

MET 351 -Metallurgy / Materials and Processes, Course Syllabus

Catalog Description: (4) Prerequisite CHEM 181 or permission of instructor. Ferrous and nonferrous metals and alloys; polymeric, ceramic and cellular materials; use of phase diagrams, cooling curves, stress-strain diagrams and metallography. Note: Special Course Fee of \$20.00.

Course Content and Objectives: Engineering Materials Technology is a field of study in applied science related to materials, materials processing, and the various specific concerns of research, development, design, manufacture, construction, maintenance and life cycle of engineered products.

This course addresses: 1) the awareness and importance of engineered materials in everyday life, 2) society's dependence on materials, and 3) the value of knowledge of engineering materials technology to the consumer, citizen, and member of the technological workforce.

Student Learning Outcomes and Assessment: The student should show their ability to:

1. classify and identify materials in engineering context via labwork and examinations.
2. design and process materials to obtain predicted properties via labwork and project work.
3. track specific materials in a structure and describe their life cycle via labwork and examinations.
4. specify materials and processes to meet technical and social criteria via project work and examinations.

Resources: Engineering Materials Technology, current ed., by Jacobs & Kilduff; Prentice Hall Publ.

Software: Net access, word processing, spreadsheet and graphing capability required.

Instructor: Dr. Craig Johnson, Hogue Technology Rm. 304, 963-1118 (Dept. 1756) cjohnson@cwu.edu

Hours: as posted on the office door, or set up an appointment!

Grading Policy: HW / Lab Assignments	(5+)	40%
Exams, Quizzes	(2)	40%
Individual Project	(1)	10%
Participation/involvement	(30)	10%

(weightings are approximate)

A(92-100), A-(90-92), B+(88-90), B(82-88), B-(80-82), C+(78-80), C(72-78), C-(70-72), D+(68-70), D(62-68), D-(60-62), F(<60)

NOTE: Extended absence is grounds for a failing grade. Late work may be refused or penalized.

Homework: Homework (and/or 'labs' or activities) is required in this class. You may wish to keep a copy of your homework so that you have a reference to use while studying for the tests.

Project: An individual project is required. More information will be handed out in class, but they are oriented toward using the course content in a subject of your interest and will be orally presented in class. Please gear your effort toward your portfolio, and professional development. Students have created relationships outside the campus which have lead to employment!

BlackBoard™: Use of BB is required in this class. You will find the syllabus there, take quizzes, get other assignments, and communicate with the class.

Conduct: Role of the instructor vs. role of the student.

The instructor is a facilitator. This role is two-fold. First, to facilitate the accomplishment of the course objectives. Do not expect to have the text read to you. Class time will be used for discussion of the assigned and any supplementary material, as well as reviewing homework, taking exams, etc. Second, you will be assessed on your progress in accomplishing course objectives, and be given timely feedback.

The student is an active learner. This role demands personal responsibility for your learning. Strive to optimize your learning skills, and keep track of your outcomes. Be prepared to participate in all activities.

ADA: Students who have special needs or disabilities that may affect their ability to access information and/or material presented in this course are encouraged to contact me or the ADA Compliance Officer, Director, ADA Affairs and Students Assistance at 963-2171, for disability related educational accommodations.

ETHICS: Plagiarism is considered a serious offense and will not be tolerated. Anyone not familiar with how to paraphrase, quote, or cite is encouraged to seek assistance from the Writing Lab on campus. Papers containing plagiarized material shall receive an "F." Cheating on exams will be dealt with in the same manner as cheating on an FAA test - the score for the exam will be a "0". CWU Policy is enforced.

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall 2005
(Class Meetings: MWF from 3 to 5PM, Note: BlackBoard™ will be used on Fridays)

Date/Wk	Content	Reading To Do:	Due
9/21	0 Intro – creation, selection & recycling (car part LCA)	Chapter 1,2	Scavenger Hunt
9/23	History: Who used what, when? Why are wars fought? Introduction to BlackBoard, Sample Homework, Quiz, and E-mail.		CS1:History Case Study 2pg Mon HS American Steel 1hr
9/26	1 <u>Bonds & Materials</u> (2.1-2), Poly/Ceramics/Comp	Chapter 3	Activity1: Selection
9/28	<u>Process & Structure: Characterization</u> (3.1-2)		Activity2: Characterization
9/30	NO CLASS MEETING: Use BlackBoard™		CS2: TBA Quiz 2
10/3	2 <u>Atomic Structure and Defects</u> (3.2- cont'd)		Activity3: Metallography
10/5	<u>Phase Diagrams</u> (3.4,5)		Act 5: Build Diagram, H2O/sugar
10/7	Use BlackBoard™		Quiz 3 _____
10/10	3 Grains (9.3.1 pg 317): Boundaries, Sizes & Shapes		Activity4: Micrograph
10/12	Exam #1	Chapter 4	
10/14	Use BlackBoard™		TBA
10/17	4 <u>Mechanical Properties</u> (4.2)		CS3: Tensile
10/19	<u>Testing & Failure Analysis</u> (4.3-6)		CS4: Fatigue
10/21	Use BlackBoard™		Quiz 5 _____
10/24	5 <u>Corrosion:</u> (4.4), Etching and Thermal Properties		Lab 1: Corrosion /Demo?
10/26	<u>Metallurgical Preparation Techniques:</u>	Chapter 5	Lab 2: Structure/Property
10/28	Use BlackBoard™		Quiz 6 _____
10/31	6 Thermal Processing :TTT, Heat Treating: (5.1-4)	<u>Individual Projects,</u>	Demo: Quenching H&B
11/2	Age Hardening, Hardenability; (5.5-6)		Lab3: Workability/Demo?
11/4	Use BlackBoard™		Quiz 7 _____
11/7	7 Week 8: <u>Intro to Jominy Lab</u> and Web Resources		Lab 4: Jominy Tests 12/1
11/9	<u>Metallurgical Evaluation Techniques</u> (Hardness, E8, E112, E82)		
11/11	Use BlackBoard™ VETERANS DAY!		Quiz 8
11/14	8 Hardening and Surface Modifications (5.7)		
11/16	Exam #2	Jominy Hardness Profile <u>Review</u>	
11/18	Use BlackBoard™ (Last time!)		Quiz 9
11/21	9 <u>Ferrous Metals: Cast and Wrought</u> : (5.8)		
11/23	****NO CLASS THANKSGIVING HOLIDAY		
11/25	****NO CLASS...		
11/28	10 <u>Non-Ferrous Alloys: Aluminum and Copper:</u> (5.9)		
11/30	<u>Powder Metallurgy:</u> (5.10)		
12/2	We will meet individually (as needed) to help with your individual projects.		

Final (Presentations and Project Reports) at ____AM/PM on _____, Dec. ____ in HT111.

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall 2004
(Class Meetings: MWF from 3 to 5PM, Note: BlackBoard™ will be used on Fridays)

Date/Wk	Content	Reading To Do:	Due
9/22	0 Intro – creation, selection & recycling (car part LCA)	Chapter 1,2	Geiger, Challenge, Scavenger Hunt
9/24	History: Who used what, when? Why are wars fought? Introduction to BlackBoard, Sample Homework, Quiz, and E-mail.		CS1:History Case Study 2pg Mon HS American Steel 1hr
9/27	1 <u>Bonds & Materials</u> (2.1-2), Poly/Ceramics/Comp	Chapter 3	Activity1: Selection
9/29	<u>Process & Structure: Characterization</u> (3.1-2)		Activity2: Characterization
10/1	NO CLASS MEETING: Use BlackBoard™		CS2: TBA Quiz 2
10/4	2 <u>Atomic Structure and Defects</u> (3.2- cont'd)		Activity3: Metallography
10/6	<u>Phase Diagrams</u> (3.4,5)		Act 5: Build Diagram, H2O/sugar
10/8	Use BlackBoard™		Quiz 3 _____
10/11	3 Grains (9.3.1 pg 317): Boundaries, Sizes & Shapes		Activity4: Micrograph
10/13	Exam #1	Chapter 4	
10/15	Use BlackBoard™		TBA
10/18	4 <u>Mechanical Properties</u> (4.2)		CS3: Tensile
10/20	<u>Testing & Failure Analysis</u> (4.3-6)		CS4: Fatigue
10/22	Use BlackBoard™		Quiz 5 _____
10/25	5 <u>Corrosion:</u> (4.4), Etching and Thermal Properties		Lab 1: Corrosion /Demo?
10/27	<u>Metallurgical Preparation Techniques:</u>	Chapter 5	Lab 2: Structure/Property
10/29	Use BlackBoard™		Quiz 6 _____
11/1	6 Thermal Processing :TTT, Heat Treating: (5.1-4)	<u>Individual Projects,</u>	Demo: Quenching H&B
11/3	Age Hardening, Hardenability; (5.5-6)		Lab3: Workability/Demo?
11/5	Use BlackBoard™		Quiz 7 _____
11/8	7 Week 8: <u>Intro to Jominy Lab</u> and Web Resources		Lab 4: Jominy Tests 12/1
11/10	<u>Metallurgical Evaluation Techniques</u> (Hardness, E8, E112, E82)		
11/12	Use BlackBoard™		Quiz 8
11/15	8 Hardening and Surface Modifications (5.7)		
11/17	Exam #2	Jominy Hardness Profile <u>Review</u>	
11/19	Use BlackBoard™ (Last time!)		Quiz 9
11/22	9 <u>Ferrous Metals: Cast and Wrought</u> : (5.8)		
11/24	****NO CLASS THANKSGIVING HOLIDAY		
11/26	****NO CLASS...		
11/29	10 <u>Non-Ferrous Alloys: Aluminum and Copper:</u> (5.9)		
12/1	<u>Powder Metallurgy:</u> (5.10)		
12/3	We will meet individually (as needed) to help with your individual projects.		

12/11 Final (Presentations and Project Reports) at 8AM on Wednesday, Dec. 8 in HT111.

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall of 2003
 (Class Meetings: MWF from 3 to 5PM, Note: BlackBoard™ will be used on Fridays)

Date/Wk	Content	Reading To Do:	Due
9/24	0 Intro - Selection and recycling (car part LCA)	Chapter 1,2	No assignment
9/26	History: Who used what, when? Why are wars fought? Introduction to BlackBoard, Sample Homework, Quiz, and E-mail.		CS1:History Case Study 2pg(9/31)
9/29	1 <u>Bonds & Materials</u> (2.1-2), Poly/Ceramics/Comp	Chapter 3	Activity1: Selection
10/1	<u>Process & Structure</u> : Characterization (3.1-4)		Activity2: Characterization
10/3	NO CLASS MEETING: Use BlackBoard™		CS2: LCA Quiz 2 10/6
10/6	2 <u>Atomic Structure and Defects</u> (3.4- cont'd)		Activity3: Metallography
10/8	Grains (5.3.1-4 pg 235): Boundaries, Sizes & Shapes		Activity4: Micrograph
10/10	Use BlackBoard™		Quiz 3 _____
10/13	3 <u>Phase Diagrams</u> (3.5-8)		Phase Change Activity
10/15	Exam #1	Chapter 4	
10/17	Use BlackBoard™		TBA
10/20	4 <u>Mechanical Properties</u> (4.2)		CS3: Ex. Tensile 10/22
10/22	<u>Testing & Failure Analysis</u> (4.3-6)		CS4: Fatigue 10/27
10/24	Use BlackBoard™		Quiz 5 _____
10/27	5 <u>Corrosion</u> : (4.4), Etching and Thermal Properties		Lab 1: Corrosion 10/29
10/29	<u>Metallurgical Preparation Techniques</u> :	Chapter 5	Lab 2: Structure/Property 11/3
10/31	Use BlackBoard™		Quiz 6 _____
11/3	6 Thermal Processing :TTT, Heat Treating: (5.1-4) <u>Individual Projects</u> ,		Demo: Quenching H&B
11/5	Age Hardening, Hardenability; (5.5-6)		Lab3: Workability 11/10
11/7	Use BlackBoard™		Quiz 7 _____
11/10	7 Week 8: Jominy Lab and Web Resources		Lab 4: Jominy Tests 12/3
11/12	<u>Metallurgical Evaluation Techniques</u> (Hardness, E8, E112, E82)		
11/14	Use BlackBoard™		Quiz 8
11/17	8 Hardening and Surface Modifications (5.7)		
11/19	Exam #2	Jominy Hardness Profile Review	
11/21	Use BlackBoard™ (Last time!)		Quiz 9
11/24	9 <u>Ferrous Metals</u> : Cast and Wrought : (5.8)		
11/26	****NO CLASS THANKSGIVING HOLIDAY		
11/28	****NO CLASS...		
12/1	10 <u>Non-Ferrous Alloys</u> : Aluminum and Copper: (5.9)		
12/3	<u>Powder Metallurgy</u> : (5.10)		
12/5	We will meet individually (as needed) to help with your individual projects.		

12/11 Final (Presentations and Project Reports) at Noon on Thursday, Dec. 11 in HT111.

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall of 2002
 (Class Meetings: MWF from 3 to 5PM, Note: BlackBoard™ will be used on Fridays)

Date/Wk	Content	Reading To Do:	Due
9/25 0	Intro - Selection and recycling (car part LCA)	Chapter 1,2	Favorite Mat'l & Why 9/27
9/27	History: Who used what, when? Why are wars fought? Introduction to BlackBoard, Sample Homework, Quiz, and E-mail.		CS1:History Case Study 2pg(9/31)
9/31 1	<u>Bonds & Materials</u> (2.1-2), Poly/Ceramics/Comp	Chapter 3	Selection Activity
10/2	<u>Material Structures:</u> Characterization (3.1-4)		Characterization Activity
10/4	NO CLASS MEETING: Use BlackBoard™		Quiz 2 & CS2(LCA) 10/7
10/7 2	<u>Atomic Structure and Defects</u> (3.4- cont'd)		Metallography Activity
10/9	Grains (5.3.1 pg 235): Boundaries, Sizes & Shapes		Micrograph Activity
10/11	Use BlackBoard™		Quiz 3 _____
10/14 3	<u>Phase Diagrams</u> (3.5-8)		Phase Change Activity
10/16	Exam #1	Chapter 4	
10/18	Use BlackBoard™		TBD _____
10/21 4	<u>Mechanical Properties</u> (4.2)		CS3: Ex. Failure 10/23
10/23	<u>Testing & Failure Analysis</u> (4.3-6)		CS4: Fatigue 10/14
10/25	Use BlackBoard™		Quiz 5 _____
10/28 5	<u>Corrosion:</u> (4.4), Etching and Thermal Properties		Lab 1: Corrosion 10/30
10/30	<u>Metallurgical Preparation Techniques:</u>	Chapter 5	Lab 2: Metallography 11/4
11/1	Use BlackBoard™		Quiz 6 _____
11/4 6	Thermal Processing (TTT, Heat Treating: (5.1-4)		Demo: Quenching H&B
11/6	Age Hardening, Hardenability; (5.5-6)		Lab3: Workability 11/13
11/8	Use BlackBoard™		Quiz 7 _____
11/11 7	****NO CLASS: VETERAN'S DAY HOLIDAY		
11/13	Week 8: <u>Individual Projects</u> , Jominy Lab and Web Resources		Lab 4: Jominy Tests 12/4
11/15	Use BlackBoard™		Quiz 8
11/18 8	Hardening and Surface Modifications (5.7)		
11/20	Exam #2		
11/22	Use BlackBoard™ (Last time!)		Quiz 9
11/25 9	<u>Ferrous Metals:</u> Cast and Wrought : (5.8)		
11/27	****NO CLASS THANKSGIVING HOLIDAY		
11/29	****NO CLASS		
12/2 10	<u>Non-Ferrous Alloys:</u> Aluminum and Copper: (5.9)		
12/4	<u>Powder Metallurgy:</u> (5.10)		
12/6	We will meet individually (as needed) to help with your individual projects.		
12/10	Final (Presentations and Project Reports) at Noon on Tuesday, Dec. 10 in HT111.		

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall of 2001

(Class Meetings: MWF from 3 to 5PM, Note: BlackBoard™ will be used on Fridays)

(DUE)

9/26	Week 1: <u>Introduction</u> – Recent Case Studies in Materials	Homework: Favorite Mat'l & Why
9/28	History: Who used what, when? Why are wars fought? Introduction to BlackBoard, Sample Homework, Quiz, and E-mail.	CS1:History Case Study 2pg(10/1) READ Chapter 1
10/1	Week 2: <u>Materials Classification /Selection/</u> : Atomic vs. Molecular	Bakelite Demo, Selection Handout
10/3	Exam #1 (I will be at a Faculty Senate Meeting)	CS2: Mat'l Selection (LCA) (10/8)
10/5	NO CLASS MEETING: Use BlackBoard™ again to:	Take the Quiz!, Read Ch.2 & 3
10/8	Week 3: <u>Sources /Life Cycle</u> : Degradation, Lab1 on Tensile Test and	CS3: Ex. Failure (2 pg. 10/10)
10/10	<u>Solutions & Phases</u> : Solids, Liquids, Diffusion and Strengthening	CS4: Fatigue
10/12	Use BlackBoard™ to:	Take the Quiz, Read Ch 4 & 5
10/15	Week 4: <u>Shaping and Forming</u> : Hardening vs. Softening (annealing),	Grain Growth
10/17	Binary Alloys and Grain Size: 1&2 phase, Vol. Fraction	Lab1: Micrographs (10/22)
10/19	Use BlackBoard™ to:	Take the Quiz, Read Ch 6 & 7
10/22	Week 5: <u>Hardening Steels</u> : Precipitation Hardening	
10/24	Martensite	Lab2: Workability
10/26	Use BlackBoard™ to:	Take the Quiz, Read Ch 8, 9 & 10
10/29	Week 6: <u>Common Steels</u> : Low, Medium and High Carbon Steels	
10/31	Hardenability: TTT Diagrams and The Jominy Test	Lab3: Jominy Tests
11/2	Use BlackBoard™ to:	Take the Quiz
11/5	Week 7: <u>Metallurgical Preparation Techniques</u> :	Lab3: Continued
11/7	Exam#2 (I will be at a Faculty Senate Meeting):	
11/9	Use BlackBoard™ to:	Take the Quiz
11/12	****NO CLASS: VETERAN'S DAY HOLIDAY	
11/14	Week 8: Individual Projects, Jominy Lab and Web Resources	
11/16	Use BlackBoard™ to:	Take the Quiz, Read Ch 11 & 12
11/19	Week 9: <u>Ferrous Alloys</u> : Cast Irons and Stainless Steels	Read Ch. 13, 14, 15 & 16
11/21	****NO CLASS THANKSGIVING HOLIDAY	
11/23	****NO CLASS	
11/26	Week 10: <u>Non-Ferrous Alloys</u> : Aluminum and Copper	
11/28	Magnesium and Titanium Alloys	
11/30	Use BlackBoard™ to:	Take the Quiz, Read Ch 17
12/3	Week 11: <u>Specialty Metals</u> : High Temperature Alloys	
12/5	Individual Project Work Continued (I will be at a Faculty Senate Meeting):	
12/7	We will meet to review the individual projects.	
12/10	Final: Noon on Monday, Dec. 10 in HT111.	

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall of 2000

(Class Meetings: MWF from 3 to 5PM)

(DUE)

9/25	Week 1: <u>Introduction</u> – Recent Case Studies in Materials	READ Introduction
9/27	History: Who used what, when? Why are wars fought?	CS1: Two Page Case Study (9/29)
9/29	Material Classification: Atomic (metals) vs. Molecular (polymers) (Bakelite Demo)	READ Chapters 22, 23 & 24
10/2	Week 2: <u>Material Sources</u> : Subatomic/Conversion vs. Extractive	READ Chapter 1
10/4	Life Cycle Design, Material Selection and Recycling: In-class Desc.	CS2: Two Page Case Study (10/9)
10/6	No Lecture: Life Cycle of Energy Related Materials/Products (attend the seminar!)	
10/9	Week 3: <u>Material Forming, Shaping and Properties</u> : Casting	READ Chapters 2 & 3
10/11	Physical Properties: Solid/Liquid/Vapor/Plasma	Short Lab 1: Conduction (10/13)
10/13	Mechanical Properties: Tension/Compression/Shear	Short Lab 2: Tensile Test (10/16) & Short Lab 3: Charpy Test (10/16)
10/16	Week 4: <u>Crystal Structure</u> : Unit Cells, IR vs. X-ray, Alloy Design	READ Chapter 4
10/18	Exam #1	
10/20	Microstructure Characterization: Grains	Short Lab 4: Rendering (10/23)
10/23	Week 5: <u>Microstructure, Phase Diagrams and ASTM</u> : E112	
10/25	Grain Size and Properties	Short Lab 5: Grain Size (10/30)
10/27	Phase Diagrams and Grain Size	
10/30	Week 6: <u>Steel</u> : ID and Selection	READ Chapters 5, 6 & 7
11/1	Steel Manufacture	NOTE: Advising for Winter
11/3	Fe/C Phase Diagram	Short Lab 6: Workability
11/6	Week 7: <u>Heat Treating Steels</u> : TTT Diagrams	
11/8	Exam #2	
11/10	Annealing, Stress Relief, Normalizing **Individual Project**	Ind. Projects Topic (11/17)
11/13	Week 8: <u>Hardening Steels</u> : Overview	READ Chapter 11, 12 & Appx 1
11/15	Hardenability: The Jominy Bar	Jominy Lab (12/3)
11/17	Specimen Preparation	
11/20	Week 9: <u>Specimen Preparation</u> : (continued), and Hardness	READ Chapter 26
11/22	NO CLASS! Thanksgiving Holiday	
11/24	NO CLASS! Thanksgiving Holiday	
11/29	Week 10: <u>Non-Ferrous Metals</u> : Overview	READ Chapter 14, 15 & 16
12/1	Corrosion: Aqueous & High Temperature	READ Chapter 19
12/3	Individual Project Presentations	
12/8	Final at Noon on Friday Dec 8 th Comprehensive!	

MET 351 - Metallurgy / Materials & Processes; Class Schedule for Fall of 1999

9/20	Register (Class Meetings: MWF from 3 to 5PM)			DUE:
9/22	Introduction - Content and Intent Review (selection and recycling)	Chapter 1,2		
9/24	Bonds & Materials (2.1-2), Polymers (6), Ceramics (7), Composites (8)	Chapter 3		
9/27	Week 2: <u>Material Structures</u> : Characterization (3.1,2,3)			
9/29	Atomic vs. Molecular Materials, Unit Cells (3.4, 6.0)			
10/1	Lab! (Report Guidelines)	Short Lab 1 (Classify Mat'ls)		10/11
10/4	Week 3: <u>Atomic Structure and Defects, Phase Diagrams</u> (3.1-8)	Chapter 5 (5.5)		
10/6	Grains (5.3.1 pg 235): Boundaries, Sizes & Shapes	Micrograph Activity (in class)		
10/8	Crystal Defects (review)	Short Lab 2 (Grain Size Meas.)		10/15
10/11	Exam #1	Chapter 4		
10/13	Phys and Mech Prop's (4.2) Ductility/Strength/Toughness	Short Lab 3 (Tensile Test)		10/18
10/15	Fatigue and Creep (4.2), ASTMs and Inspection (4.6)			
10/18	Week 4: <u>Physical & Mechanical Properties</u> : Corrosion	Chapter 5		
10/20	Famous Failures	Short Lab 4 (Charpy Impact)		10/27
10/22	Phase Diagrams (5.1-5.4)			
10/25	Thermal Processing (TTT Diagrams), and Heat Treating(5.5-5.7)			
10/27	Hardening and Surface Modifications (5.8)			
10/29	Exam #2			
11/1	Steel (5.10)	(Lab: Prep)	Lab 5 (Jominy I)	11/29
11/3	Cast Iron (5.10)	(Lab: Quench)		
11/5	Non-Ferrous (5.11) **Individual Project**	(Lab: Mount)	Ind. Projects	12/3
11/8	Background: Production Technology	(Lab: Grind)		
11/10	Case Study: Failure Analysis	(Lab: Polish)		
11/12	Presentations: Failure Analysis			
11/15	Thermo-Mech Processing (ASM) - Rolling	(Lab: Etch)		
11/17	Properties & Material Selection	(Lab: Image)	Lab 5 (Jominy II)	11/29
11/19	Joining Methods (ASM)			
11/22	Electronic Materials (9.1-9.4)		Chapter 9	
11/24	NO CLASS! (Thanksgiving Holiday)			
11/26	NO CLASS! (Thanksgiving Holiday)			
11/29	Electro-optical Materials (9.5-9.11)			
12/1	Biomimetics and Biomaterials (9.12-9.14)			
12/3	Project Reviews			
12/7-11	Final: 8AM Thurs. Dec 10 th	Comprehensive!		