Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Electrical and Electronics Engineering
Syllabus - CBCS – for AY 2023 -2024

Course Title	**ELEMENTS OF ELECTRICAL ENGINEERING**					
Course Code	**22EET203**					
Category	**Engineering Science Course (ESC)**					
Scheme and Credits	No. of Hours/Week				Total teaching hours	Credits
	L	T	P	SS	Total	
	3	**0**	**0**	**0**	**03**	**40**	**03**
CIE Marks**: 50**	SEE Marks**: 50**	Total Max. marks = **100**	Duration of SEE: **03** Hours			

COURSE OBJECTIVE:

1. Describe the basic laws of electrical engineering and energy billing.
2. Explain the working of basic electrical parameters under sinusoidal excitation.
3. Make use of three phase system of power supply
4. Predict the values of electrical parameters and quantities.
5. Explain electric, wiring schemes and equipment and personal safety measures.

UNIT I	8 hours

DC circuits and Electromagnetism: Ohm's law and Kirchhoff's laws, analysis of series, parallel, and series-parallel circuitsexcited by independent voltage sources. Power and energy. Numericals
Faraday's laws, Lenz's law. Fleming's rules & dynamically induced EMF, Statically induced EMF. The concept of self and mutual inductance & coefficient of coupling. Force on the current-carrying conductor. Energy stored in magnetic field. Numericals. Text book 1 & Text book 2

UNIT II	8 hours

AC Fundamentals and Single-phase AC circuits: Generation of sinusoidal voltage. Frequency of generated voltage. Average and RMS value, form factor, and peak factors of sinusoidal quantities. Phasor representation of alternating quantities. Concept of lead, lag and in phase of two sinusoidal quantities.
Voltage, current, and power waveforms with phasor diagram, in R, L, and C circuits. Analysis of R-L, R-C, R-L-C Series and Parallel circuits, Real, reactive and apparent powers, power triangle and power factor. Analysis of Series and Parallel AC circuits. Numericals. Text book 1 & Text book 2

UNIT III	8 hours

Three-phase AC circuits: Advantages of three-phase systems. Generation of three-phase voltage, phase sequence. Balanced supply and balanced loads. Representation of the balanced star (3 wire and 4 wire system) and delta connections. Relation between phase and line quantities. Power in balanced 3-phase circuits and power tringle. Methods Measurement of three-phase power using wattmeter. Numericals. Text book 1 & Text book 2

UNIT IV	8 hours

Measuring instruments: Construction and working principle of Wheatstone's bridge, Kelvin's double bridge, Megger. AC bridges- Maxwell's and Desauty's, concepts of current transformer and potential transformer. (Only balance equations and Excluding Vector diagram approach). Applications of CTs and PTs. Numericals. Text book 1 & Reference book 4

UNIT V	8 hours

Electric Wiring: Types, advantages and disadvantages. Color code and gauges of wires used for lighting and heating (power) circuits. One, two and three point control of load. Service mains- overhead and underground. Fuse, fuse materials and properties.
Miniature circuit breaker (MCB) \merits and demerits. Electric Shock, Safety Precautions. Earthing and its types. Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB).

Electricity bill: Power rating of household appliances. Unit of electrical energy, tariff, preparation of electricity bill. Numericals. Text book 1 & Reference book 5
TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Describe the basic concepts in electrical engineering.
CO2: Analyze-dc circuits, single-phase ac circuits.
CO3: Apply three-phase system in power generation and utilization
CO4: Determine the values of electrical parameters and quantities.
CO5: Explain the concept of electricity billing, equipment, and personal safety measures.

TEXT BOOKS
1. Basic Electrical Engineering, D. C. Kulshreshtha, McGraw-Hill Education, Revised first edition, 2019
2. Electrical and Electronic Technology, Edward Hughes, Pearson, 12th edition, 2016
3. Lecture Notes (for module 5), Dr. AIT.
REFERENCE BOOKS

1. Basic Electrical Engineering, D.P. Kothari I.J.Nagrath, McGraw-Hill Education, 4th Edition,2019.
2. Fundamentals of Electrical Engineering and Electronics, B.L. Theraja, S Chand and Company, Reprint Edition 2013.
3. Principles Electrical Engineering and Electronics, V.K Mehata, Rohit Mehta, S Chand and Company, 2nd edition, 2015.
4. Electrical and electronic measurements and instrumentation by A K Sawhney, Dhanapat Rai and Co. edition, January 2015
5. A course in Electrical Installation Estimation and costing. JB Gupta, SK Kataria & Sons, 9th Edition, July 2012

ONLINE RESOURCES
1. 40
2.https://www.youtube.com/watch?v=IZA_bJiGiJc&list=PL_mruqjnuVd8LP2z0c4yBwKAGEiEW_Si9&index=1
3. https://www.youtube.com/watch?v=3TR_DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y

SCHEME FOR EXAMINATIONS

 i. The question paper will have ten full questions carrying equal marks.
 ii. Each full question will be for 20 marks.
 iii. There will be two full questions from each module
 iv. Each full question will have sub-questions (subject to a maximum of four sub-questions)
 v. The students have to answer five full questions, selecting one full question from each module.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3										1	3		1
CO 2	3	3										1	3		1
CO 3	3	3										1	3		1
CO 4	3	3										1	2		1
CO 5	3	3				2	1					1	3		1
Strength of correlation: Low-1, Medium- 2, High-3															

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Electrical and Electronics Engineering
Syllabus - CBCS – for AY 2023 -2024

Course Title	**INTRODUCTION TO ELECTRICAL ENGINEERING**						
Course Code	**22EST204B**						
Category	**Engineering Science Core (ESC)**						
Scheme and Credits						Total teaching hours	Credits
	No. of Hours/Week						
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**40**	**03**
CIE Marks**: 50**	SEE Marks**: 50**	Total Max. marks = **100**		Duration of SEE**: 03** Hours			

COURSE OBJECTIVE:

1. Understand the basic laws of electrical engineering and energy billing.
2. Explain the working of basic electrical parameters under sinusoidal excitation.
3. Analyze the series and parallel electrical circuits for voltage, current, power, and energy.
4. Describe the construction and working principles of electrical machines.
5. Explain electric power generation, transmission and distribution, wiring schemes and equipment and personal safety measures.

UNIT I	**8 hours**

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel, and series-parallel circuits excited by independent voltage sources. Power and energy, (Simple Numerical).
Electromagnetism: Faraday's laws, Lenz's law. Fleming's rules & dynamically induced e.m.f. Statically induced e.m.f.s., the concept of self and mutual inductance & coefficient of coupling, force on the current-carrying conductor. (Simple Numerical). Text book 1 & Reference books

UNIT II	**8 hours**

AC Fundamentals: Generation of sinusoidal voltage, average and RMS value, form factor, and peak factor. (Numerical).
Single-phase circuits: Voltage, current, and power waveforms with phasor diagram, in R, L, and C circuits. Analysis of R-L, R-C, R-L-C Series and Parallel circuits, Real, reactive and apparent powers, power triangle, and Power factor. (Numerical). Text book 1,2 & Reference books

UNIT III	**8 hours**

Three Phase AC Circuits: Advantages of three-phase systems, generation of three-phase power, representation of the balanced star (3 wire and 4 wire system) and delta connected loads, phase and line relations of voltages and currents (Numerical).
Transformers: Necessity of transformer, the principle of operation, Types, and construction of single-phase transformers, EMF equation, losses, efficiency. (Numerical). Text book 1 & Reference books

UNIT IV	**8 hours**

DC Machines: Generator-Principle of operation, constructional details, induced EMF, types of generators, **Motor-** Principle of operation, back EMF, torque equations, types of motors, characteristics (shunt and series only) and applications. (Simple Numerical)
Three-phase induction Motors: Concept of rotating magnetic field, the principle of operation, constructional features of motor, types – squirrel cage and wound rotor and their applications., slip, the significance of slip, and problems on slip calculations. (Numerical). Text book 1,2 & Reference books

UNIT V	8 hours

Power transmission and distribution- Concept of electric power transmission and distribution. Low voltage distribution system (400 V and 230 V) for domestic, commercial, and small scale industry through block diagram/single line diagrams.

Safety measures and Electricity bill: Fuse and Miniature circuit breaker (MCB), merits and demerits. Electric Shock, Safety Precautions, Earthing and its types. Power rating of household appliances. Electrical energy unit, two- part electricity tariff, calculation of electricity bill.

Text book 1,2 & Reference books

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, video

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Describe the basic concepts of electrical engineering.

CO2: Analyze-dc circuits, single-phase and three-phase ac circuits.

CO3: Explain the construction and operation principle of electrical machines.

CO4: Solve basic problems on electrical machines.

CO5: Explain the concept of electric power transmission, distribution, electricity billing, equipment and personal safety measures.

TEXT BOOKS

1. Basic Electrical Engineering, D. C. Kulshreshtha, McGraw-Hill Education, Revised first edition, 2019
2. Electrical and Electronic Technology, Edward Hughes, Pearson, 12th edition, 2016
3. Lecture Notes (for module 5), Dr. AIT.

REFERENCE BOOKS

1. Basic Electrical Engineering, D.P. Kothari I.J.Nagrath, McGraw-Hill Education, 4th Edition,2019.
2. Fundamentals of Electrical Engineering and Electronics, B.L. Theraja, S Chand and Company, Reprint Edition 2013.
3. Principles Electrical Engineering and Electronics, V.K Mehata, Rohit Mehta, S Chand and Company, 2nd edition, 2015.

ONLINE RESOURCES

1. http://www.nptel.ac.in
2.https://www.youtube.com/watch?v=IZA_bJiGiJc&list=PL_mruqjnuVd8LP2z0c4yBwKAGEiEW_Si9&index=1
3. https://www.youtube.com/watch?v=3TR_DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y

SCHEME FOR EXAMINATIONS

(i) The question paper will have ten full questions carrying equal marks.
(ii) Each full question will be for 20 marks.
(iii) There will be two full questions from each module
(iv) Each full question will have sub-questions (subject to a maximum of four sub-questions)
(iv) The students have to answer five full questions, selecting one full question from each module.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3										1	3		1
CO 2	3	3										1	3		1
CO 3	3	3										1	3		1
CO 4	3	3										1	2		1
CO 5	3	3				2	1					1	3		1

Strength of correlation: Low-1,   Medium- 2,   High-3

Course Title	**RENEWABLE ENERGY SOURCES**					
Course Code	**22ETT2053**					
Category	**Emerging Technology Courses-I (ETC)**					
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**40**	**03**
CIE Marks**: 50**	SEE Marks**: 50**	Total Max. marks = **100**		Duration of SEE**: 03** Hours		

COURSE OBJECTIVE:

1. To get exposure on solar radiation and its environmental impact to power.
2. To know about the types of solar collectors, their configurations and their applications.
3. To learn about the wind energy and its economic aspects.
4. To know biomass and biogas energy production, types of biomass gasifiers and its benefits.
5. To discuss tidal and ocean thermal energy resources, conversion and power generation.

UNIT I	8 hours

Introduction: Causes of Energy Scarcity, Solution to Energy Scarcity, Factors Affecting Energy Resource Development, Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India.
Text Book 1,2,3 and Reference Book 1

UNIT II	8 hours

Solar Energy: Sun- earth Geometric Relationship, Layer of the Sun, Earth – Sun Angles and their Relationships, Solar Energy Reaching the Earth's Surface, Solar Thermal Energy Applications.
Text Book 1,2,3 and Reference Book 1

UNIT III	8 hours

Solar Thermal Energy Collectors: Types of Solar Collectors, and applications.
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Wind Turbine- Site Selection.
Text Book 1,2,3 and Reference Book 1

UNIT IV	8 hours

Biomass Energy: Biomass Production, Energy Plantation, Biomass Gasification, Theory of Gasification, Gasifier and Their Classifications, Chemistry of Reaction Process in Gasification.
Biogas Energy: Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas. Biogas Plant-KVIC and Janatha models.
Text Book 1,2,3 and Reference Book 1

UNIT V	8 hours

Tidal Energy: Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India, Energy Availability in Tides, Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power.
Ocean Thermal Energy: Introduction, Principles of Ocean Thermal Energy Conversion (OTEC), Ocean Thermal Energy Conversion plants, Closed Cycle, Open Cycle, Advantages, Disadvantages and Benefits of OTEC.
Text Book 1,2,3 and Reference Book 1

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Discuss the causes of energy scarcity and its solution, energy resources and availability of renewable energy.
CO2: Analyze the implication of renewable energy.
CO3: Summarize the economic aspects in Renewable Energy.
CO4: Discuss various generation schemes of Renewable energy.
CO5: Identify various applications of various Renewable Energy.

TEXT BOOKS

1. G D Rai, "Non- Conventional Energy Sources", Fourth Edition, Khanna Publisher, 1997

2. B H Khan, "Non-Conventional Energy Sources", Second edition, TMH,

3. S P Sukhatme, "Solar Energy for Thermal applications", Second edition, TMH, 2009

REFERENCE BOOKS

1. S S Thipse, "Non- Conventional and Renewable energy Sources", Fourth edition, Narosa publishers, 2014

ONLINE RESOURCES

www.mnre.org
www.renewableenergyworld.com
www.powergridindia.com
www.saurenergy.com
https:nptel.ac.in

SCHEME FOR EXAMINATIONS

vi. The question paper will have ten full questions carrying equal marks.
vii. Each full question will be for 20 marks.
viii. There will be two full questions from each module
ix. Each full question will have sub-questions (subject to a maximum of four sub-questions)
x. The students have to answer five full questions, selecting one full question from each module.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3					2	2						2	2	2
CO 2	3					2	2						2	2	2
CO 3	3					2	2						2	2	2
CO 4	3					2	2						2	2	2
CO 5	3					2	2						2	2	2

Course Title	**INNOVATION AND DESIGN THINKING**					
Course Code	**22IDT208**					
Category	**Humanity and Social Science Course (HSS)**					
Scheme and Credits	No. of Hours/Week				Total teaching hours	Credits
	L	T	P	SS	Total		
	01	**00**	**00**	**00**	**01**	**15**	**01**
CIE Marks**: 50**	SEE Marks**: 50**	Total Max. marks = **100**		Duration of SEE: **03** Hours		

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COURSE OBJECTIVE:
1. To explain the concept of design thinking for product and service development.
2. To explain the fundamental concept of innovation and design thinking.
3. To discuss the methods of implementing design thinking in the real world.

UNIT I	3 hours
PROCESS OF DESIGN	
Understanding Design thinking	
Introduction to Design Thinking - Theory and practice in Design thinking – Shared model in team-based design – MVP or Prototyping.	
Text Book 1,2,3,4 and Reference Book 1,2	
UNIT II	**3 hours**
Tools for Design Thinking	
Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design.	
Text Book 1,2,3,4 and Reference Book 1,2	
UNIT III	**3 hours**
Design Thinking in IT	
Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping.	
Text Book 1,2,3,4 and Reference Book 1,2	
UNIT IV	**3 hours**
DT for strategic innovations	
Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	
Text Book 1,2,3,4 and Reference Book 1,2	
UNIT V	**3 hours**
The Design Challenge:	
Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing-Documentation and the Pitching.	
Text Book 1,2,3,4 and Reference Book 1,2	

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Describe the various design process procedure.
CO2: Evaluate design ideas through different technique.
CO3: Generate design ideas through design thinking.
CO4: Identify the significance of reverse Engineering to Understand products.
CO5: Predict the design challenge properly.

TEXT BOOKS

4. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson "Engineering Design", Cengage learning (International edition), 2nd Edition, 2013.
5. Roger Martin "The Design of Business: Why Design Thinking is the Next Competitive Advantage" ,Harvard Business Press, 2009.
6. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), Design Thinking: Understand – Improve Apply, Springer, 2011.
7. Idris Mootee "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons),2013

REFERENCE BOOKS

1. Yousef Haik and Tamer M.Shahin "Engineering Design Process" Second Edition , Cengage Learning, 2011.
2. Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author), "Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover" 20 Sep 2013.

ONLINE RESOURCES
1. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Development
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
7. https://support.google.com/docs/answer/179740?hl=en

SCHEME FOR EXAMINATIONS

xi. Theory Question Paper Pattern:
CIE – Objective type (Max. marks : 25 marks)
SEE – Objective type (Max. marks : 25 marks)

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3		3			2	2						2	1	2
CO 2	3		3			2	2						2	1	2
CO 3	3		3			2	2						2	1	2
CO 4	3		3			2	2						2	1	2
CO 5	3		3			2	2						2	1	2

Strength of correlation: Low-1,   Medium- 2,   High-3