Information Form for SJTU Graduate Profession Courses

Basic Information					
* Course Name	Chinese				
	English	Transport Phenomena in Materials Processing			
* Credits					
* Course Type	Program Core Course		* Course Type	Both full & part time students	
* Course Category	Specialized Course		Targeting Students	All graduates	
* Instruction Language	Chinese		Teaching Method	In class teaching	
* Grade	Letter grading		Exam Method	Written Exam	
* School					
Subject					
Person in charge	Name	ID	School	E-mail	
				plm616@sjtu.edu.cn	
Extended Information					
* ( ) Course Description	200 32 /2				

* English Course Description	The course is a fundamental course for the students who are major in materials science and engineering, including fluid mechanics, heat transfer and mass transfer. The motivation is to give the students a comprehensive understanding of the transferring phenomena. The curriculum is set as 32 hours and 2 credits. In recent years, as the high education in China meets the needs of national economic development, and keeps up with the international practice, some majors, such as material sciences, heat treatment, casting, forging and welding, have been withdrew and combined into a new materials science and engineering. So it is necessary for a graduate student to study Transferring phenomena because the transferring of "momentum", "heat" and "mass" is very common in metal processing. For example, in metal processing, the flow of liquid metal (filling in the casting process), the gas flow (the heat treatment furnace), heat transfer and material exchange phenomena (such as the solidification process, solute redistribution, solid forming and so on), are subjects of this class and would be analyzed. During the course, students can be expected to fully understand the transferring phenomenon and their fundamental theory, thus get the ability to solve transferring phenomenon in future research work.
* ( ) Syllabus	

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English Syllabus

Chapter	Content	Hours	Format	Instructor
Section One Momentum Transfer	**Chapter One Fluid Properties** 1. Concept of fluid, basic fluid properties, category and description of flow (Flowrate, momentum flux) 1h 2. Concept of momentum transfer, Hydrostatics (Euler equation) 1h	2	Narration and interaction	Juan Chen
	Chapter Two Fluid dynamics 1 Continuity equation of fluid motion, momentum transfer equation of ideal fluid 2 h 2 Momentum transfer equation of actual fluids, Bernoulli's equation and application of ideal and actual fluids 2 h	4	Narration and interaction	Juan Chen
	Chapter Three Laminar Flow 1. Laminar flow in two coaxial rotation tubes, laminar flow between two parallel plates 2 h 2. The fluid flow around the ball, laminar flow in the porous medium 2 h	4	Narration and interaction	Juan Chen
	Chapter Four Turbulent Flow and Special Flows in Materials Processing 1. The characteristics of turbulent flow, turbulent flow in pipe 1 h 2. Approximate calculation of turbulent flow, Special flows in Materials Processing 1 h	2	Narration and interaction	Juan Chen
Section Two Heat Transfer	**Chapter Five Basic concepts and laws of heat transfer** 1. Basic mode of hear transfer, Basic concepts of heat transfer 1 h 2. Basic laws of heat transfer 1 h	2	Narration and interaction	Liming Peng
	Chapter Six Governing Equation of Heat Transfer 1. General governing equation of heat transfer 1 h 2. Simplification of governing equation-convection heat transfer governing equation, Simplification of governing	2	Narration and interaction	Liming Peng

	equation-heat conduction differential equation 1 h			
	Chapter Seven Heat Conduction Analysis 1. Methods for the key of heat conduction, one dimension steady conduction, two dimensions steady conduction 2 h 2. Non-steady heat conduction, heat transfer during metal solidification 2 h	4	Narration and interaction	Liming Peng
	Chapter Eight Convection Heat Transfer 1. Basic concepts of convection heat transfer, convection heat transfer of laminar flow in tube 2 h 2. Convection heat transfer on boundary layer, natural convection heat transfer 2 h	4	Narration and interaction	Liming Peng
	Chapter Nine Radiant Heat Transfer 1. Radiant heat transfer between black bodies, Radiant heat transfer between gray bodies 1 h 2. Network solving method of radiant heat transfer, gas radiation 1 h	2	Narration and interaction	Liming Peng
Section Three Mass Transfer	**Chapter Ten Basic concepts and governing equation of mass transfer** 1. Basic concepts of mass transport, Basic laws of mass transfer 1 h 2. Governing equation of mass transfer 1 h	2	Narration and interaction	Juan Chen
	Chapter Eleven Mass Transfer Analysis 1. Diffusion mass transfer 1 h 2. Convection mass transfer, Mass transfer between phases 1 h	2	Narration and interaction	Juan Chen
Section Four Similarity Theory and Numerical Simulation of	**Chapter Twelve Similarity Theory and Numerical Simulation of Transport Phenomena** 1. Basic concepts of similarity theory, Simulation experiment 1 h 2. Numerical Simulation of	2	Narration and interaction	Liming Peng

	Transport Phenomena | Transport Phenomena 1 h |		
* Requirements	50 100 10 PPT 30 60 60
* English Requirements	Total score: 100 points Attendance and Home work: 20% Final presentation : 20% Final exam : 60%
* Resources	1. 2000 2. 2001 3. 1989 4. G H. D.R. 1981 5. J.P. 2005
* English Resources	1. Transfer principle of metal hot forming Bonian Lin, HarbinInstitute of Technology Press, 2000. 2. Metallurgy Transport Principle in materials processing , Shusen Wu, Mechanical Industry Press, 2011. 3. Metallurgy Transport Principle , Huaqin Su, Southeast University Press, 1989. 4. Transport phenomena in metallurgy , G H. Geiger D.R. Poirier, Metallurgical industry press, 1981. 5. Heat Transfer , J.P. Holman, Mechanical Industry Press, 2005.
Note	