#### ATMANIRBHAR BHARAT' Swayampurna goa

# **Goa University**

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**गोंय विद्यापीठ** ताळगांव पठार, गोंय -४०३ २०६ फोन : +९१-८६६९६०९०४८



# (Accredited by NAAC)

GU/Acad –PG/BoS -NEP/2023/544

Date: 03/01/2024

Ref: GU/Acad –PG/BoS -NEP/2023/102/34 dated 16.06.2023

## CIRCULAR

In supersession to the above referred circular, the updated approved Syllabus of **Bachelor of Science in Electronics** Programme with following changes is enclosed.

- Minor Course ELE-111 'Analog Fundamentals EDA' from Semester I shall be also offered in Semester II in place of ELE-112 'Digital Fundamentals EDA'.
- ELE-112 'Digital Fundamentals EDA' shall now be offered in Semester III with revised Course Code ELE-212 'Digital Fundamentals EDA'.

Principals of Affiliated Colleges offering the **Bachelor of Science in Electronics** Programme are requested to take note of the above and bring the contents of this Circular to the notice of all concerned.

(Ashwin Lawande) Assistant Registrar – Academic-PG

Τo,

1. The Principals of Affiliated Colleges offering the Bachelor of Science in Electronics Programme.

Copy to:

- 1. The Director, Directorate of Higher Education, Govt. of Goa
- 2. The Dean, School of Physical and Applied Sciences, Goa University.
- 3. The Vice-Deans, School of Physical and Applied Sciences, Goa University.
- 4. The Chairperson, BoS in Electronics.
- 5. The Controller of Examinations, Goa University.
- 6. The Assistant Registrar, UG Examinations, Goa University.
- 7. Directorate of Internal Quality Assurance, Goa University for uploading the Syllabus on the University website.

Programme Structure for Semester I to VIII Under Graduate Programme- Electronics										
Semester	Major -Core	Minor	МС	AEC	SEC	I	DV	AC	Total Credits	Exit
I	ELE-100: Electronic devices	ELE-111: Analog Fundamentals- EDA (3L+1T)	ELE-131: Introduction to Electricity (1L+2T)		ELE-141: Electronics for Beginners (1L+2P)				20	
II	and circuits (3L+ 1P)		ELE-132: Repair and Maintenance of Domestic Electrical appliances (3L)		ELE-142: PCB Designing and Fabrication (1L + 2P)				20	ELE-161 : CCTV Installation (2L + 2T)
111	ELE-200: Basic Circuit Theory and Network Analysis (4) ELE-201: Linear Integrated Circuits(4)	ELE-211: Digital Electronics(4) OR ELE-212: Digital Fundamentals - EDA (3L+1T)	ELE-231: Computer troubleshooting and Maintenance(3)		ELE-241: PLC and HMI (1L + 2P)				20	
IV	ELE-202: 8085- Microprocessor(4) ELE-203: Transducers and Instrumentation(4) ELE-204: Electronic Communication(4) ELE-205: Programming in C (2)	ELE-221: Robotics (Lab Course)(4)							20	ELE-261 - Repair and Maintenance of Electrical and Electronics equipment(4)
v	ELE-300: 8051- Microcontroller(4) ELE-301: Power Electronics(4) ELE-302: Operating System(4)	ELE-321: Internet of Things and Application(4)				ELE-361: Inter- nship(2)			20	

	ELE-303: Programming					
	ELE 204: Emboddod					
	Systems(4)					
VI	ELE-305: Biomedical Instrumentation(4) ELE-306: Computer Networking and System Administration(4) ELE-307: Project(4)	ELE-322: Programming with MATLAB(4)			20	
VII	ELE-400: Augmented Reality and Virtual Reality(4) ELE-401: Artificial Intelligence(4) ELE-402: Fundamentals of Signal Processing(4) ELE-403: Optoelectronics(4)	ELE-411: Mobile App development(4)			20	
VIII	ELE-404: Agro Electronics(4) ELE-405: Digital Image Processing (4) ELE-406: VLSI Design(4) ELE-407: Industrial Automation(4)	ELE-412: Pharmaceutical Instrumentation(4)			20	

## Name of the Programme: BSc Electronics Course Code: ELE 100 Title of the Course: Electronics Devices and Circuits Number of Credits: 04 (3Lecture +1Practical) Effective from AY: 2023-24

for the Course				
Course	Inis course is intended to:			
Objectives:	Introduces basic concepts of various electronic devices.			
	• Study and analyse characteristics of various amplifiers.			
	• Understand biasing and stability techniques for an amplifier.			
	I o understand different types of amplifiers and oscillators.			
Content:	Unit I Junction Diode and its applications:	14 Hours		
	Conduction in Semiconductors, P type & N-type Semiconductor,			
	PN junction diode (ideal and practical)-constructions, Formation of			
	Depletion Layer, Diode Equation and I-V characteristics. Idea of			
	static and dynamic resistance, dc load line analysis, Quiescent (Q)			
	point. Rectifiers- Hall wave rectifier, Full wave rectifiers (centre			
	ripple factor and efficiency. Filter Churt capacitor filter, its role in			
	npple factor and efficiency. Filter-shuft capacitor filter, its role in			
	and load regulation			
	Unit II Special Purpose Diede			
	Zener and avalanche breakdown. Zener Diode, V-I Characteristics	SHOUIS		
	Zener diode as voltage regulator: Load and line regulation. Power			
	Diode Schottky Diode Varactor Diode LASER Diode Tunnel			
	diode PIN diode			
	Unit III Bipolar Junction Transistor	12 Hours		
	Bipolar Junction Transistor: Construction and working. Review of			
	the characteristics of transistor in CB. CC and CE configurations.			
	Comparison of the characteristics of CB. CC and CE. Regions of			
	operation (active, cut off and saturation), Current gains alpha( $\alpha$ )			
	, beta( $\beta$ ) and gamma( $\Gamma$ ). Relations between $\alpha$ , $\beta$ and $\Gamma$ . dc load line			
	and Q point, Transistor as switch, Transistor as Amplifier,			
	Darlington Pair, Transistor biasing and Stabilization circuits: Fixed			
	Bias, Emitter Bias and Voltage Divider Bias. Thermal runaway,			
	stability and stability factor S. Power Amplifiers: Class A, Class B,			
	Class AB Push Pull and Class C Amplifier operation.			
	Unit IV Cascaded Amplifiers:			
	Two stage RC Coupled Amplifier and its Frequency Response,	2 Hours		
	Direct Coupled Amplifier and its Frequency Response			
	Unit V Feedback in Amplifiers:			
	Concept of feedback, negative and positive feedback, advantages	2 Hours		
	of negative feedback (Qualitative only).			
	Unit VI Sinusoidal Oscillators:			
	Barkhausencriterion for sustained oscillations. Phase shift and	4 Hours		
	Colpitt's oscillator. Determination of Frequency and Condition of			
	oscillation.			
	Unit VII Unipolar Devices	CHANNE		
	JFET Construction, working and I-V characteristics (output and	6 Hours		
	transfer), JFET as Amplifier, MOSFET: DE-MOSFET and E-MOSFET,			
	transfer) UIT Construction working and I-V characteristics (output and			
	characteristics IIIT as Polavation Oscillator			
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	Any eight from below:
Practical's	1. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) <b>30 Hours</b>
	Zener diode.
	2. Half wave: Ripple factor and load regulation.
	3. Full wave: Ripple factor and load regulation.
	4. Bridge rectifiers: Ripple factor and load regulation.
	5. Zener regulator on the output of FWR.
	6. Fixed Bias and Voltage divider bias configuration for CE transistor.
	7. class A amplifier, class B amplifier, class C amplifier.
	8. RC Phase Shift Oscillator and Colpitt's oscillator.
	9. UJT as relaxation oscillator.
Pedagogy:	Lectures/Tutorials/Practical's
References/	1. Floyd Thomas "Electronic Devices ", 5th Edition, Pearson Education Publication
Readings:	,2022
	2. Malvino Albert Paul "Electronic Principles", 3rd Edition Tata McGraw-Hill
	Publication,1994.
	3. Mottershead Allan "Electronic Devices & Circuits" EEE Publication, 1973.
Course	Students will,
Outcomes:	• Understand a regulated power supply using rectifiers and filters.
	• Learn transistor biasing circuit for class A. B. AB and C amplifier.
	<ul> <li>Analyse a system as per the requirements and specifications.</li> </ul>

#### Name of the Programme: BSc Electronics Course Code: ELE-111 Title of the Course: Analog Fundamentals – EDA Number of Credits: 04 (3 Lectures +1 Tutorals) Effective from AY: 2023-24

Pre-requisites		
for the Course:		
Course	This course is intended to:	
Objectives:	Understand the basic concepts of electronic devices.	
	• Design and analyse characteristics of various amplifiers e.g.CB, CE a	nd CC.
	• Explains biasing and stability techniques for an amplifier.	
	• Design various types of amplifiers and oscillators.	
Content:	Unit I Introduction to basic components and circuit analysis	7 Hours
	Introduction to basic circuit components like resistors, capacitors,	
	inductors. Circuit analysis: Concept of Voltage and Current	
	Sources, Kirchhoff's Current Law, Kirchhoff's Voltage Law,	
	Unit II Basic of Analog Electronics	
	Introduction to basic circuit components like diodes transistors.	14 Hours
	On-Amps and Integrated Circuits (ICs) PN junction diode diode	14 110015
	as a rectifier half wave rectifier circuit Qualitative idea on	
	construction of a transistor and its working. Transistor circuits	
	such as transistor as a switch and transistor as an amplifier (single	
	stage amplifier) Block diagram of an Op Amp, symbol and ideal	
	stage amplifier). Block diagram of an Op-Amp, symbol and ideal	
	and non-inverting emplifiers	
	and non-inverting ampliners.	Cillaura
	Unit III Fliters and Oscillators	6 Hours
	First order Low Pass Filters, first order High Pass filters. First order	
	Low Pass Filters using Op-Amp, first order High Pass filter using	
	Op-Amp. Qualitative idea on Oscillators. Basics of Phase shift	
	Oscillator.	
	Unit IV Introduction to EDA tools	4 Hours
	Introduction to EDA tools, Creating a New Project, Schematic	
	Capture Window, zooming and panning, Visual Aids available to	
	Design, Display Options, Design Overview.	
	Unit V Basic Schematic	14 Hours
	Selecting Parts from the Library, Placing Objects on the	
	Schematic, wiring and terminal connection, power connections,	
	parts labels and annotation, Multi sheet designs and connectivity,	
	Library parts, import devices, create new device, Graphics and	
	pins, adding properties, attaching datasheets, indexing and	
	library selection.	
	Discuss and demonstrated the below listed case studies with	15 Hours
Totorials	EDA:	
	1. Verify the KCL and KVL.	
	2. Series and parallel LCR circuits.	
	3. Half wave rectifier.	
	4. The working of a transistor as switch.	
	5. Trasitor working as an amplifier.	
	6. Analyze the inverting and non-inverting amplifier using an Op-	
	Amp for given gain.	
	7. 1 <sup>st</sup> order active low pass and high pass filters for given cut-off	
	frequency.	
	8. Phase shift oscillator for given frequency.	
Pedagogy:	Lectures/Tutorials	-

References/	1. Mottershead Allan "Electronic Devices & Circuits" EEE Publication, 1973.
Readings:	2. Sudhakar A and Palli Shyammohan S "Circuits and Network Analysis and Synthesis", 5 <sup>th</sup> edition, Tata Mc Graw Hill, 2017.
	3. Gayakward Ramakant A. "Op-Amps and Linear Integrated Circuits", 4" Edition
	,2015
	4. https://labcenter.s3.amazonaws.com/downloads/Tutorials.pdf
Course	Students will,
Outcomes:	<ul> <li>Understand the basic concepts of analog circuit design.</li> </ul>
	• Simulate basic analog circuits using EDA tools.
	• Analyze the performance of analog circuits using EDA tools.
	Develop skills in using EDA tools like Proteus software.

#### Name of the Programme: BSc Electronics Course Code: ELE-131 Title of the Course: Introduction to Electricity Number of Credits: 03 (02Theory + 01Tutorial) Effective from AY: 2023-24

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for the Course		11	
for the course.			
Course	•	Familiarize with various electrical terms and components.	
Objectives:	•	Understand working principle of the electrical components, their	ratings and
		uses.	
	•	Develop necessary skills for house/farm wiring circuit.	
	•	Develop necessary skills for indoor and outdoor lighting system.	
Content:		Unit I Introduction to Electrical Components	10 Hours
		Electrical Devices: Resistors, Capacitors, Inductors, Transformers:	
		Symbols, specifications, working principle and their applications.	
		Electrical Sources and loads: Definition of Current, Voltage,	
		Energy, Power, power factor and measurements, Types of AC & DC	
		sources and loads, Series and Parallel connection of sources and	
		loads.	
		Batteries: Chargeable and non-chargeable batteries, Battery bank	
		installation and commissioning, Tools required for battery testing.	
		Network laws: Ohms law, Kirchhoff's laws, voltage divider and	
		current divider theorems, open and short circuits	
		Unit II INTRODUCTION TO ELECTRICITY	10 Hours
		Line Voltage: Distribution, Mains supply standards, Meaning of	
		Single phase and three phase supply, conventions followed,	
		Advantages and disadvantages of three phase supply. Star and	
		delta inter-connection of sources and loads.	
		<b>Importance of earthing and fuse:</b> Introduction of Earthing. Need	
		of earthing. Hazard. Types of earthing. Advantage of earthing.	
		working of earthing Importance of fuse types of fuse Circuit	
		Breaker and their ratings	
		House Wiring: Introduction of Wiring types of wiring advantage	
		of wiring wiring methods electrical nanel House wiring diagram	
		2 and 3-wire systems selection of proper wire size and voltage	
		dron Load calculation for residential and commercial nurnose	
		Lights and Lightning: Types of lights and their power consumption	
		and luminance comparison of incandescent LED and CEL hulbs	
		Unit III Energy Consumption and Preventive Maintenance	5 Hours
		General safety Precautions: Danger of high voltage and currents	Shours
		bandling and maintenance for all types of electrical and electronic	
		domostic Appliances. Energy consumption	
		Switches: Types and their ratings	
		Stabilizer and UDS: Types their working Dringiples (Plack level	
		stabilizer and opplications	
		Discuss and domonstrated the below listed case studies:	
	1	Discuss and demonstrated the below listed case studies:	20 Hours
	1.	Familiarization with various controls and use of CRU, Power	
		supply, Function Generator and Multi meter, Various Electronics	
Tutoriala	2	components.	
Iutoriais	2.	Battery fault detection and maintenance.	
	3.	Battery diagnostic and capacity testing.	
	4.	Inverter connection for residential house.	
	5.	introduction, working, Connection and Energy meter reading:	
	1	Electricity bill calculation.	

	6. Power Calculation of Load.			
	7. Demonstrate the single and three phase wiring (EDA).			
Pedagogy:	Lectures /Tutorials			
References/	1. Chetan Singh Solanki, "Solar Photovoltaic technology and systems" PHI learning			
Readings:	Private Itd. EEE, 2013.			
	2. Sudhakar and Shyam Mohan, "Electrical analysis and Synthesis", TMH, 2015.			
	3. Theraja and Theraja, Electrical Technology, Vol 1 by, PHI, 2016.			
	4. Satheesh Kumar, 'Electrical wiring, An Introduction' Ane Book Pvt Ltd. 2 <sup>nd</sup>			
	Edition, 2016.			
Course	Students will:			
Outcomes:	Understand basics of electrical components.			
	Understand electrical wiring and safety measures.			
	Understand lighting and its applications			
	• Apply the knowledge and techniques to design wiring and lightning for housing			
	and commercial setup.			
	Get self-employed in ever growing battery industry			

#### Name of the Programme: BSc Electronics Course Code: ELE-141 Title of the Course: Electronics For Beginners Number of Credits: 03(1Lecture +2Practical) Effective from AY: 2023-24

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Pre-requisites	Nil	
for the Course:		
Course	This course is intended to:	
Objectives:	<ul> <li>Introduce to students the basic of electronics.</li> </ul>	
	<ul> <li>Understand how circuit diagrams are drawn and constructed on breadboar</li> </ul>	rd.
	<ul> <li>To implement real life application based electronic circuits.</li> </ul>	
Content:	Unit I Basics of Electronics	2 Hours
	Electricity, Measuring Charge and Current ,AC vs. DC, Current	
	Flow,Voltage and Resistance,Picturing Voltage, Volts Are Relative,	
	Relative Voltages and Ground Potential , Resistance .	
	Unit II Building circuit Schematics	3 Hours
	Circuit Requirements ,Basic Components(resistor , inductor, capacitor),	
	Creating Your First Circuit, Adding Wires, Drawing Circuits, Drawing the	
	Ground.	
	Unit III Constructing and Testing Circuits	5 Hours
	The Solder-less Breadboard, Putting a Circuit onto a Breadboard , Using	
	Fewer Wires , Testing Circuits with a Multi-meter , Using a Multi-meter	
	with a Breadboard ,Measuring Current with a Multi-meter,Use of	
	Function Generator and Oscilloscope to observe signals.	
	Unit IV Sensors and actuators	
	Working Principles of Diode , Transistor, LED,	2 Hours
	Buzzer, Switches, Sensors (PIR, Piezo-electric sensor etc.) and Actuators	
	(Motors,Speaker etc).	
	Unit V Applications(Circuit diagram and working)	
	Simple touch sensor using transistor, Intruder Alarm, Water tank level	3 Hours
	indicator,LED chaser circuit,Rain detector,Light intensity measurement	
	using LDR,LED flip flop,Smoke detector, Clap Switch,Door knock sensing	
	doorbell, Motion detection using PIR sensors.	
Practical List	1. Simple touch sensor using transistor	
(Any 08)	2. Intruder Alarm	
	3. Water tank level indicator	
	4. LED chaser circuit	60Hours
	5. Rain detector	
	6. Light intensity measurement using LDR	
	7. LED flip flop	
	8. Smoke detector	
	9. Clap Switch	
	10. Door knock sensing doorbell.	
	11. Motion detection using PIR sensor.	
Pedagogy:	Lectures/Experiential/Practical's Learning	
References/	1. Bartiett Jonathan "Electronics For Beginners_ A Practical Introdu	action To
Readings:	Schematics, Circuits, And Microcontrollers' Apress ,2020.	
Course	2. Boysen Earl, Multi Mancy C, Electronics Projects For Dummies: Wiley,2006.	
Course	Students Will,	
Outcomes:	<ul> <li>Understand the basics of Electronics.</li> </ul>	do
	Learn to draw schematics and also the implement the circuit on breadboar involvement all stranging size its a function.	as.
	Implement electronics circuits of practical use.	

# Name of the Programme: BSc Electronics Course Code: ELE-132 Title of the Course: : Repair and Maintenance of Domestic Electrical Appliances Number of Credits: 03 (Lectures) Effective from AY: 2023-24

Pre-requisites for	Nil				
the Course:					
Course	This course is intended to:				
Objectives:	• Develop understanding of domestic wiring and key elements of	of electrical			
	appliances with basic safety practices.				
	• Impart knowledge to analyse and repair electrical appliances.				
	<ul> <li>Develop practice of maintenance of electrical equipment's.</li> </ul>				
	<ul> <li>Students will be demonstrated the various equipment's wo</li> </ul>	rking while			
	delivery of lectures.				
Content:	Unit I Introduction to Electricity	10 Hours			
	Line Voltage: Distribution, Mains supply standards, Meaning of				
	Single phase and three phase supply, conventions followed.				
	Importance Of Earthing and Fuse: Introduction of Earthing, need of				
	earthing, Hazard, Types of earthing, Advantage of earthing,				
	working of earthing, Importance of fuse, types of fuses. House				
	Wiring: Introduction of Wiring, types of wiring, advantage of				
	wiring, wiring methods, electrical panel, House wiring diagram.				
	Unit II Energy Consumption and Preventive Maintenance	07 Hours			
	General Precautions, nandling and maintenance for all types of				
	Energy Motor: Introduction working Connection and Energy				
	meter reading Power Calculation of Load Electricity Bill				
	calculation	07 Hours			
	Unit III Heating Appliances	07 110013			
	Introduction, working principle, construction, operation,				
	Installation, Maintenance and Repair (fault-finding and removal of				
	faulty component): Electrical iron, Electric stove, Electric Toaster,				
	Immersion heater, Electric geyser, Electric Oven, Induction				
	Cooktop, Electric Roti Maker, Electric Kettle.	07 Hours			
	Unit IV Motorized Appliances				
	Introduction, working principle, construction, operation,				
	Installation, Maintenance and Repair (fault-finding and removal of				
	faulty component): Electric fan (Ceiling Fan and Table Fan), Electric				
	Mixer grinder, Electric washing machine, Hairdryer, Vacuum				
	cleaner.	07 Hours			
	Unit V Electrical and Electronic Appliances				
	Introduction, working principle, construction, operation,				
	Installation, Maintenance and Repair (fault-finding and removal of				
	Emorgonov light Voltage Stabilizer (Polav based) Linear Pogulated				
	Power Supply Battery Charger Solar Voltaic cell Tube light	07 Hours			
	Unit VI Visual Electronic Annliances	07 Hours			
	Introduction block diagram working principal and different				
	sections of: Public Address System, CD/DVD player, ICD/IED				
	Television.				
Pedagogy:	Lectures/Experiential Learning	1			
References/	1. Sotcher Fred "The Repair & Maintenance of Electrical Equ	uipment: A			
Readings:	Complete Guide to Troubleshooting Portable Electric Tools and C	Generators",			
	Miramar Publishing Company, 1980				

	2. Khandpur R.S." Troubleshooting Electronic Equipment: Includes Repair and
	Maintenance" Second Edition, McGraw-Hill Education TAB,2006.
Course	Students will,
Outcomes:	• Acquire the basic knowledge of electricity and domestic wiring.
	• Understand the working of basic electrical appliances and their safety
	precautions.
	• Able to do repair and maintenance of the basic electrical appliances.

# Name of the Programme: BSc Electronics Course Code: ELE-142 Title of the Course: PCB Designing and Fabrication Number of Credits: 03(1Lecture +2Practical)

Effective from AY: 2023-24 Pre-requisites for Nil the Course: Course Understand the need for PCB Design and steps involved in PCB Design and **Objectives:** Fabricationprocess. Familiarize Schematic and layout design flow using Electronic Design Automation (EDA)Tools. Develop necessary skills for designing single sided and double-sided PCBs • using Electronic Design Automation (EDA) Tools. Introduction to PCB designing concepts Content: Unit I 3 Hours Introduction & Brief History:Background and History of PCB, Definition and Need/Relevance of PCB, Classification of PCBs: Single-sided PCBs, Double-sided PCBs, Multi-layer PCBs, Rigid and Flexible PCBs. Platted through holes technology and Surface mount technology, Terminology in PCB Design, Basic Electronic Components: Active vs Passive components and their symbols, Capacitor, Potentiometers, Resistors, Inductors, Diodes, Transistors, and Integrated Circuits. Unit II Layout and Artwork **3 Hours PCB Design Process** Layout Planning: Steps involved in layout design, General rules of Layout, Supply and Ground Conductors, Component Placing and Mounting, Cooling requirement, General design factor for digital and analog circuits. Artwork generation: Basic artwork approaches (manual and CAD), General Design guidelines for Artwork Preparation-Conductor orientation, Conductor routing, conductor spacing, Hole diameter and solder pad diameter, The square land pad, no conductor zones, pad conductor holes, conductor and solder joint pads. Laminates and Printed Circuit Board Production Unit III 2 Hours Techniques Types of Laminates, Properties of laminates, Photo printing, filmmaster production, reprographic camera, Basic process for single and double sided PCBs, Photo resists, Screen-printing process. Unit IV PCB Fabrication & Assembly 2 Hours Steps involved in fabrication of PCB. PCB Fabrication techniques-single, double sided and multilayer Etching: Introduction to PCB etching process, Dry Etching and Wet Etching, etching machine Post operations- stripping, black oxide coating and solder masking PCB component assembly processes: Solder connection, Solder joints, Solder alloys, soldering fluxes, Soldering & Desoldering tools. 2 Hours Unit V Transmission lines and crosstalk Transmission Line: Transmission lines and its effects, Significance of

Transmission line inBoard design, Types of Transmission lines. Crosstalk:The crosstalk in transmission lines, Crosstalk control in PCB design parts, planes, tracks, connectors,terminations, Minimization of crosstalk.Thermal issues: Thermal mapping of design.

**3** Hours

	Unit VI PCB designing using EDA tools	
	Different Electronic design automation (EDA) tools and	
	comparison. (Proteus, OrCAD, Eagle, Kikad, etc), Selecting the	
	Components Footprints as per design, Making New Footprints,	
	Assigning Footprint to components, Netlist generation, PCB Layout	
	Designing, Auto routing and manual routing, assigning specific text	
	(silkscreen) to design, Generating (GERBER file) for design.	60 Hours
Practical List	Part-A: Creating Artwork and Printing of single sided PCB for	
(Any 8)	the following circuits (any 4)	
	1. Regulator circuit using 7805/LM317	
	2. Adder circuit using op-amp IC 741	
	3. Bridge Rectifier	
	4. LED flasher using IC555	
	5. Twilight Switch	
	6. Touch plate switches – transistorized or 555 based	
	7. Clapping switch and IR switch	
	8. Cell charger/battery charger/mobile charger	
	9. Fire/smoke/intruder alarm	
	10. Water level controller	
	11. Displaying decimal number on 7-segment display using BCD to	
	7- segment decoder IC	
	12. Audio amplifier using op-amp IC 741	
	Part-B: Etching and drilling of single sided PCB (Compulsory)	
	13 Etching of single-side PCB for any one of the circuits	
	mentioned in Part-A	
	Part-C: Fabricate single-sided PCB (Compulsory)	
	14 Fabricate and test single-side PCB for any one of the circuits	
	mentioned in Part-A by mounting and soldering components.	
Pedagogy:	Lectures/Experiential/Practical's Learning	
References/	1. Khandpur R.S. "Printed Circuit Board Design, Fabrication Asse	embly and
Readings:	testing", TMH, 2006	
	2. Bosshart Walter C. "Printed circuit Board Design and technology,"	TMH <i>,</i> 1983
	3. Clyde F. Coombs, Jr, Happy T. Holden "Printed Circuits Handb	ook", 6th
	edition, TMH Education, 2016.	
	4. Kwashnak Kenneth "A Basic Introduction for Designing a Prin	ted Circuit
	Board (PCB) with EAGLE eCAD/CAM Software " SURVICE Engine	ering 4695
	Millennium Drive Belcamp, 2020.	
Course	Students will,	
Outcomes:	• Explain and describe the steps involved in schematic, layout, fabric	cation, and
	assembly process of PCB design.	
	<ul> <li>Able to design a single- and double-layer PCB</li> </ul>	
	• Able to fabricate the single land double layer PCB.	
	• Able to design and troubleshoot the circuit over PCB.	
	• Able to design his own circuit for any application.	

# Name of the Programme: BSc Electronics Course Code: ELE-161 Title of the Course: CCTV Installation Number of Credits: 04 (02 Lectures + 2 Tutorials) Effective from AY: 2023-24

Pre-requisites for	Nil	
the Course:		
Course	This course is intended to:	
Objectives:	• Develop understanding of basics of Networks& CCTV Technology.	
	Acquire knowledge of CCTV Camera Installation.	
	<ul> <li>Develop skills to perform trouble shooting and maintenance CCTV</li> </ul>	' systems.
Content:	Unit I Introduction to CCTV Technology (Lectures)	08 Hours
	Introducing CCTV & Uses -Elements of a basic CCTV system: -	
	Camera, monitor and digital recorder, Connectors and cables,	
	Basics of Networking -Tools and Equipment, Power Supply- Types	
	(UPS and DCPS), Functionality and Termination.	
	Unit II Types of CCTV Cameras (Lectures)	07 Hours
	Dome Camera - Bullet Type Camera - C-Mount Camera - Day/Night	
	Camera - Infrared/Night Vision CCTV Camera - Varifocal Cameras -	
	Wireless Cameras, PTZ and Bullet, indoor and outdoor,	
	monochrome, Camera specifications: - Sensitivity, signal to noise	
	ratio and resolution.	
	Unit III Cables and Connectors	04 Hours
	Types (Fibre & Copper), uses, limitations, preparation and testing,	
	Types of Connectors, Cable Conduit, Cable Tray, Industrial	
	Standard, laying Method,	
	Unit IV Networking	08 Hours
	Introduction to IP technology. Network Devices- Switches	
	(configuration & installation), Routers (configuration &	
	Installation, OLT and ONT, Configuration and remination: Server-	
	(Normal & High cocurity)	
	Unit V Wireless Communication	
	Types of Antennas Radios Configuration Limitations	
	Unit VI Installation of CCTV(Tutorials)	13 Hours
	Planning for CCTV Camera Installation - Installing the Camera -	15 110013
	Checking the Camera Functions. Connection to other security	
	systems. Cable Termination method. Hard disk installation.	
	Microphone configuration.	
	Unit VI Maintenance of CCTV & Data Management (Tutorials)	10 Hours
	Trouble Shooting and maintenance: Hardware, Managing Data:	
	Data Storage Devices - Cloud Storage Technology, Recording the	
	footage: - Analogue and Digital video recorders. Backup and	
	Archiving. Video Management Software- Adding and Deleting	
	camera, recording mode, Fail Over, Logs, report,Monitoring,Client.	
	Password Recovery.	
	Unit VII Live Stream of Video on Mobile Device( Tutorials)	05 Hours
	The Benefits of Remote Viewing - Connecting Your Recorder -	
	Enabling Remote Viewing - Installing Viewing Software -	
	Connecting to Your Smartphone - Using Web Services - Potential	
	Unit VIII Evidence Creation (Tutorials)	02 Hours
	Kole of CCTV footage - Importance of CCTV footage - Retrieve CCTV	
	Tootage – Authentication- Analyze CCTV footage	

Pedagogy:	Lectures/Experiential Learning		
References/	1. Hill Thomas," CCTV Handbook: Buying, Installing, Configuring, &		
Readings:	Troubleshooting A User's Guide to CCTV Security ",kindle edition,2019.		
	2. AISECT Content Group Participant's Guide for CCTV Installation Technician ",		
	kindle edition,2018.		
Course	Students will,		
Outcomes:	<ul> <li>Understand basics of Network &amp; CCTV Technology.</li> </ul>		
	Install CCTV System		
	Maintain of CCTV systems.		
	Note: Student can take some installation under guidance of		
	lecture/entrepreneur.		