

## Syllabus Framework and Design of Electronics for B. Sc. (Comp. Sci.) under Autonomy and NEP-2024

Sem.	Major Elective Courses	Minor Courses	GE/OE
<b>First Year Certificate Course</b>			
I		2 Theory + 1 Practical From Electronics	1 Theory From Electronics in Basket
II		2 Theory + 1 Practical From Electronics	1 Practical From Electronics In Basket
<b>Second Year Graduate Diploma</b>			
III		1 Theory + 1 Practical From Electronics	1 Theory From Electronics in Basket
IV		1 Theory + 1 Practical From Electronics	1 Practical From Electronics In Basket
<b>Third Year Graduate Degree</b>			
V	To B.Sc. (Comp. Sci.) 1 Theory + 1 Practical From Electronics	-	-
VII	To B.Sc. (Comp. Sci.) 1 Theory + 1 Practical From Electronics	-	-

### Course Codes for various courses

Sem	Major Elective Courses	Minor Courses	GE/OE
<b>First Year Certificate Course</b>			
I	-	ELMIT-111 ELMIT-112 ELMIP-113	ELOET-111
II	-	ELMIT-121 ELMIT-122 ELMIP-123	ELOEP-121
<b>Second Year Graduate Diploma</b>			
III	-	ELMIT-231 ELMIP-232	ELOET-231
IV	-	ELMIT-241 ELMIP-242	ELOEP-241
<b>Third Year Graduate Degree</b>			
V	CSMAET-351 CSMAEP-352	-	-
VII	CSMAET-361 CSMAEP-362	-	-

P.D.E.A's.

**Prof. Ramakrishna More College, Akurdi, Pune-411044**

**Syllabus Framework and Design of Electronics for**

**B. Sc. (Comp. Sci.) and B.C.A. (Sci.) under Autonomy and NEP-2023**

**Courses Codes, Generic name and Title of the paper of Electronics**

<b>Courses from Electronics Department to GE/OE Basket for non-B.Sc. (Comp. Sci.) and B.C.A. (Science) students</b>				
I	ELOET-111	Open Elective Theory from Electronics Science	Electronics for Everyone	2
II	ELOEP-121	Open Elective Theory from Electronics Science	Electronics Practical Lab V	2
III	ELOET-231	Open Elective Practical from Electronics Science	Basics of Electronics	2
IV	ELOEP-231	Open Elective Practical from Electronics Science	Electronics Practical Lab VI	2

## Syllabus of Courses Offered by Electronics Department for GE/OE Basket

F. Y. B.Sc. Semester I	
Electronics for everyone	
Course code: ELOET- 111	
No. of Credits: 2	
Unit	Contents
<b>Module 1</b>	
<b>I</b>	<b>Introduction Electronic components (8)</b> <b>Components:</b> Overview and function of components, classification of electronic components. <b>Resistors:</b> Symbol, colour code, types Fixed and variable, carbon composition, metal film, wire wound variable resistor, potentiometers, presets, logarithmic, linear, multiturn potentiometers, special purpose thermistor, VVR, LDR, - technical specifications (value, Wattage, Temperature coefficients) <b>Capacitors:</b> General information, symbol, colour code, types such as air, paper, electrolytic, mica, tantalum, polystyrene, fixed and variable capacitors, specifications of capacitors. Power factor, working voltage, measurement of capacitance. <b>Inductors and Transformers:</b> Principle of operation, symbol, types of inductors: air core, iron core, ferrite core, AC mains choke, frequency response of inductor, Principle of operation of transformers, Types : single phase/three phase, auto-transformer and isolation transformers, Audio, IF and RF.
	<b>Semiconductors Diode: (7)</b> Classification of materials - insulators, metals and semiconductors, energy band theory (brief idea), intrinsic and extrinsic semiconductors, p and n type semiconductors, mechanism of current conduction in semiconductors, Formation of P-N junction, barrier potential Static V-I characteristic (qualitative), breakdown mechanism: Zener vs. Avalanche effect. Zener diode (as a voltage regulator), LED, Photo diode, Opto-coupler, diode as a rectifier
<b>Module 2</b>	
<b>III</b>	<b>Introduction to Electronics devices (10)</b> <b>Batteries:</b> Dry cells, Lead acid accumulators, Nickel Cadmium cells, standard cells, principle, specifications, lifetime, calculation of time and ratings <b>Fuses, Relays, and Switches:</b> Fast and slow blow fuses, Pilot lamps, Relays- symbol, types and specifications, reed, and electromagnetic relays, SPDT, DPDT, band switches, touch switches, thumb wheel switches, micro-switches, specifications, application areas <b>Microphones and Loudspeakers :</b> symbol, types of microphones: variable resistance (carbon), variable capacitance (condenser), variable inductance (moving coil), symbol, types of loudspeakers, specifications of (frequency response, impedance, power rating, size, directionality) of midrange-speaker, tweeter, woofer
	<b>Tools in Electronics Laboratories: (5)</b> Wire stripping pliers, Adjustable stripping plier, Needle nose plier, Slip joint plier, Adjustable slip plier, tweezers, Anti-static tweezers, Wire cutter, Utility knife, Screw driver, Hand drill, Power drill, Wire Wrapping tool, Wrapping tape, Hacksaw, File, Vice / Jammer, Soldering gun, Crimping tool, Different types of soldering guns, De-soldering pump, Continuity tester, Electric tester.
<b>Text and Reference Books:</b>	
1.	Basic Electronics, Grob , Mitchel E. Schultz, 11 <sup>th</sup> Edition, .McGraw Hill
2.	Practical Electronics: Components and Techniques, J.M. Hughes, O'Reilly Media, Inc.,
3.	Troubleshooting Electronic Equipment, R.S. Khandpur,.(2007) McGraw Hill
4.	Consumer Electronics, S. P. Bali, Pearson (2008).
<b>Course Outcomes (COs): On completion of the course, the students will be able to:</b>	
CO1: Identify the electronic components. CO2: Identify the electrical components. CO3: Identify the electronic tools. CO4: Identify the electrical tools. CO5: Understand the specifications of the given components CO6: Learn the use of various mechanical and electrical tools	

<b>F. Y. B.Sc. Semester II</b>	
<b>Electronics Practical (OE) Lab -5</b>	
<b>Course code: ELOEP- 121</b>	<b>No. of Credits: 2</b>
<b>Total 10 experiments are to be performed by student.</b>	
<b>Contents</b>	
<ol style="list-style-type: none"> <li>1. Preparatory Experiment Study of components and instruments.</li> <li>2. Preparatory Experiment Study of DSO and Signal generator (Parameters)</li> <li>3. Study of Inductors and transformers</li> <li>4. Study of Switches, Fuses and Relays</li> <li>5. Study of various types of Batteries.</li> <li>6. Study of cables, connector and Circuit Boards</li> <li>7. Study of Microphones and Loudspeakers</li> <li>8. Study of Tools in Electronics Laboratories and practice of various soldering techniques.</li> <li>9. Study and testing of different types of diodes.</li> <li>10. Study of Characteristics of PN junction Diode.</li> <li>11. Study of rectifiers.</li> <li>12. Study of diode clipper circuit.</li> <li>13. Study of diode clamper circuit.</li> <li>14. Study of SSD.</li> </ol> <p>*Note:- Preparatory Experiments are Compulsory. Take any 8 practicals from 3 to 14.</p>	
<b>References:</b>	
<ol style="list-style-type: none"> <li>1. Basic Electronics, Grab, Mitchel E. Schultz, 11<sup>th</sup> Edition, .McGraw Hill</li> <li>2. Practical Electronics: Components and Techniques, J.M. Hughes, O'Reilly Media, Inc.,</li> <li>3. Troubleshooting and Repairing Major Appliances, Eric Kleinert, Third Edition, .McGraw Hill</li> <li>4. Troubleshooting Electronic Equipment, R.S. Khandpur,.(2007) McGraw Hill</li> <li>5. Consumer Electronics, S. P. Bali, Pearson (2008).</li> </ol>	
<b>Course Outcomes (COs): On completion of the course, the students will be able to:</b>	
CO1: Able to identify different types of resistors, capacitors, Semiconductor diodes. CO1: Able to identify different types of Inductors and transformers. CO3: Able to select correct components according to application. CO4: Identify and select correct battery specification according to application. CO5: To acquire skill of use of Tools used in Electronics Laboratories. CO6: To acquire skill of soldering various components on zero PCB. CO7: To acquire knowledge of different electronics components and its use in circuits	

<b>S. Y. B.Sc. Semester III</b>	
<b>Basics of Electronics</b>	
<b>Course code: ELOET-231</b>	
<b>No. of Credits: 2</b>	
<b>Unit</b>	<b>Contents</b>
<b>Module 1</b>	
<b>I</b>	<b>Bipolar Junction Transistors (BJT): (5)</b> Basic structure and formation of BJT, different current components, different configuration of transistors (CB, CE, CC). Transistor parameters $\alpha$ and $\beta$ and DC biasing, transistor load-line and Q-point (concept), operating point and need for biasing. Thermal runaway (brief idea). Stability of transistor biasing: factors.
<b>II</b>	<b>Amplifiers and Oscillators: (5)</b> CE amplifier, current and voltage gain, input and output impedance, power gain. large-signal amplifiers (concept). Feedback in amplifiers :negative and positive feedback, advantages of negative feedback General theory of feedback amplifier, Barkhausen criterion for oscillation, Different types of Oscillator,
<b>III</b>	<b>Field Effect Transistor: (5)</b> Junction Field Effect Transistor (JFET): N and P channel JFET, Metal Oxide Semiconductor Field Effect Transistor (MOSFET), n-channel (NMOS) and p-channel (PMOS), depletion and enhancement type MOSFETs, drain and transfer characteristics of MOSFET, FET parameters. Advantages of FETs over BJTs.
<b>Module 2</b>	
<b>IV</b>	<b>Boolean Algebra, Logic gates and Logic families: (9)</b> Introduction to analog signals and digital signals, Positive and Negative logic, Logic gates: definition, symbols, truth tables, Boolean expressions of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates Different logic families: TTL, ECL, MOS & CMOS, specification, fan-out, power dissipation, propagation delay, noise margin. Rules and laws of Boolean algebra, De-Morgan's theorem, simplification of Logic equations using Boolean algebra rules, NAND and NOR as a Universal gate. Min terms, Max terms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Digital logic circuits: half adder and full adder.
<b>V</b>	<b>Integrated Chips IC Design Technology: (6)</b> Introduction to chip integration: Scale of integrations: SSI, MSI, LSI, VLSI, ULSI (basic idea only). Different ICs of logic gates. Study of Timer IC 555, Astable, Mono-stable and Bistable multivibrators.
<b>Reference Books:</b>	
<b>1.</b>	Malvino Electronics Principles By- Malvino A. P. Ed-6, McGraw Hill publication.
<b>2.</b>	Modern Digital Electronics By Jain R.P. Ed-4, Pub- Tata McGraw Hill publication India
<b>3.</b>	Digital Fundamentals By Floyd T.M. Ed-11, Pub-Person Education Publication.
<b>Course Outcomes (COs): On completion of the course, the students will be able to:</b>	
CO1: Study and Explain construction details of various semiconductor devices. CO2: Explain operation, characteristics behavior, technical specification of various semiconductor devices. CO3: Explain needs and operation details of elementary electronic circuits and systems. CO4: Get familiar with concepts of digital electronics. CO5: Understand basic logic gates and different logic families. CO6: Understand Integrated chips with reference to logic gates and timer IC555.	

<b>S. Y. B.Sc. Semester IV</b>	
<b>Electronics Practical (OE) Lab -6</b>	
<b>Course code: ELOEP- 241</b>	<b>No. of Credits: 2</b>
<b>Total 10 experiments are to be performed by student.</b>	
<b>Contents</b>	
<ol style="list-style-type: none"> <li>1. Testing of transistor and its study as amplifier</li> <li>2. Study of logic gates</li> <li>3. Study of half adder and full adder circuits.</li> <li>4. Study of transistor as a switch</li> <li>5. Study of Phase shift oscillator.</li> <li>6. Study of Monostable Multivibrator by using IC 555/Transistor</li> <li>7. Study of Astable Multivibrator by using IC 555/Transistor.</li> <li>8. Study of Speed controller of DC Motor.</li> <li>9. Study of street light controller using LDR/Photodiode.</li> <li>10. Study of Thermister.</li> <li>11. Study of thumbwheel switch.</li> <li>12. Project on electronics.</li> <li>13. Electronics Project</li> </ol> <p><b>*Note: - Electronics project is equivalent to 2 practicals. If electronics practical is opted, then take any 8 practicals from 1 to 12.</b></p> <p><b>Guide lines for Electronic Project are as follows:</b></p> <ul style="list-style-type: none"> <li>• Each student is expected to perform 1 Hobby projects in this semester.</li> <li>• Per teacher 10 students are allotted. Maximum 2 students are allowed in one group.</li> <li>• Teacher should guide them for feasibility of different circuit ideas suggested by student. He should also provide theoretical support needed for the project.</li> <li>• In special case if cost and complexity of project is too much then more number of students are allowed to accommodate in single project.</li> <li>• After 15 days student should approach the respective guide to provide the project progress.</li> <li>• <b>Evaluation process: -</b> <ol style="list-style-type: none"> <li>1. Continuous and cumulative evaluation after 15 days.</li> <li>2. Project demonstration along with Handwritten project report.</li> <li>3. Project oral/Presentation.</li> <li>4. Report should not be copy written.</li> </ol> </li> </ul>	
<b>References:</b>	
<ol style="list-style-type: none"> <li>1. Grob's Basic Electronics, Mitchel E. Schultz, 11<sup>th</sup> Edition, .McGraw Hill</li> <li>2. Troubleshooting and Repairing Major Appliances, Eric Kleinert, Third Edition, .McGraw Hill</li> <li>3. Troubleshooting Electronic Equipment, R.S. Khandpur, .(2007) McGraw Hill</li> <li>4. Consumer Electronics, S. P. Bali, Pearson (2008).</li> </ol>	
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**Question paper format for Semester End Examination  
NEP-2020,**

<b>Time: 02 Hours</b>		<b>Max Marks: 35</b>	
<b>Theory question weightage will be given to each topic equivalent to number of lecturers allotted to unit in a syllabus.</b>			
<b>Instructions to the Candidate:</b> <div><div>1. All Questions are compulsory.</div><div>2. Figures to the right indicates full marks.</div><div>3. Use of log table and scientific calculator is allowed.</div></div>			
<b>Q. No.</b>	<b>Question format</b>	<b>Question Type</b>	<b>Marks</b>
<b>Q. 1</b>	Attempt <b><u>any EIGHT (8)</u></b> of the following: <b>out of 10</b>	<b>Knowledge based questions:</b>	<b>8x1=8</b>
<b>Q. 2</b>	Attempt <b><u>any FOUR (4)</u></b> of the following: <b>out of 6</b>	<b>Comprehensions based questions</b>	<b>4x2=8</b>
<b>Q. 3</b>	Attempt <b><u>any TWO (2)</u></b> of the following: <b>out of 3</b>	<b>Analysis and application based questions</b>	<b>2x3=6</b>
<b>Q. 4</b>	Attempt <b><u>any TWO (2)</u></b> of the following: <b>out of 3</b>	<b>Synthesis and evaluation based questions</b>	<b>2x4=8</b>
<b>Q. 5</b>	Attempt <b><u>any ONE (1)</u></b> of the following: <b>out of 2</b>	<b>Synthesis and evaluation based questions</b>	<b>1x5=5</b>

**Use Blooms taxonomy**

