GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-II

Course Title: Basic Electronics
(Course Code: C4321601)

Diploma programme in which this course is offered	Semester in which offered
Information Technology	Second

1. RATIONALE

Electronic devices and components are used for controlling the flow of electrical currents for the purpose of information processing and system control. Basic electronics comprises the minimal “electronics components” that make up a part of everyday electronics equipment. These electronic components include resistors, transistors, capacitors, diodes, inductors and transformers. Basic electronics also concerns the measurement of voltage, current (electron flow) and resistance in the assembled working "circuit." At the end of the course the student will be able to gain knowledge of basic electronics components and also know how to measure basic electrical parameters which will be useful in advanced courses.

2. COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Apply the concepts of basic electronics to understand working, characteristics and application in the industries**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

At the end of the course the student will be applying adequate knowledge of basic electronics to understand working, characteristics and application in the industries**.**

a) Classify Resistor, Inductor and Capacitor based on their application.
b) Use Diode and Transistors for different applications in circuits.
c) Classify cables and connectors based on their application.
d) Use switches, transformers and rectifiers in circuits.
e) Measure signal parameters of basic electronics circuits.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	2	2	2	0	0	25	25	50

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** - End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) that are the subcomponents of the COs. *Some of the **PrOs** marked **'*'** are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'*.

SR	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Study and Identify Resistors using Color Code.	I	2
2	Study and Identify with an Inductor.	I	2
3	Study and Identify Capacitors.	I	2
4	Study V-I characteristics of PN Junction Diode.	II	2
5	Study and Identify Transistors.	II	2
6	Study and Identify types of Cable.	III	2
7	Study and Identify various connectors for various types of Cables.	III	2
8	Study and Identify Types of Switches.	IV	2
9	Study and Identify Types of Transformers.	IV	2
10	Test working of Half wave Rectifier and Full wave Rectifier.	IV	2
11	Test working of Bridge Rectifier.	IV	2
12	Measurement of various electrical quantities in a circuit using Digital Multimeter.	V	2
13	Study Front panel controls of Cathode Ray Oscilloscope (CRO)	V	2
14	Measurement of Amplitude and Frequency electrical signal using Cathode Ray Oscilloscope(CRO)	V	2
	Total		**28**

Note

*i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

*ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency..*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Identify various basic electronics components.	20
2	Identify various basic semiconductor components.	25
3	Classify various cables and connectors.	15
4	Use different basic electronics accessories in various circuits.	20
5	Measure general electrical parameters with Digital multimeter and CRO.	20
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Basic Electronics Trainer Kits, Electronics Components Electronics Kits	All
2	Electronics Workbench / MultiSIM or Similar Simulator Software Desktop Computers with basic configuration (Windows OS, 4GB RAM etc)	All
3	Cathode Ray Oscilloscope (CRO),	10,11,13,14
4	Different Cables and Connectors	6,7
5	Digital Multimeter	1 to 12

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned COs and PrOs. More could be added to fulfill the development of this competency.

a) Work as a leader/a team member.
b) Follow ethical practices.

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

9. UNDERPINNING THEORY

Only the major Underpinning Theory is formulated as higher level UOs of *Revised Bloom's taxonomy* in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at Application and above level)	Topics and Sub-topics
Unit – I Basic Electronics Components	**1a.** Introduction to analog electronics. and various analog electronics terminology **1b.** Introduction to Resistors and Classify various resistors **1c.** Identify Resistor's value with its color code. **1d.** Identify various Inductors in terms of their application. **1e.** Differentiate various Capacitors in terms of their application.	**1.1.1** Active and passive components. **1.1.2** Important definitions. **(i)** Amplitude, Frequency, Phase **(ii)** Signal, waveform **1.1.3** Signals and their responses. **(i)** Unit step, Unit Impulse and Unit Ramp **(ii)** Parabolic, Triangular and Sawtooth. **1.2.1** Basics of Resistors **1.2.2** Types of Resistors **1.2.3** Resistors color code **1.3.1** Basics of Inductors **1.3.2** Types of Inductor and its Applications **1.4.1** Basics of Capacitors **1.4.2** Types of Capacitors and applications
Unit – II Semiconductor Components	**2a.** Identify P-N junction diode, its working and applications. **2b.** Classify diodes with their application. **2c.** Identify various Transistors in terms of their application.	**2.1.1** Basics of Diode **2.1.2** PN Diode Characteristics **2.1.3** Types of Diode and Applications **2.2.1** Basics of Transistors **2.2.2** types of Transistors(FET and BJT) and its applications

Unit– III Cables and Connectors	**3a.** Identify various Cable **3b.** Identify various Connectors	**3.1.1** Single core and Multi core wire **3.1.2** Single strand and Multi Stand wire **3.1.3** Coaxial cables cable **3.1.4** Twisted pair cable **3.1.5** Fiber optic cable **3.1.6** Computer Cable: VGA, HDMI **3.2.1** FRC connector **3.2.2** Power connector **3.2.3** RJ-45 connector **3.2.4** RJ-11 connector **3.2.5** RS 232 **3.2.6** USB and Types
Unit– IV Electronics Accessories	**4a.** Identify various Switches. **4b.** Identify types of transformers and classification **4c.** Classify and test types of rectifiers.	**4.1.1** Toggle switch- SPDT, DPDT,TPDT **4.1.2** Push button latch and non latch **4.1.3** DIP switch **4.1.4** Membrane switch **4.2.1** Step up transformer **4.2.2** Step Down transformer **4.2.3** Center Tapped transformer **4.3.1** Half wave rectifier **4.3.2** Full Wave rectifier **4.3.3** Bridge rectifier
Unit– V General Measuring Instruments	**5a.** Measure basic parameters of electrical circuits using Digital Multimeter. **5a.** Measure basic parameters of electrical circuits using Digital Multimeter. **5a.** Identify Front panel control of CRO.	**5.1.1** Voltage (volts) , Current(amps), Resistance(ohms) **5.2.1** Basics of Digital Multimeter (DMM) **5.2.2** Features of Digital Multimeter **5.2.3** How to measure current , voltage and Resistances with DMM **5.3.1** Basics of Cathode Ray Oscilloscope(CRO) **5.3.2** Basic front panel controls **5.3.3** CRO Applications

***Note**: The UOs need to be formulated at the 'Application Level' and above of Revised Bloom's Taxonomy' to accelerate the attainment of the COs and the competency.*

10. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching/ Practical Hours	Distribution of Theory Marks			
			R Level	U Level	A	Total Marks
I	Basic Electronics Components	06	Not Applicable			
II	Semiconductor Components	04				
III	Cables and Connectors	04				
IV	Electronics Accessories	08				
V	General Measuring Instruments	06				
Total		**28**				

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

Note*: This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from the above table.*

11. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare a document which differentiates basic electronics components.
b) Undertake micro-projects in teams
c) Give a seminar on any relevant topics.
d) Undertake a market survey of different other electronics components.

12. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) ***'T' in section No. 4*** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
b) Guide student(s) in undertaking micro-projects.
c) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
d) With respect to ***section No.11***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

13. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

- **Case Study 1:** Compare various cables that are used for computers.
- **Case Study 2:** List out new measuring equipment used in electronics circuits.
- **Case Study 3:** Study new features of the latest model of CRO and multimeter.

14. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Principles Of Electronics	V K Mehta, Rohit Mehta	S. Chand Publishing, 2020, ISBN: 935283836X
2	Electronic Principles	Albert Malvino, David J. Bates	McGraw Hill Education, 2017 ISBN: 0070634246
3	Electronic Devices and Circuit	Boylestad, Nashelsky	McGraw Hill EducationPearson Education India, 2015 ISBN: 9332542600
4	Cables and Wiring	John Cadick	Cengage Learning, 1998 ISBN: 0766802701

15. SOFTWARE/LEARNING WEBSITES

a) www.electrical4u.com/
b) www.elprocus.com/
c) www.electronicsforu.com/
d) www.nptel.ac.in.
e) www.khanacademy.org
f) Online CRO Simulator: https://eleceng.dit.ie/dsp/elab/

16. PO-COMPETENCY-CO MAPPING

Semester II	Basic Electronics (Course Code: C4321601)									
	POs and PSOs									
Competency & Course Outcomes	**PO 1** Basic & Discipline specific knowledge	**PO 2** Problem Analysis	**PO 3** Design/ development of solutions	**PO 4** Engineering Tools, Experimentation & Testing	**PO 5** Engineering practices for society, sustainability & environment	**PO 6** Project Management	**PO 7** Life-long learning	**PSO 1**	**PSO 2**	**PSO 3** (If needed)
Competency ***.Apply the concepts of basic electronics to understand working, characteristics and application in the industries***										
Course Outcomes CO a) Classify Resistor, Inductor and Capacitor based on their application.	3	2	-	-	-	2	-			
CO b) Use Diode and Transistors for different applications in circuits.s.	3	2	-	-	-	2	-			
CO c) Classify cables and connectors based on their application.	3	2	-	-	-	2	-			
CO d) Use switches, transformers and rectifiers in circuits.	3	2	-	-	-	2	-			
CO e) Measure signal parameters of basic Electronics circuits	2	2	-	2	-	2	2			

Legend: '**3**' for high, '**2**' for medium, '**1**' for low or '**-**' for the relevant correlation of each competency, CO, with PO/ PSO

17. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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1	MS. P.N.Parikh	HOD-IT Government Polytechnic for Girls, Ahmedabad	pritigpit@gmail.com
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