Programme	**Master of Technology in Mechanical Engineering**				Year of Regulation		**2018**
Department	**Mechanical Engineering**				Semester		**I**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME 511	**Conduction and Radiation**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	To introduce the concept of conductive and radiative heat transfer	Course Outcomes	CO1	Illustrate the basic laws and mechanisms of basic modes of heat transfer.
	To teach the mechanisms of heat transfer under various conditions		CO2	Analyze problems involving heat conduction in one dimensional geometries under steady state.
	To develop an ability and skill to design a thermal system		CO3	Analyze problems involving steady state heat conduction in one dimensional geometries.
	To develop an ability to analyse various industrial thermal system		CO4	Analyze problems involving transient state heat conduction
			CO5	Evaluate a radiative thermal system with and without heat conduction

		SYLLABUS		
No.	Content		Hours	COs
I	**Introduction**: Basic modes of heat transfer, heat transfer mechanisms and the governing laws.		**03**	**CO1**
II	**Steady-state Conduction**: **One Dimensional Problems** Fourier's law of heat conduction in Cartesian, cylindrical and spherical coordinates, heat conduction equations in isotropic and anisotropic materials: in Cartesian, cylindrical and spherical coordinate system, Initial and boundary conditions, 1-D conduction problems without and with heat generation: plane wall, hollow cylinder, composite tube, hollow sphere, etc.		**10**	**CO2**
III	**Steady-state Conduction**: **Two and Three Dimensional Problems** Steady 2-D problem in Cartesian, analytical methods, problems in cylindrical and spherical coordinate system, steady 3-D conduction in Cartesian coordinate, graphical methods and conduction shape factor., Method of superposition, Stationary and moving heat sources and sinks, Moving boundary problems, Duhamel's theorem.		**08**	**CO3**
IV	**Unsteady-State Conduction**: One dimensional transient problems, solution methods, Lumped system analysis, Semi-infinite media, Laplace transform, Duhamel's theorem, example problems.		**05**	**CO4**
V	**Radiation**: Mechanism of energy transport in thermal radiation, laws of radiation: Planck's law, Wien's displacement law, Stefan-Boltzmann law, Intensity of radiation, Irradiation vs. radiosity, Diffuse vs. specular surfaces, absorptivity, reflectivity, transmissivity, black body radiation, grey body, Kirchhoff's law, view factor, radiation in presence of participating medium, solid angle, radiation in infinite parallel planes with and without participating medium, Radiation exchange among gray diffuse surfaces, Two surface network, three surface network,Derivation of radiation transport equations (RTE), Radiative equilibrium, Divergence of radiative heat flux.		**10**	**CO5**
	Total Hours		**36**	

Text Books and References
7. F. P. Incropera and D. P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons.
8. M. N. Ozisik, "Heat Transfer-A Basic Approach", McGraw Hill
9. M. F. Modest, "Radiative Heat Transfer", Academic Press
Supplementary Readings
1. R. Siegel and J. R. Howell, "Thermal Radiation Heat Transfer", Taylor & Francis
2. V. S. Arpaci, "Conduction Heat Transfer", Addison-Wesley