Faculty of Science and Technology

PRATAP COLLEGE, AMALNER (AUTONOMOUS)

Affiliated to Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon

'A+' Grade
NAAC Re-Accredited
(3rd Cycle)

Syllabus For

S.Y.B.Sc. (Electronics)

(*As per NEP-2020*)

(With effect from June - 2025)

PRATAP COLLEGE, AMALNER (AUTONOMOUS)

Affiliated to Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon

NEP-2020 Structure and Credit Distributions with Selection of Major/Minor at Second Year

B.Sc. (Honors/Research)—Second Year

Year (Level)	Sem	Faculty	Subject–I (M-1)		Subject–II (M-2)	Sub-III (M- 3)	Open Elective (OE)	VC,SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP,OJT, RP	Min. Credits for the Year (Sem)	Degree
			Mandatory DSC	Elective DSE	MIN							
			The student must choose one subject as a major subject as Major out of M-1,M-2,M-3 that he/she has chosen in the first year.		The student must choose one subject as a minor subject out of M-1, M-2, and M-3 that he/she has chosen in the first year. (Minor Must be other than Major)							
2 (5.0)	III	Science	DSC-5(2T) DSC-6(2T) (IKS) DSC-7(2P)	---	MIN-1(2T) MIN-2(2T) MIN-3(2P)	---	OE-3 (2T)	SEC-1(2T) SEC-2(2P)	AEC-3(2) (MIL)	CC-3(2)	44 (22+22)	UG Diploma in Faculty
	IV	Science	DSC-8(2T) DSC-9(2P)	---	MIN-4(2T) MIN-5(2P)	---	OE-4 (2T)	VC-1(2T) VC-2(2P)	AEC-4 (2) (MIL)	CC-4(2) & * OJT/Int/CEP (4)		
	Credit: 2nd Year		10	---	10	---	04	08	04	08	44	

Abbreviations:

- **T: Theory Course**
- **P: Practical course**
- **DSC: Discipline-Specific Core Course**
- **DSE: Discipline-Specific Elective Course**
- **MIN: Minor subject**
- **GE/OE: Generic/Open Elective**
- **CEP: Community Engagement and** service
- **VSEC: Vocational Skill and Skill Enhancement Courses**
- **VC: Vocational Skill Courses**
- **SEC: Skill Enhancement Courses**
- **CC: Co-curricular Course**
- **VEC: Value Education Courses**
- **IKS: Indian Knowledge System**
- **AEC: Ability Enhancement Courses**
- **OJT: On-Job Training:** Internship/Apprenticeship
- **RP: Research Project**
- **RM: Research Methodology**

Note:

1. **Syllabi of AEC, VEC, IKS, and CC will be displayed separately by PCA.**
2. **Science student will choose OE offered by Faculty Of Commerce and Management or Humanities.**

Program Specific Outcomes of SYBSC Electronics

PSO 1	**Circuit Design & Simulation** Mastery Students will be able to design, analyze, and simulate analog and digital circuits using tools like PSPICE, applying theoretical knowledge to practical scenarios.
PSO 2	**Proficiency in PCB Design & Fabrication** Learners will gain hands-on experience in printed circuit board (PCB) layout, etching, and assembly, preparing them for real-world hardware development.
PSO 3	**Embedded Systems & Microcontroller Applications** Students will develop skills in programming and interfacing microcontrollers (e.g., 8051) and microprocessors (e.g., 8085), enabling them to build embedded solutions for automation and control systems.
PSO 4	**Semiconductor Device Applications** Graduates will understand the working principles and applications of semiconductor devices, and apply them in designing efficient electronic systems.
PSO 5	**Hardware Integration & Troubleshooting** Students will acquire the ability to integrate hardware components and troubleshoot electronic systems, preparing them for roles in electronics maintenance and support.
PSO 6	**Use of Modern Tools & Techniques** Learners will be adept at using modern electronic tools, simulation software, and testing instruments to evaluate and optimize circuit performance.
PSO 7	**Ethical and Sustainable Practice** Students will demonstrate awareness of ethical responsibilities and sustainable practices in electronics design and manufacturing.

Semester-wise Code structure for SY.B.Sc. Electronics (Honors/Research) Programme as per NEP-2020, for affiliated colleges w.e.f. June 2025.

Course Type	Course	Course Code	Course Title	Credits	M			
					Internal (CA)		External (UA)	
					T	P	T	P
Sem - III								
DSC	DSC-5	ELE- MJ-231	Digital Circuits & Applications	2	20	--	30	--
DSC	DSC-6	ELE-IKS-232	Ancient and Recent communication	2	20	--	30	--
DSC	DSC-7	ELE-MJP-233	Digital Circuits & Applications Lab-I	2	--	20	--	30
MIN	MIN-1	ELE-MN-236A	Electronics devices and Applications	2	20	--	30	--
MIN	MIN-2	ELE-MN-236B	Microprocessor 8085	2	20	--	30	--
MIN	MIN-3	ELE-MNP-236C	Devices & Microprocessor Lab-I	2	--	20	--	30
OE	OE-3	ELE-OE-237	Computer Applications	2	20	--	30	--
SEC	SEC-1	ELE-SEC-234	PCB Designing & Manufacturing	2	20	--	30	--
SEC	SEC-2	ELE-SECP-235	PCB Manufacturing Lab - I	2	-	20	--	30
Sem-IV								
DSC	DSC-8	ELE-MJ-241	Semiconductor Devices and Applications	2	20	--	30	--
DSC	DSC-9	ELE-MJP-243	Devices and Applications Lab - I	2	--	20	--	30
MIN	MIN-4	ELE-MN-246 A	8051 Microcontroller	2	20	--	30	--
MIN	MIN-5	ELE-MNP-246 B	8051 Microcontroller Lab - I	2	--	20	--	30
OE	OE-4	ELE-OE-247	Electronic Products Maintenance	2	20	--	30	--
VC	VC-1	ELE-VC-244	Linear Integrated Circuits using PSPICE	2	20	--	30	--
VC	VC-2	ELE-VCP-245	Linear Integrated Circuits using PSPICE Lab -I	2	--	20	--	30
OJT/ Int/CEP	OJT/ Int/CEP	ELE-CEP-242	Electronic Projects for Community	4	--	40	--	60

S. Y. B. Sc.
SEM-III

DSC-5

ELE-MJ-231 DIGITAL CIRCUITS & APPLICATIONS

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to;

CO 1	Understand and examine the structure of various number systems and its application in digital design.
CO 2	Gain the ability to understand, analyze and design various combinational and sequential circuits.
CO 3	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics
CO 4	Will be able to simplify boolean equations by using K-map

Unit	Title and Contents	No of Hrs/ Marks
Unit 1	**K-Map Simplification & Data processing circuits** Simplification of function using K-Map, Minimization of SOP form, Don't care conditions, Design examples of Halfsubtractor & full subtractor. Idea of multiplexing and demultiplexing, multiplexer- 2:1 line, 4:1 line, 8:1 line, demultiplexer- 1:2, 1:4, 1:8, Decoder- BCD to decimal, Encoder-decimal to BCD using OR gates.	**8 Hrs, 8 M**
Unit 2	**Flip- flops** Logic circuit, truth table, working and symbols for R-S flip flop (using NAND & NOR gates), clocked R-S flip-flop, D flip-flop, T Flip Flop & J-K Flip flop, race-around, idea of edge triggering flip - flop, symbol for positive and negative edge triggering flip flop, J-K master- slave flip flop, concept of preset and clear inputs.	**8 Hrs, 8 M**
Unit 3	**Shift registers And Semiconductor memories** Type of registers, serial in - serial out, serial in - parallel out, parallel in - serial out, parallel in - parallel out (4 bit)Shift register, Semiconductor Memories, Types of Semiconductor Memories depending on access right, read write operation, Types of ROM (PROM, EPROM, EAPROM, EEPROM), Types of RAM- Static & Dynamic, Advantages of Semiconductor Memories.	**8 Hrs, 8 M**
Unit 4	**Counters** Asynchronous counter (3 bit), modulus of counter: mod-3, mod-5 & mod-10 (decade counter), Synchronous counter (3 bit), up-down counter (3 bit), ring counter.	**6 Hrs, 6 M**

References:

1. Digital Principles and Applications, A.P.Malvino & D.P.Leach ; 4/e, Tata McGraw Hill
2. Digital Electronics, W.H. Gothmann ; Prentice Hall of India Private Limited
3. Modern Digital Electronics, R.P. Jain ; 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Digital electronics, Principles and applications, R. L. Tokheim ; 6th Edition, Tata McGraw Hill
5. Digital Techniques and applications, Y.G.Yangalwar, Nirali Publication

DSC-6

ELE-IKS-232: Ancient and Recent Communication

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to;

CO 1	Explain the significance of ancient Indian communication techniques and compare them with modern communication methods.
CO 2	Describe the basic concepts and components of electronic communication systems.
CO 3	Analyse amplitude modulation(AM) techniques,including modulation index,power relations, and receiver operations.
CO 4	Differentiate between amplitude modulation(AM) and frequency modulation(FM), understanding their working principles and applications.

Unit	Title and Contents	No of Hrs/ Marks
Unit 1	**Ancient Indian Knowledge Systems (IKS) and Communication:** Introduction to Indian Knowledge Systems (IKS) and their contributions to communication. Ancient communication methods: Oral traditions, visual signaling (smoke, fire, and sound signals). Acoustic knowledge in ancient India and its relation to wave propagation.Comparison of ancient and modern communication techniques. Importance and applications of electronic communication, Types of Signals: Analog signal, Digital signal,and Baseband signal (Definitions only).	**6 Hrs** **6 M**
Unit 2	**Analog Communication:** Block diagram of Communication system: Information, Transmitter, Channel, Receiver, Definition of Base band signal, Types of communication: Simplex, Half-duplex, and Full-duplex. Electromagnetic Spectrum: Band designations and applications (Cover all bands), Noise: Definition, Types of Noise, Noise Figure, signal to noise ratio. Modulation: Definition, Need of modulation, Types of Modulation.	**6 Hrs** **6 M**
Unit 3	**Analog and Angle Modulation:** Amplitude Modulation, Mathematical representation, modulation index, and frequency spectrum. Power relations and concept of sidebands (DSB-SC,SSB-TC,SSB- SC, VSB). Transistorized AM Modulator, Block diagram and working of AM transmitter, Demodulation:AM diode detector. Angle modulation: Basics of Frequency Modulation (FM) and Phase Modulation (PM), Modulation index, frequency spectrum, and FM generation and detection(Ratio detector). Comparison of AM and FM, Advantages, disadvantages,and applications.	**10 Hrs** **10 M**

Unit 4	**Digital communication & modulation techniques**: Digital versus analog communication, Definition: Channel capacity, Bit rate, Baud rate, quantization, Sampling theorem-statement and significance, Sampling types, Block diagram of digital communication, multiplexing techniques- only introduction. Classification of pulse modulation techniques, PAM-Generation, PAM detector, waveform, PWM and PPM - basic principal, waveform, Advantages and disadvantages of PAM, PWM and PPM. PCM-Block diagram, generator, Amplitude shift keying - principle, waveform, ASK generator, Advantages and disadvantages of ASK, FSK and PSK.	**8 Hrs** **8 M**

References:

1. Indian Knowledge Systems: A Holistic View, Kapil Kapoor, 1st Edition, 2005, D.K. Printworld.
2. Science and Technology in Ancient India, Roshen Dalal, 1st Edition, 2020, Rupa Publications.
3. Ancient Indian Science and Technology, H.S. Mukunda, 1st Edition, 2009, Bharatiya Vidya Bhavan.
4. Electronic Communication Systems, George Kennedy and Bernard Davis, 4th Edition, 1999, Tata McGraw-Hill.
5. Fundamentals of Communication Systems, John G. Proakis and Masoud Salehi, 2nd Edition, 2014, Pearson Education.
6. Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
7. Indian Knowledge Systems (IKS) – Official Portal, Ministry of Education, Government of India, https://iksindia.org (Online resource)
8. Advanced Electronics Communication Systems-Tomasi,6th edition,PrenticeHall.
9. Principles of Electronic communication systems –Frenzel,3rd edition, Mc GrawHill

DSC-7

ELE-MJP-233 Digital Circuits & Applications Lab-I

(Practical Course Credits: 2, Total Hrs: 60)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Understand the digital circuit designing
CO 2	Understand the digital devices and circuits
CO 3	Understand the concept of Flipflop, counter, Multiplexer
CO 4	Understand the k-map designing

Practicals : (Any Eight)

1. Use of K-Map (4 variables).
2. Designing of half adder and full adder using K-map.
3. Study of clocked R-S flip flop using universal gates.
4. Study of 4:1 line multiplexer/ 1:4 line demultiplexer.
5. Study of shift register using IC 7495 (left & right operation).
6. Study of BCD to decimal decoder.
7. Study of decimal to BCD encoder.
8. Study of T- flips flop.
9. Study of D- flips flop.
10. Study of decade counter using IC7490
11. Study of Diode Matrix ROM
12. Study of JK-flip flop using universal gates.

MIN - 1

ELE-MN-236A Electronics Devices & Applications

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Understand the electronic devices and its specifications
CO 2	Understand the applications of electronics devices
CO 3	Understand digital electronics circuits and its application.
CO 4	Able to analyze and understand the design of digital circuits.

Unit	Title and Contents	No of Hrs/ M
Unit 1	**Semiconductor Diodes** PN junction diode– Formation of Depletion Layer, forward biasing, reverse biasing - avalanche, zener breakdown, I-V char, rectifier-half wave, bridge rectifier, Capacitor filter, Zener diode - construction, I-V char, zener voltage regulator	8 Hrs 8 M
Unit 2	**Transistor** Construction and operation of BJT (NPN and PNP), CB, CE and CC configuration, JFET- Construction, working and I-V characteristics, UJT: Construction, working, JFET as an amplifier,UJT as Relaxation oscillator,	8 Hrs 8 M
Unit 3	**Data Processing circuits** Idea of Multiplexing and DeMultiplexing, Multiplexer: 2 to 1, 4 to 1, DeMultiplexer: 1 of 2, 1 of 4, Decoder: BCD to decimal decoder, Encoder: Decimal to BCD encoder using OR-gates.	4 Hrs 4 M
Unit 4	**Flip-Flops,Shift Registers and Counters** Introduction to sequential logic circuit, RS-FF using NAND/ NOR gates, Clocked RS- FF, D- FF, JK- FF, PRESET and CLR, Race around condition, Master Slave J-K FF, T-FF, Introduction to Shift Register, Classification of Register and Types, Concept of counter, Asynchronous counter (3-bit), Decade counter, Synchronous counter (3-bit)	10 Hrs 10 M

References:

1. Principles of Electronic Devices and Circuits , B. L. Theraja, S. Chand Publication
2. Principles of Electronics, V. K. Mehta, S. Chand publication
3. Digital Principles and Applications, A.P.Malvino & D.P.Leach ; 4/e, Tata McGraw Hill Publishing Co. Ltd.
4. Digital Electronics, W.H. Gothmann ; Prentice Hall of India Private Limited
5. Modern Digital Electronics, R.P. Jain ; 2/e, Tata McGraw Hill Publishing Co. Ltd., New Delhi

MIN - 2

ELE-MN-236B Microprocessor 8085

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Understand the basics of central processing unit
CO 2	Understand the architecture of microprocessor
CO 3	Understand and writing the assembly language programming
CO 4	Understand the integration of hardware and software

Unit	Title and Contents	No of Hrs/ M
Unit 1	**Fundamentals of Microcomputer** Simple Microcomputer Architecture, Input/output Devices, Address bus, Data bus, Control bus, Data storage (idea of RAM and ROM), Computer memory, Memory Interfacing, Memory Map, High level language, Low level language, Assembler, Compiler.	**6 Hrs 6 M**
Unit 2	**Architecture of 8085 Microprocessor** Features of 8085, Block diagram, function of each block, Registers, ALU, Stack memory, Stack Pointer, Program counter, Concept of Interrupt, Hardware interrupts. Pin-out diagram of 8085, function of each pin, Data and address buses, De-multiplexing the Bus AD7-AD0, Timing states (T-state), Machine Cycle, Instruction cycle. Timing diagram for Read and write operation (MOV A,M and MOV M,A)	**8 Hrs 8 M**
Unit 3	**Instruction set of 8085 Microprocessor.** Study of addressing mode for 8085:-Register Addressing, Immediate Addressing, Direct Addressing, Register Indirect Addressing, Instruction set: Data transfer instructions, Arithmetic Instructions, Logical Instructions, Branching Instructions, Stack, I/O and Machine Control Instructions.	**8 Hrs 8 M**
Unit 4	**Assembly Language Programming** Assembly Language Format, Arithmetic Programs: - 8-bit addition, 8-bit subtraction, Decimal addition and subtraction of two 8-bit numbers, 8-multiplication, one's and two's complement of 16-bit numbers, find largest and smallest Number from a series of given number. Code Conversion Programs: Hex to ASCII , BCD to binary .	**8 Hrs 8 M**

References:

1. Microprocessor and Interfacing Programming and Hardware, D. V. Hall, Tata McGraw Hill Publication
2. Microprocessor Architecture, Programming and Applications, R. S. Gaonkar, 5th Ed., Penram International,2007.
3. 8080A/8085 Assembly Language Programming, Lance A. Leventhal, McGraw Hill
4. The 8080/8085 Microprocessor Book, Rob Walker, Texas Instruments

MIN - 3

ELE-MNP-236C Devices & Microprocessor Lab - I

(Practical Course Credits: 2, Total Hrs: 60)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Understand the semiconducting devices characteristics and applications
CO 2	Understand the digital devices and circuits
CO 3	write the assembly language programming
CO 4	Understand the Microprocessor 8085 using programming concepts.

Practicals

Section A : Electronic Devices (Any four)

1. Study of the I-V Characteristics of p-n junction Diode,
2. Build and test Full wave Bridge rectifier.
3. Study of the I-V characteristics CE circuit.
4. To study Transistor as a switch (LED ON/OFF).
5. Study of clocked R-S flip flop using universal gates.
6. Study of 4:1 line multiplexer/ 1:4 line demultiplexer.
7. Study of shift register using IC 7495 (left & right operation).
8. Study of BCD to decimal decoder.
9. Study of decimal to BCD encoder.
10. Study of T/D flips flop.

Section B : 8085 Microprocessor (Any four)

1. Assembly language program to add two16-bit Numbers.
2. Assembly language program to calculate the sum of this rise of numbers using subroutine.
3. Assembly language program to transfer a block of data from one location to another location of memory.
4. Assembly language program to find the smallest/largest number from a series of numbers.
5. Assembly language program to arrange set 8 bit number starting location in ASCENDING order Display the stored vector in address-data field.
6. Assembly Language Program to multiply 8-bit unsigned number by 8-bit unsigned number using repeated addition.
7. Assembly Language Program to divide 8-bit unsigned number by 8-bit unsigned number using repeated subtraction.

OE - 3

ELE-OE-237 Computer Applications

Course Outcomes (COs):

At the end of this course, student will be able to

CO 1	Aquire Basic skills of computer
CO 2	Ability to navigate the file system.
CO 3	Ability to create and edit documents, spread sheets
CO 4	Ability to perform basic data manipulation using spread sheets and use Indian languages in documents

Unit	Topics	Lectures / Marks
Unit 1	**Basics of Information Technology:** Computer Systems: characteristics of a computer, components of a computer system – CPU, memory, storage devices and I/O devices, Memory: primary (RAM and ROM) and secondary memory, Storage devices: hard disk, CD ROM, DVD, pen/flash drive, memory stick, I/O devices: keyboard, mouse, monitor, printer, scanner, web camera, Types of software: system software (operating system, device drivers), application software including mobile applications	**8 Hrs 8 M**
Unit 2	**Cyber-safety:** Safely browsing the web and using social networks: identity protection, proper usage of passwords, privacy, confidentiality of information, cyber stalking, reporting cybercrimes , Malware: Viruses, adware	**6 Hrs 6 M**
Unit 3	**Introduction to a word:** create and save a document. , Edit and format text: text style (B, I, U), font type, font size, text colour, alignment of text. Format paragraphs with line and/or paragraph spacing. Add headers and footers, numbering pages, grammar and spell check utilities, subscript and superscript, insert symbols, use print preview, and print a document. ,Insert pictures, change the page setting, add bullets and numbering, borders and shading, Use auto-format, track changes, review comments, use of drawing tools, shapes and mathematical symbols.	**8 Hrs 8 M**
Unit 4	**Spreadsheets:** concept of a worksheet and a workbook, create and save a worksheet.,Working with a spreadsheet: enter numbers, text, date/time, series using auto fill; edit and format a worksheet including changing the colour, size, font, alignment of text; insert and delete cells, rows and columns. Enter a formula using the operators (+,-,*, /), refer to cells, and print a worksheet. • Use simple statistical functions: SUM (), AVERAGE (), MAX (), MIN (), IF () (without compound statements); embed charts of various types: line, pie, scatter, bar and area in a worksheet.	**8 Hrs 8 M**

References Books:

1. Fundamentals and applications Ashok Arora Pragati Prakashan Computer fundamentals D. P.

Nagpal, S Chand Publications
2. Understanding Digital literacy by Rodney H. Jones
3. Digital Literacy by Paul Glister
4. Digital Literacies for learning by Allan Martin and Dan Madigan

SEC - 1

ELE-SEC-234 PCB Designing & Manufacturing

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

After completion of the course, students will adopt the ability to

CO 1	Explain PCB Manufacturing Processes
CO 2	Handle advanced techniques and CAD tools for designing PCB
CO 3	Apply the knowledge and techniques to fabricate the multilayer PCBs
CO 4	Comprehend PCB Assembly & SMT

Unit	Title and Contents	No of Hrs/ M
Unit 1	**Basics of printed circuit boards** Component of printed circuit boards, classifications and manufacturing of PCB's, Standards of PCB's, active and passive components, Component package types : Through Hole Packages, Axial lead, Radial Lead, , Single Inline Package(SIP), Dual Inline Package(DIP), Transistor Outline(TO), Pin Grid Array(PGA), Metal Electrode Face(MELF), Leadless Chip Carrier(LCC), Small Outline Integrated Circuit(SOIC), Quad Flat Pack(QPF) and Thin QFP (TQFP), Ball Grid Array(BGA), Plastic Leaded Chip Carrier(PLCC) Flowchart of Manufacturing of PCB: Single sided, double-sided PCB	**8 Hrs 8 M**
Unit 2	**Design Considerations** General PCB design considerations, Mechanical design considerations, Electrical design considerations, component placement considerations, Design rules for analog, digital, power supply, high frequency, fast pulse circuits	**6 Hrs 6 M**
Unit 3	**Introduction to Electronic design automation (EDA) tools for PCB designing** Brief Introduction of various simulators, SPICE and PSPICE Environment, Selecting the Components Footprints as per design, Making New Footprints, Assigning Footprint to components, Net listing, PCB Layout Designing, Auto routing and manual routing. Assigning specific text (silkscreen) to design, creating report of design, creating manufacturing data (GERBER) for design	**8 Hrs 8 M**
Unit 4	**Introduction to Printed Circuit Board manufacturing** Laminates and types, image transfer techniques, etching solutions and arrangements, Mechanical operations: cutting, punching drilling; soldering: materials, tools, variables, Other soldering tools, Details of hand soldering, PCB assembly process. Surface mounting technology	**8 Hrs 8 M**

Reference Books:

1. Printed Circuit Boards, Design Fabrication and assembly, R. S. Khandpur, McGraw Hill
2. Printed Circuits handbook, Clyde Coombs
3. Printed Circuit board design using Autocad, Chris Schroeder, Newness publications
4. Complete PCB design using Orcad capture and layout, Kraig Mitzner, Elsevier publication

SEC-2

ELE-SECP-235 PCB Manufacturing Lab - I

(Practical Course Credits: 2, Total Hrs: 60)

Course Outcomes:

On successful completion of the course, the students will be able to understand

CO 1	PCB Component Identification and Layout
CO 2	PCB Manufacturing & Assembly Concepts
CO 3	PCB Design using EDA Tools
CO 4	PCB manufacturing

Practicals (Any Eight)

1. Study of PCB layout design steps
2. Preparation of etching solution and its parameters.
3. Layout design and fabrication of bridge rectifier circuit using PCB.
4. Layout design and fabrication of power supply using PCB
5. Layout design and fabrication of RC phase shift oscillator using trasistor using PCB.
6. Layout design and fabrication of op-ampadder/substractor using PCB
7. Layout design and fabrication of astable/bistable multivibrator using PCB
8. Layout design and fabrication of flip-flop circuit using Logic gates
9. Layout design and fabrication of Half adder/full adder using PCB
10. Layout design and fabrication of mux/ demux PCB usingIC's
11. Layout design and fabrication of 8051 development board
12. Layout design and fabrication of Ardiuno development board

S. Y. B. Sc.
SEM-IV

DSC-8

ELE-MJ-241 Semiconductor Devices & Applications

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Apply knowledge to develop circuits using electronic devices.
CO 2	Apply practical knowledge to solve real life problems of the society.
CO 3	Apply the concept and knowledge of Basic analog circuits to develop new systems.
CO 4	Apply the concept and knowledge of electronic devices to real life problems.
CO 5	Understand and analyze, linear electronic circuits

Unit	Title and Contents	No of Hrs/ M
Unit 1	**Junction Diode** PN junction diode– Formation of Depletion Layer, forward and reverse biasing, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode- Zener and avalanche breakdown, I-V characteristics, Reverse saturation current.	**8 Hrs 8 M**
Unit 2	**Applications of Junction Diodes in power supply** Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge): circuit diagrams, working and waveforms, PIV, ripple factor and efficiency (Derivation not expected). Comparison of rectifiers, Filters- working, in/out waveforms of capacitive, inductive, Pi filter, Zener diode as a voltage regulator, Problems on Zener regulator	**8 Hrs 8 M**
Unit 3	**Bipolar Junction Transistor** Construction and operation of BJT (NPN and PNP), CB, CE and CC configuration, characteristics of transistor in CE and CB configurations, h parameter definitions for CE, Regions of operation (active, cut off and saturation), Current gains α and β, Relations between α and β, BJT as Switch Need of dc biasing, Biasing methods : voltage divider, dc load line DC Q point.	**8 Hrs 8 M**
Unit 4	**Unipolar Devices** JFET- Construction, working and I-V characteristics (output and transfer), Pinch off voltage, JFET as an amplifier, UJT: Construction, working, Relaxation oscillator, MOSFET: Construction and working principle of NMOS, PMOS, CMOS	**6 Hrs 6 M**

References:

1. Principles of Electronic Devices and Circuits , B. L. Theraja, S. Chand Publication
2. Principles of Electronics, V. K. Mehta, S. Chand publication
3. Basic Electronics, Bernard Gro, McGraw Hill Publication
4. Introduction to Semiconducting Materials and Devices, M. S. Tyagi, WILEY-INDIA
5. Basic Electronics Engineering: Including Laboratory Manual, Satya Sai Shrikant, Springer

DSC-9

ELE-MJP-243 Devices & Applications Lab - I

(Practical Course Credits: 2, Total Hrs: 60)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Understand the device specifications
CO 2	Understand the operation and performance of different rectifier and filter circuits for power supply applications
CO 3	Understand the voltage regulator circuits
CO 4	Analyze the I-V characteristics of bipolar junction transistors (BJT) in switching applications

Practicals (Any Eight)

1. Study of the I-V Characteristics of p-n junction Diode,
2. Study of the I-V Characteristics of Zener diodes.
3. Build and test Half wave rectifier
4. Build and test Centre-tapped Full wave rectifier.
5. Build and test Full wave Bridge rectifier.
6. Study of capacitor filter circuit
7. To study Zener diodes as a voltage regulator.
8. Study of the I-V Characteristics CE circuit.
9. Study of the I-V characteristics CB circuit.
10. To study Transistor as a switch (LED ON/OFF).
11. Study of the output characteristics of common source JFET.

MIN - 4

ELE-MN-246A 8051 Microcontroller

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to understand

CO 1	the microcontroller and its architecture considerations & capable to analyze the operating modes
CO 2	embedded programming
CO 3	I/O port programming
CO 4	Design and implement small scale embedded system

Unit	Title and Contents	No of Hrs/ M
Unit 1	**Introduction to Microcontroller** Block diagram of microcontroller Advantages and disadvantages of microcontroller, Comparison between microprocessor and microcontroller, Applications of microcontroller (list only)	**6 Hrs 6 M**
Unit 2	**Architecture of 8051 Microcontroller** 8051 microcontroller – Features, Block diagram, CPU registers, Flags and Program Status Word, Program Counter, Data Pointer, Pin out diagram, Special Function Registers & their Format: Stack & Stack Pointer, Internal RAM /ROM, Oscillator & Clock, Concept External Memory, I/O ports (Ports-0,1,2 & 3), Counter and Timers, Serial data input/ output transfers, difference between serial and parallel data transfer, Interrupts.	**8 Hrs 8 M**
Unit 3	**Instruction Syntax, Addressing Modes and Instructions** Addressing modes, immediate addressing, Register addressing, Direct addressing, Register Indirect addressing, Indexed addressing, Relative addressing, Absolute addressing, Long addressing, Bit inherent addressing, Bit Direct addressing, Instruction set, Arithmetic Instructions, Logical Instructions, Jump and Call and Loop Instructions, flag manipulation instructions.	**8 Hrs 8 M**
Unit 4	**8051 Microcontrollers basic and I/O port Programming** Introduction to programming, Assembler directives, Assembly language programming-simple data transfer, arithmetic, logical, looping and code conversion programming , Introduction to I/O programming, I/O port pins description and their functions,, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation.	**8 Hrs 8 M**

References:

1. 8051 microcontroller and embedded systems using assembly and C, M.A. Mazidi, Pearson Education India
2. 8051 microcontrollers, Satish Shah, Oxford University Press
3. Embedded Microcontroller Systems: Real time interfacing, J. W. Valvano, J. W. Valvano 2011

MIN - 5

ELE-MNP-246B 8051 Microcontroller Lab - I

(Practical Course Credits: 2, Total Hrs: 60)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Use simulator of 8051 microcontroller
CO 2	Understand the fundamentals of low-level programming
CO 3	Gain hands-on experience with 8051 microcontroller interfacing
CO 4	Design and implement practical embedded applications using keypad input, analog-to-digital conversion, and real-time device control.

Practicals : (Any Eight)

1. Write a program for addition / subtraction of two 8 bit numbers and store the results.
2. Write a program for multiplication / division of two 8 bit numbers and store the result In the AX register.
3. Write a program to convert 8 bit decimal numbers into hexadecimal form.
4. Write a program to convert hexadecimal numbers into BCD form.
5. Write a program to convert a BCD number into hexadecimal number.
6. Write a program to move the contents of an array from one memory location to another memory location.
7. Interfacing of DC stepper motors with 8051 microcontroller.
8. To switch ON and OFF the LEDs.
9. To Display 0 to 9 number by interfacing of Seven segment display with 8051 microcontroller.
10. Interfacing of LCD display to 8051 microcontroller.
11. Interfacing of 4x4 Keypad with 8051 microcontroller.
12. Interfacing of ADC converter with 8051 microcontroller.

OE- 4 (T)

ELE-OE-247 Electronic Products Maintenance

(Credits: 2, Total Hours: 30)

Course Outcomes (COs):

At the end of this course, student will be able to

CO 1	Understand different electronic products used in homes
CO 2	To get the skill related with repairing methods of electronics
CO 3	To understand different components in related with Electronics
CO 4	Outline the appliance service, installation, and preventive maintenance procedures

Unit	Topics	Lectures/ Marks
Unit 1	**Fundamentals of Service** Selecting, purchasing, and installing major home appliances – Electric and gas ranges, cooktops and ovens, refrigerators and Freezers, dishwashers, laundry equipment, air-conditioners	**6 Hrs** **6 M**
Unit 2	**Safety Measures:** Safety measures, tools needed, customer satisfaction, communication skills, basic techniques to diagnose a problem	**4 Hrs** **4 M**
Unit 3	**Basic components:** Components related to electrical, electronics Resistors, Diodes,Transistors, Integrated Circuits (ICs), Switches, Fuses, Batteries, Transformers, Connectors and Terminals, Gas Safety Components: Pressure Regulators, Shut-off Valves, Leak Detectors, Flame Arrestors, Pressure Relief Valves, Gas Burners/Appliances, thermocouples.	**10 Hrs** **10 M**
Unit 4	**Role of Maintenance:** Appliance Service, installation, and preventive maintenance procedures for following (any 5 appliances) Automatic Dishwashers, Garbage Disposers, Automatic Electric Dryers, Electric ranges, Cooktops and Ovens, Microwave Oven, Refrigerators and Freezers, Automatic Ice makers, Room Air conditioners, Dehumidifier	**10 Hrs** **10 M**

References Books:

1. Troubleshooting and Repairing Major Appliances, Eric Kleinert, Third Edition, McGraw Hill .
2. Troubleshooting Electronic Equipment, R.S. Khandpur,) 2007 (McGraw Hill .
3. Consumer Electronics, S.P.Bali, Pearson (2008).

VC - 1

ELE-VC-244 Linear Integrated Circuits using PSPICE

(Theory Course Credits: 2, Total Hrs: 30)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Understand the basics amplifier and timer circuits
CO 2	Design the application of linear integrated circuits IC's
CO 3	Use simulation software for electronics circuits
CO 4	Design and testing PSPICE circuits

Unit	Title and Contents	No of Hrs/ M
Unit 1	**Operational Amplifiers** Characteristics of an Ideal and Practical Operational Amplifier (IC741), Open and closed loop configuration, Frequency Response, CMRR, Slew Rate	**4 Hrs** **4 M**
Unit 2	**Applications of Op-Amps** Inverting and non-inverting amplifiers, concept of Virtual Ground, Summing and Difference Amplifier, Differentiator, Integrator, Comparator and Zero-crossing detector, and Active low pass and high pass	**8 Hrs** **8 M**
Unit 3	**Timer (IC555)** Introduction, Block diagram of IC 555, Astable, Monostable and Bistable multivibrator circuits. Period and frequency of multivibrators, Problems, duty cycle & derivation.	**8 Hrs** **8 M**
Unit 4	**Introduction to SPICE** Circuit Schematic : Components library, Create and edit circuits, Changing the parameters of components, Concept and creation of subcircuits and Macros, , Types of analysis: Type of analysis : DC analysis, AC analysis, parameter sweep, Transient Response , output methods: Graph, Probe, Bode plot, Smith chart	**10 Hrs** **10 M**

References:

1. OP - Amps and Linear Integrated Circuit, R.A.Gaikwad, 4th edition, Prentice Hall
2. Operational Amplifiers and Linear ICs, David A.Bell, 3rd Edition, Oxford University Press.
3. Pspice for circuit theory and electronic devices by Paul Toblin
4. Laboratory experiments and Pspice simulation in Analog Electronic by L. K. Maheshwari, Prentice Hall of India

VC - 2

ELE-VCP-245 Linear Integrated Circuits using PSPICE Lab - I

(Practical Course Credits: 2, Total Hrs: 60)

Course Outcomes:

On successful completion of the course, the students will be able to

CO 1	Study the characteristics of Linear Integrated Circuit IC's
CO 2	Apply the applications of amplifier and timer circuits
CO 3	Use simulation software for electronics circuits
CO 4	Design and testing PSPICE circuits

Nore: In the following practicals students are expected to create schematic in circuit editor and test the circuit using suitable type of analysis available in spice simulator.

Practicals (Any eight)

1. Study of the
2. To build and test the adder circuit of operation amplifier circuit using SPICE simulator.
3. To build and test the subtractor circuit of operation amplifier circuit using SPICE simulator.
4. To build and test the integrator circuit of the operational amplifier using SPICE simulator.
5. To build and test the differentiator circuit of the operational amplifier circuit using SPICE simulator.
6. To build and test the first order low pass/high pass filter circuit of an operational amplifier using PSPICE simulator.
7. To study the astable multivibrator circuit using the SPICE simulator.
8. To study the bistable multivibrator circuit using the SPICE simulator.
9. To study the monostable multivibrator circuit using the SPICE simulator.
10. Design, Built and test Square and triangular Wave generator using the SPICE simulator.
11. Study of Log Amplifier with diode and Op-Amp using the SPICE simulator.
12. Study of unity follower using the SPICE simulator.

OJT /Int/ CEP

ELE-CEP-242 : Electronic Projects for Community

(Course Credits: 4)

***OJT/Int/CEP corresponding to the Major (Core) Subject**

During project work, follow the following guidelines –

1. Title of the project must be well defined.
2. Planning of the project must be specified.
3. Aim, Objectives, Designing and theoretical background of the work should be specified in detail.
4. Actual work done must be reported along with experimental procedure.
5. There must be observations, results and conclusions of the project work.
6. In case of the projects related to the development of computer software algorithm, program strategy, module wise description etc. must be provided.
7. Applications of the work must be specified clearly.
8. Further extension / future scope of the work may be suggested for better outcome of the project.
9. References must be specified

Semester wise Planning & Evaluation of the project work

Work Assigned	Marks	Total
Fabrication and Testing of the Project Circuit	20	60
Preparation of the Project Report	20	
Final Presentation of the Project	20	