SCHEME OF COURSE WORK:

Course Details:

Course Title	VIRTUAL LAB ON FLUID AND THERMAL SCIENCES					
Course Code	19ME22M1	**LTPC**	**0**	**0**	**3**	**1.5**
Program	M.Tech.					
Specialization	Thermal Engineering					
Semester	I					
Prerequisites	Engineering Thermodynamics, Fluid Mechanics and Heat Transfer					
Course to which is a prerequisite	NA					

Course Outcomes:

CO1	Determine major and minor losses for internal flow through a pipe, nozzle-diffuser and able to experiment with flow measurement devices like Venturimeter
CO2	Explain heat conduction through different geometrical shapes and compare the results obtained
CO3	Explain heat conduction through composite systems of different cross-sections and validate results through comparison.
CO4	Determine the overall heat transfer coefficient of parallel and counter flow heat exchanger.
CO5	Identify relation between intensity of the radiation from a flat source or point source with distance.

Program Outcomes:

PO Code	**Program Outcome (PO)**
PO1	exhibit in-depth knowledge in thermal engineering specialization
PO2	think critically and analyse 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
PO6	understand group dynamics, contribute to collaborative multidisciplinary scientific research
PO7	demonstrate knowledge and understanding of engineering and management principles and apply the same with due consideration to economical and financial factors
PO8	communicate complex engineering problems with the engineering community and society, write and present technical reports effectively
PO9	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 Vs Program Outcomes

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

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

Assessment Methods:

Day to Day Evaluation (Record and Observation): 20M
Two mid-term examination at the end of each cycle: 20M
End Semester Examination: 60M

Teaching-Learning and Evaluation

Week	Topic/Content	CO	Sample Questions	Teaching-Learning Strategy	Assessment method & Schedule
1	Demo on Virtual Lab and its Functionality				
2	Energy losses in pipe flow	CO1	Determine the pressure drop in a pipe flow	Practical Demo and Exercise the practical on virtual mode	Day to day to evaluation Observation (10M) and Record submission (10M)
3	Flow through Venturi meter	CO1	Estimate the volumetric flow rate of the fluid flow through a pipe by making use of Venturi-meter		
4	Incompressible flow through nozzle and a diffuser	CO1	Estimate the pressure and velocity variations for a flow through nozzle		
5	Conduction analysis of a single material sphere	CO2	Determine the 1D heat conduction through a sphere		
6	Conduction analysis of a single material cylinder	CO2	Determine the 1D heat conduction through a sphere		
7	To investigate the Lambert's distance law	CO5	Explain the Lamberts distance Law		
8	Conduction analysis of a double material slab	CO3	Determine equivalent thermal conductivity of a composite slab		

Mid-Term Examination 1					
9	Conduction analysis of a double material slab	CO3	Determine equivalent thermal conductivity of a composite slab	Practical Demo and Exercise the practical on virtual mode	Day to day to evaluation Observation (10M) and Record submission (10M)
10	Conduction analysis of a double material sphere	CO3	Determine the thermal conductivity of an insulating powder by making use sphere-sphere method		
11	Conduction analysis of a double material cylinder	CO3	Determine critical radius of insulation of an insulation layer over a pipe for minimizing the heat loss		
12	To determine the overall heat transfer coefficient (U) in the parallel flow heat exchanger.	CO4	Determine the effectiveness and OHTC (Theoretical and Experimental) of a parallel flow heat exchanger		
13	To determine the overall heat transfer coefficient (U) in the counter flow heat exchanger.	CO4	Determine the effectiveness and OHTC (Theoretical and Experimental) of a parallel flow heat exchanger		
14	To investigate the Lambert's direction law (Cosine law)		Describe the role of Lambert's cosine law in radiation		
Mid Term Examination-II					
End Term Examination					