Course Name: **Introduction to Electrical Engineering**		Semester	1/II
Course Code:	1BESC104B/204B	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours	40 Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

At the end of the course, the student will be able to:

1. Explain the generation of power and the laws used in DC circuits.
2. Analyse single-phase and three-phase circuits.
3. Describe the construction, operation and applications of DC machines.
4. Describe the construction, operation and applications of transformers and induction motors.
5. Explain electricity billing and safety meaSSSSsures

Pre-requisite: Students should have the knowledge of
1. Ohms Law Kirchhoff's Current and Voltage Law.
2. Fundamentals of AC and DC Circuits.
3. Basic of Magnetism.

Module-1	**Hours: 08**
Power Generation: Conventional and non conventional energy sources. Single-line diagram of power supply system showing power station, transmission system and distribution system. Definition of power grid. Hydel, Nuclear, Solar & Wind power generation (Block Diagram approach) **Electromagnetic Induction:** Faraday's law of electromagnetic induction, Lenz's law, dynamically and statically induced emf, Fleming's right-hand rule Fleming's left-hand rule. Inductance and mutual inductance, coefficient of coupling, Simple problems.	
Module-2	**Hours: 08**
Single-Phase Circuits: Generation of single-phase system. Equation of AC voltage and current, average value, RMS value, form factor, peak factor and their relation [No derivations]. Voltage and current relationships in R, L and C circuits,analysis of R-L, R-C and R-L-C series circuits illustrative examples. concept of power, reactive power, apparent power and power factor, **Three-Phase Circuits:** Generation of three-phase systems, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections. Definition of balanced and unbalanced source and load. Problems with balanced loads.	
Module-3	**Hours: 08**
DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple problems. **DC Motor**: Principle of operation, back emf and its significance. Torque equation, types of motors, Applications of DC motors. Simple problems.	
Module-4	**Hours: 08**
Transformers: Introduction to transformers, necessity of transformer, principles of operation, Constructional features of single phase transformers. EMF equation, losses, Calculation of efficiency at different loads.Simple problems. **Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, Applications. problems.	

Module-5	Hours: 08
Domestic Wiring: Two-way and three-way control of loads. Electricity Bill: Definition of "unit" used for consumption of electrical energy, power rating of common household appliances. Two-part electricity tariff. Equipment Safety measures: Working principle of fuse and miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric shock, safety precautions to avoid shock. Earthing and types: Plate earthing and pipe earthing.	

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

1. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.

Reference books

1.Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.0
2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.
3.Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.
4.Basic Electrical and Electronics Engineering, K.Vijayarekha, et al, Cengage. Reprint 2023.
5. Handbook of Electrical Engineering formulae, Harish C Rai, CBS Publications, 2018.

Web links and Video Lectures (e-Resources):

Web links and Video Lectures (e-Resources): www.nptel.ac.in

(1)Principle of Electrical Sciences, Prof Sanjay Agrawal, Indira Gandhi National Open University.

(2)Electricity and Electrical Wiring, Dr. Antara Mahanta Barua, Krishna Kanta Handiqui State Open University, Guwahati.

Course outcome (Course Skill Set): At the end of the course the student will be able to:

CO1	Understand the concepts of various energy sources and Electromagnetism
CO2	Analyze the single phase and three phase AC circuits.
CO3	Discuss the construction and operation of DC Machines.
CO4	Discuss the construction and operation of AC Machines.
CO5	Explain the concepts of electricity billing, circuit protective devices and personal safety measures.

Course Name: **Basics of Electrical Engineering**		Semester	I
Course Code	1BEE105/205	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours	40Hours Theory	Total Marks	100
Credits	3 Credits	Exam Hours	3 Hours
Examination type (SEE)	**Theory**		

Course Objectives:

At the end of the course, the student will be able to:
1. Apply the basic laws used in the analysis of DC circuits, Electrostatics and Electromagnetism.
2. Assess implications of electromagnetic induction.
3. Analyse the single phase circuits.
4. Analyse the three phase circuits and measure power.
5. Explain electricity billing, domestic wiring and safety measures against electricity.

Pre- requisite: Students should have the knowledge of
1. Ohms Law Kirchhoff's Current and Voltage Law.
2. Fundamentals of AC and DC Circuits.
3. Basic of Magnetism.

Module-1	**Hours:08**
DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems on series and parallel circuits. **Electromagnetic Induction:** definition of magnetic field, mmf, Flux Density and relative Faraday's law of electromagnetic induction, Lenz's law, dynamically and statically induced emf, Fleming's right-hand rule . Inductance and mutual inductance, coefficient of coupling, Simple problems .	
Module-2	**Hours:08**
Single-phase Circuits: Generation of sinusoidal voltage. Expression of average value, RMS value, form factor and peak factor of sinusoidal voltage and current. Phasor representation of alternating quantities. Analysis of R, L and C circuits. Series and parallel R-L, R-C and R-L-C circuits with phasor diagrams, calculation of real power, reactive power, apparent power, and power factor, illustrative examples. **Three- phase Circuits:** Generation of three-phase system, phase sequence, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections, considering the phasor diagram. Definition of balanced and unbalanced source and load. Measurement of 3-phase power by 2-wattmeter method. Effect of low power factor on watt meter readings. Comparison between single phase and three-phase systems.	
Module-3	**Hours:08**
Transformer: Introduction to transformers, principles of operation, Constructional features of single phase transformers. EMF equation. Problems. **Three-phase induction Motors:** Concept of rotating magnetic field, Principle of operation.	

Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems.	
Module-4 **DC machines:** Introduction,construction and working principle of DC generator,EMF equation. Working principle of DC motor, Significance of Back EMF in DC motor problems **Alternator:** Introduction,construction and working principle of alternator ,EMF equation considering pitch factor and winding factor types of alternators and their constructional features , problems on EMF equation.	**Hours:08**
Module-5 **Domestic Wiring:** Service mains – overhead and underground. Types of wiring: Exposed to open space – wooden batten wiring and casing and capping. Concealed wiring: conduit wiring. Wiring for two-way and three-way control of load. **Domestic Electricity Bill:** Power-rating of household connected loads. Sanctioned Load. Practical unit of measuring energy, Unit, its definition.Electricity bill [as per Electricity Supply Companies (escoms)]: Tariff method considered: two-part tariff. Particulars considered for billing: sanctioned load and units consumed. Calculation of electricity bill for domestic consumers. **Equipment Safety Measures:** Working principles of fuse and miniature circuit breaker (MCB),the merits and demerits of fuse and MCB. Personal safety measures: Electric shock, possible effects of shocks. Safety precautions to avoid personal shock while dealing with electricity. Importance of earthing, types of earthing: Pipe and plate.	**Hours:08**

Semester End Examination (SEE):

Theory SEE will be conducted by Institute as per the scheduled timetable, with common question papers for the course

1. The question paper will have ten questions. Each question is set for 20 marks.

2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources: Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year):

Textbooks:

1. A textbook of Electrical Technology byB.L. Theraja, Volume-1, S Chand and Company, Reprint Edition 2014. [Covers modules 1 to 4]

2. Basic Electrical Engineering, D.C. Kulshreshtha, McGraw Hill, 2nd Edition, 2024. [Covers all modules]

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill 2nd edition, 3rd Reprint 2024.

2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.

3. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.

4. Basic Electrical and Electronics Engineering, S.K Bhattacharya, et al, Pearson. 2 nd edition,2017.		
Course outcome (Course Skill Set): At the end of the course the student will be able to:		
CO1	Understand the DC Electric circuits and principles of Electromagnetism.	
CO2	Analyze the single phase and three phase AC circuits.	
CO3	Discuss the construction and operation of various AC Electrical Machines.	
CO4	Discuss the construction and operation of various DC Electrical Machines.	
CO5	Explain the concepts electricity billing, circuit protective devices and personal safety measures.	