



[Course Information](#)

[Contact Information](#)

[Course Description](#)

[Learning Resources, Technology & Texts](#)

[Learning Outcomes](#)

[Assignments](#)

[Grading Scale](#)

[Attendance Policy](#)

[Course Schedule](#)

[Classroom Guidance Regarding Protect Purdue](#)

[Academic Integrity](#)

[Nondiscrimination Statement](#)

[Accessibility](#)

[Mental Health/Wellness Statement](#)

[Emergency Preparation](#)

Course Information

- **AAE 554 - Fatigue of Structures and Materials**
- **CRN's:**
 - **Engineering Professional Education (EPE): 21055**
 - **On campus (001): 21567**
- **Instructional Modality: Async Online with exams in person for those on campus.**
 - *For EPE students, you must arrange for an in-person proctor in accordance with EPE rules. EPE students must take the exam +/- 1 day of the on campus students. 3 credit hours*
 - *For on campus students (001), you will have exams in person at specified times. 3 credit hours*
- **Prerequisites (if any): Prior undergraduate course in mechanics of materials (such as AAE 204)**

Instructor(s) Contact Information

- **Name of the instructor: Michael Sangid**
- **Office Location: 2027 ARMS**
- **Office Phone Number: 765-494-0146**
- **Email: msangid@purdue.edu**
- **Instructor Office/Consultation: by appointment**

- **Name of the teaching assistant (TA): Patrick Morrison**
- **TA's Email: morri585@purdue.edu**
- **TA's Office/Consultation Hours:**
 - **Tuesdays (starting Aug 29): 3 to 5 pm EST in room HAMP 2117 and via <https://purdue.webex.com/meet/morri585>**

Course Description

Development and application of methods for predicting the fatigue life of structural components. Characterization and response of materials to cyclic loading. Fatigue resistant design of aerospace structures. Both fatigue crack initiation and crack propagation concepts are discussed.

Learning Resources, Technology & Texts

- **Highly Recommended Textbook**
 - *Metal Fatigue in Engineering*, Ali Fatemi, Wiley, 9780471510598 (available online via Purdue Libraries, by clicking [here](#) and in Brightspace)
- **Other Supplementary Readings**
 - *Mechanical Behavior of Materials*, Norman E. Dowling, Prentice Hall (a print copy may be available in the Engineering library)
 - *Fatigue of Materials*, Subra Suresh, Cambridge (available online via Purdue Libraries, by clicking [here](#) and in Brightspace)
 - *Fundamentals of Structural Integrity*, A.F. Grandt, Jr., Wiley (a print copy may be available in the Engineering library)
 - Additional relevant journal papers will be posted to Brightspace
- **Brightspace learning management system**

Learning Outcomes

By the end of the course, you will be able to:

- Develop methods for characterizing fatigue resistance of materials
- Predict cyclic lives of structural components
- Apply approaches for preventing fatigue failures through materials selection, fatigue resistant design, and "fleet management" concepts
- Examine crack initiation and crack propagation approaches for life assessment

Assignments

Your learning will be assessed through a combination of weekly homework and two exams spread throughout the academic period. Details on these assignments and exams, including a schedule of due dates will be posted on the course website.

Assignments	Due	Percentage
Homework (11x)	Throughout the semester	25%
Midterm	TBD – Middle of Semester	35%
Final (cumulative)	End of semester	40%
		Total: 100%

- **Homework (10 total, 25%, ongoing)** - Assigned weekly on the previous Tuesday (given on Brightspace) and due on the following Thursday by 10:00 AM ET via Brightspace. Late HW will not be accepted.
 - The HW is for your own benefit and is necessary to properly learn the material. It is expected that each student put forward an honest effort in solving each problem. Although discussion of assignments between students is permitted, **the solution should represent your own efforts and understanding of the problem. Blatant copies of the solutions will not be accepted, and repeated evidence of copying will lead to failure of the course.**

- **In most cases, homework will be graded within 1-2 weeks after the due date of the submission. In most cases, the answer key will be available within a week of the submission.**
- Lastly, the purpose of homework assignments is for students to gain further understanding of classroom principles through application to practical problems. A critical aspect is problem solving and thinking about strategies to solve each question. This training is important to your overall understanding of the material and the ability to do well on the exams.
- HW will be graded based on approach, demonstration of work, and effort (not necessarily on the answer). **Full credit will be given if the student has demonstrated that thought and effort has been put into the solution and the student is on the right track.** If the question is not attempted, minimal effort is given, the student gives a flippant response, or the trajectory towards the solution is completely off path, then no credit will be given for this question. The individual HW will not be marked up to identify where the student deviated from the path and give partial credit, as we would rather dedicate this time to spending time with students a priori and towards teaching. **Instead, a detailed HW solution will be given to the students after the HW is submitted. This HW solution can be used as a study guide towards the exam.**
- 11 HWs will be assigned, only the highest 10 scores will count towards your grade. In other words, students are allowed to drop 1 HW score. This is intended, so students can manage their other responsibilities for work, other class projects, research, travel, etc. that might come up during the semester.
- **Midterms (1 total, 35%, October 5th, 8-10 pm, HAMP 1144)** - The midterm will be held at night for on campus students, to allow students more time and space. For EPE students, they must arrange for a proctor in accordance to EPE rules. EPE students must take the exam +/- 1 day of the on campus students.
 - A non-communicating calculator and 8.5"x11" crib sheet are allowed. The crib sheet must be hand-written and cannot be duplicated and used by another student. The material on the exam will be closely related to the lectures and types of questions asked on the HW.
 - The exam solutions will not be distributed to the students, but will be reviewed in class. Exam grades will not be openly discussed. If the students have grade appeals, they must submit a written appeal along with the original copy of their graded exams within one week of the exams being returned. The exam will be re-graded, which may reduce the overall grade, as any grading that was too generous may be corrected.
- **Final Exam (1 total, 40%, DATE TBD)** – The exam will be accumulative. The final exam date/time is determined by the registrar. For distance students, they must arrange for a proctor in accordance to EPE rules. Distance students must take the exam +/- 1 day of the on campus students.
 - A non-communicating calculator and 8.5"x11" crib sheet are allowed. The crib sheet must be hand-written and cannot be duplicated and used by another student. The material on the exam will be closely related to the lectures and types of questions asked on the HW.

Grading Scale

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.

A+: 96.5-100%
 A: 93.1-96.4%
 A-: 89.5-93.0%
 B+: 86.4-89.4%
 B: 83.1-86.3%
 B-: 79.5-83.0%
 C+: 76.4-79.4%

C: 73.1-76.3%
 C-: 69.5-73.0 %
 D+: 66.4-69.4%
 D: 63.1-66.3%
 D-: 59.5-63.0%
 F: 59.4% or below

Attendance Policy

This is considered an asynchronous class and therefore I am not taking attendance. It is your job to stay up-to-date with the readings, digital discussions, video lectures that I post each and completing your digital notebook, group project, and individual project to meet the timelines.

In the event that you contract COVID-19 and are unable to meet the deadlines and expectations of the course, please contact me as soon as possible to work out alternative options.

Course Schedule

The “suggested” completion dates for each module are based on HW due dates. However, you are more than welcome to move ahead through the modules if you would like.

Module # and Title	Suggested Completion Date	Assignments
1 - Introduction to Fatigue	August 24, 2023	Introduce Yourself Discussion Board
2 – Design for Fatigue	August 31, 2023	Homework 1
3 – High Cycle Fatigue	September 7, 2023 September 14, 2023	Homework 2 Homework 3
4 – Low Cycle Fatigue	September 21, 2023 September 28, 2023	Homework 4 Homework 5
5 – Physics of Fatigue	October 12, 2023	None
6 – Multiaxial Fatigue	October 19, 2023	Homework 6
7 – Fatigue Crack Growth	October 26, 2023 November 2, 2023 November 9, 2023	Homework 7 Homework 8 Homework 9
8 – Sequencing Effects	November 16, 2023	Homework 10
9 – Environmental Effects	November 30, 2023	Homework 11

* Schedule and assignments subject to change. Any changes will be posted in the learning management system.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.”

The Honor Pledge Task Force, a student organization responsible for stewarding the mission of the Honor Pledge and encouraging a culture of academic integrity, has asked to prominently include the following student-initiated Purdue Honor Pledge on the syllabus, as well as exams and HW assignments:

The [Purdue Honor Pledge](#) “As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue”

In general, notes, exams, exam solutions, homework's, and homework solutions are considered to be *'derivative works'* of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials. As such, they cannot be sold or bartered without express written permission of the instructor. Specifically, you are **not** allowed to post any course materials or derivative works of this class on commercial websites.

Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our course Brightspace under University Policies.

Accessibility

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247."

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [WellTrack](#). Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one-on-one virtual or in-person sessions with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Emergency Preparation

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. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

Missed or Late Work

The student must notify me three business days before the due date if you need extra time to submit your assignment. Asking for an extension does not guarantee it will be granted. Without advance notice, late exams or homework assignments will not be accepted without penalty unless there are extenuating circumstances beyond the student's control (e.g., illness, family emergency, bereavement, etc.). To ensure fairness in the class, the instructor will not make the solutions available until all students have turned in that assignment, including approved late submittals. If the solutions are posted, accepted late assignments will no longer be accepted.

Incompletes

A grade of incomplete (I) will be given only in unusual circumstances. To receive an "I" grade, a written request must be submitted prior to December 1, and approved by the instructor. The request must describe the circumstances, along with a proposed timeline for completing the course work. Submitting a request does not ensure that an incomplete grade will be granted. If granted, you will be required to fill out and sign an "Incomplete Contract" form that will be turned in with the course grades. Any requests made after the course is completed will not be considered for an incomplete grade.

Copyright

Online educational environments, like all learning environments, should provide opportunities for students to reflect, explore new ideas, post opinions openly, and have the freedom to change those opinions over time. Students enrolled in and instructors working in online courses are the authors of the works they create in the learning environment. As authors, they own the copyright in their works subject only to the university's right to use those works for educational purposes (Visit [Purdue University Copyright Office](#)). Students may not copy, reproduce or post to any other outlet (e.g., YouTube, Facebook, or other open media sources or websites) any work in which they are not the sole or joint author or have not obtained the permission of the author(s).

Netiquette

Your instructor and fellow students wish to foster a safe online learning environment. All opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea, but you are not to attack an individual. Our differences, some of which are outlined in the University's nondiscrimination statement below, will add richness to this learning experience. Please consider that sarcasm and humor can be misconstrued in online interactions and generate unintended disruptions. Working as a community of learners, we can build a polite and respectful course ambience. Please read the Netiquette rules for this course:

- Do not dominate any discussion. Give other students the opportunity to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Avoid using vernacular and/or slang language. This could possibly lead to misinterpretation.
- Keep an "open-mind" and be willing to express even your minority opinion.
- Think and edit before you push the "Send" button.
- Do not hesitate to ask for feedback.

Violent Behavior Policy

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

See the [University's full violent behavior policy](#) for more detail.

Diversity and Inclusion Statement

In our discussions, structured and unstructured, we will explore a variety of challenging issues, which can help us enhance our understanding of different experiences and perspectives. This can be challenging, but in overcoming these challenges we find the greatest rewards. While we will design guidelines as a group, everyone should remember the following points:

- We are all in the process of learning about others and their experiences. Please speak with me, anonymously if needed, if something has made you uncomfortable.
- Intention and impact are not always aligned, and we should respect the impact something may have on someone even if it was not the speaker's intention.
- We all come to the class with a variety of experiences and a range of expertise, we should respect these in others while critically examining them in ourselves.

Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students from 8:00 – 5:00, Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency funds. Click [here](#) for details and the request form. Primarily through the Dean of Students Office, Purdue has a range of ways to support students through times of struggle and insecurity. In addition to highlighting the availability of the Dean of Students, you can find additional resources in the following links:

- [ODOS overall resources portal](#)
- [Student of concern reporting](#)
- The [ACE Campus Food Pantry](#)

Course Evaluation

During the last two weeks of the course, you will be provided with an opportunity to evaluate this course and your instructor. Purdue uses an online course evaluation system. You will receive an official email from evaluation administrators with a link to the online evaluation site. You will have up to two weeks to complete this evaluation. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

Student Help and Success

Your Brightspace course shell includes links to the following student resources under the Student Help and Success content, from here you may find links to the following student services.

- Registrar
- Financial Aid
- Academic Advising
- Veterans Success Center
- Student Employment
- Center for Career Opportunities.

Disclaimer

This syllabus is subject to change. Relevant changes to this course will be announced and posted on the course website via Brightspace.