

18MTE64	MODELING AND SIMULATION IN MATERIAL PROCESSES	L	T	P	C
		3	0	0	3
Course Objectives:					
1.	To study about thin films, coatings and application techniques.				
UNIT I	INTRODUCTION	9	+	0	
Introduction to modeling, simulation models, Casting process: modeling of heat transfer, direct heat conduction modeling, one-dimensional and multidimensional inverse modeling, fluid flow and heat transfer model,					
UNIT II	CASTING MODELING	9	+	0	
thermodynamics of solidification, metal/mold interfacial heat transfer, deformation and stresses in castings, thermo-mechanical modeling in casting, determination of heat transfer coefficient and air gap width in permanent mould castings, continuous casting and DC casting process,					
UNIT III	WELDING AND HEAT TREATMENT SIMULATION	9	+	0	
Welding process: weld heat -source models, thermal analysis with-microstructure, transient fluid flow, residual stresses in welds, Heat treatment: metal quenchant, interfacial heat transfer, diffusion model, microstructure model, carburization model, quench crack simulation, creep simulation,					
UNIT IV	MODELLING	9	+	0	
Modeling of rolling, forming and extrusion processes, Artificial Neural Net works in materials processing, Phase-field modeling and Monte-Carlo simulations,					
UNIT V	SOFTWARES	9	+	0	
introduction to commercially available softwares - Solid Cast, FlowCast, OptiCast,.Deform HT, ProCast, MagmaSoft, Design of experiments and factorial designs.					
Total (L+T) = 45 Hours					
Course Outcomes:					
Upon completion of this course, the students will be able to:					
CO1	:	Explain the basics of modeling.			
CO2	:	Describe the principles in casting modeling.			
CO3	:	Know about welding and heat treatment simulation			
CO4	:	Identify commercially available softwares for modeling			

Text Books:	
1.	Modeling in Welding, Hot Powder Forming and Casting (Eds. L. Koarlsson), ASM, MaterialsPark,OH,1997.
2.	Szekely,J.,Evans, J.E.andBrimacombe, J.K., The Mathematical and Physical Modelling of Primary Metal processing Operations, Wiley, 1988.
Reference Books:	
1.	Numerical Recipes: The Art of Scientific Computing, Cambridge Univ. Press, N.Y., 1988.
2.	D.R. Poirier and G.H. Geiger: Transport Phenomena in Materials Processing, TMS, warrendale 1994.
3.	R.I. L. Guthrie: Engineering in Process Metallurgy, Oxford Science Publications (1989)