NIRMA UNIVERSITY

Institute:	Institute of International Study
Name of Programme:	Bachelor of Science (Computer Science and Engineering)
Faculty:	Faculty of Technology & Engineering
Course Code:	1EE802
Course Title:	Electrical Science
Course Type:	Vocational
Year of Introduction:	2022 – 23

L	T	Practical component				C
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. illustrate the role of circuit elements in different system conditions. (BL2)
2. explain use of electrical safety devices in basic applications. (BL2)
3. apply the concepts of digital electronics for logic circuit design. (BL3)
4. distinguish the operational aspects of AC-DC systems. (BL4)
5. appraise the role of semiconductor devices and their applications. (BL4)

Syllabus: **Teaching Hours: 30**

Unit 0 **Course Description** 02

Overview of the course, discussion on course policy, course website and blog, importance of the course, evaluation, professional relevance, present scenario and future trends, relevance to UN SDG.

Unit I **Review of DC Circuits** 05

Kirchhoff's laws, mesh and nodal analysis, star-delta transformation, Superposition theorem, Thevenin's and Norton's theorem, electrostatics, absolute and relative permittivity, electric field, capacitor types, charging and discharging of capacitor.

Unit II **Single-phase AC Circuits** 05

Generation of alternating emf and associated terms, phasor representation, Analysis of RL and RC series and parallel circuits, power triangle, power factor, resonance in RLC series and parallel circuit, related numerical.

Unit III **Magnetic Circuits** 03

Introduction to magnetic circuits, terms and definitions, comparison between electric and magnetic circuit, magnetic circuit analysis, dot convention, series-parallel connection of inductors, rise and decay of current in inductive circuit.

Unit IV	**Polyphase AC Circuits** Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, solution to three phase balanced circuits, power measurement in three-phase circuits, variation in wattmeter reading with power factor, related numerical.	05
Unit V	**Analog Electronics** Half and full wave rectifiers, special purpose diodes, clipper & clamper circuits, regulator, BJT and its applications as amplifier, oscillator, timer IC and multivibrators.	05
Unit VI	**Digital Electronics:** Number systems and its arithmetic, binary codes, Boolean-algebra & simplification of Boolean expression; logic gates, concept of universal logic; implementation of Boolean expressions using logic gates, application of digital circuits (e.g., adder, subtractor, multiplexer, de-multiplexer, analog to digital converter, digital to analog converter).	05

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
This shall consist of at least 10 practical / simulations based on the above syllabus.

Suggested Reading:

1. Hughes, E., Smith, I. M., Hiley, J. and Brown, K., Electrical and Electronic Technology, Prentice Hall (India).
2. Vincent Del Toro, Textbook of Principles of Electrical Engg., Prentice Hall of India Pvt. Ltd., New Delhi.
3. William Hart Hayt, George W. Hughes, Introduction to Electrical Engineering, Mc-Graw-Hill
4. U. A. Patel, Elements of Electrical and Electronics Engineering, Atul Prakashan.
5. A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, Textbook of Basic Electrical Engineering, TMH Publishing Co.
6. Rohit Mehta, V. K. Mehta, Principles of Electronics, S. Chand Publications.
7. J. Nagrath, Basic Electrical Engineering, TMH Publishing Co. Ltd.

Suggested List of Experiments (not restricted to the following):
(Only for Information)

1. To verify Kirchhoff's current and Kirchhoff's voltage law.
2. To demonstrate charging and discharging phenomenon of a capacitor and determine time constant.
3. To analyse single phase RL and RC series circuit.
4. To demonstrate and analyse the resonance curve of R-L-C series AC circuit.
5. To verify the relationships between line and phase quantities in three phase star and delta connection.
6. To measure power in three phase circuit by two wattmeter method.
7. To implement rectifier circuits using PN junction diode.
8. To design and realize bipolar junction transistor as an amplifier in common emitter configuration.

9. To design and realize binary to gray code converter.
10. To synthesize the arithmetic expressions using adders.
11. To demonstrate domestic wiring systems
12. To explain electrical protective equipment functioning and demonstrate operation.
13. To plot the I-V characteristic and the P-V curve of solar cell and find the maximum power point, efficiency of a given solar cell.
14. Virtual lab experiments – VI characteristic of diodes, Virtual lab experiment – Half and full wave rectifier, Transistor based amplifier circuits (http://vlabs.iitkgp.ac.in/be/#)