Program	BACHELOR OF TECHNOLOGY (B.Tech)	**Semester - 1**
Type of Course	Engineering Science Course	
Prerequisite	High School Education &Physics	
Rationale	Electricity has been the main source of energy for the developing and developed countries. knowledge of Semiconductor technology is very much essential for the development of different switches and Electronics component. In view of this, it is essential for all computer and IT engineering graduates to know the basic aspects of electrical and electronics technology. This subject deals with basic circuit solution methods and basics of domestic electrical installations, safety devices and energy consumption.	
Effective From A.Y.	2025-26	

Teaching Scheme (Contact Hours)				Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
Lecture	Tutorial	Lab	Credit	SEE TH	IAT	SEE P	CCE	
3	-	2	4	70	30	50	50	200

***SEE** - Semester End Examination, **IAT** - Internal Assessment Test, **CCE** - Continues & Comprehensive Evaluation*

Course Content

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
1	**D. C. Circuits** Introduction of Electrical Current, Voltage, Power and Energy; Sources of Electrical Energy ,Ideal electrical circuit elements - Resistor, Inductor and Capacitor; Fundamental laws of electric circuits - Ohm's Law and Kirchhoff's Laws; Analysis of series and parallel , Node and Mesh analysis, Superposition theorem, Thevenin Theorem, Norton Theorem, Different types of Batteries, Basic calculations for electrical energy consumption.	8	15
2	**AC Circuit** Generation of sinusoidal voltage; Average value, R.M.S value, form factor, peak factor, Phasor representation of alternating quantities; Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Series and parallel resonance. Concepts of Real power, Reactive power, Apparent power, Power factor, Concept of Earthing, Safety precautions for electrical appliances (Fuse Unit (SFU), MCB)	9	20
3	**Basics of Semiconductors** **Introduction of Semiconductors:** Types of materials : Conductors, semiconductors and insulators, Atomic structure and bonding in semiconductors, Intrinsic and Extrinsic semiconductors **Semiconductor Materials:** Silicon, Germanium and compound semiconductor, Crystal structure and growth techniques (Czochralski process, Float zone process)	6	15
4	**Charge carriers in semiconductors** Electrons and holes, Carrier concentration and Fermi level, Temperature dependence of carrier concentration **Semiconductor fundamentals :** Carrier transport mechanism, Drift and diffusion, mobility and conductivity, Generation and recombination of carriers.	8	20
5	**Semiconductor Diodes** Formation of P-N Junctions, Depletion region and built-in potential, current – voltage characteristics Types of diodes (Zener, Schottky, LED), Diode characteristics and applications Application : Half wave rectifier, full wave rectifier	7	15
6	**Semiconductor devices** Bipolar Junction Transistors (BJTs): structure and operation, Current gain and input/output characteristics, Application of BJTs **Field Effect Transistors (FETs) :** Types of FETs (JFET, MOSFET), Structure and operation of MOSFETs, Characteristics and applications of FETs, **Other semiconductor devices : S**olar cells, Photodiodes (Principle, construction and Working)	7	15
	Total	45	100

Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application	Analyze	Evaluate	Create
Weightage	30	40	10	10	10	0

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes

At the end of this course, students will be able to:	
CO1	Describe the fundament electrical laws and its application to electrical circuits.
CO2	Analyze AC circuit theory to single-phase circuits with different combinations of elements and demonstrate electrical safety devices their installations, protection and personnel safety.
CO3	Discuss the basics of semiconductor.
CO4	Describe the mechanism of semiconductors.
CO5	Describe the fundamental of diodes.
CO6	Distinguish about BJTs, FETs and other semiconductor devices.

CO PO Mapping

CO	CO - 1	CO - 2	CO - 3	CO - 4	CO - 5	CO - 6
PO - 1	3	3	3	3	3	3
PO - 2	2	3	2	2	2	2
PO - 3	2	2	2	1	2	2
PO - 4	2	2	2	2	2	2
PO - 5	2	2	1	1	1	1
PO - 6	1	2	1	1	1	1
PO - 7	1	1	1	1	1	1
PO - 8	1	1	1	1	1	1
PO - 9	1	1	1	1	1	1
PO - 10						
PO - 11	1	1	1	1	1	1

Reference Books

1.	**Electrical Technology Vol-1** By B. L. Theraja | S. Chand & Co. Ltd.
2.	**Basic Electrical Engineering** By Nagsarkar and Sukhija | Oxford University Press
3.	**Basic Electrical Engineering** By D C Kulshreshtha | Tata McGraw Hill, Pub. Year 2010
4.	**Basic Electrical Engineering** By D. P. Kothari and I. J. Nagrath | Tata McGraw Hill
5.	**Engineering Physics** By R.K. Gaur and S.I. Gupta | Dhanpat Rai & Sons, Delhi
6.	**A Textbook of Engineering Physics** By M.N. Avadhanulu and P.G. Kshirsagar |10th revised Ed, S. Chand. & Company Ltd, New Delhi.
7.	**Concepts of Modern Physics** By Aurthur Beiser | McGrawhill, 6th Edition, 2009.
8.	**A Textbook of Engineering Physics** By M.N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy | Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
9.	**Physics for Animators** By Michele Bousquet with Alejandro Garcia | CRC Press, Taylor & Francis, 2016.

List of Practical

1.	**To study and understand different symbols and verify the ohm's law.**
2.	**To verify the Kirchhoff's current and voltage laws.**
3.	**To verify Series and Parallel connection of Resistor.**
4.	**To verify response of RL circuit and its impedance calculation.**
5.	**To verify response of RC circuit and its impedance calculation.**
6.	**To study the characteristics of P-N Junction diode.**
7.	**To study the characteristics of LED diode.**
8.	**To study the characteristics of Zener diode.**
9.	**To measure voltage and current of solar cells.**
10.	**To study series and parallel connection of Solar cell.**
11.	**Identify the band gap of semiconductor (Four probe method)**

Miscellaneous

List of Laboratory/Learning Resources Required:

1. Voltmeter, Ammeter, Multimeter, Rheostate, wires.
2. RL and RC circuit kit.
3. Power Supply(DC and AC)
4. Zener diode kit
5. LED diode kit
6. PN junction diode kit

Activities Suggested under Self-learning (A total of 45 hours)

Sr.
No. Name of the activity No. of hours Evaluation criteria 1 Project work related to the subject Duration = 21hr Based on the project submitted. 2 Assignment Work 6 assignments of 2hr Each.
Total=12 hr Based on the assignment submitted. 3 Poster/chart/power point preparation on technical topics and/or Expert Lecture Duration = 12 hr Based on poster/chart preparation and presentation skills 4 Industry / research laboratory visit Visit (5hr) +
Report Preparation (5hr) = 10 hr Based on the project submitted. 5 Technical video learning related to subject. Video (5hr) +
Report Preparation (5hr) = 10 hr Based on the project report submitted. 6 Self-learning online courses. Minimum duration of course 10hr = Total 10hr Based on their certificate 7. Videos on Industrial safety aspects based on subject Video (5hr) +
Report Preparation (5hr) = 10 hr Based on their video and report presentation 8. Working/non-working model on technical topics Working model 12hr and Non-working model 8 hr Based on model presentation 9. Industrial exposure for
2-3 days to observe and provide tentative solutions on society/environment/ health/any other issue Industrial exposure duration (15hr) + problem identification and tentative solutions (10hr) = Total 20hr Based on their understanding, problem finding and report presentation 10. Group Discussion on emerging/trending technical topics based on subject. Duration 1hr each= Total 2 hr Based on performance in group discussion, technical depth, knowledge etc. 11. Real world case studies-based learning. Duration of data collection (5hr) + Report Preparation (5hr) = Total 10 Hours Based on in-depth study, technical depth, data collected, fact finding, etc

Useful Links

1. https://nptel.ac.in/courses/108105112
2.www.vlabs.co.in
3. Superconductivity : https://www.youtube.com/watch?v=MT5XI5ppn48
4. Animation : https://www.youtube.com/watch?v=kj1kaA_8Fu4
5. Virtual LAB : https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
6. Virtual LAB : https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1