

ABET

Competency Matrix			<i>Cognitive Objectives</i>						
MASC 302 Materials Science for Engineers			Number	Knowledge	Und. / Comp.	Application	Analysis	Synthesis	Evaluation/Appreciation
Learning Outcome	Competency Category	Competencies							
1 Crystals	1 Crystal Structures	7 Crystal systems	1.1.1						
		Unit cells	1.1.2						
		Miller indices of planes and directions	1.1.3						
		Simple covalent & ionic structures	1.1.4						
		Bragg's Law	1.1.5						
	2 Imperfections	Point defects, vacancy concentration	1.2.1						
	Perfect and mixed dislocations, Burgers vectors	1.2.2							
	Planar defects, stacking faults	1.2.3							
2 Diffusion	1 Diffusion	Diffusion mechanisms	2.1.1						
		Fluxes using Fick's 1st Law	2.1.2						
		Diffusion profiles using Fick's 2nd Law	2.1.3						
3 Mechanical Properties	1 Tensile testing	Tensile testing	3.1.1						
		Properties derived from tensile testing	3.1.2						
	2 Hardness testing	Hardness testing	3.2.1						
		3 Fatigue testing	Fatigue testing	3.3.1					
	4 Creep testing		Three stages of creep	3.4.1					
		Minimum creep rate	3.4.2						
		Activation energy for creep	3.4.3						
	5 Plastic Deformation	5	Cold work, work hardening exponent	3.5.1					
			Annealing	3.5.2					
			Hot working	3.5.3					
4 Solidification	1 Solidification	Nucleation and growth	4.1.1						
		Development of cast structures	4.1.2						
5 Phase Diagrams	1 Phase Diagrams	Unary phase diagrams	5.1.1						
		Binary phase diagrams	5.1.2						
		Gibbs' Phase Rule	5.1.3						
		The Lever Law	5.1.4						
		Invariant reactions	5.1.5						
6 Steels	1 Steels	Fe/C diagram	6.1.1						
		TTT diagrams	6.1.2						
		Common heat treatments	6.1.3						
		Stainless steels	6.1.4						
		Cast iron microstructures	6.1.5						
7 Corrosion	1 Corrosion	Basic electrochemical reactions	7.1.1						
		Potential differences from ECS tables	7.1.2						
		General, galvanic, and pitting corrosion	7.1.3						
8 Other Engineering Materials	1 Ceramics	Common engineering ceramics	8.1.1						
	2 Polymers	Condensation and addition reactions	8.2.1						
		Common thermoplastic and thermoset polymers	8.2.2						
	3 Composites	Rule of Mixtures	8.3.1						
Modulus and strength, isostress and isostrain conditions		8.3.2							
Critical volume fraction and length		8.3.3							
9 Physical Properties	1 Electrical Behavior	Ohm's Law	9.1.1						
		Conductivity, semiconductivity	9.1.2						
		Simple devices	9.1.3						