TO: The Faculty of the College of Engineering
FROM: Faculty of the School of Aeronautics and Astronautics
RE: New Graduate Course, AAE 54800 Mechanical Behavior of Aerospace Materials

The faculty of the School of Aeronautics and Astronautics have approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

Course no. **AAE 54800 Mechanical Behavior of Aerospace Materials**
Terms offered Fall, Lecture 3, Lab 0, Cr. 3.

Description: This course serves as an overview for materials behavior for students without a materials background, including seniors and entry-level graduate students. Materials are at the foundation for all of engineering, as evident by the latest products that we design, to the airplanes that we fly, to the latest smart phones. In fact breakthroughs with material research are often accompanied by rapid advancements in technology. Thus it is paramount for all engineers to have an understanding of the structure and behavior of materials.

In this class, we focus on the structure of materials, the microstructure connection to mechanical properties, and ultimately failure mechanisms. Materials play an important role in both design and manufacturing, which will be addressed in the context of components and extreme environments. Of specific interest will be defects within materials, defect formation/evolution, and their role in strengthening mechanisms.

Material anisotropy, micromechanisms, and elasto-plastic properties at the atomic, single-crystal/constituent, and polycrystal/material levels and their use in explaining the deformation and failure characteristics in metals, polymers, and ceramics; failure mechanisms and toughening in composites; structure and behavior of aerospace materials: metal alloys, ceramic-matrix composites, and fiber-reinforced polymer composites. Particular topics will also include: elastic deformation, dislocation mechanics, plastic deformation and strengthening mechanisms, creep, and failure mechanisms; design criteria; special topics. We will attempt to have minimal overlap with AAE 554 'Fatigue of Structures and Materials'; therefore, we will not cover fracture, fatigue, or stress concentrators.

Reason: The aerospace community has the most stringent constraints on materials usage, when considering trade-offs with reliability, lightweighting, strength, and behavior in extreme environmental conditions. Yet, in the undergraduate curriculum in the School of AAE, there is limited emphasis on topics related to materials. This course is intended to give students an intermediate level understanding of mechanical behavior of materials, yet no prior materials knowledge is necessary. This course has limited overlap with other courses offered at Purdue (MSE 555 builds on prior MSE course information and does not focus on aerospace materials & ME 569 has not been offered in 10 years, is more closely aligned to AAE 554 topics, and the proposed course goes into more depth into material structure and relationship to properties). And in the previous three times this course was offered, it has been taken by students in the following schools: AAE, ChemE, CE, EE, IE, MSE, and ME

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Tom Shih, J. William Uhrig and Anastasia Vournas Head and Professor of Aeronautics and Astronautics
School of Aeronautics and Astronautics

Office of the Registrar
FORM 40G REV. 8/16

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE (50000-60000 LEVEL)

DEPARTMENT: AAE   EFFECTIVE SESSION: Fall 2017

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [✓] 1. New course with supporting documents (complete proposal form)
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered
- [ ] 12. Transfer from one department to another

	PROPOSED:	EXISTING:
Subject Abbreviation	AAE	AAE
Course Number	54800	59000

Long Title: Mechanical Behavior of Aerospace Materials

Short Title: Mech Behavior Aero Materials

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
- [✓] Fall
- [ ] Spring
- [ ] Summer

CAMPUS(ES) INVOLVED
- [ ] Calumet
- [ ] Cont Ed
- [ ] Ft. Wayne
- [ ] Indianapolis
- [ ] N. Central
- [ ] Tech Statewide
- [✓] W. Lafayette

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range:
   Minimum Cr. Hrs
   (Check One) To [ ] Or [ ]
   Maximum Cr. Hrs
3. Equivalent Credit: Yes [ ] No [✓]
4. Thesis Credit: Yes [ ] No [✓]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
   Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees [ ] Coop [ ] Lab [ ] Rate Request
   Include comment to explain fee
6. Registration Approval Type
   Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [✓]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	75	2	15	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS): (Note: If description will not fit in space provided, please create a separate document and attach it to this form.)

See attached

*COURSE LEARNING OUTCOMES: (Note: If course learning outcomes will not fit in space provided, please create a separate document and attach it to this form.)

See attached

Calumet Department Head — Date	Calumet School Dean — Date	Calumet Director of Graduate Studies — Date
Fort Wayne Department Head — Date	Fort Wayne School Dean — Date	Fort Wayne Director of Graduate Studies — Date
Indianapolis Department Head — Date	Indianapolis School Dean — Date	IUPUI Associate Dean for Graduate Education — Date
North Central Department Head — Date	North Central School Dean — Date	North Central Director of Graduate Studies — Date
[signature] 9/6/2017 West Lafayette Department Head — Date	West Lafayette College/School Dean — Date	Date Approved by Graduate Council — Date
Graduate Area Committee Convener — Date	Graduate Dean — Date	Graduate Council Secretary — Date
		West Lafayette Registrar — Date

OFFICE OF THE REGISTRAR

Grad Form 40G must include the Graduate Council's supporting document, which is available at http://www.purdue.edu/registrar/forms/form_40_Intro.html

Course Description

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Student Learning Outcomes

Ability to express vector and tensor equations using indicial notation.

Ability to express crystallography according to Miller indices and define slip systems in basic crystal structures.

Ability to calculate and understand the physical basis of elastic anisotropy.

Ability to understand, calculate, and use basic states of stress and yield criteria.

Ability to define and understand the physical basis of point, line, and area defects in crystalline materials.

Ability to calculate the strain fields, stress fields, and energy of dislocations, in addition forces between dislocations.

Ability to understand dislocation motion as well as interactions between dislocations.

Ability to resolve shear stress on slip systems during deformation of single crystals and calculate the velocity gradient.

Ability to apply equilibrium and compatibility constraints to plastic flow of polycrystalline materials.

Ability to understand origins of twinning, stacking faults, and the shape memory effects.

Ability to understand physics and calculate strengthening influence of solutes, precipitates, grain boundaries, and strain hardening.

Ability to understand physical origins of creep, calculate creep using Larson-Miller expressions, and use creep deformation mechanism map.

Ability to understand origins of residual stress and apply to constrain problems.

Ability to understand and apply statistical approaches to identify probability of failure and property variations.

Ability to define and classify polymer structures.

Ability to understand viscoelasticity and calculate behavior using classical models.

Ability to distinguish physical mechanisms of polymer deformation, crazing, and fracture.

Ability to express stiffness and strength of fiber reinforced composite structures.

Detailed Graduate Course Proposal for Academic Review

Note: The detailed course proposal is intended for academic review by the appropriate area committee of the Graduate Council. It supplements the Form 40G that is intended for administrative review of the Graduate School and Registrar.

To: Purdue University Graduate Council

From: Faculty Member: Michael D. Sangid
Department: School of Aeronautics and Astronautics
Campus: West Lafayette

Date: January 30, 2017

Subject: Proposal for New Graduate Course

Contact for information if questions arise:
Name: Michael D. Sangid
Phone: 40146
Email: msangid@purdue.edu
Address: ARMS 3329

Course Number: AAE54800
Course Title: Mechanical Behavior of Aerospace Materials
Short Title: Mech Behavior Aero Materials

Course Description:

This course serves as an overview for materials behavior for students without a materials background, including seniors and entry-level graduate students. Materials are at the foundation for all of engineering, as evident by the latest products that we design, to the airplanes that we fly, to the latest smart phones. In fact breakthroughs with material research are often accompanied by rapid advancements in technology. Thus it is paramount for all engineers to have an understanding of the structure and behavior of materials.

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A. Justification for the Course

Justification of the need for the course

The aerospace community has the most stringent constraints on materials usage, when considering trade-offs with reliability, lightweighting, strength, and behavior in extreme environmental conditions. Yet, in the undergraduate curriculum in the School of AAE, there is limited emphasis on topics related to materials. This course is intended to give students an intermediate level understanding of mechanical behavior of materials, yet no prior materials knowledge is necessary. This course has limited overlap with other courses offered at Purdue (MSE 555 builds on prior MSE course information and does not focus on aerospace materials & ME 569 has not been offered in 10 years, is more closely aligned to AAE 554 topics, and the proposed course goes into more depth into material structure and relationship to properties). And in the previous three times this course was offered, it has been taken by students in the following schools: AAE, ChemE, CE, EE, IE, MSE, and ME.

Justification that course will be taught at a graduate level

- The course is being offered at the 500-level to allow both graduate and undergraduate students to participate. It has been offered three times, each time with enrollment of at least 20 students. This enrollment is usually split about 70/30 between graduate and undergraduate students.
- Intermediate (entry level graduate) texts are used throughout this course, along with relevant journal papers.
- At the end of the course, the students will demonstrate learning outcomes that are indicative of graduate level concepts.

Justification of the demand for the course

- Anticipated enrollment
    - Undergraduate 10
    - Graduate 30
    - Graduate (distance) 15

Justification for online delivery

This course will be offered online, due to demand by distance students. The first online delivery is expected Fall of 2018. The course is appropriate for online delivery and interactions with distance students.

B. Learning Outcomes and Methods of Assessment

Learning Outcomes	Assessment Methods
Ability to express vector and tensor equations using indicial notation.	• Individual exams and HWs
Ability to express crystallography according to Miller indices and define slip systems in basic crystal structures.	• Individual exams and HWs
Ability to calculate and understand the physical basis of elastic anisotropy.	• Individual exams and HWs
Ability to understand, calculate, and use basic states of stress and yield criteria.	• Individual exams and HWs
Ability to define and understand the physical basis of point, line, and area defects in crystalline materials.	• Individual exams and HWs
Ability to calculate the strain fields, stress fields, and energy of dislocations, in addition forces between dislocations.	• Individual exams and HWs
Ability to understand dislocation motion as well as interactions between dislocations.	• Individual exams and HWs
Ability to resolve shear stress on slip systems during deformation of single crystals and calculate the velocity gradient.	• Individual exams and HWs
Ability to apply equilibrium and compatibility constraints to plastic flow of polycrystalline materials.	• Individual exams and HWs
Ability to understand origins of twinning, stacking faults, and the shape memory effects.	• Individual exams and HWs
Ability to understand physics and calculate strengthening influence of solutes, precipitates, grain boundaries, and strain hardening.	• Individual exams and HWs
Ability to understand physical origins of creep, calculate creep using Larson-Miller expressions, and use creep deformation mechanism map.	• Individual exams and HWs
Ability to understand origins of residual stress and apply to constrain problems.	• Individual exams and HWs
Ability to understand and apply statistical approaches to identify probability of failure and property variations.	• Individual exams and HWs
Ability to define and classify polymer structures.	• Individual exams and HWs

Ability to understand viscoelasticity and calculate behavior using classical models.	• Individual exams and HWs
Ability to distinguish physical mechanisms of polymer deformation, crazing, and fracture.	• Individual exams and HWs
Ability to express stiffness and strength of fiber reinforced composite structures.	• Individual exams and HWs

Final Grading Criteria

Describing the criteria that will be used to assess students and how the final grade will be determined. Add and delete rows as needed.

Assessment Methods (should match method types in the previous table)	Weight Toward Final Course Grade
Exams and Quizzes	72%
Homework	24%
Class Participation	4%

Methods of Instruction

Class Hrs/Week	Method of Instruction	Contribution to Outcomes
3	Lecture	Each class includes a lecture given by a combination of chalkboard and PowerPoint notes. This lecture is meant to be an open discussion as students can engage with questions.
2	Independent Study	Students are assigned reading each week either in the form of textbook or journal papers.
0.25	Seminar	Two or three times a semester, students are encouraged to go to seminars that are aligned with course subjects.

C. Prerequisite(s)

- Basic mechanics of materials course, such as: AAE352, ME323, CE231 or CE270, MSE382, etc.
- No prior materials science knowledge is required.

D. Course Instructor(s)

Name	Rank	School, dept., or center	Graduate Faculty or expected date
Michael D. Sangid	Assistant Professor	AAE	Yes (C8403)

Michael D. Sangid received his B.S. (2002) and M.S. (2005) in Mechanical Engineering from the University of Illinois at Urbana-Champaign (UIUC). After his Master's degree, Dr. Sangid spent two years working in Indianapolis, IN for Rolls-Royce Corporation, specializing in material characterization, fatigue, fracture, and creep of high temperature aerospace materials before resuming his education in 2007. He received his PhD in Mechanical Engineering from UIUC in 2010 and continued as a post-doctoral associate. In the spring of 2012, Dr. Sangid started as an assistant professor at Purdue University in the School of Aeronautics and Astronautics with a courtesy appointment in Materials Engineering, where he continues his work on building computational materials models for failure of structural materials with experimental validation efforts focused at characterization of the stress/strain evolution at the microstructural scale during in situ loading. He is a recipient of the TMS Young Leaders Award, the ASME Orr Award, TMS Early Career Faculty Fellow, and the AFOSR, ONR, and DARPA Young Investigator/Faculty Awards. He is currently the Purdue lead in the Lightweight Innovations for Tomorrow (LIFT) Institute and the Advanced Analytics thrust of the Digital Manufacturing and Design Innovation Institute (DMDII).

E. Course Schedule or Outline

I.	Physical Mechanisms for Elasticity and Plasticity			
	A.	Mechanics Preliminaries		
		1.	Indicial notation	1 hour
		2.	Crystallography	1.5 hours
	B.	Elasticity		
		1.	Physical basis and links to crystallography	1 hour
		2.	Anisotropy and stress-strain relationships	1.5 hours
		3.	States of stress and yielding	1 hour
		4.	Example of crystal rotation	0.5 hours
	C.	Dislocation Mechanics		
		1.	Definitions and basics	1 hour
		2.	Elastic properties	2 hours
		3.	Energies	1 hour
		4.	Forces	1 hour
		5.	Obstacles to dislocation motion	1 hour
		6.	Partial dislocations and stacking faults	1 hour
II.	Deformation and Strengthening Mechanisms			
	A.	Plastic Deformation		
		1.	Single crystal plasticity	1.5 hours
		2.	Polycrystalline plasticity	2 hours
		3.	Twinning and shape memory	1.5 hours
	B.	Strengthening Mechanisms		
		1.	Solid solution strengthening	1 hour
		2.	Precipitates	1 hour
		3.	Strain hardening	1 hour
		4.	Grain boundaries	1 hour
	C.	Creep		
		1.	Overview of phenomenon	0.5 hour
		2.	Larson Miller creep	1 hour
		3.	Deformation Mechanism Map	1.5 hour
		4.	Case study: ice deformation	0.5 hour
III.	Engineering Materials			
	A.	Thermomechanical loading		
		1.	Residual Stresses	1 hour
		2.	Contact Mechanics	0.5 hour
		3.	Case study: two-bar problem	1 hour
	B.	Ceramics and statistical failure		
		1.	Ceramics and Weibull statistics	1.5 hour
		2.	Probability of failure	1 hour
		3.	Property variability	1 hour
	C.	Polymers and Composites		
		1.	Polymer structure	1 hour
		2.	Time dependency and visco-elasticity	1 hour
		3.	Polymer failure mechanisms	1 hour

4.	Composites overview	1.5 hours
5.	Composite elasticity	0.5 hour
6.	Composites strength	2 hours

F. Reading List (including course text)

Primary Reading List

- "Mechanical Behaviour of Engineering Materials: Metals, Ceramics, Polymers, and Composites," Roesler, Joachim, Harders, Harald, Baeker, Martin; Springer, 2007; ISBN 978-3-540-73446-8.
- "Mechanical Behavior of Materials," by William F. Hosford; Cambridge; ISBN-10: 0521846706
- Online book: Defects in Crystals by Helmut Foll: http://www.tf.uni-kiel.de/matwis/amat/def_en/index.html

Secondary Reading List

- Mechanical Behavior of Materials, Thomas H. Courtney, McGraw Hill
- Mechanical Behavior of Materials, Norman E. Dowling, Prentice Hall
- Deformation and Fracture Mechanics of Engin. Material, Richard W. Hertzberg, Wiley
- Materials Science and Engineering, An Introduction, William D. Callister, Wiley
- Mechanics of Materials, James M Gere & Barry J. Goodno, Cenage Learning
- Introduction to Dislocations, D Hull & DJ Bacon, Butterworth-Heinemann
- Microstructural Design of Fiber Composites, Tsu-Wei Chou, Cambridge
- Theory of Dislocations, Hirth & Lothe, Krieger
- Crystals, Defects, and Microstructure, Rob Phillips, Cambridge

G. Library Resources

Name of journal, proceedings, book, video, or other acquisition	**Already in Libraries?**
Mechanical Behaviour of Engineering Materials: Metals, Ceramics, Polymers, and Composites, Joachim Roesler, Harald Harders, Martin Baeker, Springer.	Yes
Mechanical Behavior of Materials, William F. Hosford, Cambridge.	Yes
Mechanical Behavior of Materials, Thomas H. Courtney, McGraw Hill	Yes
Mechanical Behavior of Materials, Norman E. Dowling, Prentice Hall	Yes
Deformation and Fracture Mechanics of Engin. Material, Richard W. Hertzberg, Wiley	Yes
Materials Science and Engineering, An Introduction, William D. Callister, Wiley	Yes
Mechanics of Materials, James M Gere & Barry J. Goodno, Cenage Learning	Yes
Introduction to Dislocations, D Hull & DJ Bacon, Butterworth-Heinemann	Yes
Microstructural Design of Fiber Composites, Tsu-Wei Chou, Cambridge	Yes
Theory of Dislocations, Hirth & Lothe, Krieger	Yes
Crystals, Defects, and Microstructure, Rob Phillips, Cambridge	Yes

H. Course Syllabus (now required)

Example shown from Spring 2017.

AAE 590 Mechanical Behavior of Materials

Course Registration Numbers: 18360

Schedule: Tuesdays and Thursdays at 10:30 – 11:45 am in 3115 ARMS

Instructor: Michael D. Sangid; Email: msangid@purdue.edu
Office: 3329 ARMS; Telephone: 494-0146
Office Hours: Wednesdays 3:00 – 4:00 pm
Immediately before or after class
Additionally available by appointment

Please note: To ensure that everyone has the same access to questions/answers, please ask questions about the HW during class or seek HW help in the scheduled office hours. Emailing questions should be avoided. Also, please do not ask general/vague questions, such as 'how do I do #X (while showing up with no prior work)?' or 'is this right?'

Prerequisites: AAE 204 / AAE 352 – No prior knowledge of materials science is needed

Required Text: "Mechanical Behaviour of Engineering Materials: Metals, Ceramics, Polymers, and Composites," Roesler, Joachim, Harders, Harald, Baeker, Martin; Springer, 2007; ISBN 978-3-540-73446-8.
Can be downloaded for Purdue students for via going through the Purdue library website and entering the title into the keyword search:
http://www.springer.com/materials/mechanics/book/978-3-540-73446-8

Recommended Text:
"Mechanical Behavior of Materials," by William F. Hosford; Cambridge; ISBN-10: 0521846706
Online book: Defects in Crystals by Helmut Foll:
http://www.tf.uni-kiel.de/matwis/amat/def_en/index.html

Supplemental Texts:
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Deformation and Fracture Mechanics of Engin. Material, Richard W. Hertzberg, Wiley
Materials Science and Engineering, An Introduction, William D. Callister, Wiley
Mechanics of Materials, James M Gere & Barry J. Goodno, Cenage Learning
Introduction to Dislocations, D Hull & DJ Bacon, Butterworth-Heinemann
Microstructural Design of Fiber Composites, Tsu-Wei Chou, Cambridge
Theory of Dislocations, Hirth & Lothe, Krieger
Crystals, Defects, and Microstructure, Rob Phillips, Cambridge

Course Website:
We will be using Blackboard

The current schedule as well as supplementary information will be kept on the website. The HW and figures displayed in class will be found in the restricted access folder.

Course Description:

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Approach: Active learning – classes are a mixture of lecture and discussion

Students are expected to be present and prompt for class, to keep up with the materials and homework assignments, and to live up to the highest standards of honesty and integrity. Lectures will include presentation of concepts and methods and working of examples. A typical class period will include a lecture highlighting the important concepts and integrating examples. Students are encouraged and expected to be lively and participate with the lectures. The class notes will be given on the blackboard with figures shown on the overhead (the figures will be made available through the class website). It is expected that the students come to class and take notes. If a student cannot make it to class, they should arrange to get the notes from one of their classmates.

Homework: Assigned weekly on the previous Thursday (given on website) and due on the following Thursday. You are allowed to drop the lowest score out of the 10 HW assignments. You may work in teams of 1 to 3 on the HW. Please write each of your names on the HW assignment that you turn in.

The HW is for your own benefit and is necessary to properly learn the material. It is expect that each student put forward an honest effort in solving each problem. Working together is not a means to 'divide up' the work. If you turn in an assignment with more than one name on it; each person must have put forth their best effort on every problem and discussed this problem with the group. Any abuse of this policy and we will go back to individual assignments.

Grading: 3 Credit Hours – HW (24%), Midterm 1 (24%), Midterm 2 (24%), Final (24%), and In-Class Participation & Exercises (4%). In general, we will have a 90%|80%|70%|60% grade scale with +/- grades. Depending on how the class performs on its assignments and tests, the instructor reserves the right to curve the scale in the favor of the class, if necessary, based on his discretion. Grades will never be curved downward.

Definition of Academic Dishonesty: Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty" (*University Regulations*, Part 5, Section III, B, 2, a). Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest" (University Senate Document 72-18, December 15, 1972).

Academic Integrity: "Purdue University values intellectual integrity and the highest standards of academic conduct. To be prepared to meet societal needs as leaders and role models, students must be educated in an ethical learning environment that promotes a high standard of honor in scholastic work. Academic dishonesty undermines institutional integrity and threatens the academic fabric of Purdue University. Dishonesty is not an acceptable avenue to success. It diminishes the quality of a Purdue education which is valued because of Purdue's high academic standards" (S. Akers, *Academic Integrity, A Guide for Students*, 1995, revised 1999). Also, see PURDUE UNIVERSITY CODE OF HONOR

Honors Credit: It is possible to take AAE590 for honors credit with approval from the instructor. The idea of extra projects involving teaching others (in some form of outreach) what you've learned in the class has always been appealing. Wikipedia is a very powerful tool for this, although a lot of resources already exist for mechanical behavior of materials. An honors class project for AAE 590 will consist of creating/modifying a Wikipedia page with concepts, applications, and/or examples from aerospace structural analysis (with your choice of topics from class). The topic is due on Thursday, March 30, 2015. Please include a printout of the original page that you intend to modify or the search result containing no wiki found for that topic. The project is due Thursday, April 20, 2017. Please email me a URL link to your Wikipedia website and turn in a printout of the page.

Students with Disabilities: Students with disabilities requiring additional assistance should make themselves known to the instructor.

Campus Emergency: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control.

Additional Information: This class will uphold Purdue University's policies on 'Attendance and Grief Absence', 'Adverse Weather', 'Campus Emergency', etc. Please consult purdue.edu for more information.

			Topic	Reading	HW Due Dates
	Week	**1**			
1	Tues	10-Jan	Into and Mechanics Prelim	Ch 1; App. A	
2	Thur	12-Jan	Crystallography	App. B; 6.2.4	
	Week	**2**			
3	Tues	17-Jan	Elasticity - physical basis and link to crystallography	Ch 2	
4	Thur	19-Jan	Elasticity - anisotropy; stress-strain relationship		1
	Week	**3**			
5	Tues	24-Jan	States of Stress and Yielding, Ex of Rotation	3.1-3.3.3;3.5	
6	Thur	26-Jan	Dislocation Mechanics - Basics & Elastic. Prop	6.1-6.2	2
	Week	**4**			
7	Tues	31-Jan	Dislocation Mechanics - Basics & Elastic. Prop	6.2	
8	Thur	2-Feb	Dislocation Mechanics - Energy and Forces	6.3	3
	Week	**5**			
9	Tues	7-Feb	Dislocation Mechanics - Obstacles	6.2	
10	Thur	9-Feb	Dislocations - Partials and Stacking faults	6.3	4
	Week	**6**			
11	Tues	14-Feb	Review and Catch-up (Exam Covers Lect. 1-10 / HW 1-4)		
12	Thur	16-Feb	Plastic Deformation - single crystal	6.5	
	Thur	***16-Feb***	***Midterm Exam I- 6:30-7:30 pm in ARMS 1103***		
	Week	**7**			
13	Tues	21-Feb	Plastic Deformation polycrystal	6.4	
14	Thur	23-Feb	Twinning and Shape Memory	6.4	5
	Week	**8**			
	Tues	28-Feb	*No class - TMS conference*		
	Thur	2-Mar	*No class - TMS conference*		
	Week	**9**			
15	Tues	7-Mar	Strength. Mech. - Solid Solution; Precip. Strengh.	7.1-7.2;7.5	
16	Thur	9-Mar	Strength. Mech. - Strain Hardening; Grain Boundary	7.3	6
	Week	**10**			
	Tues	14-Mar	*No class - Spring Break*		
	Thur	16-Mar	*No class - Spring Break*		

			Topic	Reading	HW Due Dates
	Week	**11**			
17	Tues	21-Mar	Creep - Overview, Phenomenon, and Larson Miller	11.1	
18	Thur	23-Mar	Creep - Deformation Map and Example	11.2	
	Week	**12**			
19	Tues	28-Mar	Two bar ex, residual stress, and contact mechanics		7
20	Thur	30-Mar	Review and Catch-up (Exam Covers Lect. 12-18 / HW 5-7)		
	Week	**13**			
	Mon	***3-Apr***	***Midterm Exam II- 6:30-7:30 pm in ARMS 1103***		
21	Tues	4-Apr	Ceramics and Weibull Statistics (*)		
22	Thur	6-Apr	Statistics; Probability of Failure; Property Variability		8
	Week	**14**			
23	Tues	11-Apr	Polymer Structure	8.1;8.3;8.5-7	
24	Thur	13-Apr	Polymer Time Dependency and Visco-Elasticity	8.2	9
	Week	**15**			
25	Tues	18-Apr	Polymer Mechanical Behavior and Failure	8.4; 8.8	
26	Thur	20-Apr	Composites Behavior-I	9.1-9.3	
	Week	**16**			
27	Tues	25-Apr	Composites Behavior-II	9.4	10
28	Thur	27-Apr	Review and Catch-up (Exam Covers Lect. 19-27 / HW 8-10)		

Final Exam (TBD during week of 5/1/17 to 5/6/17)

(*) Denotes guest lecturer

EMERGENCIES CALL 911
PURDUE POLICE & FIRE

EMERGENCY PREPAREDNESS SYLLABUS ATTACHMENT

EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.

- **Indoor Fire Alarms** mean to stop class or research and immediately **evacuate** the building.
  - Proceed to your Emergency Assembly Area away from building doors. **Remain outside** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
- **All Hazards Outdoor Emergency Warning Sirens** mean to immediately seek shelter (**Shelter in Place**) in a safe location within the closest building.
  - "Shelter in place" means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency*. **Remain in place** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

**In both cases, you should seek additional clarifying information by all means possible...Purdue Emergency Status page, text message, Twitter, Desktop Alert, Albertus Beacon, digital signs, email alert, TV, radio, etc....review the Purdue Emergency Warning Notification System multi-communication layers at* http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html

EMERGENCY RESPONSE PROCEDURES:

- Review the **Emergency Procedures Guidelines** https://www.purdue.edu/emergency_preparedness/flipchart/index.html
- Review the **Building Emergency Plan** (available on the Emergency Preparedness website or from the building deputy) for:
  - evacuation routes, exit points, and emergency assembly area
  - when and how to evacuate the building.
  - shelter in place procedures and locations
  - additional building specific procedures and requirements.

EMERGENCY PREPAREDNESS AWARENESS VIDEOS

- "Shots Fired on Campus: When Lightning Strikes," is a 20-minute active shooter awareness video that illustrates what to look for and how to prepare and react to this type of incident. See: http://www.purdue.edu/securePurdue/news/2010/emergency-preparedness-shots-fired-on-campus-video.cfm (Link is also located on the EP website)

MORE INFORMATION

Reference the Emergency Preparedness web site for additional information: https://www.purdue.edu/ehps/emergency_preparedness/