DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A $^{+}$' Grade

CIRCULAR NO.SU/ B.Sc./NEP-2020/91/2026

It is hereby inform to all concerned that, the Revised syllabi prepared by the Board of Studies/Ad-hoc Boards/Committees and recommended by the Faculty of Science & Technology, **Academic Council at its meeting held on 02nd June 2026 has accepted** the following **Revised syllabi of Bachelor of Science & Basket** under the Faculty of Science & Technology **as per Norms of National Education Policy-2020 and as per Government Letter dated 13 March 2024** run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Botany	Vth and VIth semester
2.	B.Sc.Biotechnology	Vth and VIth semester
3.	B.Sc.Zoology	Vth and VIth semester
4.	B.Sc.Agrochemical and Fertilizer	Vth and VIth semester
5.	B.Sc.Geology	Vth and VIth semester
6.	B.Sc.Environmental Science	Vth and VIth semester
7.	B.Sc.Home Science	Vth and VIth semester
8.	B.Sc.Diary Science and Technology	Vth and VIth semester
9.	B.Sc.Automobile Technology	Vth and VIth semester
10.	B.Sc.Physics	Vth and VIth semester
11.	B.Sc.Chemistry	Vth and VIth semester
12.	B.Sc.Analytical Chemistry	Vth and VIth semester
13.	B.Sc.Polymer Chemistry	Vth and VIth semester
14.	B.Sc.Electronics	Vth and VIth semester
15.	B.Sc.Forensic Science & Cyber Security	Vth and VIth semester
16.	B.Sc.Microbiology	Vth and VIth semester
17.	B.Sc.Fisheries Science	Vth and VIth semester
18.	B.Sc.Mathematics	Vth and VIth semester
19.	B.Sc.Forensic Science	Vth and VIth semester
20.	B.Sc.Information Technology	Vth and VIth semester
21.	B.Sc.Horticulture	Vth and VIth semester
22.	B.Sc.Networking & Multimedia	Vth and VIth semester
23.	B.Sc.Biochemistry	Vth and VIth semester
24.	B.Sc.Industrial Chemistry	Vth and VIth semester
25.	B.Sc.Bioinformatics	Vth and VIth semester

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26.	**B.Sc.Instrumentation Practice**	**Vth and VIth semester**
27.	**B.Sc.Non-Conventional and Conventional Energy**	**Vth and VIth semester**
28.	**B.Sc.Statistics**	**Vth and VIth semester**
29.	**B.Sc.Computer Science**	**Vth and VIth semester**
30.	**Bachelor of Computer Application**	**Vth and VIth semester**

This is effective from the Academic Year 2026-27 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/AC.No.06/4498-113
Date:- 12.06.2026.

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Deputy Registrar,
Syllabus Section

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

B.Sc. Degree Programme

(Three Year / Four Years (Hons) /Four Years (Hons with Research)

Course Structure and Syllabus for Third Year

(AS PER NEP-2020)

Subject (Major): Electronics

Effective from 2026-27 (Academic Year)

13/05/2026
Prof M. D. Shirsat
BoS - Electronics

Professor Bhaskar Sathe,
Dean,
Faculty of Science & Technology,
Dr.Babasaheb Ambedkar
Marathwada University
Chhatrapati Sambhajinagar

Structure of B. Sc. (Three / Four Years Honours / Honours with Research Degree) Programme with Multiple Entry and Exit Options

Subject (Major): Electronics

BSc Third Year : 5th Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory DSC	SUB/DSC/T/ 300	Power Electronics	2		2		2+2+2+2= 08
	SUB/DSC/T/ 301	Microcontroller -1	2		2		
	SUB/DSC/P/ 326	Practical based on SUB/DSC/T/ 300		4		2	
	SUB/DSC/P/ 327	Practical based on SUB/DSC/T/ 301		4		2	
Discipline Specific Electives (DSE) (Choose any one from SUB/DSE/T/ 300 and SUB/DSE/T/ 301) and corresponding Practicals	SUB/DSE/T/ 300	Programmable Logic Controllers (PLC)	2		2		2+2=4
	SUB/DSE/T/ 301	Fiber Optics Communication	2		2		
	SUB/DSE/P/ 326	Practical based on SUB/DSE/T/ 300		4		2	
	SUB/DSE/P/ 327	Practical based on SUB/DSE/T/ 301		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	SUB/Mn/T/ 300	To be chosen from other discipline of same faculty	2		2		2+2 = 04
	SUB/Mn/T/ 301	To be chosen from other discipline of same faculty	2		2		
VSC (Vocational Skill Courses) (Choose any one from SUB/VSC/T/ 300 and SUB/VSC/T/ 301) and corresponding Practicals	SUB/VSC/T/ 300	8086 Microprocessor Interfacing	2		2		2+2 =04
	SUB/VSC/T/ 301	Solar Technology and Maintenance	2		2		
	SUB/VSC/P/ 326	Practicals based on SUB/VSC/T/ 300		4		2	
	SUB/VSC/P/ 327	Practicals based on SUB/VSC/T/ 301		4		2	
OJT/ FP/CEP/CC/RP (Choose any one from pool of courses)	SUB/FP/CEP/ P/326	Field Project / community engagement and service		4		2	02
			12	20	12	10	22

Minor Courses for other Discipline

SUB/Mn/T/ 300 : Consumer Electronics-II

(This is a 2 credit theory course to be designed for other discipline)

SUB/DSE/T/ 301: Communication Electronics- II

(This is a 2 credit theory course to be designed for other discipline)

BSc Third Year: 6th Semester

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) Mandatory DSC	SUB/DSC/T/ 350	Instrumentation	2		2		2+2+2+2+2 = 10
	SUB/DSC/T/ 351	Microcontroller -II	2		2		
	SUB/DSC/P/ 376	Practical based on SUB/DSC/T/ 350		4		2	
	SUB/DSC/P/ 377	Practical based on SUB/DSC/T/ 351		4		2	
	SUB/DSC/T/ 352	IKS-2 (Materials and Resonant Devices in IKS)	2		2		
Discipline Specific Electives (DSE) (Choose any one from SUB/DSE/T/ 350 and SUB/DSE/T/ 351) and corresponding Practicals	SUB/DSE/T/ 350	Oscillators and Multivibrators using Transistors	2		2		2+2=4
	SUB/DSE/T/ 351	Arduino Programming and Interfacing	2		2		
	SUB/DSE/P/ 376	Practical based on SUB/DSE/T/ 350		4		2	
	SUB/DSE/P/ 377	Practical based on SUB/DSE/T/ 351		4		2	
Minor (Choose any one from pool of courses) **It is from different discipline of the same faculty**	SUB/Mn/T/ 350	To be chosen from other discipline of same faculty	2		2		2+2 = 04
	SUB/Mn/T/ 351	To be chosen from other discipline of same faculty	2		2		
OJT/ FP/CEP/CC/RP (Choose any one from pool of courses)	SUB/OJT/P/ 376	On Job Training		8		4	04
			12	20	12	10	22

Minor Courses for other Discipline

SUB/Mn/T/ 350: Television Technology - I

(This is a 2 credit theory course to be designed for other discipline)

SUB/Mn/T/ 351: Television Technology - II

(This is a 2 credit theory course to be designed for other discipline)

Semester V

SUB/DSC/T/300: Power Electronics

Total credits:02 **Total Contact Hours:30 Hrs**

Course Objectives: This course aims to familiarize students with the fundamental concepts of power electronics.

1. Understand the construction and working mechanism of the thyristor family.
2. Learn the different types and applications of detection sensors.
3. Understand the ac and dc drive fundamentals.

Course Outcomes (Cos) After completion of the course, students will be able to

1. Analyze and test the power semiconductor devices and their applications.
2. Compare and contrast various power semiconductor devices according to their applications.
3. Have confidence in dealing with high-power Equipment and upgrade their performance.
4. Use the knowledge acquired through this lab to design circuits that are useful in day-to-day life.

Unit - I: Thyristors **08 Hrs**

Silicon Controlled Rectifiers, Unijunction Transistors, Diac, Triac, IGBTs {Construction, Operation, Equivalent Circuit, Characteristics};

Unit- II: Detection Sensors **12 Hrs**

Limit Switches, Proximity Detectors, Inductive Proximity Switches {Pons, Output Stages, Operation): Capacitive Proximity Switches, Photoelectric Sensors, Methods of Detection, Operating Specifications, Sensor Interfacing (Electromagnetic Relays, Resistive Load, Inductive Load, Solid State Relay, Two Wire System)

Unit - III: D C Drives and AC Drives **10 Hrs**

DC Drive Fundamentals, Variable Voltage DC Drive, Motor Braking, AC Drive Fundamentals, AC Drive System, Circuit Operation of AC Drive, Motor Braking,

Books Recommended:

1. Industrial Electronics {Circuits, Instruments and Control Techniques} — Terry Bartelt, DELMAR, Cengage Learning India Pvt. Ltd. Delhi, 2009
2. Introduction to Power Electronics — V Jagannathan, PHI, New Delhi, 2004

Power Electronics — M D Singh and K B Khanchandani,

SUB/DSC/T/301: Microcontroller-I

Total Credits:02 **Contact Hours:30**

Course Objectives: Students will facilitate to –

1. Understand and explain microcontroller architecture, programming and interfacing
2. Analyse the process of industrial automation and design automation system using microcontroller
3. Provide an opportunity to the students to enter into entrepreneurship

Course outcomes: After completion of the course students will be able to -

1. Design and develop automated system based on 8051 Microcontroller
2. Apply the basics of number system to solve arithmetic and logical operations of 8051 microcontrollers.
3. Develop assembly language programming for 8051 microcontrollers.
4. Analyse and debug assembly language programme for 8051 microcontroller
5. Interface I/O devices

Unit - I: 8051 Microcontroller **12 Hrs**

Introduction: microprocessors and microcontrollers, comparing microprocessors and microcontrollers, development system for microcontrollers, embedded versus external memory devices, 8-bit and 16-bit microcontrollers, CISC and RISC processer, Harvard and Von Neumann architecture, commercial microcontroller devices, Features of 8051 Microcontroller, MCS-51 architecture, Registers in MCS-51, 8051Pin description, Memory Organization.

Unit - II: Addressing Modes and Instructions **08 Hrs**

8051 Addressing Modes, MCS-51 Instruction set, 8051 Instructions and simple programmes, Using stack pointer.

Unit - III: Interrupts, Timer/Counters, Serial Communication & Applications of MCS-51 **10 Hrs**

Interrupts, Interrupts in MCS-51, Timers and Counters, Serial communication, Pin diagrams of 89C51 and 89C2051, square wave generation, pulse generation, staircase ramp generation, pulse width measurement.

Books Recommended:

1. Microcontrollers [Theory and Applications]- Ajay Deshmukh, TMH, New Delhi,2009
2. The 8051 microcontroller and embedded system – Mazidi M. A., Mazid J. G. I and McKinlay R. D- Pearson PHI,2009
3. The 8051 Microcontroller- K. J. Ayala, DELMAR, Cengage Learning India Pvt,Ltd Delhi,2008.

SUB/DSC/P/326: Practicals based on SUB/DSC/T/300

Power Electronics (Practical)

Total credits:02 **Total Contact Hours:60 Hrs**

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

Experiments

1. Study of SCR characteristics.
2. Study of UJT characteristics.
3. Study of DIAC characteristics.
4. Study of TRIAC characteristics.
5. Half-wave rectifier using SCR.
6. Study of firing or two SCRs using one UJT for power control.
7. Study of Triac as a light dimmer.
8. Diac operated temperature sensitive switch using thermistor.
9. UJT relaxation oscillator.
10. Study of IGBT characteristics

SUB/DSC/P/327: Practicals based on SUB/DSC/T/301

Microcontroller-I (Practical)

Total Credits:02 **Contact Hours:60**

Every candidate appearing for university examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

Experiments

1. Write a program to blink LED with 0.5 Hz frequency and implement it using Atmel 89C51.
2. Write a program for 8-bit up counter and implement it using Atmel 89C51.
3. Write a program for 8-bit binary down counter and implement it using Atmel 89C51.
4. Write a program to interface a switch and 8 LEDs for binary up counter when switch is closed and pause the counter when switch is open, implement it using Atmel 89C51.
5. Write a program to generate square waveforms using Atmel 89C51 and implement it.
6. Write a program for pulse generators using Atmel 89C51 and implement it.
7. Write a program for pulse width measurement using Atmel 89C51 and implement it.

SUB/DSE/T/300 : Programmable Logic Controllers (PLC)

Total Credits:02 **Contact Hours:30**

Learning Objectives:

- Understand the basic concept, functions, and applications of Programmable Logic Controllers (PLCs)
- Explain industrial motor control circuits and relay ladder logic circuits
- Develop and interpret ladder diagrams for simple control systems
- Identify and describe PLC hardware components: rack, power supply, processor, I/O modules, and programming unit
- Understand PLC addressing and the relationship between data file addresses and I/O modules

Course Outcomes: After completion of course, students will be able to:

- Describe typical components of a Programmable Logic Controller
- Explain the basic concepts of a Programmable Logic Controller
- State basic PLC terminology and their meanings.
- Explain and apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction
- Use ladder language programming for real applications
- Explain the concept of basic digital electronics and data manipulation

Unit -I Introduction to programmable controllers Industrial motor control circuits, Relay Ladder logic circuits, Building a Ladder Diagram, Rack assembly, Power Supply, PLC Programming Unit, Input /Output section, Processor Unit, Addressing, Relationship of Data File Adress to I/O modules

10 Hrs

Unit -II Fundamental PLC Programming PLC program execution, Ladder diagram programming Language, Ladder diagram programming, Relay logic instructions Timer instruction, counter instruction, Data manipulation instructions, Arithmetic operations, writing a program

10 Hrs

Unit -III Advanced programming Jump command, Data manipulation, Discrete input/output modules, troubleshooting I/O interfaces

10 Hrs

Learning Resources:

1. Industrial Electronics- Terry Bartelt, DELMAR, Cengage Learning India Pvt Ltd. Delhi 2009

2. Introduction to Power Electronics - V Jagannathan, PHI, New Delhi, 2004

3. Power Electronics -M D Singh and K B Khanchandani,

4. Mano, M. Morris. Digital logic and computer design. Pearson Education India, 2017.

5. Kamel, Khaled, and Eman Kamel. Programmable logic controllers: Industrial control. McGraw Hill Professional, 2013.

6. Handbook, P. L. C. "Practical Guide to Programmable Logic Controllers." Automation Direct. com.

SUB/DSE/P/326 : Practicals based on SUB/DSE/T/300

Programmable Logic Controllers (Practicals)

Total Credits:02 **Contact Hours:60**

Every candidate appearing for university examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

1. Study of Water Level Controller, Using PLC Simulator
2. Study of Traffic Light Control, Using PLC Simulator
3. Study of Horizontal Motion of Conveyor Belt using Limit Switches, Using PLC Simulator
4. Study of Lift Control, Using PLC Simulator
5. Study of Bottling Plant with Counter, Using PLC Simulator
6. Study of PLC field device interface module
7. Study reversal of DC motor direction using PLC simulator
8. Study of pump control, 10 sec ON. And 20 sec OFF using PLC simulator
9. Study of mathematical operation on PLC using simulator

SUB/DSE/T/301: Fiber Optics Communication

Total Credits:02 **Contact Hours:30**

Course Objectives:

1. The course aims to provide students with a comprehensive understanding of the principles underlying optoelectronic devices, including light sources, detectors, modulators, and optical fibers.
2. To provide adequate knowledge about the Fiber optics communication.
3. Develop practical skills through laboratory experiments: Students will engage in hands-on laboratory sessions to reinforce theoretical concepts and gain practical experience in designing and implementing systems

Course outcomes:

1. Students will demonstrate a comprehensive understanding of the principles underlying optoelectronics, including the interaction of light with semiconductor materials, the generation and detection of light signals, and the operation of optoelectronic device.
2. Students will be able to apply optoelectronic components and systems to solve practical engineering problems encountered in various industrial sectors, including telecommunications, medical devices, and automotive, aerospace, and renewable energy.
3. Students will develop analytical and problem-solving skills necessary to analyze complex optoelectronic systems, troubleshoot issues, and optimize performance in industrial settings

Unit –I **10 Hrs**

Lamps and illumination systems, LEDs – working principle and applications, LED lighting, Display devices, indicators, numeric, alphanumeric and special function displays, Liquid Crystal Display elements, Plasma Displays, Multimedia projectors.Semiconductor lasers, - Fabry-Perot lasers, Distributed Feedback, (DFB) lasers, Distributed Bragg Reflection (DBR) lasers

Unit –II **10 Hrs**

Photodetectors types and applications, PN and PIN Photodiodes, Avalanche Photodiodes (APD) Optocouplers, Opto interrupters, LASCR. used in safety interlocks, power isolators, rotary and linear encoders and remote control. Intrinsic and Extrinsic Fiber optic sensors.

Unit –III **10 Hrs**

Optical Fiber Theory, Parameters of Optical Fibers, Types of Optical Fibers-Single Mode and Multi-Mode Fibers, Step Index & Graded Index Fibers. Modal Properties-Waveguide Parameter (V Number), Cut-off wavelength, Dispersion-Intermodal and Intramodal dispersion Loss Mechanism in Optical Fibers-Adsorption and Scattering, Fresnel Reflection, Micro bending & Macro bending, Connector types and Splices, Misalignment and Mismatch losses.

Reference Books

1. Optical Engineering Fundamentals B.H. Walker, PHI

2. Electro-Optical Instrumentation Sensing and Measuring with Lasers: SilvanoDonati, Pearson

4. Fiber optics and Optoelectronics: R.P. Khare, Oxford Press.

5. Optical Fiber Communication Principles and Systems A. Selvarajan, S.Kar and Srinivas, TMH

6. Optical Fiber Communications G. Keiser, TMH

SUB/DSE/P/327: Practicals based on SUB/DSE/T/301

Total Credits:02 **Contact Hours:60**

Fiber Optics Communication (Practical)

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

Experiments

1. Light Emitting Diodes (LEDs)
2. Light Depended Resistors (LDRs)
3. Infrared LED's and Sensors
4. Optocouplers
5. Photodiodes and Phototransistors
6. Optical Communication - Optical Fiber Training Set
7. To establish analog link using Optical Fiber.
8. To establish voice link using optical fiber.
9. To Transmit and receive Pulse Amplitude Modulated (PAM) signal using Optical fiber.
10. To measure Propagation loss in optical fiber

SUB/Mn/T/300: Consumer Electronics-II

(This course is designed for students from other disciplines)

Total credits:02 **Total Contact Hours:30 Hrs**

Course Objectives: This course aims to familiarize with the fundamental concepts of popular consumer gadgets and appliances.

1. Understand the working mechanism of commonly used domestic appliances
2. Learn day to day maintenance of commonly used domestic appliances.
3. Familiarize with utilities of various popular office gadgets and digital access devices

Course Outcomes (Cos): After completion of this course students will be able to

1. Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
2. Ability to explore technical knowledge in diverse areas of Electronics and experience an environment in cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also higher studies.
3. Ability to design & perform electronic experiments as well as to analyse & suggest effective solutions.

Unit – I : Consumer Electronic Appliances **10 Hrs**

Photocopier: (Block diagram and working principle), Microwave Oven: (Block diagram, single chip controllers, types, wiring diagram, safety instructions, electrical specifications), Washing Machine: (Block diagram, electrical specifications, types and features of (Automatic, Semi-automatic and Fuzzy Logic) washing machines)

Unit – II : Smart appliances **10 Hrs**

Digital Camera and Camcorder: Working principle, picture processing, picture storage, electrical specification Scanner: Working principle, Specifications, types of scanners (Handheld, Flatbed, Sheet fed, Portable Scanners), interface cables, ports and connectors Bar code reader: Working principle, applications, Wearable antenna: Construction, Working principle and applications, Smart Wrist bands: Construction, applications and functional units (sensors, signal conditioning, microcontrollers, wireless connectivity, power management, firmware, storage)

Unit – III: Office Automation appliances **10 Hrs**

Laser Printer: Working principle, features, specifications, functional block diagram, control unit, and troubleshooting procedure, Smart Interactive Board: Working procedure, features, and specifications, LED Projector: Working principle, features, specifications, functional block diagram, control unit, and troubleshooting procedure, Biometric Attendance System: Hardware and software components, working procedure, Video conferencing system: Components and working procedure, Paper shredding machine: Components and working procedure.

1. Consumer Electronics, Bali S.P. Pearson Education India, New Delhi
2. Audio video systems: Principle practices and troubleshooting, Bali R and Bali S.P. Khanna Book Publishing Co.(P)
3. Audio Video Systems: principle and practices and troubleshooting, Gupta R.G. Mc Graw Hill
4. The Wearable Technology handbook, Haider Raad Ohio publishing and academic services
5. Consumer Electronics for Engineers by Philip Herbert Hoff
6. Industrial Electronics, T.E. Kisseil, PHI
7. Smartphones as Locative Media, Jordan Frith Wiley. 2014.
8. Home Automation, Dennis C Brewer. Que Publishing 2013.
9. Digital Storage in Consumer Electronics, Thomas M. Coughlin Elsevier and Newness 2012

SUB/Mn/T/301: Communication Electronics- II

Total Credits:02 **Contact Hours:30**

(This course is designed for students from other disciplines)

Unit –I **10 Hrs**

Types of Modulation: Amplitude modulation, expression for amplitude modulated voltage, waveforms of amplitude modulated voltage, sidebands produced in amplitude modulated wave, Frequency modulation, expression for frequency modulated voltage, waveforms of frequency modulated voltage, sidebands produced in frequency modulated wave, Phase modulation.

Unit –II **10 Hrs**

Modulation and Detection: Amplitude modulation theory, Square Law modulation, class C linear diode detector, varactor diode frequency modulator, Armstrong modulator, phase discriminator, AM transmitter, Superheterodyne receiver

Unit –III **10 Hrs**

Digital Communication: Synchronization, Asynchronous transmission, Probability of error in base-band transmission, Matched filter, Bit timing recovery, Digital carrier system, amplitude shift keying, frequency shift keying, phase shift keying.

Reference Books

1) Electronics and Radio Engineering – M L Gupta
2) Electronic Communications [IV Edition] –Dennis Roddy & J Coolen.
3) Advanced Electronic Communication Systems –Wayne Tomasi.
4) Introduction to Telecommunication –A A Gokhale.

SUB/VSC/T/300 : 8086 Microprocessor Interfacing

Total Credits:02 **Contact Hours:30**

Learning Objectives:

- Understand interfacing of semiconductor memory including static RAM and dynamic RAM with microprocessors.
- Learn interfacing and operation of I/O ports for effective data input and output control.
- Analyze architecture, pin diagram, and operating modes of 8255 PPI for peripheral interfacing.
- Develop skills to interface and control ADC, DAC, and stepper motors using 8255.
- Understand data communication methods and implement interfacing and programming of 8251 communication interface

Course Outcomes: After completion of course, students will be able to:

- Interface and manage SRAM/DRAM with a microprocessor for reliable memory operations.
- Design and implement efficient I/O port interfacing for data transfer.
- Configure and utilize 8255 PPI modes for peripheral interfacing applications.
- Integrate and control ADC, DAC, and stepper motor systems using 8255.
- Implement and program serial communication using the 8251 interfaces.

Unit I **10 Hrs**

Interfacing of memory and I/O: Semiconductor memory interfacing, static RAM interfacing, dynamic RAM interfacing, interfacing I/O ports

Unit II **10 Hrs**

Programmable Input – Output 8255: PIO 8255 pin diagram and architecture, modes of operation of 8255, Interfacing ADC, interfacing of DAC, stepper motor interfacing

Unit III **10 Hrs**

Communication Interface: Methods of data communication, architecture and signal description, operating modes, interfacing and programming of 8251

Learning Resources:

1. The INTEL Microprocessors 8086 /8088, 80186/80188, 80286, 80386, 80486,

Pentium and Pentium Processor –Barry B. Brey Printice-Hall INDIA

2. Advanced Microprocessors and Peripherals (Second Edition) A K Ray & K M Bhurchandi Tata McGraw Hill 2009

3. Microprocessors – S. K. Gupta Pragati Prakashan Meerut

4. Microprocessors – II –A. P. Godse Technical Publications Pune

SUB/VSC/P/326 : Practicals based on SUB/VSC/T/300

8086 Microprocessor Interfacing (Practicals)

Total Credits:02 **Contact Hours:60**

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

1) Interface 8 LED and 8 switches & write ALP to display status of switch using 8255.
2) Write a program for 8 bit binary UP counter and implement it using 8255
3) Write a program for 8 bit binary DOWN counter and implement it using 8255
4) Write a program to acquire 8 – bit data from an ADC and implement it using 8255
5) Interface Hex Key board and seven segment display to display key pressed on seven segment display
6) Write ALP to generate triangular waveform of frequency 500 HZ using DAC 0800 with 8255 & 8086 microprocessor
7) Design stepper motor controller and write an ALP to rotate shaft of stepper motor in clockwise direction & anticlockwise direction

SUB/VSC/T/301 : Solar Technology and Maintenance

Total Credits:02 **Contact Hours:30**

Learning Objectives:

- Understand the importance of renewable energy sources and the role of solar energy in sustainable development.
- Explain solar radiation, solar spectrum, and the photovoltaic effect used in solar energy conversion.
- Identify different types of solar cells such as monocrystalline, polycrystalline, and thin-film solar cells.
- Describe the construction, working principle, and characteristics of solar cells, panels, modules, and arrays.
- Analyse the efficiency and basic electrical parameters of solar photovoltaic systems

Course Outcomes: After completion of course, students will be able to:

- Understand the fundamentals of solar energy and photovoltaic systems.
- Learn the construction, working, and characteristics of solar cells and modules.
- Develop knowledge of solar power system components and installations.
- Acquire skills in operation, testing, troubleshooting, and maintenance of solar systems.
- Understand safety practices and performance evaluation of solar energy systems

Unit I: Fundamentals of Solar Energy and Photovoltaic Technology **10 Hrs**

Introduction to renewable energy sources, Need and importance of solar energy, Solar radiation and solar spectrum, Principles of photovoltaic effect, Types of solar cells: Monocrystalline, Polycrystalline, Thin film solar cells, Construction and working of solar cell, Characteristics of solar cell and solar panel, Solar photovoltaic modules and arrays, Efficiency of solar PV systems, Basic electrical concepts related to solar systems.

Unit II: Solar Power Systems and Installation Techniques **10 Hrs**

Components of solar PV systems: Solar panels, Batteries, Charge controllers, Inverters. Standalone and grid-connected solar systems, Solar street lighting system, Solar water pumping system, Solar water heating system, mounting structures and panel orientation, Site selection and shadow analysis, Wiring and electrical protection devices, Earthing and lightning protection, Installation procedures and safety precautions

Unit III: Solar System Maintenance and Troubleshooting **10 Hrs**

Preventive and corrective maintenance, Cleaning and maintenance of solar panels, Battery maintenance techniques, testing instruments used in solar systems, Measurement of voltage, current, and power, Fault diagnosis in solar PV systems, Troubleshooting of inverter and charge controller, Performance analysis of solar systems, Energy auditing and efficiency improvement, Safety practices during maintenance.

Learning Resources:

1. *Non-Conventional Energy Sources*, G. D. Rai, Khanna Publishers.
2. *Solar Energy: Principles of Thermal Collection and Storage*, S. P. Sukhatme and J. K. Nayak, McGraw Hill Education.
3. *Solar Photovoltaics: Fundamentals, Technologies and Applications*, Chetan Singh Solanki, PHI Learning.
4. *Solar Energy: Fundamentals and Applications*, H. P. Garg and J. Prakash, Tata McGraw Hill.
5. *Renewable Energy Technologies*, Ashok Kumar and Sunita Suman, Wiley India.

SUB/VSC/P/327 : Practicals based on SUB/VSC/T/301

Solar Technology and Maintenance (Practicals)

Total Credits:02 **Contact Hours:60**

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

1) Study of different types of solar cells and solar panels
2) Measurement of open circuit voltage and short circuit current of a solar panel
3) Plotting V-I characteristics of a solar PV module
4) Study and testing of solar charge controller
5) Study of solar inverter and its operation
6) Installation and wiring of a small solar home lighting system
7) Battery charging and maintenance using solar PV system
8) Measurement of solar panel efficiency under different conditions
9) Fault identification and troubleshooting in solar PV systems
10) Preventive maintenance and cleaning procedure for solar panels

Semester VI

SUB/DSC/T/350: Instrumentation

Total credits:02 **Total Contact Hours: 30 Hrs**

Course Objectives: This course aims to familiarize students with the fundamental concepts of instrumentation.

1. Understand the working mechanism of the commonly used display and recorder
2. Learn the different types and applications of transducers.

Course Outcomes (Cos) After completion of the course, students will be able to

1. Appreciate the operation of various measuring and control instruments that they encounter in their respective fields.
2. Visualize the sensors and the measuring systems when they have to work in areas of an interdisciplinary nature, and also think of sensors and sensor systems when they encounter a new situation in their careers.
3. Identify and select the right process or phenomenon on which the sensor should depend.
4. Know various stimuli that are to be measured in real-life instrumentation

UNIT - I: Qualities of Measurements **7 Hrs**

Performance Characteristics, Static Characteristics, Errors in Measurement, Types of Static Errors, Sources of Errors, Dynamic Characteristics, Standard, Atomic Frequency and Time Standards.

UNIT -II: Displays and Recorder **7 Hrs**

LED display, seven-segment display, LCD display

Recorder

X-Y recorder, Magnetic Tape recorder, Frequency modulation recording, Digital data recording.

Unit-III: Transducers **16 Hrs**

Electrical transducers, selecting a transducer, Resistive transducer, Resistive position transducer, Inductive transducer, Differential output transducer, linear variable differential transducer (LVDT), capacitive transducer (pressure), Load Cell, Piezo — electric transducer. Photoelectric transducers: - photo multiplier tube, photo cells, photo-voltaic cell, semiconductor photo diode, photo transistor. Temperature transducer: - RTD, Resistance thermometer, Thermistor, Thermocouple. UNIT — V: Assignments and Tutorials

Books Recommended

1. Electronic Instrumentation —Second edition by H.S.Kalsi (Mc Graw Hill Company)

2. Transducers and Instrumentation by D V S Murty (PHI)

SUB/DSC/T/351: Microcontroller-II

Total Credits:02 **Contact Hours:30**

Course Objectives:

Students will facilitate to –

1. Understand and explain microcontroller architecture, programming and interfacing
2. Analyse the process of industrial automation and design automation system using microcontroller
3. Provide an opportunity to the students to enter into entrepreneurship

Course outcomes:

After completion of the course students will be able to -

1. Design and develop automated system based on 8051 Microcontroller
2. Apply the basics of number system to solve arithmetic and logical operations of 8051 microcontrollers.
3. Develop assembly language programming for 8051 microcontrollers.

Unit I: 8051 Timer Programming in Assembly Language **10 Hrs**

Programming 8051 timers, counter programming

Unit II: 8051 Serial port Programming in Assembly Language **10 Hrs**

Basics of serial communication, 8051 connections to RS232, 8051 Serial Port programming in assembly language.

Unit III: Interrupt Programming in Assembly Language and Sensor Interfacing **10 Hrs**

8051 interrupts, programming timer interrupts, programming external hardware interrupts, interrupts priority in the 8051/8052, LCD Interfacing, ADC {0809}, DAC {0808} interfacing, sensor interfacing and signal conditioning {LM34 and LM35}.

Books Recommended:

1. The 8051 Microcontroller and embedded system- M A Mazadi, J. G. Mazadi and R. D. McKinley, Pearson PHI, 2009.
2. The 8051 Microcontroller- K J Ayala, DELMAR, Cengage Learning India Pvt. Ltd.
3. Microcontrollers [Theory and Applications]- Ajay Deshmukh, TMH, New Delhi, 2009.

SUB/DSC/P/376: Practicals based on SUB/DSC/T/350

Instrumentation (Practical)

Total credits:02 Total Contact Hours:60 Hrs

Every candidate appearing for the examination must produce a journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and the Head of the department.

Experiments

1. Study of IC AD590 as a temperature sensor.
2. Study of PTI 00 as a temperature sensor.
3. Study of the thermistor as a temperature sensor.
4. Study of the photodiode as a light sensor
5. Study of a photo transistor as a light sensor
6. Study of a photovoltaic cell as a light sensor
7. Study of LDR as a light sensor
8. Study of temperature sensing transducer.

SUB/DSC/P/377: Practicals based on SUB/DSC/T/351

Microcontroller-II (Practicals)

Total Credits:02 **Contact Hours:60**

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

Experiments

1. Write a program to generate square waveforms and implement it using Atmel 89C51 with DAC.
2. Write a program to staircase waveforms and implement it using Atmel 89C51 with DAC.
3. Write a program to generate triangular waveform with period of 1 ms and implement it using it using Atmel 89C51 with DAC.
4. Write a program for stepper motor direction control using a switch and implement it using Atmel 89C51.
5. Write a program to display Microcontroller on 2+8 LCD module and implement it using Atmel 89C51.
6. Interfacing of matrix keyboard using MCS-51.
7. Program based on MCS-51 Timer.
8. Program based on MCS-51 Counter.
9. Program based on MCS-51 Interrupts.
10. Temperature controller with MCS-51.

SUB/DSC/T/352: Materials and Resonant Devices in Indian Knowledge Systems

Total Credits:02 **Contact Hours:30**

Course Objectives:

Students will facilitate to –

1. Analyze ancient Indian electrochemical concepts using modern circuit theory.
2. Study indigenous metallurgical processes relevant to conductive and sensor materials.
3. Examine resonant acoustic systems using wave and signal theory.
4. Interpret traditional measurement devices using instrumentation principles.
5. Develop scientific validation skills through experimental modeling.

Course outcomes:

After completion of the course students will be able to -

1. Interpret electrochemical descriptions in ancient texts using modern electrochemistry.
2. Analyze corrosion-resistant materials from an electronics materials perspective.
3. Apply resonance theory to traditional metallic acoustic devices.
4. Evaluate indigenous measurement systems using instrumentation theory.
5. Develop small conceptual prototypes inspired by indigenous technologies

Unit I: Indigenous Metallurgy and Electronic Materials **(10 Hours)**

Corrosion resistance mechanisms in Iron Pillar of Delhi, Passive oxide layer formation and surface chemistry, Phosphorus-assisted rust resistance, Zinc distillation at Zawar - vapor phase extraction, Wootz steel microstructure and nano-carbon features, Relevance to nanostructured sensing materials

Unit II: Resonant Systems and Acoustic Devices **(10 Hours)**

Resonance theory and harmonic generation, Panchaloha alloy composition and material properties, Temple bell frequency spectrum analysis, Damping factor and quality factor (Q) estimation, Standing wave formation in dome structures, Analogies to resonators and MEMS acoustic devices

Unit III: Indigenous Measurement and Instrumentation Systems **(10 Hours)**

Angular measurement systems in Surya Siddhanta, Sundial geometry as analog time-measurement device, Mechanical-to-angular signal conversion, Calibration principles in pre-electronic instruments, Error analysis and uncertainty estimation, Comparison with modern analog instrumentation

Books Recommended:

1. Electrochemical Methods: Fundamentals and Applications

   Authors: Allen J. Bard, Larry R. Faulkner and Henry S. White; 3rd Edition (2022)

2. Materials Science and Engineering: An Introduction
   Authors: William D. Callister, Je and David G. Rethwisch

3. Acoustics for resonant systema de acoustic theory)

   Authorn: Heinrich Kuftruff

4. History of Science and Technology in Ancient India: The Beginnings

   Author: Debiprasad Chattopadhyaya

5. Science and Society in Ancient India

   Author: Debiprasad Chattopadhyaya

6. Surya Siddhanta for astronomical measurement & Instrumentation context)

   Traditional Sanskrit text (anonymous) Often published with translations/editions by Indian scholarly publishers

SUB/DSE/T/350: Oscillators and Multivibrators Using Transistors

Total credits:02 **Total Contact Hours:30 Hrs**

Course Objectives:

1. To study the principles of feedback in electronic circuits, including positive and negative feedback.
2. To study the operation of sinusoidal oscillators, including their working principles and applications.
3. To explore different types of oscillators (e.g., LC, RC) and their frequency stability.
4. To understand the working principles of multivibrators (Astable, Monostable, and Bistable) and their applications.
5. To analyze the operation of time-based circuits, such as sweep and sawtooth wave generators.
6. To explore the applications of time-based circuits in devices like oscilloscopes and televisions.

Course Outcome:

1. Demonstrate an understanding of positive and negative feedback and their effects on amplifier performance.
2. Design and analyze basic oscillator circuits for specific frequency requirements.
3. Describe the working principles of multivibrators and their applications in pulse generation and timing circuits.
4. Understand the operation of time-based circuits and their applications in generating linear time-dependent signals.
5. 5. Apply knowledge of time-based circuits in real-world applications, such as display systems and measurement instruments.

Course Content:

Unit-I : Feedback Principles **8 Hrs**

Concept of positive and negative feedback, Advantages of negative feedback, such as gain stability, increased bandwidth, decreased distortion, decreased noise, increased input impedance, decreased output impedance

Unit-II : Oscillators **8 Hrs**

Requirements of an oscillator, Barkhausen criterion, Hartley oscillator, Colpitts oscillator (circuit diagram, working condition for oscillations, and expression for frequency). R-C oscillators: phase-shift oscillator, Wien bridge oscillator (circuit diagram, working condition for oscillations, and expression for frequency)

Unit-III : Multivibrators and Time Base Circuits **14 Hrs**

Transistor as a switch, Transistorized Astable Multivibrator, Transistorized Monostable Multivibrator, Transistorized Bistable Multivibrator, Transistorized Schmitt's trigger, types of time base circuits, methods of generating time base waveforms, Exponential sweep circuit, Sweep circuit using a transistor switch, Sweep circuit using a UJT, Transistor constant current sweep, Miller sweep circuit, Bootstrap sweep circuit

Reference Books:

1. A Text-book of Applied Electronics by R. S. Sedha, Multicolour Edition-2018, S. Chand & Company, New Delhi.
2. Handbook of Electronics by Gupta, Kumar, 44th Edition, 2017, Pragati Prakashan, Meerut.
3. Introduction to Electronics by K J M Rao, Oxford and IBH Publishing Company.
4. Basic Electronics Solid State by B. L. Theraja, Multicolour Edition- 2008, S. Chand & Company, New
5. Delhi. 5. Principles of Electronics by V. K. Mehata, Rohit Mehata, 2013 Edition, S. Chand & Company New Delhi.

SUB/DSE/P/376: Practicals based on SUB/DSE/T/350

Oscillators and Multivibrators Using Transistors (Practicals)

Total credits:02 **Total Contact Hours:60 Hrs**

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

List of Experiments:

1. Construct and study a transistorized Hartley oscillator.
2. Construct and study a transistorized Colpitt's oscillator.
3. Construct and study a transistorized Phase shift oscillator.
4. Construct and test the Wein bridge oscillator.
5. Design and build a transistorized Astable multivibrator of a given pulse and space width.
6. Design and study a transistorized monostable multivibrator.
7. Construct and study a transistorized bistable multivibrator.
8. Construct and study the Schmitt Trigger Using Transistors
11. Construct and study the UJT time base circuit.
12. Construct and study a constant current ramp generator. Measure its rise time and fall time.

SUB/DSE/T/351 : Arduino Programming and Interfacing

Total credits:02 **Total Contact Hours:30 Hrs**

Learning Objectives:

- Understand serial communication techniques in Arduino systems.
- Interface communication modules such as Bluetooth and Wi-Fi.
- Develop simple IoT-based monitoring and control applications.
- Diagnose and troubleshoot hardware and software issues in Arduino systems.
- Apply safety practices while designing and interfacing Arduino-based projects

Course Outcomes: After completion of course, students will be able to:

- Understand the architecture and features of Arduino boards and microcontrollers.
- Develop programming skills using the Arduino IDE and embedded C concepts.
- Interface sensors, actuators, and display devices with Arduino boards.
- Learn serial communication and data acquisition techniques using Arduino.
- Design simple automation and control applications using Arduino.

Unit I: Introduction to Arduino and Programming Fundamental **10 hrs**

Introduction to embedded systems, Overview of Arduino platform and applications, Arduino boards and specifications, Architecture of Arduino Uno, Installation of Arduino IDE, Structure of Arduino program, Data types, variables, operators, and control statements, Functions and libraries in Arduino, Digital input and output programming, LED interfacing and push button interfacing, PWM concept and LED brightness control

Unit II: Sensor and Display Interfacing with Arduino **10 hrs**

Analog input and output concepts, Interfacing temperature sensor, LDR, and ultrasonic sensor, Interfacing IR sensor and motion sensor, LCD interfacing with Arduino, Seven-segment display interfacing, Servo motor and DC motor interfacing, Relay interfacing and device control, ADC concept in Arduino.Data acquisition using sensors,

Unit III: Communication, Applications, and Troubleshooting **10 hrs**

Serial communication using UART, Arduino serial monitor and serial plotter, Bluetooth interfacing with Arduino, Wi-Fi interfacing basics, Interfacing GSM module basics, IoT applications using Arduino, Data logging and monitoring systems, Power supply and protection circuits, Troubleshooting Arduino hardware and software, Safety precautions during interfacing and programming.

Learning Resources:

1. Michael Margolis, *Arduino Cookbook*, O'Reilly Publications.

2. Simon Monk, *Programming Arduino: Getting Started with Sketches*, McGraw Hill Education.
3. Brian Evans, *Beginning Arduino Programming*, Apress Publications.
4. Dogan Ibrahim, *Arduino Projects Handbook*, Wiley Publications.
5. John Boxall, *Arduino Workshop*, No Starch Press.

SUB/DSE/P/377 : Practicals based on SUB/DSE/T/351

Arduino Programming and Interfacing (Practicals)

Total credits:02 **Total Contact Hours:60 Hrs**

Every candidate appearing for examination must produce journal showing that he/she has completed six (06) experiments during the semester. The journal must be certified at the end of the semester by the concerned teacher and Head of the department.

1) Study of Arduino Uno board, Arduino IDE installation, and basic program execution
2) Interfacing and programming of LEDs using digital output pins
3) Push button interfacing and control of LED using Arduino
4) PWM-based LED brightness control using Arduino
5) Interfacing and testing of temperature sensor and LDR with Arduino
6) Interfacing ultrasonic sensor for distance measurement using Arduino
7) Interfacing LCD display and seven-segment display with Arduino
8) Interfacing and control of servo motor, DC motor, and relay module using Arduino
9) Serial communication using Arduino serial monitor, Bluetooth, and Wi-Fi module basics
10) Mini project based on sensor interfacing and IoT monitoring system using Arduino

SUB/Mn/T/350: Television Technology Part-I

Total credits:02 **Total Contact Hours:30 Hrs**

(This is a 2 credit theory course designed for other discipline)

Course Objectives:

Students will facilitate to –

1. To equip students with the technical skills to operate, maintain and produce content using professional T.V equipment.
2. Key goals include understanding camera operation, lighting, editing , broadcasting principles.
3. To understand signal processing.
4. To analyze emerging technologies.
5. Develop scientific validation skills through experimental modeling.

Course outcomes:

After completion of the course students will be able to –

1. Understand operate, and troubleshoot TV broadcasting systems.
2. Analyze the working principals of television transmitter and receiver.
3. Mastering studio camera, lighting, editing, and directing techniques.

- These outcomes are designed to prepare students for roles such as TV technicians, production assistants.

Unit I: Basic Television system: **06 Hrs**

Picture transmission, Sound transmission. Picture reception. Sound reception synchronization. Gross structure, Image continuity, Number of scanning lines, Flicker, Fine structure

Unit II: Composite Video signal: **08 Hrs**

Video signal dimensions. Horizontal sync details, vertical details, functions of vertical pulse train. Channel Bandwidth Vestigial side. transmission efficiency, channel bandwidth for colour transmission

Unit III: Picture Tube and T. V. Camera Tubes, Signal propagation and antennas.

16 Hrs

Monochrome Picture tube, Beam deflection. Screen phosphor, picture tube circuit, controls. T. V. Camera Tubes Basic Principle Image orthicon, vidicon, plumbicon. Radio wave propagation. T. V. signal transmission, Interference suffered by carrier signals, Preference of

A. M. for picture transmission. Antennas -Transmission antennas, T.V receive antennas, colour T. V. antennas, transmission lines.

Books Recommended:

1. Monochrome and Colour T. V. by R. R. Gulati: Eastern Ltd. Wild

2. Television Engineering Arvind Dhake.

SUB/Mn/T/351: Television Technology Part-II

Total credits:02 **Total Contact Hours:30 Hrs**

(This is a 2 credit theory course designed for other discipline)

Course Objectives:

Students will facilitate to –

1. To equip students with the technical skills to operate, maintain and produce content using professional T.V equipment.
2. Key goals include understanding camera operation, lighting, editing, broadcasting principles.
3. To understand signal processing.
4. To analyze emerging technologies.
5. Develop scientific validation skills through experimental modeling.

Course outcomes:

After completion of the course students will be able to –

1. Understand operate, and troubleshoot TV broadcasting systems.
2. Analyze the working principals of television transmitter and receiver.
3. Mastering studio camera, lighting, editing, and directing techniques.

These outcomes are designed to prepare students for roles such as TV technicians, production assistants.

Unit I: T. V. Receiver: **06 Hrs**

Receiver sections, vestigial Sideband Correction Sound signal separation, sound section. Syne processing and AFC circuit, Vertical deflection circuit Horizontal deflection circuit.

Unit II: Video Detector Video Amplifiers and Sound system: **10 Hrs**

Video signal detection Basic video detector, IF filter, inter carrier sound, Video Amplifiers: Picture requirements, video Picture requirements, video amplifiers, Direct coupled video amplifier, partial de coupling insertion, video pre amplifier in an IC chip. Sound signal separation, sound take off circuit. Intercarrier sound IF amplifier, AM limiting, FM detection, sound section integrated circuit (using IC CA 30 3065.)

Unit III: Deflection circuit and Essential's of Colour TV: **14 Hrs**

Requirements of the vertical deflection stage, transistor multivibrator driven vertical output stage, vertical sweep module. Integrator circuit for vertical system. Horizontal out-put stage, transistor horizontal output circuits, transistor line output stage, horizontal combination IC CA

920, SCR horizontal output circuit. **Essential's of Colour TV:** Compatibility, natural light colour perception, three colour theory luminance, Hue and saturation, Colour TV camera, luminance signal. Colour T. V. display tubes, Delta gun colour picture tube purity and convergence. PTL colour picture tub Trintron colour picture tube.

Books Recommended:

1 Monochrome and Colour T. V. by R. R. Gulati: Eastern Ltd. Wild
2 Television Engineering Arvind Dhake.