SCHEME OF COURSE WORK

Course Details:

Course Title	**: Experimental Methods in Thermal Engineering**		
Course Code	**: 19ME2205**	**L T P C**	**:3 0 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Thermal Engineering**		
Semester	**: II**		
Prerequisites	**:NIL**		

Course Outcomes (COs):

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

1. Identify the suitable instrument for measuring transport parameters and estimate error
2. Select suitable range of pressure gauge and compute its dynamic response
3. Distinguish different flow visualization methods and temperature measurements.
4. Determine thermal conductivity in solids, liquids and gases and radiation measurements
5. Develop transfer function of given mechanical system by using concept of control system

Program Outcomes (POs):

A postgraduates of Thermal Engineering will have the

PO1	exhibit in-depth knowledge in thermal engineering specialization
PO2	think critically and analyze complex engineering problems to make creative advances in theory and practice
PO3	solve problem, think originally and arrive at feasible and optimal solutions with due consideration to public health and safety of environment
PO4	use research methodologies, techniques and tools, and will contribute to the development of technological knowledge
PO5	apply appropriate techniques, modern engineering tools to perform modeling of complex engineering problems with knowing the limitations
PO 6	understand group dynamics, contribute to collaborative multidisciplinary scientific research
PO 7	demonstrate knowledge and understanding of engineering and management principles and apply the same with due consideration to economical and financial factors
PO 8	communicate complex engineering problems with the engineering community and society, write and present technical reports effectively
PO 9	engage in life-long learning with a high level of enthusiasm and commitment to improve knowledge and competence continuously
PO10	exhibit professional and intellectual integrity, ethics of research and scholarship and will realize the responsibility towards the community
PO11	examine critically the outcomes of actions and make corrective measures

Course Outcome versus **Program Outcomes:**

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	M	M		M	M	S		M			M
CO2	M			M		M					
CO3	M	M	M	M		S					
CO4	M	M	M	M	M	S					
CO5		S		M	M	S		M			

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction, Instrument classification, static and dynamic characteristics of instruments	CO1	Explain the static and dynamic characteristics of instrument	▫ Lecture	
2	Different types of error analysis, uncertainty, reliability of instruments	CO1	Explain different types of errors	▫ Lecture ▫ Problem solving	**Assignment- 1 (Week 2- 6)**
3	Concept of resistance transducer, capacitive transducer and piezoelectric transducer	CO1	Describe piezoelectric transducer with neat sketch	▫ Lecture ▫ Discussion	
4	Concept of photoconductive, photovoltaic, ionization and hall effect transducer	CO1	Describe hall effect transducer with neat sketch	▫ Lecture ▫ Discussion	
5	Dynamic response considerations and Bridgman gauge	CO2	Explain Bridgman gauge with neat sketch	▫ Lecture ▫ Problem solving	
6	McLeod,Pirani thermal conductivity, Knudsen and Alphatron gauge	CO2	Explain Pirani thermal conductivity gauge with neat sketch	▫ Lecture ▫ Discussion	
7	Flow measurement by drag effect	CO3	What are the different types of flow measurements and explain briefly	▫ Lecture ▫ Discussion	
8	Hot wire anemometer, magnetic flow meter, flow visualization methods	CO3	Explain briefly flow visualization methods	▫ Lecture ▫ Discussion	
9	**Mid-Test 1**				**Mid-Test 1 (Week 9)**
10	Interferometer and laser Doppler anemometer and temperature measurement by mechanical effect	CO3	Describe interferometer with neat sketch	▫ Lecture ▫ Discussion	
11	Temperature measurement by radiation effect, transient response of thermal systems	CO3	Explain transient response of thermal systems	▫ Lecture ▫ Discussion	**Assignment- 2 (Week 11- 16)**
12	Thermocouple compensation and temperature Measurements in high speed flow	CO3	Explain how temperature is measured in high speed flow	▫ Lecture ▫ Discussion	
13	Thermal conductivity measurement of solids, liquids and gases	CO4	Discuss the methods to find thermal conductivity of solids, liquids and gases	▫ Lecture ▫ Discussion	
14	Measurement of gas diffusion, convective heat transfer	CO4	Explain the method to measure the gas diffusion with the help of neat sketch.	▫ Lecture ▫ Discussion	
15	humidity measurements, heat flux meters	CO4	Describe heat flux meter with the help of neat sketch.	▫ Lecture ▫ Discussion	
16	Measurement of emissivity, reflectivity and Transmissivity and solar radiation measurement	CO4	Discuss the methods to find emissivity, reflectivity and Transmissivity	▫ Lecture ▫ Discussion	
17	Introduction and classification of control systems and servo mechanism	CO5	Explain servomechanism in control systems	▫ Lecture ▫ Discussion	
18	Transfer function for different types of mechanical systems	CO5	What is transfer function? Explain transfer function of spring-mass-damper system	▫ Lecture ▫ Problem solving	
19	**Mid-Test 2**				**Mid-Test 2 (Week 19)**
20/21	**END EXAM**				**END EXAM**