Information Form for SJTU Graduate Profession Courses

Basic Information				
* Course Name	Chinese			
	English Strength of Materials			
* Credits	3	* Teaching Hours	48	
* Semester	Fall	* Cross-semester?	No	
* Course Type	Course Program Core	* Course Type	For full-time students	
* Course Category	Specialized Course		Letter grading	Exam Method

* School				
Subject				
Person in charge	Name	ID	School	E-mail
				mtsmmc@sjtu.edu.cn

Extended Information	
* ( ) Course Description	
* English Course Description	**Contents:** Strength of Materials discusses the basic theories of deformation and fracture as well as the main principals of strengthening and toughening for engineering materials. This course is divided into two parts. Part 1 is Deformation and Strengthening of Materials, includes elastic deformation, basics of dislocation theories, plastic deformation and principals of strengthening. Part 2 is Fracture and Toughening of Materials, includes Basics of Fracture, Fracture Mechanics, Physics of Fracture and Principles of Toughening. **Targets:** By studying the course, the students should achieve the goals as follows: (1) To have a grasp of the basic theories and physic essences of material's deformation and fracture; (2) To know well the influencing factors of material strength, the relationships among the strength, chemical composition and microstructure, the basic means improving material strength, and the basic analysis methods of material failures; (3) To obtain a preliminary ability to selecting, using the traditional materials and developing novel materials.

* ( ) Syllabus	**1h** **23h** **1** 3h 1.1 1.2 1.3 1.4 1.5 **2** 6h 2.1 2.2 2.3 **3** 6h 3.1 3.2 3.3 3.4 **4** 8h 4.1 4.2 4.3 4.4 4.5 4.6 4.7 **24h** **5** 3h 5.1 5.2 5.3 5.4 **6** 9h 6.1 6.2 6.3 6.4 **7** 9h 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 **8** 3h 8.1 8.2 8.3

* English Syllabus	Preface(1h) **Part 1 Deformation and Strengthening of Materials** **1 Elastic Deformation** 1.1 Thermodynamics Analysis of Elasticity 1.2 Elastic Constitutive Relation 1.3 Modulus of Elasticity 1.4 Rubber Elasticity 1.5 Viscoelasticity **2 Basics of Dislocation Theory** 6h 2.1 Elastic Mechanics of Dislocation 2.2 Dynamics of Dislocation 2.3 Dislocations in Real Crystals **3 Plastic Deformation in Crystals** 6h 3.1 Elastic Constitutive Relation 3.2 Mechanisms of Plastic Deformation 3.3 Yielding 3.4 Plastic Flow **4 Principals of Strengthening** 8h 4.1 Defects and Strength 4.2 Work Hardening 4.3 Boundary Strengthening 4.4 Solid -Solution Strengthening 4.5 Particle Strengthening 4.6 Combination of Strengthening 4.7 Other Strengthening **Part 2 Fracture and Toughening of Materials 24h** **5 Basics of Fracture** 3h 5.1 Outline of Fracture 5.2 Fracture Process 5.3 Notch Strength 5.4 Environment Strength **6 Fracture Mechanics** 9h 6.1 Linear Elastic Fracture Mechanics 6.2 Elastic-Plastic Fracture Mechanics 6.3 Dynamic Fracture Mechanics 6.4 Introductions to Damage Mechanics **7 Physics of FDracture** 7.1 Theories of Brittle Fracture 7.2 Theories of Ductile Fracture 7.3 Criterion for transition between Ductile fracture and Brittle Fracture 7.4 Interaction between crack tip and dislocation 7.5 Steady Propagating of Crack 7.6 Dislocation Simulation of Crack 7.7 Atomic Theories of Fracture 7.8 Fracture and Fractal **8 Principles of Toughening** 3h 8.1 Overall 8.2 Toughening Mechanisms based on Strength Design 8.3 Toughening Mechanisms based on Fracture Design

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* English Resources	1 Li Qingsheng, ***Strength of Materials***, Science Press of Shanxi Province, China, 1990 2 Thomas H Courtney ***Mechanical Behavior of Materials*** China Machine Press 2004 3 Shi Deke ***Dislocations and Strength of Materials,*** Xian Jiao Tong University Press, 1988 4 Ha Kuanfu ***The Mechanisms and Theories on Mechanical Behavior of Metals***, Science Press, China, 1983 5 Xiao Jimei ***Toughness and Toughening of Metals***, Shanghai Sci. and Tech. Press, 1980
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