GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: ALL

Course / Subject Code : BE01R00111

Course / Subject Name : Basic Electronics Engineering

w. e. f. Academic Year:	2024-25
Semester:	Ist Year
Category of the Course:	ESC

Prerequisite:	**High School Physics and Mathematics**
Rationale:	Electronics is playing a key role in all engineering applications. All engineers should have the basic knowledge of electronics. Purpose of this course is to make students familiar with basic electronic devices, circuits and their applications. Students will be able to operate electronic test and measurement equipment like digital multi-meter, CRO, DC power supply and function generator.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Analyze the general and special purpose diode circuits	N
02	Design biasing circuits for BJT and FET	C
03	Analyze BJT circuits in small-signal domain	N
04	Analyze FET circuits for DC voltages and currents	N
05	Understand usage of Special Purpose Diodes	U

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	TW/SL	TH		ESE (E)	PA (M)	PA/ (I)	TW/ SL (I)	ESE (V)	
45	0	30	45	120	04	70	30	20	30	50	200

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, PA = Progressive Assessment, ESE = End-Semester Examination

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Semiconductor Diodes:** p-n junction diode, Characteristics and parameters, Diode approximations, DC load line analysis, Temperature effects, Diode AC models, Diode specifications, Diode testing, Zener diodes.	6	15
2.	**Diode Applications**: Half-wave and Full-wave rectifiers, Power supply, RC and LC power supply filters, Zener diode voltage regulators, Series and shunt clipping circuits, Clamping circuits, DC voltage multipliers.	6	15
3.	**Bipolar Junction Transistors** : BJT operation, BJT voltages and currents, BJT amplification, BJT switching, CB, CE and CC characteristics, Transistor testing.	6	15
4.	**BJT biasing** : DC load line and bias point, Base bias, Collector-to-base bias, Voltage- divider bias ,Comparison of basic bias circuits, Bias circuit design.	6	15
5.	**AC analysis of BJT circuits** : Coupling and bypass capacitors, AC load lines, transistor models and parameters, CE circuit analysis, CE circuit with unbypassed emitter resistor, CC circuit analysis, CB circuit analysis, Comparison of CE, CB and CC circuits	6	15
6.	**Field Effect Transistors**: Junction Field Effect Transistors, JFET characteristics, JFET data sheets and parameters, FET amplification and switching, MOSFETs	5	10
7.	**FET biasing** : DC load line and bias point, Gate bias, Self bias, Voltage divider bias, Comparison of basic JFET bias circuits	4	5
8.	**Special Purpose Diodes**: Light Emitting Diode(LED), Photo diode, Solar cell, PIN diode, Varactor diode, Schottky diode, Tunnel diode, Seven segment display	6	10
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	**20**	**25**	**30**	**0**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth Edition
2. Jacob Millman, Christos Halkias, Chetan D. Parikh, "Integrated Electronics", Tata McGraw Hill, Second Edition

Open source software and website:

1. http://nptel.ac.in/courses/122106025 (Basic Electronics and lab by Prof. T.S.Natarajan)

Suggested Course Practical List:

1. VI characteristics of p-n junction diode, LED and photo diode
2. Half wave and full wave rectifier circuits
3. Clipper and clamper circuits
4. Zener diode regulator circuit
5. CE amplifier characteristics
6. CB amplifier characteristics
7. CC amplifier characteristics
8. Transistor as a switch
9. Voltage gain and current gain of a CE amplifier
10. FET characteristics
11. Varactor diode and tunnel diode characteristics
12. Seven segment LED operation

List of Laboratory/Learning Resources Required: CRO, Function Generators, DC power supply, bread board and discrete electronic components

Suggested Project List: Project based on design of a small circuit with input and output signal observations on CRO.

- **Activities suggested under Self-learning/Team Work:**

Sl. No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data.
2.	Technical Video based learning	Duration of video =	Report /presentation based on

	related to the subject	5h Report preparation = 5h Total = 10h	the video learning outcomes.
3.	Assignment writing. Numericals based assignment is preferable.	5 assignments of 2h each. Total = 10h	Based on the assignment submitted.
4.	Problem solving/Coding using C, C++, Python, SCILAB, MATLAB, MS-EXCEL or any other relevant software	5 small coding based assignment of 2h each. Total = 10h	Based on the coding solution submitted.
5.	Self learning on-line course	Minimum duration of the course should be 10h.	Examination based assessment at the end of course. Based on the certificate produced.
6.	Complex problem solving	Maximum 2 problem. Study of the problem and solution finding, Total = 10h	Based on the depth of the solution submitted.
7	Videos on Industrial safety aspects based on subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based on quiz/report submitted
8	Discussion on research paper based on relevant subject	5 research paper = 20 h	Summarize research paper and evaluation critical parameters
9.	Poster/chart/power point preparation on technical topics	Duration = 6 h	Based on poster/chart preparation and presentation skills
10	Working/non-working model on technical topics	Working = 12 h Non- working = 8 h	Based on inter department/external evaluation
11	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/any other issue	Duration = 15 h for industrial exposure Problem identification and tentative solution = 10 h Total = 20 h	Based on evaluation of critical problems and solutions
12	Group Discussion on emerging/trending technical topics based on subject	Duration = 1 h each	Based on performance in group discussion, technical depth, knowledge etc.
13.	Real world case studies-based learning	Duration of data collection/study = 5h	Based on in-depth study, technical depth, data collected,

		Report preparation = 5h Total = 10h	fact finding, etc.
14.	Application/Software development	Duration = 10 h	Depending on the complexity of the Application/Software

Note:
1. All the suggested activity should be related to the subject.
2. The number of hours are suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours is fixed.
3. Rubrics for the evaluation can be prepared by the faculty.

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