

Spring 2018

MSE 624 – Failure Analysis (class#15606)

Time: Tues 7:00 – 9:45 pm, room JD 1552

Instructor: Dr. Behzad Bavarian

Office: JD 3513, Office Hour: T 6:00 – 7:00 pm, Tel: 818-677-3917

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Lectures: <http://Canvas.csun.edu>

Course Description: An introductory course in failure analysis using basic materials properties and engineering principles for understanding the causes of failures and methods of preventing future failures by applying the lessons learned in the process of studying failures. A number of real-life case studies will be used to reinforce topics discussed in the lectures.

Learning Objectives: To understand the principles of engineering and science in applications of materials and design. To learn to find information in literature and other available sources. To learn to use information systems (computer, internet, and other available sources) in engineering practice. Special emphasis is placed on methodology and presentation of conclusions.

Methods of Student's Evaluation: One Mid-Term examination and a Final Examination. Case studies (homework), Term Paper and a 10-minute Oral Presentation of Term Paper.

Text Book: Donald J. Wolpi, Understanding How Components Fail, 3rd Edition, Published by ASM International, 2013.

References:

1. ASM Metals Handbook, 10th Edition, Volume 11
2. R. W. Hertzberg, R. P. Vinci and J.L. Hertzberg, Deformation and Fracture Mechanics of Engineering Materials, 5th Ed., J. Wiley & sons, 2013.
3. G. E. Dieter, Mechanical Metallurgy, McGraw-Hill, Inc., 1986
4. Case Histories in Failure Analysis, ASM International, 1979
5. T. L. Anderson, Fracture Mechanics, Fundamentals and Applications, CRC 1995
6. William D. Callister Jr, and David G. Rethwisch, Fundamentals of Materials Science and Engineering: An Integrated Approach, John Wiley & Sons, NY, 4th Edition, 2012.
<http://www.wiley.com/college/callister>

Grading Policy:	Mid-term	35%
	Term Paper/ Oral Presentation,	15% (Report Due by May 8, 2018)
	Assignments	10%
	Final Exam	40%

Grading System: A through F with Plus/Minus Grading

Homework format: Short report (~3-4 pages on the subject including the list of references)

Schedule of Class:

Date	Topic	Reading Assignment and homework
January 23	General Procedures of Failure Analysis	Chapters 1, 2 and 3 Chapt. 12 (Hertzberg, ref#2), and Appendix D
January 30	Types of Failures	Chapters 4, 5 & 6 HM: Root Cause Analysis
February 6	Ductile and Brittle Failures	Chapters 7, 8, 9
February 13	Fatigue Failures	Chapter 10 HM: SEM/EDAX application
February 20	Wear Failures	Chapter 11 and 12
February 27	Corrosion Failures	Chapter 13 Product liability
March 6	Corrosion Fatigue, Hydrogen Damage, Fracture Mechanics	Chapter 15 HM: Implants failures
March 13	Mid-Term	
March 27	High Temperature Failures	Chapter 14 Oral Presentation
April 3	Cast & Wrought Failures, Weld, Braze and Soldering Failures	Oral Presentation
April 10	Tool Failures, Shafts & Bearing Failures	Oral Presentation
April 17	Gear & Spring Failures	Oral Presentation HM: Aircraft failures
April 24	Fastener Failures	Oral Presentation
May 1	Boiler, Heat Exchangers and Pressure Vessel Failures	Oral Presentation HM: Failures in Electronics
May 8	Composites, Ceramics and Polymer Failures	Oral Presentation
May 15	Final	8-10pm