using any computer software

[Minimum of 8 experiments have to be performed by student]

Group-C

1. Interfacing LED, Switch And Relay, Thumb wheel switch and 7-segment display to 8051
2. Serial communication of MC 8051 to personal computer
3. Interfacing of DAC to 8051
   Square, Ramp generation, Triangular Wave generation
4 Interfacing to ADC 0809/0804 to measure 0-5V,
5 Interfacing of Stepper motor to MC 8051 for a given angle.
6. Study of 8051 timers MODE 1 & MODE 2 (Square wave generator, LED ON/OFF)
7. DC motor control using MC 8051 with PWM technique.
8. Arithmetic operation with MC 8051-C
9. Logical and Bit Processing with MC 8051-C
10. Addressing modes in PIC

[Minimum of 8 experiments have to be performed by student]

Group(D)

1. Study of thermocouple (594/595)
2. SCR Firing by UJT
3. AC voltage controller
4. Study of characteristics of RTD(PT-100)

5. Study of AC and DC Timer.
6. Study of Instrumentation Amplifier (TL084/LM 324)
7. Measurement of Strain Gauge- using Bridge Amplifier.
8. Phase-Shift Control of SCR
9. Study of ON/OFF Temperature Controller (LM 34/LM35/AD590)
10. DC Motor Control.

[Minimum of 8 experiments have to be performed by student]

Project

Every student should take up a project & submit in the report the work he has carried out. The project work will be assessed independently at the time of practical examination.

Industrial Visits

In order to give exposure of Industry, Research Institute & advances in the field of electronics industrial visits should be arranged. It is expected that students of B.Sc. I, II, & III should visit the Electronics Industries / Research Institutes / Educational Institutes.

Seminars

Every students of B.Sc. II & B.Sc. III Electronics will have to deliver one seminar of at least 15 min. on the advanced topics in the Electronics, which are not included in the syllabus. The seminar will be the compulsory activity for all the students of B.Sc. II & B.Sc. III electronics

Equivalence

Old course

Ele(P-V): Linear Integrated circuit and MATLAB

Ele(P-VI): Communication Systems

Ele(P-VII): Advanced Microcontrollers and Embedded C

Ele(P-VIII): Instrumentation and Power Electronics

New course

Ele(P-V): Linear Integrated circuit and MATLAB

Ele(P-VI): Communication Systems

Ele(P-VII): Advanced Microcontrollers and Embedded C

Ele(P-VIII): Instrumentation and Power Electronics