KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON

'A' Grade
NAAC Re-accredited
(4th Cycle)

Semester-wise Code structure and Syllabus for

B.Sc. (Electronics)

(Honors/Research) Programme

As per NEP2020 for Affiliated Colleges

w.e.f. June 2024

Faculty: Science and Technology

Preamble

The Indian government and University Grants Commission (UGC) has initiated several measures to bring distinction, quality, and uniformity in the Higher Education System of the country. The important measures taken to enhance academic standards include enhancements in curriculum, teaching- learning process and examination and evaluation systems. In view of this, KBC North Maharashtra University, Jalgaon has taken several initiatives to upgrade and improve the academic excellence, examination reforms for overall development of the students. As per the expectations of NEP 2020, KBC North Maharashtra University, Jalgaon is going to implement the curriculum for undergraduate program. As per the initiatives led by the Honorable Vice Chancellor, Pro-Vice Chancellor and Dean of the Faculty of Science and Technology and academic bodies of our university, one day workshop was organized for syllabus framing. Participants in the workshop cooperated with their constructive minds of re-structuring the syllabi of B.Sc. (Electronics) as per the NEP-2020 pattern and it has been finalized during the workshop and the same will be effectively implemented from the academic year 2024-25. The main objective of reforming the syllabi of F.Y.B.Sc. (Electronics) is to create manpower that can cater the present needs of the society with perfect understanding of Electronics and complete skill to serve the industry and country. It is expected that the students studying Electronics will apply their practical minds to solve real life problems of the society and the world in future by becoming entrepreneur to serve the mankind.

Board of Studies (Electronics and Instrumentation),
KBC North Maharashtra University, Jalgaon

Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon.

FACULTY OF SCIENCE AND TECHNOLOGY, B.Sc. (Honors) PROGRAMME

Credit distribution structure for First year Honors/Honors with Research Degree Programme with Multiple Entry and Exit options

Abbreviations:

- **T:** Theory Course
- **P:** Practical course
- **DSC:** Discipline Specific Core Course
- **DSE:** Discipline Specific Elective Course
- **MIN:** Minor subject
- **VSEC:** Vocational skill and Skill enhancement courses
- **VSC:** Vocational Skill Courses
- **SEC:** Skill Enhancement Courses
- **GE/OE:** Generic/open elective
- **CI:** Constitution of India
- **IKS:** Indian Knowledge System
- **CEP:** Community engagement and service
- **OJT**: On Job Training: Internship/ Apprenticeship
- **RP:** Research Project
- **RM:** Research methodology
- **ES:** Environment studies
- **ENG:** English
- **MIL:** Modern Indian language

- **Co-curricular Course (CC)**
  a) **CC-1: CC-120: Sports and Yoga**
  b) **CC-2: CC-130: NSS or NCC**
  c) **CC-3: CC-220: Human Rights and Environment Law**
  d) **CC-4: CC-229: Communication Skills and Personality Development**
- **Value Education Courses (VEC)**
  a) **VEC1: EA-118: Environmental Awareness**
  b) **VEC2: CI-129: Constitution of India**
- **Indian Knowledge System (IKS):**
  a) **IK: 119: Ayurvedic Medicine in Ancient India**
- **Ability Enhancement Courses (AEC)**
  a) **AEC-1: EG: 101 – English -1**
  b) **AEC-2: EG: 102 – English -2**
  c) **AEC-3: MR: 201 – Marathi -1**
  d) **AEC-3: HN: 201 – Hindi -1**
  e) **AEC-3: MR: 202 – Marathi -2**
  f) **AEC-3: HN: 202 – Hindi -2**

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Semester-wise Code structure for B. Sc (Honors/Research) Programme as per NEP2020, for Affiliated Colleges w.e.f – June 2024.

B. Sc (Honors/Research) – First Year ELECTRONICS, Semester - I, Level - 4.5

Sr. No.	Course	Course Type	Course Code	Name of the course (Title of the Paper)	Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
							T	P	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
1	DSC-1 (T)	DSC	EL-111	Electronics Components and Network Analysis	2	30	2	--	20	30	2
	DSC-2 (T)	DSC	EL-112	Fundamentals of Digital Electronics	2	30	2	--	20	30	2
	DSC-3 (P)	DSC	EL-113	Electronics Lab I	2	60	--	4	20	30	4
2	MIN-1 (T)	Minor	El-114	Introduction to Electronics	2	30	2	--	20	30	2
	MIN-2 (P)	Minor	EL-115	Electronics MIN Lab I	2	60	--	4	20	30	4
3	OE-1 (T)	GE/OE	EL-116	Hardware and Networking	2	30	2	--	20	30	2
4	SEC-1 (T)	SEC	EL-117	Agro-electronics	2	30	2	--	20	30	2
5	VEC-1 (T)	VEC	EA-118	Environmental Awareness	2	30	2	--	20	30	2
	IKS -1	IKS	IK-119	Ayurvedic Medicine in Ancient India	2	30	2	--	20	30	2
	CC-1	CC	CC-120	A) Sports OR B) Yoga	2	30	--	--	50	--	2
	AEC-1	AEC	EG-101	English-1	2	30	2	--	20	30	2
				Total	22						

B.Sc. (Honors/Research) – First Year, ELECTRONICS, Semester - II, Level - 4.5

Sr. No.	Course	Course Type	Course Code	Name of the course (Title of the Paper)	Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
							T	P	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
1	DSC-4 (T)	DSC	EL-121	Electronics Semiconductor Devices	2	30	2	--	20	30	2
	DSC-5 (T)	IKS-2	EL-122	Contribution of India in Electronics and Technology	2	30	2	--	20	30	2
	DSC-6 (P)	DSC	EL-123	Electronics Lab II	2	60	--	4	20	30	4
2	MIN-3 (T)	Minor	El-124	Fundamentals of Arduino	2	30	2	--	20	30	2
	MIN-4 (P)	Minor	EL-125	Electronics MIN Lab II	2	60	--	4	20	30	4
3	OE-2 (T)	GE/OE	EL-126	Digital Literacy	2	30	2	--	20	30	2
4	SEC-2 (T)	SEC	EL-127	Measuring and Testing Instruments	2	30	2	--	20	30	2
	SEC-3 (P)	SEC	EL-128	Electronics SEC Lab I	2	60	--	4	20	30	4
5	VEC-2 (T)	VEC	CI-129	Constitution of India	2	30	2	--	20	30	2
	CC-2	CC	CC-130	A) NSS OR B) NCC	2	30	--	--	50	--	2
	AEC-2	AEC	EG-102	English-2	2	30	2	--	20	30	2
				Total	22						

B. Sc (Honors/Research) – Second Year ELECTRONICS, Semester - III, Level - 4.5

Sr. No.	Course	Course Type	Course Code	Name of the course (Title of the Paper)	Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
							T	P	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
1	DSC-7 (T)	DSC	EL-211	Analog Circuit and Application	2	30	2	--	20	30	2
	DSC-8 (T)	DSC	EL-212	Digital Circuits and Application	2	30	2	--	20	30	2
	DSC-9 (P)	DSC	EL-213	Electronic Lab III	2	60	--	4	20	30	4
	DSC-10 (P)	DSC	EL-214	Electronics Lab IV	2	60	--	4	20	30	4
2	MIN-5 (T)	Minor	EL-215	Application of Electronics in Real Life	2	30	2	--	20	30	2
	MIN-6 (P)	Minor	EL-216	Electronics MIN Lab III	2	60	--	4	20	30	4
3	OE-3 (T)	GE/OE	EL-217	Introduction to Google Apps	2	30	2	--	20	30	2
4	VSC-1	VSC	EL-218	Programming in C	2	30	2	--	20	30	2
	VSC-2	VSC	EL-219	Electronics VSC Lab I	2	30	2	--	20	30	2
5	CC-3	CC	CC-220	A) Human Rights and Environmental Law OR B) Cyber Security	2	30	2	--	50	--	2
	AEC-3	AEC	MR-201 OR HN 201	Marathi -1 OR Hindi - 1	2	30	2	--	20	30	2
				Total	22						

B. Sc (Honors/Research) – Second Year, ELECTRONICS, Semester - IV, Level - 4.5

Sr. No.	Course	Course Type	Course Code	Name of the course (Title of the Paper)	Total Credit	Hours/ Semester	Teaching Scheme (hrs/week)		Evaluation Scheme		
							T	P	Continuous Internal Evaluation (CIE) (CA)	End Semester Evaluation (ESE) (UA)	Duration of Examination (Hrs)
1	DSC-11 (T)	DSC	EL-221	Linear Integrated Circuits	2	30	2	--	20	30	2
	DSC-12 (T)	DSC	EL-222	8085 Microprocessor	2	30	2	--	20	30	2
	DSC-13 (P)	DSC	EL-223	Electronics Lab V	2	60	--	4	20	30	4
	DSC-14 (P)	DSC	EL-224	Electronics Lab VI	2	60	--	4	20	30	4
2	MIN-7 (T)	Minor	EL-225	Android App Development	2	30	2	--	20	30	2
	MIN-8 (P)	Minor	EL-226	Electronics MIN Lab IV	2	60	--	4	20	30	4
3	OE-4 (T)	GE/OE	EL-227	Non-Conventional Energy Harvesting	2	30	2	--	20	30	2
4	CEP-1	CEP	EL-228	Electronics Minor Project I	2	30	2	--	20	30	2
5	CC-4	CC	CC-229	Communication Skills and Personality Development	2	30	2	--	50	--	2
	AEC-4	AEC	MR 202 OR HN 202	Marathi -2 OR Hindi - 2	2	30	2		20	30	2
				Total	22						

DSC-I (T)

EL-111 Electronics Components and Network Analysis

(Credit Point: 2, Total Hours: 30)

Course Objective:

- Identify basic electronics elements and systems used in analog and digital circuits.
- Explain fundamental laws and elements of electrical circuits.

Course Outcomes:

After completion of this course student is able to:

CO No.	CO	Cognitive Level
CO 1	Understand the fundamental principles of resistive components, inductive components, and AC circuits, including their behavior in different configurations.	2
CO 2	Apply circuit analysis techniques and network theorems to solve complex electrical circuits.	3
CO 3	Analyze and design circuits using capacitors, inductors, transformers, and passive filters to meet specific requirements	4
CO 4	Demonstrate proficiency in working with various circuit components, including resistors, inductors, and capacitors, and apply this knowledge to real-world applications.	4
CO 5	Develop problem-solving skills in electrical circuit analysis and design and apply these skills to practical scenarios in the field of electrical engineering.	5

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**Basic Circuit Resistive Components** *Resistors*: Introduction of resistor, Resistive circuits: Series circuit, characteristics of series circuit, series voltage divider, open and short in series circuit, Parallel circuit, laws of parallel circuit, open and short in parallel circuit, series-parallel circuits. Capacitors: Principles of capacitance, capacitors in series and parallel.	7 Hour, 7 Marks
Unit 2	**Basic Circuit Inductive Components** *Inductors*: Self and mutual inductance, Inductance in series and parallel *Transformers*–Step-up and Step-down Transformers, Turn-Ratio, Voltage and Current Ratio. Types of Transformers (introduction only) *Relays and Switches*- Electromagnetic Relay, Relay as Switch, Concept of Pole and Throw, Types of Switches – SPST, SPDT, DPST and DPDT.	7 Hour, 7 Marks
Unit 3	**Circuit Analysis** and **Network Theorems** Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Thevenin's Theorem. Norton's Theorem. Maximum Power Transfer Theorem. Problem based on these theorems.	9 Hour, 9 Marks

Unit 4	**AC Fundamentals** Vector Representation of an Alternating Quantity, AC through pure resistance, inductance and capacitance. Concept of Reactance and Impedance, RL, RC and RLC circuits, Passive RC filters (Low pass, high pass and band pass filters). Series and parallel resonance	7 Hour, 7 Marks

Reference Books:

1. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGrawHill 2005)
2. Electrical Circuits, K.A. Smith and R.E. Alley (2014) Cambridge University Press
3. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
4. Network, Lines and Fields, J.D. Ryder, Prentice Hall of India.
5. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.

DSC-2 (T)

EL-112 Fundamentals of Digital Electronics

(Credits: 2, Total hour: 30)

Objectives:

- To introduce students to the fundamental concepts of digital electronics.
- To familiarize students with different number systems, including binary, octal, and hexadecimal, and their conversion techniques.
- To provide students with a foundational understanding of logic gates and their behavior.
- To introduce basic logic gates and its applications
- To teach students binary arithmetic operations, including addition and subtraction.

Course Outcomes:

After completion of this course student is able to:

CO No.	CO	Cognitive Level
CO 1	Apply knowledge of different number systems and perform conversions accurately.	6
CO 2	Students will demonstrate proficiency in analyzing and designing digital circuits using a variety of logic gates and logic gate combinations.	4
CO 3	Students will be capable of differentiating between positive and negative logic and applying this understanding to solve digital logic problems.	3
CO 4	Graduates will be proficient in performing binary arithmetic operations and applying 1's complement and 2's complement representations in practical scenarios.	5
CO 5	Students will develop the ability to simplify Boolean expressions, apply De Morgan's Theorems, and analyze digital circuits, preparing them for more advanced courses or careers in the field of digital electronics and computer science.	6

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**Number Systems and Digital Codes:** Introduction to Digital Electronics and Number Systems - Understanding the Concept of Radix and its Significance, Number Systems: Decimal Number System - Binary Number System - Octal Number System – Hexadecimal Number System - Base conversion techniques. Digital Code: Binary Coded Decimal (BCD), Gray code.	8 Hour, 8 Marks

Unit 2	**Logic Gates and their Application in Digital Circuits** *Fundamental of Logic Gates*: Concept of Positive and Negative Logic, Basic Gates: NOT - Gate, OR Gate – AND – Gate *Derived Gates*: NAND gate - NOR Gates - EX-OR Gate - EX-NOR Gate NAND and NOR Gate as Universal Logic Gates, applications of EX-OR gate: Controlled inverter, Parity Generator/Checker.	6 Hour, 6 Marks)
Unit 3	**Binary Arithmetic** Signed binary numbers, 1's Complement representation, 2's Complement representation, Binary Addition, Binary Subtraction**,** Binary subtraction Using 1's Complement method, Binary subtraction **using** 2's Complement method.	8 hour, 8 Marks
Unit 4	**Boolean Algebra** Basic Laws of Boolean Algebra, De Morgan's Theorems, Realizing digital circuit for logic equation, Simplifications of Boolean expression - Application of Boolean Algebra.	8hour, 8 Marks

Reference Books:

1. Modern Digital Electronics, R. P. Jain, 4thEdition, McGraw Hill Edu, (2009)
2. Digital Principles and Applications, A.P. Malvino, D. P. Leach and Saha, 7thEd., (2011)
3. Tata McGraw Fundamentals of Digital Circuits, Anand Kumar, 2ndEdn, (2009) PHI Learning Pvt. Ltd.
4. Digital Circuits and systems, Venugopal, (2011) Tata McGraw Hill.
5. Digital Fundamentals, Thomas L. Flyod, Pearson Education Asia (1994)
6. Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994)

DSC-3 (P)

EL-113 Electronics Lab I

(Credits 2, Total hour: 60)

Course objectives

- To identify and test various electronic components.
- Practical application of network theorems.
- To understand the characteristics of resonance circuits practically.
- To provide students with a foundational understanding of logic gates and their behavior.
- To study the basic of digital circuits.

Course Outcomes

After completion of this course, student is able to:

CO No.	CO	Cognitive Level
CO 1	Identify, test, and specify electronic components, such as resistors, capacitors, inductors, switches, fuses, transformers, and relays.	2
CO 2	Understand and apply the principles of series voltage divider circuits.	2
CO 3	Apply Kirchhoff's Current Law to analyze and solve electrical circuits.	3
CO 4	Apply Kirchhoff's Voltage Law to analyze and solve electrical circuits.	3
CO 5	Verify and apply network theorems, including Thevenin's Theorem, Norton's Theorem, and the Maximum Power Transfer Theorem, to practical circuits.	3

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Section A: (Perform any 6)

1. Identification, testing and specification of electronic components (R, C, L, Switches, Fuse, Transformer and Relay)
2. Study of Series voltage divider circuit.
3. Study of Kirchhoff's Current Law.
4. Study of Kirchhoff's Voltage Law.
5. Verification of Thevenin's Theorem.
6. Verification of Norton's Theorem.
7. Verification of Maximum Power Transfer Theorem.
8. Study of RC/RL network.
9. Study of passive RC low/high/band pass filter.
10. Study frequency response of Series/ Parallel resonance circuits.

Section B:(Perform any 6)

1. Built, Test and Verify AND Gate using Diode and IC.
2. Built, Test and Verify OR Gate using Diode and IC.
3. Built, Test and Verify NOT Gate using Transistor and IC.

4. Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICs
5. Study of NAND gate as universal Gate.
6. Study of NOR gate as universal Gate.
7. Build and test Parity Generator.
8. Build and test Parity Checker.
9. Demonstrate Demorgon's Theorems.
10. Designing digital circuit for given logic equation.

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MIN- 1 (T)

EL-114 Introduction to Electronics

(Course Credits: 2, Total Hours: 30)

Course objectives:

- To identify schematic symbols & understand basic formulae & laws in electronics.
- To get a basic idea about types, specification and values of basic active & passive components.
- To understand basic principles of digital electronics.

Course Outcomes (COs):

After studying this course students will be able to

CO No.	CO	Cognitive Level
CO 1	Gain a comprehensive understanding of the fundamentals of analog electronics, including voltage, current, DC and AC signals, waveforms, and the application of Kirchhoff's and Ohm's laws.	2
CO 2	Demonstrate proficiency in recognizing, identifying, and explaining the operation of key semiconductor devices, such as PN junction diodes, Zener diodes, and Bipolar Junction Transistors.	3
CO 3	Develop a strong grasp of number systems, including decimal, binary, octal, and hexadecimal, and the ability to perform base conversions and work with BCD codes.	2
CO 4	Master the basics of digital electronics, including understanding and applying Boolean algebra, gate symbols and truth tables, binary arithmetic, and basic logic operations.	3
CO 5	Apply knowledge of logic gates and binary arithmetic to design and simplify digital circuits, including half adders, full adders, and the application of De Morgan's Theorems.	4

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Unit	Title and Contents	Lectures/ Hours
Unit: 1	**Basics of Analog Electronics:** Evolution and Impact of Electronics, importance in today's world, Voltage and Current, DC and AC signal, Digital Signals, waveforms, Kirchhoff's law, ohm's law. Familiarization of Resistors, Capacitors, Inductors, Transformers, relays, switches, fuse, wires.	9 Hours, 9 Marks
Unit: 2	**Semiconductor Devises:** PN junction diode, Zener diode, Bipolar Junction Transistors (symbol, Structure, principle of operation, I-V characteristics, applications (list only).	6 Hours, 6 Marks

Unit: 3	**Number Systems:** Importance of digital electronics, Concept of Radix, Number Systems: Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Base conversion, 8421 BCD code.	5 Hours, 5 Marks
Unit: 4	**Basics of digital electronics** Basic Gates (Symbol and Truth table): OR Gate, AND Gate, NOT Gate, Derived Gates (Symbol and Truth table): NAND gate, NOR Gates, EX-OR Gate, EX-NOR Gate. NAND and NOR as Universal Logic Gates Binary arithmetic: Addition and subtraction, 1's Complement, 2's Complement of binary number. Half adder and Full Adder. Basic Laws of Boolean Algebra, De Morgan's Theorems, Simplifications of Boolean expression.	10 Hours, 10 Marks

References Books:

1. Basic Electronics: Bernard Grob, McGraw Hill Publication
2. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education,
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011)
4. Digital Electronics: Jain R.P., Tata McGraw Hill.

MIN-2 (P)

EL-115 Electronics MIN Lab I

(Credit: 2, Total Hours: 60)

Course Objectives:

- Familiarization with various electronic components.
- Hands on testing and measuring laboratory equipment.
- Familiarization with digital logic gate ICs.
- Understanding of combinational logic circuits.

CO No.	CO	Cognitive Level
CO 1	Develop a strong familiarity with fundamental electronic components and instruments commonly used in electronics experimentation.	4
CO 2	Gain proficiency in operating and utilizing essential electronic instruments like the digital multimeter, power supply, function generator, and oscilloscope for measurement and experimentation.	3
CO 3	Apply the knowledge and skills to accurately measure and analyze AC and DC signal parameters using an oscilloscope, including amplitude, frequency, and voltage.	4
CO 4	Understand and analyze the forward and reverse characteristics of semiconductor devices, including PN junction diodes and Zener diodes.	2
CO 5	Master the principles of digital logic by verifying truth tables for various logic gates and implementing logic diagrams, including simplifying Boolean expressions and applying De Morgan's theorem.	5

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List of Experiments (Perform any 08):

1. Familiarization with basic electronic components (resistors, capacitors, inductors, diodes, fuses, switches & transistors)
2. Study of front panel and use of instruments: Digital Multimeter, Power Supply, Function Generator and Oscilloscope
3. Measurement of AC (Amplitude, Frequency) and DC (Voltage) signal parameters using Oscilloscope
4. Study of forward and reverse characteristics of PN Junction Diode
5. Study of reverse characteristics of Zener Diode
6. Study IV characteristics of Transistor
7. Verification of KCL and KVL
8. Verification of Ohm’s law
9. Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICs.
10. Simply the given Boolean expression and implement it by logic diagram.

11. Verification of De-Morgan’s theorem
12. Study of NAND and NOR gates as Universal gates.
13. Study of Half Adder/ Full Adder
14. Simply the given Boolean expression and implement it by logic diagram.

OE-1 (T)

EL-116 Hardware and Networking

(Credit: 2, Total Hours: 30)

Course Objectives:

- To provide students with the knowledge of computer systems and associated peripherals.
- To introduce students with the concept of Networking.
- To introduce students with Network Architecture.

Course Outcome:

CO No.	CO	Cognitive Level
CO 1	Students will understand the e basics of computer systems along with peripherals	2
CO 2	Students will be able to articulate fundamental networking concepts.	3
CO 3	Students will be aware about the concepts of the Network Architecture.	4
CO 4	Students will be able to understand working of Internet	2
CO 5	Recognize the significance of operating systems (e.g., Windows and Linux), and the importance of antivirus software in the context of computer systems and networks.	4

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**Introduction to Computer Hardware** Components of a computer system: Hardware vs. software, Central Processing Unit (CPU): CPU architecture, CPU types and performance, Popular CPU Chips and their Characteristics, Memory: RAM and ROM, Storage devices: HDDs, SSDs, Input and Output Devices: Keyboards, mouse, monitors, printers.	7 Hour, 7 Marks
Unit 2	**Introduction to Computer Software** Introduction to Software, Concept of Booting. Concepts of High Level, Low Level, Languages, Compiler and Interpreter, Types of Software: System software, Application Software, Operating System: Introduction, Need and Types, Windows and Linux OS. Need of antivirus.	7 Hour, 7 Marks
Unit 3	**Networking Fundamentals** Introduction to Networking: Importance of networking, Network types. Network Topologies: Physical Network Topologies - STAR, BUS, RING topologies. Logical Network Topologies - Local Area	9 Hour, 9 Marks

	Networks (LANs). Ethernet and LAN technologies, Wide Area Networks (WANs). Introduction to Repeater, Hub, Switch, Router.	
Unit 4	**Internet** Concept of Internet, Applications of Internet. World Wide Web (WWW), Web Browsing Software. Search Engines. Understanding URL.	7 Hour, 7 Marks

Reference Books:

- Fundamentals of Computers, V. Rajaraman, PHI Publication
- Computer Fundamentals, P. K. Sinha, BPB Publication
- Computer Networks, Tannenbaum, A.S.,
- Computer Hardware: Installation, Interfacing Troubleshooting and maintenance, James K L PHI Learning Press (Eastern Economy Edition, 2013)

SEC-1 (T)

EL-117 Agro-Electronics

(Credits: 2, Total Hours: 30)

Course Objectives:

- To learn core components, Devices, process and functionalities of Electronics.
- To understand the basic measuring equipments required to perform electronic experiments.
- To understand the importance of Electronics in day-to-day life.
- To understand the role of Electronics in consumer, medical, industry products etc.

Course Outcome:

After studying the course,

CO No.	CO	Cognitive Level
CO 1	Gain a comprehensive understanding of the fundamentals of electronics, including the historical evolution of electronics, the concepts of electric current and voltage, and the introduction to essential electronic components and equipment.	2
CO 2	Develop proficiency in the use of specialized instruments for agriculture, such as those used for pH measurement, electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil temperature.	3
CO 3	Explore the application of electronics in agriculture, covering topics like smart irrigation automation, remote sensing, GIS/GPS positioning systems, yield monitoring, soil sampling, and their role in modern farm machinery.	2
CO 4	Understand the differences between traditional and modern agricultural practices and delve into advanced agricultural technologies such as the Internet of Things (IoT), online marketing of agricultural products, agricultural drones, robotics, and artificial intelligence in farming.	2
CO 5	Acquire the knowledge and skills needed to apply electronic technologies to enhance agricultural productivity and sustainability, including disease detection, surveying, and optimizing farming operations using AI.	3

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**Introduction to Agricultural Environment** **Components of Agricultural Ecosystem, Environmental Factors Impacting Agriculture:** Role of Climate, weather, and soil shaping agricultural practice with influence of water management, irrigation	7 Hours, 7 Marks

	practices, temperature, humidity, and light on crop growth, health, and yield -**Precision Agriculture and Agro-Electronics:** Sustainable Farming and Environmental Conservation - Challenges, Innovations, and Future Trends	
Unit 2	**Instrument technology for agriculture** Instrument for measurement of pH, Electrical Conductivity, Gas analysis, humidity, Leaf area, Chlorophyll content and soil temperature	7 Hours, 7 Marks
Unit 3	**Agriculture Electronics** Smart irrigation in automation, Introduction to remote sensing and applications, atmospheric investigation, visual image interpretation, GIS/GPS positioning system for farming, yield monitoring and mapping, soil sampling and analysis, role of electronics in farm machinery	8 Hours, 8 Marks
Unit 4	**Advanced Agricultural Technologies** Difference between traditional and modern agricultural practices; Internet of Things (IoT), Online Marketing of agro based products, Agricultural Drones for disease detection and survey, & Robotics, Artificial Intelligence (AI) based farming.	8 Hours, 8 Marks

Reference Books:

- Bhatia, S.L. "Handbook of Electrical Engineering". Khanna Publications.
- Bsown, R.H., "Farm Electrification". McGraw Hills, 1956.
- Considine T..M. "Process/Industrial Instruments and Controls· Handbook", McGraw Hill 1993.
- Kuhar, John. E. 1977. The precision farming guide for agriculturalists. Lori J. Dhabalt, USA
- Barret, E.C. and Curits, L.F. "Introduction to Environmental Remote Sensing". John Wiley and Sons Inc. New York, 1976.
- Megh R. Goyal, “Emerging Technologies in Agricultural Engineering” Apple Academic Press.

VEC-1 (T)

EA-118 Environmental Awareness

(Credits: 2, Total Hours: 30)

IKS-1

IK-119 Ayurvedic Medicine in Ancient India

(Credits: 2, Total Hours: 30)

CC-1

CC-120 A) Sports OR B) Yoga

(Credits: 2, Total Hours: 30)

AEC-1

CC-120 English-1

Semester II

DSC-4 (T)

EL-121 Electronics Semiconductor Devices

(Credits: 02, Hours: 30)

Course Objectives:

- Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their Applications.

Course Outcomes:

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

CO No.	CO	Cognitive Level
CO 1	Gain a thorough understanding of semiconductor basics, including the characteristics of semiconductor materials, energy band gaps, and the distinction between intrinsic and extrinsic semiconductors.	2
CO 2	Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.	3
CO 3	Demonstrate the different biasing rules of the semiconductor devices.	4
CO 4	Demonstrate the Applications of semiconductor devices.	4
CO 5	Develop proficiency in semiconductor diodes, comprehending the formation of P-N junctions, different biasing conditions for P-N junction diodes, and the working principles and characteristics of Zener diodes and light-emitting diodes (LEDs).	5

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**Semiconductor Basics** Semiconductor materials, Holes and Electrons, energy band gaps. Types of Semiconductors: Intrinsic Semiconductor and Extrinsic Semiconductor. Extrinsic Semiconductor: N-Type Semiconductor, P-Type Semiconductor, Intrinsic vs Extrinsic Semiconductor,	8 Hours, 8 Marks
Unit 2	**Semiconductor Diodes** What is P-N Junction? Formation of P-N Junction, Biasing Conditions for the P-N Junction Diode, Forward Bias, Reverse Bias, V-I Characteristics of P-N Junction Diode. Zener diode: Symbol, Construction and Working. Light emitting diode: Symbol, Construction and Working.	8 Hours, 8 Marks
Unit 3	**Diodes Circuits and Applications** Diode Clippers and Clampers, Half wave rectifier, Full wave and bridge rectifier, PIV and surge, current, Block diagram of power supply, Zener as voltage regulator.	7 Hours, 7 Marks

Unit 4	**Bipolar Junction Transistor (BJT)** Bipolar Junction Transistor (PNP and NPN Transistor): symbol, construction, working principle, I-V characteristics, parameters, specifications. Transistor configurations: CB, CC and CE, Biasing circuits voltage divider, DC load line, Q point, Relationship of α, β and γ.	7 Hours, 7 Marks

References:

1. B.L. Theraja, Basic Electronics Solid State, S Chand and Company Ltd. (2007)
2. Solid state Electronic Devices, B. G. Streetman and S. Banerjee, Pearson Education (2006)
3. S. M. Sze, Semiconductor Devices: Physics and Technology, 2ndEdition, Wiley India edition (2002)
4. Basic Electronics and Linear circuits, N. N. Bhargava, D. C. Kulshreshtha, S. C. Gupta, Tata Mc Graw Hill (2008)
5. Nasar, S. A. (2004). Electric Circuits, Schaum's outline series, Tata McGraw Hill.
6. Nahvi, M. & Edminister J. (2005). Electrical Circuits, Schaum's Outline Series, Tata McGraw-Hill.
7. Semiconductor Device Physics and Design, Umesh k. Mishra and Jasprit Singh, Springer (2008)

DSC- 5-(T) (IKS-2)

EL-122 Contribution of India in Electronics and Technology

(Credits: 2, Total Hours: 30)

Course Objectives:

- To provide introduction about Electronics and Technology in India.
- To familiarize students about R&D institutes and Industries in India.
- To provide information about Electronics related Revolutions in India

Course Outcomes:

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

CO No.	CO	Cognitive Level
CO 1	Understand the historical evolution of electronics in India and the government policies that have shaped the electronics industry, including key projects and initiatives introduced by the Ministry of Electronics and Information Technology (MeitY).	2
CO 2	Familiarize yourself with the major research and development organizations and academic institutions in the field of electronics in India, as well as statutory bodies, and recognize their roles and contributions to the electronics sector.	2
CO 3	Gain insight into the landscape of electronics industries in India, including public sector and private sector companies, and their diverse roles in areas such as consumer electronics, telecommunications, computer hardware, and defense electronics. Understand the challenges faced by Indian electronics industries.	2
CO 4	Explore the significant electronic revolutions in modern India, including satellite and communication, telecom, mobile technology, information technology, and innovations in railway computerization. Recognize the milestones achieved in Indian science and technology.	2
CO 5	Develop a comprehensive understanding of the electronic ecosystem in India, including its historical context, key players, and policy initiatives, and recognize the impact of electronics on the country's development and progress.	2

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**History of Electronics and Government Policies in India** Introduction, History of Electronics in India. Review of Govt. Policies for Electronics. Introduction to Projects & Initiatives by MeitY (Govt. of India)	04Hrs, 04M
Unit 2	**R&D Organizations and Academic Institutions of Electronics** Introduction to R&D Organizations: MeitY, C-DAC, C-MET, NIELIT, SAMEER, STPI, ERNET, BISAG(N), Semiconductor Lab (Mohali), CEERI, DRDO, CEL, C-DOT and NIC. Introduction to - Statutory Bodies: CCA, ICERT and UDAI, Academic Institutes: IITs, NITs, IISc, NIELIT and GIoE.	10Hrs, 10M
Unit 3	**Electronics Industries in India** Public Sector Companies: BEL, ECIL, CIL, BSNL, MTNL, BBNL, SECI, Rajasthan Electronics and Instruments Limited, HTL, Digital India Corporation, NISG and CSC-e governance services India Ltd. (Brief description of each) Private Sector Companies: Consumer Electronics Companies, Telecommunication Companies, Computer Hardware Industries, Defense Electronics Industries. Brief review of challenges for Indian Electronics Industries (Brief description of each)	12Hrs, 12M
Unit 4	**Electronics Revolutions in the Modern India** Satellite and Communication Revolution, Telecom Revolution, Mobile Revolution, IT Revolution, Railway Computerization, Milestones of India in Science and Technology.	04Hrs, 04M

References:

1. https://www.iksindia.org
2. https://www.meity.gov.in
3. https://www.isro.gov.in
4. https://www.nsilindia.co.in
5. https://www.wikipedia.org
6. https://www.byjus.com
7. https://www. yourarticlelibrary.com
8. Introduction to Indian Knowledge System: Concept and Application, by R Mahadevan PHI Learning India.

DSC- 6 (P)

EL-123 Electronics Lab II

(Credits: 2, Total Hours:60)

Course objectives:

- Familiarize with various Semiconductor devices.
- To understand the behavior of semiconductor devices.
- Understand the practical use of various semiconductor devices.
- Familiarize with combinational and sequential circuit ICs.
- Design of various combinational and sequential circuits.
- Study various data processing circuits.

Course Outcomes (COs):

After completion of this course, students will be able to

CO No.	CO	Cognitive Level
CO 1	Analyze the I-V characteristics of semiconductor devices, such as p-n junction diodes and Zener diodes and comprehend their behavior.	3
CO 2	Understand the operation and performance of different rectifier circuits, including half wave, center-tapped full wave, and bridge full wave rectifiers.	2
CO 3	Investigate the use of Zener diodes as voltage regulators in full wave rectifiers and comprehend their function in stabilizing output voltage.	4
CO 4	Analyze the I-V characteristics of bipolar junction transistors (BJT) in the common-emitter (CE) configuration and understand their operating principles.	3
CO 5	Study the I-V characteristics of unijunction transistors (UJT) and design a UJT relaxation oscillator, gaining practical knowledge of UJT behavior and applications.	3

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Section A (Any Ten)

1 Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
2 Study of (a) Half wave rectifier (b) Centre-taped Full wave rectifier and (c) Bridge Full wave rectifier.
3 To study Zener diode as a voltage regulator on the output of FWR.
4 Study of the I-V Characteristics of BJT in CE configuration.
5 Study of the I-V Characteristics of UJT.
6 To design and Study of the UJT relaxation oscillator.
7 Study of the output characteristics of common source JFET.
8 To study Transistor as a switch (LED ON/OFF)

References Books:

1. Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
2. Basic Electronics, Bernod Grob, McGra-Hill, India. Applied Electronics, R. S. Sedha, S. Chand and Company, New Delhi.

3. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
4. Solid State Electronic Devices, Ben G Streetman and S. Banerjee, Pearson Education
5. Electronic Devices and Circuits, Allen Mottershead, Good year Publishing Corporation.
6. Digital Principles and Applications, A. P. Malvino, D.P. Leach and Saha, 7th Ed., (2011) Tata McGraw
7. Digital Electronics, S. K. Mandal (2010) 1st edition, McGraw Hill
8. Digital System Design, M. Morris Mano, Pearson Education Asia, (Fourth Edition)

MIN- 3 (T)

EL-124 Fundamentals of Arduino

(Credits: 2, Total Hours: 30)

Course objectives:

- Learn how to prototype circuits with a breadboard.
- Learn the Arduino programming language and IDE.
- Program basic Arduino examples.
- Prototype circuits and connects them to the Arduino.

Course Outcomes (COs):

After studying this course students will be able to

CO No.	CO	Cognitive Level
CO 1	Gain an understanding of microprocessors and microcontrollers, including their role in embedded systems and a knowledge of their wide-ranging applications.	2
CO 2	Acquire the skills to install, configure, and work with Arduino, including the features of the Arduino UNO board, digital and analog inputs, and the microcontroller's onboard capabilities.	3
CO 3	Design useful systems required in automation and robotics	3
CO 4	Apply the knowledge to design small projects	3
CO 5	Develop proficiency in Arduino programming, covering sketch layout, basic building blocks, functions, data types, and control structures, enabling you to write and understand code for various applications.	5

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Unit	Title and Contents	Lectures / Marks
Unit 1	Introduction to microprocessor and microcontroller, Concept of embedded system, List of Applications	6 Hours, 6 Marks
Unit 2	**Introduction to Arduino:** Installation and configuration of Arduino, Features of Arduino, Introduction to Arduino UNO board and its features: digital and analog inputs, power supply, RX and TX, on board microcontroller, analog and digital ports	8 Hours, 8 Marks
Unit 3	**Basics of Arduino Programming:** Layout, Sketch, Basic building blocks, setup() and loop() functions Data types, if-else statements, control loops: for, while, user defined functions, in build functions	8 Hours, 8 Marks

Unit 4	**Applications/Interfacing:** Installation of Arduino, Interfacing of LED, Interfacing sensors (IR sensor, UV sensor, accelerometer sensor), Interfacing LCD, Inter facing Arduino with Bluetooth/ Wi-Fi module	8 Hours, 8 Marks

References Books:

1 Arduino Books for begineers by Mike Cheich
2 Arduino Beginners guidebook- Basic Robotics book, learn innovation with Arduino by Enamul Hassan
3 Arduino: The Complete guide to Arduino by James Arthur

MIN- 4 (P)

EL-125 Electronics MIN Lab II

(Credits: 2, Total Hours: 60)

Course objectives:

- Learn how to prototype circuits with a breadboard.
- Learn the Arduino programming language and IDE.
- Program basic Arduino examples.
- Prototype circuits and connects them to the Arduino.

Course Outcomes (COs):

After completion of this course, students will be able to

CO No.	CO	Cognitive Level
CO 1	Get skills of using Arduino platform	3
CO 2	Acquire skills of interfacing different modules to Arduino	4
CO 3	Design useful systems required in automation and robotics	5
CO 4	Apply the knowledge to design small projects	3

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List of experiments (Any four) (1 Project equivalent to 2 experiments)

1 Interfacing LED array
2 Interfacing DC Motor
3 Interfacing Stepper Motor
4 Interfacing PIR sensor
5 Interfacing 16x2 LCD and display Hello word.
6 Interfacing Ultrasonic sensor
7 Interfacing LM 35 temperature sensor
8 Interfacing Liquid level detector
9 Interfacing Soil moisture detector
10 Interfacing Light dimmer
11 Interfacing Smoke detector
12 Interfacing notice board to mobile through Bluetooth module
13 Do it yourself project

OE- 2 (T)

EL-126 Digital Literacy

(Credits: 2, Total Hours: 30)

Course objectives:

- Familiarize with basics of Computer/laptop and accessories.
- Understand the practical use of internet and its use in daily life.
- Have the knowledge of various apps like BHIM, Google, etc.
- Understand the practical use of online platforms like ZOOM, Google meet etc.

Course Outcomes (COs):

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

CO No.	CO	Cognitive Level
CO 1	Acquire basic skills of using computer and smart phone	2
CO 2	Use Google tools effectively	4
CO 3	Operate different day to day useful apps on mobile or laptop	5
CO 4	Use digital technology effectively for various purposes	3

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Unit	Topics	Lectures / Marks
Unit 1	**Basic computer and smart phone skills:** Introduction and working of parts of computer/laptop, computer and laptop accessories: Headphone, mouse, keyboard and web cam, smart phone skills: connecting laptop to projector	6 Hours, 6 Marks
Unit 2	**Digital skills for daily life:** Configuring and activating internet connection for smart phone, data connection, mobile hotspot (tethering), opening and operating Gmail account, Smart typing skills: figure placement for efficient typing, Effective use of email templates, scheduling emails, configuring emails Using Wi-Fi at home to access high speed internet, wired connections for connecting computers, WhatsApp on desktop, creating business account, sharing files, book marking, pinning chats.	8 Hours, 8 Marks
Unit 3	Using BHIM app, Google pay, QR code, online shopping apps. UPI payment, Photo scan by google photos, google meet, Google tools, presentation modes in google meet, captions and host controls, sharing video recording and chat transcript, searching location using google maps, Social Media Applications, creating poll or quiz, sharing large files	8 Hours, 8 Marks

Unit 4	Virtual conferencing applications, background in Zoom and using different features in Zoom, Google assistant in smart phone, Google translate, converting smart phone to digital microscope, solving Maths equations using photo math, MS Maths solver, Brainly and Socratic app, identifying plants using Plant Snap app, human body anatomy using anatomy learning app, NASA app, learning new language using Duolingo app, Google lens	8 Hours, 8 Marks

References Books:

1 Digital Literacy: Concepts, Policies and practices by Colin Lankshear
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-2 (T)

EL-127 Measuring and Testing Instruments

(Credits: 2, Hours: 30)

Objectives

- To provide adequate knowledge in electrical measurements and instrumentation.
- To make the students to gain a clear knowledge of the basic laws governing the operation of electrical instruments and the measurement techniques.
- To have an adequate knowledge in the measurement techniques for resistance, voltage and current.
- Detailed study of resistance, inductance, and capacitance measurement.
- Emphasis is laid on the meters used to measure current and voltage.

Outcomes

Student will be able to

CO No.	CO	Cognitive Level
CO 1	To make the students to gain a clear knowledge of the basic laws governing the operations of electrical instruments and measurement techniques.	2
CO 2	Detail study of resistance, inductance, and capacitance measurement	3
CO 3	Emphasis is laid on the meters used to measure current and voltage	3
CO 4	Apply the concept of use of knowledge of Instrumentation to real life problems.	4
CO 5	Understanding of the course will create scientific temperament.	2

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Unit	Title and Contents	Lectures/ Marks
Unit 1	**Electrical Measurements:** Functional elements of typical measurement system, Characteristics of instruments. Standards of measurements and calibration. Methods of measurement. Errors in Measurement & Measurement standards. Static performance characteristics: Accuracy, Precision, Accuracy versus precision, Sensitivity, Linearity, Concept of Errors, and their types.	9 Hours, 9 Marks
Unit 2	**Electronic Measurements Instruments:** Permanent magnet moving coil (PMMC) meter - construction and working. DC ammeter, Calculation of shunt resistance, Ayrton multirange ammeter and numerical problems. DC Voltmeter, Calculation of series resistance, multirange voltmeter, sensitivity, loading effect and numerical problems. Series Type and Shunt Type Ohm meter. Idea of Analog Multimeter.	10 Hours, 10 Marks

Unit 3	**Digital Testing Instruments:** Working principle of Digital Multimeter. Measurement of Different Electrical Parameters. Advantages and Disadvantages of Digital Multimeter. Difference between Analog and Digital Multimeter.	5 Hours, 5 Marks
Unit 4	**Cathode Ray Oscilloscope:** CRO- Block diagram of general purpose CRO and function of each block. Applications – Voltage and frequency measurement.	6 Hours, 6 Marks

REFERENCE BOOKS

1 J.B.Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation', S.K. Kataria & Sons, Delhi, 2003.
2 S.K.Singh, 'Industrial Instrumentation and control', Tata McGraw Hill, 2003.
3 E.W.Golding & F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler & Co, 1994.
4 A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpath Rai & Co (P) Ltd, 2004.
5 Electronics Instrument& Measurement Techniques-W.D.Cooper
6 Electronics Instrumentation –H.S.Kalsi(TMH)

SEC-3 (P)

EL-128 Electronics SEC Lab I

(Credits: 2, Hours: 60)

Course Objective:

- To provide adequate knowledge in electrical measurements and instrumentation.
- To make the students to gain a clear knowledge of the basic laws governing the operation of electrical instruments and the measurement techniques.
- To have an adequate knowledge in the measurement techniques for resistance, voltage and current.
- Detailed study of resistance, inductance and capacitance measurement.
- Emphasis is laid on the meters used to measure current and voltage.

Course Outcome:

CO No.	CO	Cognitive Level
CO 1	Demonstrate the ability to design a basic series ohmmeter circuit using a PMMC meter and accurately measure resistor values, showcasing practical understanding.	3
CO 2	Design and construct a DC voltmeter with a specified range, in this case, 5 V, and successfully measure various voltage values, showcasing practical skills in circuit design and application.	5
CO 3	Design and build a DC voltmeter with a 10V range and accurately measure different voltage values, demonstrating practical competency in meter construction and usage.	5
CO 4	Construct a DC ammeter with a 20mA range and successfully measure various current values, demonstrating practical competency in ammeter design and application.	5

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List of Experiments (Any 8)

1. To design basic series ohmmeter circuit using PMMC meter and measure value of resistor using this ohmmeter.
2. To design DC voltmeter using PMMC meter with range of 5 V and measure different values of voltages.
3. To design DC voltmeter using PMMC meter with range of 10V and measure different values of voltages.
4. To design DC ammeter using PMMC meter with range 10mA and measure different values of currents.
5. To design DC ammeter using PMMC meter with range 20mA and measure different values of currents.

6. To measure value of resistors using color code method and using Analog and Digital Multimeter.
7. To determine the percentage difference of the measured resistance using Analog multimeter and Digital multimeter.
8. To determine the percentage difference of the measured voltage using Analog multimeter and Digital multimeter.
9. To determine the percentage difference of the measured current using Analog multimeter and Digital multimeter.
10. Use of C.R.O as a measurement tool for amplitude of different AC signals.
11. Use of C.R.O as a measurement tool for frequency of AC signal.

VEC-2 (T)

CI-129 Constitution of India

(Credits: 2, Hours: 30)

CC-2

CC-130 A) NSS OR B) NCC

(Credits: 2, Hours: 30)

AEC-2

English-2

(Credits: 2, Hours: 30)

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