

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BASIC ELECTRONICS (Modified Version January 2014)**

**SUBJECT CODE: 2110016**

**B.E. 1<sup>st</sup> YEAR**

**Type of course:** Basic

**Prerequisite:** N.A.

**Rationale:** N.A.

## Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE Viva (V)	PA (I)		
4	0	2	6	70	30*	30	20**	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

## Content:

Sr. No.	Topic	Teaching Hrs.
1	Circuit Concepts <ul style="list-style-type: none"><li>Electrical Quantities</li><li>Lumped Circuit Elements</li><li>Kirchhoff's Laws</li><li>Meters and Measurements</li><li>Analogy between Electrical and other Non-Electrical Physical Systems</li><li>A case study</li></ul>	6
2	Circuit Analysis Techniques: <ul style="list-style-type: none"><li>Thevenin and Norton Equivalent Circuits</li><li>Node-Voltage and Mesh-Current Analysis</li><li>Superposition and Linearity</li><li>Wye-Delta Transformation</li><li>Computer Aided Circuit Analysis</li><li>A Case Study</li></ul>	8
3	Analog Building Blocks and Operational Amplifiers Basic ideas <ul style="list-style-type: none"><li>The Amplifier Block</li><li>Ideal Operational Amplifier</li><li>Practical Properties of Operational Amplifiers</li><li>Applications of Operational Amplifiers</li><li>A case study</li></ul>	8
4	Digital Building Blocks <ul style="list-style-type: none"><li>Digital System Building Blocks</li></ul>	8

	<ul style="list-style-type: none"> <li>• Digital System Components</li> <li>• Computer Systems</li> <li>• Computer Networks</li> <li>• A case study</li> </ul>	
5	Signal Processing: <ul style="list-style-type: none"> <li>• Signals and Spectral Analysis</li> <li>• Modulation, Sampling and Multiplexing</li> <li>• Interference and Noise</li> <li>• A case Study</li> </ul>	8
6	Communication Systems <ul style="list-style-type: none"> <li>• Waves, Transmission Lines, waveguides and Antenna Fundamentals</li> <li>• Analog Communication Systems</li> <li>• Digital Communication Systems</li> <li>• A Case Study</li> </ul>	6
7	Basic Control Systems <ul style="list-style-type: none"> <li>• Feedback Control Systems</li> <li>• Digital Control Systems</li> <li>• A Case Study</li> </ul>	6

**Reference Books:**

1. Introduction to Electrical Engineering, M S Sarma, Oxford University Press

**Course Outcome:**

After completion of the course, the student will be able to –

- Determine the behavior of simple passive electrical circuits with independent voltage and current sources.
- Design simple analog signal processing functions using operational amplifiers.
- Design simple combinational and sequential functions using gates and flip-flops.
- Explain the functioning of digital system components including DACs, ADCs, memory and display devices,
- Explain the organization of computer systems and computer networks.
- Determine the properties of simple signal processing systems.
- Determine the behavior of analog and digital communication systems.
- Determine the behavior of simple linear feedback control systems

**List of Experiments:**

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency. Following is the list of

experiments for guidance. A student should perform at least 10 experiments out of the given 14 with at least one experiment from each Unit

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	a. Observe the behavior of RLC circuits with ideal and non-ideal voltage sources and current sources. b. Verify Thevenin's and Norton's Theorems	2
2	II	Simulate passive electrical circuits using Multisim simulator and compare the simulated response with that of the actual circuit	2
3	III	Determine the parameters of three commercial Op Amps	2
4	III	Perform simple analog signal processing functions using Op Amps	2
5	IV	Design simple combinational functions as per specifications and verify the correctness of your design	2
6	IV	Design simple sequential functions as per specifications and verify the correctness of your design	2
7	IV	Measure the characteristics of given DACs and ADCs	2
8	V	Simulate simple modulation, sampling, multiplexing, demodulation signal processing functions Multisim	2
9	V	Simulate simple filtering signal processing function Multisim	2
10	V	Measure the performance of a given signal processing system	2
11	VI	Determine the behavior of a given analog communication system through simulation using Multisim	2
12	VI	Determine the behavior of a given digital communication system through simulation using Multisim	2
13	VII	Determine the behavior of a second and third order control systems through simulation using Multisim	2
14	VII	Determine the behavior of a practical control system using ON-OFF and P controllers through simulation using SciLab Determine the behavior of a practical control system using PI and PID controllers through simulation using SciLab	2

### Major Equipment's:

- (1) CRO (At least 20MHz)
- (2) Function Generator (Frequency range up to 20 MHz) – need to have sine, square wave output.
- (3) Dual Power Supply (0-12V/15V DC)/3A

- (4) Micrometers for measurement of voltage and current with suitable ranges.
- (5) Multimeter
- (6) Various Electronics Components including different types of Op Amps and digital ICs.
- (7) PCs

**List of Open Source Software/learning website:**

Software:               Multisim and SciLab ([www.scilab.org](http://www.scilab.org))

Learning Material:   <http://nptel.iitm.ac.in/>. [www.spoken-tutorial.org](http://www.spoken-tutorial.org)

\*PA (M): 10 marks for Active Learning Assignments, 20 marks for other methods of PA;

ACTIVE LEARNING ASSIGNMENTS: Students will prepare power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus of Basic Electronics is covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be sent to [achievements@gtu.edu.in](mailto:achievements@gtu.edu.in).

\*\*PA (I): The faculty may also allocate additional marks out of PA for Practical Work, in addition to the regular practicals. This work may be as follows:

- (i) Practical work planned by students, with the approval/ guidance of the students.
- (j) Preparation of a case study on a present day electronic system of choice.