Syllabus, Fall Semester 2009

Course Number	**ENGR 361-01**
Course Title	**Engineering Materials**
Instructors	Dr. Dennis Stephens (Metals/Alloys & Course Coordinator) Dr. Dave Meitz (Polymers/Plastics) Dr. Kent Budd (Ceramics);
Communications	dwstephens@stthomas.edu (651) 962-5750; [FAX: 962-6419] dwmeitz@mmm.com (651) 733-1433 [FAX: 575-3055] kdbudd@mmm.com (651) 733-4066; [FAX: 737-4682]
Time/Location	Monday Evening, 5:30 to 8:30 PM, OSS LL18
Required Text	W.D. Callister, *Materials Science and Engineering*, 6th or 7th Ed, John Wiley & Sons
Reference Books	M. Ashby, *Materials Selection in Mechanical Design*; ASM Engineered Materials Handbooks: Vol.2, *Engineering Plastics* & Vol.4, *Ceramics and Glasses*
Course Description	This course introduces the theory and application of engineering materials. The emphasis is on traditional structural materials, but emerging materials technology is also discussed. The physical and mechanical properties, uses and limitations of metals, polymers, ceramics, and composite materials are explored. Traditional learning may be supplemented by guest speakers or industrial tours, exposing the student to materials processing and testing.
Course Objective	This overview of engineering materials- manufacture, processing, evaluation and degradation- promotes successful selection and application of materials.
Learning Outcomes	• Communicate effectively in the terminology of materials engineering *as demonstrated by class response, homework and exams.* (ME12). • Discover the importance of materials engineering in product design and manufacture, *as demonstrated by homework, exams and application of engineering principles in the associated lab*. (ME3, 4, 8). • Explore selection and modification of materials for cost-effective performance and reliability, *demonstrated by an inquisitive nature and response to open-ended questions*. (ME2, 11, 13, 14, 16).
Course Methodology	A traditional lecture/discussion format and grading are employed. The modular approach assures instructor proficiency and depth in each topic. Demonstrations will introduce unusual materials, key processes or test methods. Material failure case studies will be discussed.
Major Assignments	Review assigned material prior to class. Lecture grades are based on homework and exams, influenced by attendance and participation.
Academic Integrity	All students are expected to understand and follow University of St. Thomas policies on Academic Integrity. These are described at: http://www.stthomas.edu/policies/student_policy_book/Academic_rights_and_procedures.htm
Students with disabilities	Contact the Enhancement Program – Disability Services to learn about classroom accommodations for qualified students. We are located in room 119 of O'Shaughnessy Educational Center. Appointments can also be made by calling 651-962-6315 or 800-328-6819, extension 6315. For more information, visit the web at http://www.stthomas.edu/enhancementprog/.

Grading Policy		
	Metals and alloys Polymers and Plastics Ceramics	150 points 75 points 75 points
	Lecture total	300 points
	Laboratory	100 points
	Course total	400 points

Biographic Sketches	**Dr. Dennis Stephens** earned a BS degree in metallurgical engineering at the University of Minnesota and PhD at Michigan Tech, also in metallurgical engineering. He has 40 years experience in heat treating, metal working and failure analysis. **Dr. David Meitz** develops retroreflective traffic control signage systems at 3M. He is a Sr. Research Specialist and graduate of Illinois-Urbana and DePaul Universities. His PhD. in polymer physical chemistry and rheology is from Carnegie-Mellon. **Dr. Kent Budd** is a Staff Scientist in 3M's Advanced Materials Technology Center, specializing in chemically derived electrical and optical ceramics. His BS and PhD Ceramics Engineering degrees were earned at the University of Illinois-Urbana.

ENGR 361-01 Course Outline, Fall Semester 2009		
DATE	**TOPIC**	**TEXT SECTIONS**
September 14	**Overview, Grading, Intro to Materials Science** Atomic structure, interatomic bonds, crystallinity	**Callister:** Skim chapter 1; read chapters 2, 3
September 21	**Mechanical properties of materials** Crystalline defects; deformation and introduction to strengthening mechanisms in metals	**Callister:** Chapters 4, 6.1-10, 7
September 28	**Alloys and Phase Diagrams** Solid solutions, diffusion and microstructure; heat treatment of non-ferrous alloys	**Callister:** Read chapters 5, 9.1-14, 10.1-4, 11.3, 11.9, Skim 11.4-6,
October 5	**Ferrous Metallurgy** Cast iron and steel: the iron-carbon system; heat treatment of steel; intro to tool steels	**Callister:** Read chapters 9.18-20, 10.5-9, 11.7-8, Skim 11.1-2
October 12	**Corrosion; Plating / Inorganic Metal Finishes** Corrosion and prevention: passivity, plating, conversion coatings, anodizing, inhibitors.	**Callister:** Read chapter 17.1-9; other materials TBA
October 19	**Introduction to Composite Materials:** Particle & fiber reinforcement, structural composites	**Callister:** Read chapter 16
October 26	**Review / Midterm Exam**	**Text, notes, handouts and homework; NO COMPUTERS**
November 2	**Polymers/Plastics I** Polymer chemistry, molecular structure	**Callister:** Chapter 14, 15.19 & 15.20
November 9	**Polymers/Plastics II** Properties: thermoplastics, thermosets & elastomers	**Callister:** Chapter 15.1-15.18
November 16	**Polymers/Plastics III** Processing, specific applications of polymers	**Callister:** Chapter 15.22-24, and Chapter 17.11-13
November 23	**Ceramics I** Chemistry and structure of ceramics; glass (amorphous) structure, processing, applications	**Callister:** Read chapters 12.1-7 and 13.1-7
November 30	**Ceramics II** Ceramic processing, mechanical properties	**Callister:** Chapter 13.8-11, 8.1-8.5, 12.8-11
December 7	**Ceramics III** Properties and applications of advanced ceramics	**Callister:** Selected portions of chapters 18-21 TBA
December 14	**Final Exams: Polymers and Ceramics**	**Text, notes, handouts and homework. NO COMPUTERS**