# Course Syllabus

**Instructor:**

| Name | Office | E-mail | Phone |
|---|---|---|---|
| Mr. Kevin Calabro | JMP 2108 | kcalabro@umd.edu | 301-405-2983 |

**Teaching Assistants:**

| Name | Office | E-mail |
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| Mr. James Baldwin | JMP 2102 | baldwinj929@gmail.com |
| Mr. Randall Kania | JMP 2102 | randall.j.kania@gmail.com |

**Office Hours:** By Appointment

**Course Description:**
Why did the Silver Bridge between Ohio and West Virginia collapse on Christmas Eve, 1967? What caused the top of an Aloha Airlines flight to rupture, creating a convertible airplane? How do these kinds of massive structural damage occur, and how might we prevent them? This course will introduce students to topics of stress and strain and their importance in determining the safety and reliability of engineering structures. Some of the major structural failures worldwide will be identified and researched as to the circumstances leading up to the failures. Reasons for failures will be investigated and are expected to include engineering, social, political, ethical, and economic explanations. Other possible failures to be researched and analyzed would be the collapse of a walkway in Kansas City, the failure of the Tacoma Narrows Bridge in Washington, the collapse of a bridge on Interstate 95 in Connecticut, and the collapse of the Twin Towers in New York after 911. Students in the seminar will determine the exact cases to be explored. Students will frequently test materials in the laboratory to better understand different types of failure that can occur and to try to better understand what can be done to prevent these failures. Testing machines in the J. M. Patterson Building will be used for the laboratory component of the work.

**University of Maryland Policies for Undergraduates:**
Policies relevant to Undergraduate Courses are found here: http:ugst.umd.edu/courserelatedpolicies.html. Topics that are addressed in these various policies include academic integrity, student and instructor conduct, accessibility and accommodations, attendance and excused absences, grades and appeals, copyright and intellectual property.

**Basic Needs Security:**
If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live and believe this may affect your performance in this course, please visit http://go.umd.edu/basic-needs for information about resources the campus offers you and let me know if I can help in any way.

**Course Materials:**
Ressler, S. (Director). (2011). *Understanding the World's Greatest Structures: Science and Innovation from Antiquity to Modernity* [Video series]. The Great Courses. Chantilly, VA.

- Many videos available through YouTube.com
- Online streaming videos may be purchased for $39.95 at: https://www.thegreatcourses.com/courses/understanding-the-world-s-greatest-structures-science-and-innovation-from-antiquity-to-modernity.html

**Course Objectives:**
During this course, students will learn the many modes in which engineering failures can occur. Students will learn to read information on various engineering failures and develop the ability to use that information along with the technical expertise that they will develop to explain to a lay audience the reasons for the failure, its impact on those affected by it, and the lessons learned from the failure. We are interested in not only the immediate effect but also its effect on designs of the future, the economy, and society in general. It is expected that all students taking the class will participate in class discussions in an open and friendly manner.

**Homework Policy:**
Homework will be assigned as the material is covered and is expected to be completed by the start of class on the deadline date. All written assignments require a PDF file upload through Canvas by the start of class on the assignment due date. An assignment that is not turned in at that time will be accepted by the beginning of the next class period for 80% credit. *No assignment will be accepted beyond that time.* Students are encouraged to discuss and formulate solutions to the assignments by working together, but assignment sets *must* be completed and submitted by each individual team. *Copying is unacceptable and will not be tolerated*.

**Grading Policy:**

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| Class Discussions | 15% |
| Laboratories | 40% |
| Presentation 1 | 15% |
| Presentation 2 | 30% |
| | 100% |

**Tentative Schedule of Lecture Topics:**

| | Date | Topic | Homework Deadline |
|---|---|---|---|
| 1 | Tu, 8/27 | Introduction to Course, Discussion of major failure topics<br>Video 01: Learning to See and Understand Structure | |
| 2 | Th, 8/29 | Video 02: The Science of Structure – Forces in Balance<br>Discussion of Tension Failure | |
| 3 | Tu, 9/3 | Discussion of Material Properties in Tension<br>Preparation for Tension Testing Lab | Video 03<br>Video 04 |
| 4 | Th, 9/5 | Tension Testing (Lab 1) | |
| 5 | Tu, 9/10 | Analysis of Tension Data<br>Discussion of Shear Failure | |
| 6 | Th, 9/12 | Preparation for Shear Testing Lab | |
| 7 | Tu, 9/17 | Shear Testing (Lab 2)<br>Analysis of Shear Data | |

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| 8 | Th, 9/19 | Discussion of Buckling Failure<br>Tension Testing - Revisited<br>Column Buckling Lab design | Lab 1<br>Video 05 |
| 9 | Tu, 9/24 | Column Buckling Testing (Lab 3A)<br>Video 06: Building Across – Beams and Bending | Video 08 |
| 10 | Th, 9/26 | Discussion of Flexural Stresses<br>Bending Testing (Lab 3B)<br>Video 09: Loads and Structural Systems | Lab 2 |
| 11 | Tu, 10/1 | Video 17: Great Cantilever Bridges - Tragedy and Triumph<br>Introduce student presentation requirements/expectations<br>Students work on presentations in class | Video 09 |
| 12 | Th, 10/3 | Students work on presentations in class | Video 11 |
| 13 | Tu, 10/8 | Discussion of Combined States of Stress | Video 12 |
| 14 | Th, 10/10 | Student Presentations 1 | Lab 3A or 3B<br>Video 13 |
| 15 | Tu, 10/15 | Student Presentations 1 | |
| 16 | Th, 10/17 | Student Presentations 1 | |
| 17 | Tu, 10/22 | Truss design project | Video 07 |
| 18 | Th, 10/24 | Truss design project | Video 14 |
| 19 | Tu, 10/29 | Truss design project | |
| 20 | Th, 10/31 | Truss design project | |
| 21 | Tu, 11/5 | Science, technology and society considerations | Video 19 |
| 22 | Th, 11/7 | Science, technology and society considerations | |
| 23 | Tu, 11/12 | Truss design project | |
| 24 | Th, 11/14 | Truss design project | |
| 25 | Tu, 11/19 | Truss design project | |
| 26 | Th, 11/21 | Course conclusions | Video 24<br>Lab 4 |
| 27 | Tu, 11/26 | Students work on presentations in class | |
| 28 | Th, 11/28 | Thanksgiving break | |
| 29 | Tu, 12/3 | Student Presentations 2 | Presentation 2 |
| 30 | Th, 12/5 | Student Presentations 2 | |
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| | TBA | Final Exam – Student Presentations 2 | |