

Course title: Fundamentals of thermal and electrical engineering				
Course code: ENR 119		No. of credits: 2	L-T-P: 28-00-00	Learning hours: 28
Pre-requisite course code and title (if any): No				
Department: Department of Energy and Environment				
Course coordinator: Dr. Som Mondal			Course instructor(s): Dr. Som Mondal/ Dr Aviruch Bhatia	
contact details: som.mondal@terisas.ac.in				
Course type: Core			Course offered in : Semester 1	
Course Description				
<p>The course is designed to provide basic knowledge of thermal and electrical engineering. It incorporates the fundamentals of thermodynamic principles and their applications. This course provides the required level of knowledge of thermal engineering to understand the mechanical engineering and related courses to the students not having background of mechanical Engineering. It also incorporates the fundamentals of electrical circuit components, electrical and magnetic circuits, DC and AC sources. This course provides the required level of knowledge of electrical engineering to understand power system and related courses to the students not having background of electrical engineering</p>				
Course objectives				
<ul style="list-style-type: none"> ▪ Providing basic knowledge of thermodynamic principles. ▪ Providing knowledge related to thermodynamic processes. ▪ Providing knowledge about use of steam tables. ▪ Provide basic knowledge of electrical circuit components. ▪ Providing knowledge related to characteristics and behaviour of electrical circuits on AC and DC sources and their applications. ▪ Providing knowledge of magnetic circuits. 				
Course content				
Module	Topic	L	T	P
	Fundamentals of thermal engineering (1 credit)			
1	Zeroth law of thermodynamics System, surroundings and properties. Energy and Processes. Work and heat. Zeroth law of thermodynamics.	3	0	0
2	First law of thermodynamics First law of thermodynamics. Constant pressure process. Adiabatic and Polytropic Process. Steady state flow process. Limitations.	4	0	0
3	Second law of thermodynamics Kelvin-Plank statement and Clausius statement. Reversibility, irreversibility and carnot cycle. Entropy. Temperature entropy diagram.	4	0	0
4	Power and refrigeration cycles Reheat, regeneration and binary vapour cycle. Gas power cycle. Refrigeration cycle. Thermodynamics of ideal gas mixture.	3	0	0
	Fundamentals of electrical engineering (1 credit)			
5	Circuit components Resistance (R), Inductance (L) and Capacitance (C). Ohm's law. DC and AC sources – voltage and current, ideal and practical, dependent and independent	2	0	0
6	DC circuits KCL & KVL, loop or mesh analysis, nodal analysis, star↔delta transformation, Thevenin's and Norton's theorem, superposition theorem, maximum power transfer theorem.	4	0	0
7	AC circuits Representation of sinusoidal quantities, steady state analysis of R-L-C series and parallel circuits, resonance in electrical circuits, energy and power, complex power – apparent, active and reactive power, three phase ac circuits – phase & line voltages and currents	4	0	0

8	Magnetic circuits Magnetic flux and mmf, analogy between electrical and magnetic circuits, magnetic materials, eddy current & hysteresis losses.	4	0	0
		28	0	0
Evaluation criteria				
<ul style="list-style-type: none"> ▪ Assignment: 10% ▪ Test 1: 20% ▪ Test 2: 20% ▪ Test 3: 50% 				
Learning outcomes				
<ul style="list-style-type: none"> ▪ Understanding the basics of characteristics and behaviour of laws of thermodynamics. ▪ Solving the problems related to thermodynamic applications. ▪ Solving the problems related power and refrigeration cycles. ▪ Understanding the use of steam tables and apply them to real problems. ▪ Understanding the basics of DC and AC sources along with their applications on electrical circuits. ▪ Solving the problems related to applications of network theorems and solving complex DC circuits. ▪ Solving the problems related to R-L-C circuits connected to single phase and three phase AC. ▪ Solving the problems related to magnetic circuits. 				
Pedagogical approach				
A combination of class-room interactions, tutorials, assignments and projects.				
Materials				
RE Sonntag, C Borgnakke, GJ Van Wylen: Fundamentals of Thermodynamics, Sixth Edition, (Wiley-India, 2007). PK Nag: Engineering Thermodynamics, Third Edition (Tata McGraw-Hill, 2005) YA Cengel and MA Boles: Thermodynamics: An Engineering Approach, Sixth Edition (Tata McGraw-Hill, 2008) SR Turns: An Introduction to Combustion: Concepts and Applications, Second Edition (McGraw Hill, 2000) B.L.Theraja, A.K.Theraja, "A text book of Electrical Technology", S.Chand Publication, 2012 D.P.Kothari, I.J.Nagrath, "Fundamentals of electrical engineering", Tata Mc Graw-Hill Publication, 2016				
Additional information (if any): NA				
Student responsibilities				
Attendance, feedback, discipline: as per university rules				

Reviewers

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