(New Scheme 2010)

STUDY AND EVALUATION SCHEME
FOR

1. ELECTRONICS & COMMUNICATION ENGINEERING
2. ELECTRONICS ENGINEERING (DIGITAL ELECTRONICS)
3. ELECTRONICS ENGINEERING (MEDICAL ELECTRONICS)

SEMESTER - IV

Code No.	Subject	Study Scheme Period/Week			Evaluation Scheme						Total Marks
		L	T	P	Internal Assessment		External Assessment Exam				
					Theory	Practical	Written Paper		Practical		
					Max Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
1	Electronic Devices and Circuits - III	4	-	3	50	25	100	3	50	3	225
2	Introduction to Microprocessors	4	-	3	50	25	100	3	50	3	225
3	Electronic Instruments and Measurements	4	-	3	50	25	100	3	50	3	225
4	Personal Computer Organisation	4	-	3	50	25	100	3	50	3	225
5	Electronic Design and Drawing	-	-	4	-	50	-	3	100	3	150
6	Minor Project	-	-	6	-	50	-	-	100	3	150
**	Student Centered activities	-	-	2	-	-	-	-	-	-	-
	TOTAL	16	-	24	200	200	400		400		1200

** Student centered activities will include: extension lectures, field visits, Soft Skills, seminars, debates, hobby clubs, library studies, awareness regarding ecology and environment, conservation of energy (Petroleum products, electricity etc), social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made.

ELECTRONIC DEVICES & CIRCUITS – III

L	T	P
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RATIONALE

DETAILED CONTENTS

1. **Wave shaping Circuits** **(15%)**
   General idea about different wave shapes. Review of transient phenomena in R-C and R-L Circuits. R-C and R-L differentiating and integrating Circuits. The applications (physical explanation for square/ rectangular input wave shapes only). Diode clippers, series and shunt biased type. Double clipper circuits. Zener diode clipper circuits. Use of transistors for clipping. Diode clamping circuit for clamping to negative peak, positive or any other level for different input waveforms (e.g. sine, square, triangular), ideal transistor switch, explanation using C.E. output characteristics.
2. **Timer I.C.** **(10%)**
   Block diagram of I.C. timer (such as 555) and its working. Use of 555 timer as mono-stable and astable multivibrators.
3. **Multivibrator Circuits** **(15%)**
   Concept of multivibrator : astable, monostable, bistable. 555 timer as mono and astable multivibrator. Op-amp as monostable, astable multivibrator and schmitt trigger circuit.
4. **Time Base Circuits** **(15%)**
   Need of time base (sweep) wave forms, special features of time base signals. Simple method of generation of saw tooth wave using charging and discharging of a capacitor. Constant current generation of linear sweep voltage circuit using op-amp.
5. **Integrated Electronics** **(5%)**
   Fabrication of transistor by planner process, a typical fabrication process for ICS (brief explanation).
6. **Regulated Power Supply** **(15%)**
   Concept of regulation. Principles of series and shunt regulators. Three terminal voltage regulator ICs (positive, negative and variable applications). Block diagram of a regulated power supply. Concepts of cv,cc and foldback limiting, short circuit and overload protection. Major specifications of a regulated power supply and their significance (line and load regulation, output ripple and transients). Basic working principles of a switched mode power supply (SMPS). Concept of floating andngrounded power supplies and their interconnections to obtain multiple output supplies. Brief idea of CVT,UPS and dual tracking power supply.
7. **VCO (IC565) and PLL(IC566) and their applications** **(10%)**
8. **Thysistors and UJT** **(15%)**
   Name,symbol,characteristics and working principles of SCR, Triac, diac, SCS, SUS,SBS and LASCR. Mention of their applications. Basic structure, principle of operation and VI characteristics of UJT. Explanation of working of UJT as relaxation oscilliator and its use in thyristor.

PRACTICAL WORK

1. Observe and Plot the output Waveshapes of R-C differentiating circuits
2. Observe and Plot the output Waveshapes R-C integrating circuits for squarewave input (observe the effect of the R-C time constant of the circuit on the output waveshape for both the circuits)
3. Construct biased and unbiased series and shunt clipping circuits for positive and negative peak clipping of a sine wave using switching diodes and d.c. sources.
4. Construct a double clipper circuit using diodes and sources and observe wave shapes.
5. Construct zener diode and transistor clipper circuits for positive peak, negative peak and double clipping of sine (other wave shapes).
6. To clamp sine and square wave to their positive and negative peaks and to a specified level.
7. To plot input vs. output characteristics of schmitt trigger circuit and plot the input output waveshapes with a ine wave input.
8. To test mono and astable multivibrator and to plot waveform.
9. To make and test the operations of monostable and astable multivibrator circuits using 555 timer.
10. To determine and plot firing characteristics of SCR by varying anode to cathode voltage and varying gate current.
11. To note the waveshapes and voltages at various points of a UJT relaxation oscillator circuit.
12. To plot the firing characteristics of a triac in different modes, namely, mode I+, mode I-, mode III+ and mode III

Note : Use of simulation software such as OrCADPSpice MULTISIM, ELECTRONIC WORK BENCH etc. for performing some of the above on the computer also, which will enhance the understanding of the students beyond traditional laboratory experiments.

INTRODUCTION TO MICROPROCESSORS

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RATIONALE:

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings them face with mainframe systems. Thus the study of microprocessors is relevant in finding employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers. Microprocessors find application in process control industry. They are also a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessors are an area of specialization. Students of electronics engineering often use microprocessors to introduce programmable control in their projects, in industrial training.

DETAILED CONTENTS

1. **Introduction** (5%)
   - (a) Typical organization of a microcomputer system and functions of its various blocks.
   - (b) Microprocessors, its evolution, function and impact on modern society.
2. **Architecture of microprocessor (with reference to 8085 microprocessor) (10%)**
   - (a) Concept of bus, bus organization of 8085.
   - (b) Functional block diagram of 8085 and function of each block.
   - (c) Pin details of 8085 and related signals.
   - (d) Demultiplexing of address/data bus (AD0-AD7), generation of read, writes control signals.
3. **Instruction timing and Cycles** (10%)
   - (a) Instruction cycle, machine cycle and T states.
   - (b) How a stored programme is executed-Fetch and Execute cycles.
4. **Programming (with respect to 8085 microprocessor)** (15%)
   - (a) Brief idea of machine and assembly languages, machine and mnemonic codes
   - (b) Instruction format and addressing mode, identification of instructions as to which addressing mode they belong.
   - (c) Concept of instruction set, explanation of the instructions of the following groups of instruction set of 8085. Data transfer group, Arithmetic group, Logic group, Stack, I/O and machine Control Group.
   - (d) Programming exercises in assembly language (Examples can be taken from the list of experiments)
5. **Memories and I/O interfacing** (10%)
   - (a) Memory organization, memory map, partitioning of total memory space, address decoding, concept of mapped I/O and memory mapped I/O. Interfacing of memory and I/O devices
   - (b) Concept of memory mapping, concept of stack and its function.
6. **Interrupts** (10%)
   - (a) Concept of interrupt, maskable and non-maskable, edge triggered interrupts, software interrupts, restart instruction and its use.
   - (b) Various hardware interrupts of 8085, servicing interrupts, extending interrupt system.
7. **Data Transfer Techniques** (10%)

(c) Concept of programmed I/O operations, sync data transfer, async data transfers (handshaking), Interrupt driven data transfer, DMA, serial output data, serial input data.

8. **Brief idea and programming of interfacing chip 8255.** **(10%)**

9. **Microcontrollers** **(10%)**

(a) Introduction, architecture of 8051 only applications of microcontrollers.

10. **Comparison** **(10%)**

(a) 8085, Z80, 6800 (8 bit microprocessors)

LIST OF PRACTICALS

1. Addition of two 8 bit numbers
2. (a) To obtain 2's complement of 8 bit number
   (b) To subtract a 8 bit number from another 8 bit number using 2's Complement
3. Extract fifth bit of a number in A and store it in another register.
4. Count the number of bits in high state in accumulator
5. Check even parity and odd parity of a binary number
6. Addition of two sixteen bit numbers
7. Subtraction of a sixteen bit number from another sixteen bit number
8. Multiplication of two 8 bit numbers by repetitive subtraction
9. Divide two 8-bit numbers by repetitive subtraction
10. (a) Smallest number of three numbers.
    (b) Largest number of three numbers
11. To sort an array of unsigned binary numbers in decreasing/increasing order
12. Generate timing delay through software

ELECTRONIC INSTRUMENTS & MEASUREMENTS

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RATIONALE

The study of this subject will help a student to gain the knowledge of the working principles and operation of different electronic instruments (Analog as well as digital). The practical work done in this subject will help to acquire skill in operation and testing of the instruments as per their specifications will also be imparted.

DETAILED CONTENTS

1. **Basics of Measurement** **(5%)**
   - (i) Review of performance, specifications of instruments, accuracy, precision, sensitivity, resolution range etc. Errors in measurement and loading effects.
2. **Multi-meter:** **(10%)**
   - (i) Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance in a multi-meter
   - (ii) Specifications of a multi-meter and their significance
   - (iii) Limitations with regards to frequency and input impedance
3. **Electronic Voltmeter** **(10%)**
   - (i) Advantages over conventional multi-meter for voltage measurement with respect to input impedance and sensitivity.
   - (ii) Principles of voltage, current and resistance measurements (block diagrams only)
   - (iii) Specifications of an electronic Voltmeter/Multi-meter and their significance.
4. **AC Milli-voltmeter** **(10%)**
   - (i) Types of AC millivoltmeters : Amplifier-rectifier and rectifier-Amplifier, Block diagram and explanation of the above types of ac millivoltmeters
   - (ii) Typical specifications and their significance
5. **Cathode Ray Oscilloscope** **(20%)**
   - (i) Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only – no mathematical treatment) Deflection sensitivity, brief mention of screen phosphor for CRT in relation to their visual persistence and chemical composition
   - (ii) Explanation of time base operation and need for blanking during fly back ; synchronization
   - (iii) Block diagram explanation of a basic CRO and a triggered sweep oscilloscope, front panel controls
   - (iv) Specifications of a CRO and their significance
   - (v) Use of CRO for the measurement of voltage (dc and ac) frequency, time period and phase angles
   - (vi) Special features of dual treace, delayed sweep and storage CROs (brief mention only); introduction to digital CROs
   - (vii) CRO probes, including current probes.
   - (viii) Digital storage Oscilloscope: Block diagram and principle of working.
6. **Signal Generators and Analysis Instruments** **(15%)**
   - (i) Block diagram, explanation and specifications of
   - (ii) laboratory type low frequency and RF signal generators
   - (iii) pulse generator and function generator
   - (iv) Brief idea for testing, specification for the above instruments
   - (v) Distortion factor meter, wave analysis and spectrum analysis
7. **Impedance Bridges and Q-Meters** **(15%)**

(i) Block diagram explanation of working principles of a laboratory type (balancing type) RLC bridge. Specifications of a RLC bridge.

(ii) Block diagram and working principles of a Q-meter

8. Digital Instruments: **(15%)**

(i) Comparison of analog and digital instruments, characteristics of a digital meter

(ii) digital voltmeter

(iii) Block diagram and working of a digital multi-meter

(iv) Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution.

(v) Principles of working and specifications of logic probes, signature analyzer and logic analyzer.

(vi) Digital, LCR bridges

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency voltages and currents
3. To measure Q of a coil and observe its dependence on frequency, using a Q-meter
4. Measurement of voltage, frequency, time period, and phase angle using CRO
5. Measurement of time period, frequency, average period using universal counter/frequency counter
6. Measurement of rise, fall and delay times using a CRO
7. Measurement of distortion of a LF signal generator using distortion factor meter
8. Measurement of R,L and C using a LCR bridge/universal bridge

PERSONAL COMPUTER ORGANIZATION

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4	-	3

RATIONALE

DETAILED CONTENTS

1. **Hardware Organisation of PC:** **(15%)**
   Microcomputer Organisation, 8086/8088 microprocessor, its architecture, brief view of instruction set, memory address and addressing techniques and I/O addressing, the Motherboard of PC: memory organisation, system timers/counters, interrupts, vectoring, interrupt controller, DMA controller and its channels, PC-bus slots, various types of digital buses, serial I/O ports e.g., COM1 & COM2, parallel port.
2. **The Video Display of the PC:** **(15%)**
   The basic principles of the working of video monitors, video display adapters (monochrome and colour graphic). Video modes, detailed study of colour video monitors, introduction to TFT monitors, difference between monochrome, colour and TFT video monitors.
3. **The Keyboard of the PC:** **(10%)**
   The basic principles of the working of a PC keyboard scan codes, introduction to multimedia keyboard.
4. **Disk Drives:** **(15%)**
   Constructional features of Hard disk, Floppy disk and their drives and HDD, DVD drive and CD ROM drive, Pen drive working principle of HDD drive, CD ROM drive, DVD drive, introduction to special type of disk drives like Zip drive, MO drive, Logical structure of a disk and its organization, Boot record. File Allocation Table (FAT), NTFS Disk Directory.
5. **Peripheral Devices:** **(15%)**
   Basic features of various other peripheral devices e.g. mouse, scanner, plotter, digitizer, modem, light pen and joystick, working principle of DMP, Inkjet and Laser printers, Basic operation digital camera, FAX.
6. **Power Supply:** **(10%)**
   SMPS used in PC and its various voltages, basic idea of constant voltage transformer (CVT) and Uninterrupted Power Supply (UPS) – offline and line interactive types.
7. **The BIOS and DOS Services:** **(10%)**
   The basic ideas of BIOS and DOS services for Diskette, Serial Port, Key board, Printer and Misc. services.
8. **Advances Microprocessors:** **(10%)**
   Introduction to PISC and CISC system and comparison between the two introduction to superscalar architecture, detailed study of Pentium IV processor, mother board of PC, memory organization, Catch memory, keyboard interfacing, serial and parallel ports, introduction to pipelining.

PRACTICALS

1. To identify various components, devices and sections of a PC.
2. To interconnect the system unit with the video monitor, mouse and key board, and test the operation of the PC.
3. To connect various add-on cards and I/O devices to a PC motherboard, and test their working.
4. To note the voltages and waveforms at various terminals in the I/O channel (Bus Slots).
5. To study the SMPS circuit of a PC, measure various supply voltages, and connect it to the motherboard and other appropriate I/O devices.
6. To study the operation of a CVT used to supply power to a PC.
7. To study the operation of an uninterrupted power supply (UPS).

Reference Books

1. IBM PC and Clones, Hardware, troubleshooting, and maintenance by B.Govindarajulu-TMH publication.
2. Microprocessor and Interfacing by Raffiquzman.
3. Hall, Douglas, "Microprocessors & Interfacing". McGraw Hill.
4. Bose, SK, "Hardware & Software of personal computers".
5. Small computer theory and Application by Denton G.Dailey-TMH Publications
6. Uffenbeck.

ELECTRONIC DESIGN & DRAWING

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RATIONALE

The purpose of this subject is to give practice to the student in drawing of symbols as per ISI standard. Elementary design and drawing of semi-conductor devices, various components, circuits of a small power transformer, design of square wave generator and circuitry for using a dc micro-ammeter.

DETAILED CONTENTS

1. Draw the standard symbols of the following (30%)

(a) (Different parts of ISI Standard IS.2032 may be referred to) for electronics with specification in Digital EC and Microprocessor System Design.

(b) Components : Resistors – Fixed, tapped and variable(presets and potentio-meters LDR, VDR and Thermistor, Capacitors – Fixed, tapped and variable types RF and Af chokes and inductors air cored, solid cored and laminated cored. transformer – step up, step down, Af and Rf types, Auto transformer, IF transformer, three phase transformer, Antenna, chasis, Earth, loudspeaker, Microphone, ear-phone, fuse, indicating lamp, co-axial cables, switches – double pole-on/off double pole, double throw an drotary types, terminal and connections of conductors.

(c) Devices: Semiconductor – rectifier diode, zener diode, variactor diode, tunnel diode, photo diode, light emitting diode (LED), Bipolar transistor,

(d) Working principles of ramp, dual slope and integrating type of field effect transistor (FET), MOSFET Photo transistor. Unjunction transistor (UJT) silicon control Rectifier (SCR), Diac and Triac case outlines (with their type numbers) of different types of semiconductor diodes, transistors, SCR, diacs, triacs and ICS (Along with indicators for identifying pins etc.)

2. Draw the Following (30%)

Circuit diagram of typical multimeter, Circuit diagram of a typical electronic multimeter – Circuit diagram of a typical transistor radio receiver. Complete lock diagram of a typical monochrome TV transmitter and receiver system. Front panel details of typical CRO.

3. Design and Draw for the given Specifications the following : (40%)

(a) A small power transformer. A simple power supply using a full wave rectifier and different types of filters. A simple zener regulated power supply. A small-signal (single-stage low-frequency amplifier) given specifications being the input impedance, load impedance, voltage gain and input signal level and the frequency range.

(b) Square-wave generator using 555 timer. sinusoidal oscillator-Wein's Bridge type using an op-amp. Voltage-controlled oscillator using IC565. Circuitory for using a DC micro-ammeter as

(i) a voltmeter
(ii) a current meter
(iii) for specified ranges

MINOR PROJECT

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Students should be asked to assemble the minor projects on the following topics:-

1. **Communication**
2. **Industrial Electronics**
3. **digital Electronics**
4. **Microprocessor Based Projects**
5. **Medical Electronics**
6. **Instrumentation & Control**

and the students will assemble & test the projects in the lab of respective Polytechnic/Institute.

Students are expected to visit at least two industries during 4^{th} semester & prepare the project report of the industries visited by them.

CRITERIA FOR EVALUATION

Assembly & Testing of Project	**80%**
Visit to Industries & Report Writing	**20%**