KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON

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

Semester-wise Code structure and Syllabus for

F.Y. 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.

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

B.Sc. (Honors/Research) - First Year

Year (Level)	Sem.	Faculty	Subject-I (M-1)	Subject-I (M-2)	Subject-I (M-3)	Open Elective (OE)	VC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT, RP	Min Credits for the Year	Degree
1 (4.5)	Sem-I	Science	DSC-1 (2T) DSC-2 (2P)	DSC-1 (2T) DSC-2 (2P)	DSC-1 (2T) DSC-2 (2P)	OE-1 (2T)	—	AEC-1(2) (Eng) VEC-1(2)(EA) IKS (2)	CC-1(2)	44 (22-22)	UG Certificate in Faculty
	Sem-II	Science	DSC-3 (2T) DSC-4 (2P)	DSC-3 (2T) DSC-4 (2P)	DSC-3 (2T) DSC-4 (2P)	OE-1 (4T)	—	AEC-2(2) (Eng) VEC-2(2) (CI)	CC-2(2)		
Credit: 1st Year			08	08	08	06	—	10	4	44	

Note:

- T: Theory Course, P: Practical Course, Number in bracket indicate credit allotted
- The courses which do not have practical, "P" will be treated as "T"

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
- **VC:** Vocational Skill Courses
- **SEC:** Skill Enhancement Courses
- **GE/OE:** Generic/Open elective
- **CEP:** Community engagement and service
- **CC - Co-curricular Course**
- **VEC: Value Education Courses**
- **IKS: Indian Knowledge System**
- **AEC: Ability Enhancement Courses**
- **Eng: English**
- **MIL: Modern Indian language**
- **CI: Constitution of India**
- **EA: Environment Awareness**
- **OJT: On Job Training: Internship/ Apprenticeship**
- **RP: Research Project**
- **RM: Research methodology**

Note:

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

Semester-wise Code structure for B. Sc Electronics (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											
Course	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Teaching Hours / Week**			**Marks**			
					T	**P**	**Total**	**Internal (CA)**		**External (UA)**	
								T	**P**	**T**	**P**
DSC-1	**DSC**	**EL-111**	Introduction to Electronics	2	2	--	2	20	--	30	--
DSC-2	**DSC**	**EL-112**	Electronics DSC Lab I	2	--	4	4	--	20	--	30
OE-1	**OE**	**EL-113**	Hardware and Networking	2	2	--	2	20	--	30	--
B. Sc (Honors/Research) – First Year, Electronics SEMESTER – II, Level – 4.5											
DSC-3	**DSC**	**EL-121**	Electronics Semiconductor Devices	2	2	--	2	20	--	30	--
DSC-4	**DSC**	**EL-122**	Electronics DSC Lab II	2	--	4	4	--	20	--	30
OE-2	**OE**	**EL-123**	Digital Literacy	4	4	--	4	40	--	60	--

DSC-1 (T)
EL-111 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	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 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 and full adders	4

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Unit	Title and Contents	Lectures/ Hours
Unit: 1	**Basics of Analog Electronics:** Evolution and Impact of Electronics, Voltage and Current (DC and AC signal), Familiarization of Resistors, Capacitors, Inductors, Transformers, relays, switches, fuse (basic principle, symbol; types and applications (list))	5 Hours, 5 Marks
Unit: 2	**Circuit Analysis and Network Theorems** Ohm's law, Kirchhoff's laws. 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.	10 Hours, 10 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.	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.

DSC-2 (P)

EL-112 Electronics DSC Lab I

(Credits 2, Total hour: 60)

Course objectives

- To identify and test various electronic components.
- Practical application of Ohm's Law, KVL & KCL
- 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, 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

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Section A: (Perform any 5)

1. Identification, testing and specification of electronic components (R, C, L, Switches, Fuse, Transformer and Relay)
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 Series and parallel voltage divider circuit.
5. Study of Kirchhoff's Current Law
6. Study of Kirchhoff's Voltage Law

Section B:(Perform any 5)

1. Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICs
2. Study of NAND gate as universal Gate.
3. Study of NOR gate as universal Gate.
4. Study Half adder
5. Study Full Adder
6. Build and test the logic circuit for logic equation y = A + (B.C)
7. Build the test logic circuit for logic equation y = (A.B) + (B.C)

Note:

- Industrial/Field visit equivalent to 2 practical
- Workshop/Hands-on training equivalent to 1 practical

OE-1 (T)

EL-113 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 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.	8 Hour, 8 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 Networks (LANs). Ethernet and LAN technologies, Wide Area Networks (WANs). Introduction to Repeater, Hub, Switch, Router.	10 Hour, 10 Marks

Unit 4	**Internet** Concept of Internet, Applications of Internet. World Wide Web (WWW), Web Browsing Software. Search Engines. Understanding URL.	5 Hour, 5 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)

DSC-3 (T)

EL-121 Electronic Semiconductor Devices

(Credits: 02, Hours: 30)

Course Objectives:

- Acquire fundamental knowledge and exposure 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, light-emitting diodes (LEDs) an Bipolar Junction Transistor (BJT)	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.	5 Hours, 5 Marks
Unit 2	**Semiconductor Diodes** 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.	10 Hours, 10 Marks
Unit 3	**Diodes Circuits and Applications** Half wave rectifier, Full wave and bridge rectifier, PIV and surge current, capacitive filter, Block diagram of power supply, Zener as voltage regulator. Three terminal regulated power supply using IC 7805.	7 Hours, 7 Marks

Unit 4	**Bipolar Junction Transistor (BJT)** Bipolar Junction Transistor (PNP and NPN Transistor): symbol, construction, working principle, I-V characteristics, specifications. Transistor configurations: CB, CC and CE. DC load line, Q point, Relationship of α and β. Stability factor, Need of Biasing, Different methods of Biasing (List), Voltage divider biasing (Detail).	8 Hours, 8 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- 4 (P)

EL-122 Electronics DSC 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.

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

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Section A (Any Ten)

1. Study of the I-V Characteristics of p-n junction Diode,
2. Study of the I-V Characteristics of Zener diode.
3. Build and test Half wave rectifier
4. Build and test Centre-taped Full wave rectifier.
5. Build and test Full wave Bridge rectifier.
6. To study Zener diode as a voltage regulator on the output of FWR.
7. Study I-V characteristics of Light emitting diode
8. Study of the I-V Characteristics of BJT in CE configuration.
9. To study Transistor as a switch (LED ON/OFF)
10. Biasing circuits voltage divider,
11. DC load line
12. Build and test regulated power supply using IC 78XX
13. Build and test variable voltage regulated power supply using IC 317
14. Industrial/Field visit equivalent to 2 practicals
15. Workshop/Hands-on training equivalent to 1 practical

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, Goodyear Publishing Corporation.

OE- 2 (T)

EL-123 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, 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