

**COURSE DETAILS & CLASS SCHEDULE**

Class	Section	Number	Lecture	Location
ARO3271	1	73163	7:00 am – 8:15 pm MW	13-1229
ARO3271	2	73164	8:30 am – 9:45 pm MW	13-1229

Week	Date	Day	Lecture	Topics	ASHvI Chapters	Online or In-class
1	01/25	M	1	Plastic Bending of Beams - Elasto-Plastic	1.0-2.2	F2F
	01/27	W	2	Plastic Bending of Beams - Cozzone's Method	2.3	F2F
2	02/01	M	3	Fatigue	3.0-3.3	F2F
	02/03	W	-	<b>Test#1 (L1-2)</b>	---	F2F
3	02/08	M	4	The Endurance Limit	3.4-3.5	F2F
	02/10	W	5	Fluctuating Stresses	3.6-3.7	F2F
4	02/15	M	6	Cumulative Fatigue Damage	3.8	F2F
	02/17	W	7	Fracture Mechanics - Stress Intensity & Mod Factor	4.0-4.3	F2F
5	02/22	M	8	Fracture Mechanics - Linear Elastic Crack Growth	4.0-4.3	F2F
	02/24	W	-	<b>Test #2 (L1-6)</b>	---	F2F
6	03/01	M	9	Fasteners: Non-Aerospace Standards & Strengths	5.0-5.2, 5.5	F2F
	03/03	W	10	Fasteners: Aerospace Standards & Strengths	5.3-5.4	F2F
7	03/08	M	11	Fasteners: Shear Analysis	5.6	F2F
	03/10	W	12	Fasteners: Tension & Preloaded Joints	5.7	F2F
8	03/15	M	13	Fasteners: Tension & Fatigue of Preloaded Joints	5.8	F2F
	03/17	W	-	<b>Test #3 (L1-11)</b>	---	F2F
9	03/22	M	14	Welds: Design & Analysis	6.0-6.4	F2F
	03/24	W	15	Welds: Simplified Analysis & Strength	6.2-6.4	F2F
H	03/29	Tu	H	Holiday (Easter Break)	---	---
	03/31	Th	H	Holiday (Easter Break)	---	---
10	04/05	M	16	Welds: Fatigue Analysis	6.5-6.7	F2F
	04/07	W	-	<b>Test #4 (L1-14)</b>	---	F2F
11	04/12	M	17	Stability of Flat Plates	8	F2F
	04/14	W	18	Buckling & Crippling of Thin-Flanged Sections	9	F2F
12	04/19	M	19	Effective Sheet Widths & Inter-Rivet Buckling	10	F2F
	04/21	W	20	Euler-Johnson & Stiffened Columns	11	F2F
13	04/26	M	21	Buckling of Cylinders	12	F2F
	04/28	W	-	<b>Test #5 (L1-19)</b>	---	F2F
14	05/03	M	22	Buckling of Curved Panels	13	F2F
	05/05	W	23	Shear Resistant Beams	14	F2F
15	05/10	M	24	Diagonal Tension Beams	14	F2F
	05/12	W	25	Review	14	F2F
16	05/17	Tu	-	<b>Section 2 - Final Exam (L1-23, 7:00 am-8:50 am)</b>	---	F2F
	05/19	Th	-	<b>Section 1 - Final Exam (L1-23, 7:00 am-8:50 am)</b>	---	F2F

Note: This syllabus plan is subject to change. Keep your eyes peeled for updates & have the latest on hand.

**GRADING SCALE & WEIGHTS**

**Grade Weights:** 10% HW, 30% Quizzes, 50% Tests (10% Ea.), 10% Final Exam.

**Grade Scale:** 93% A, 90% A-, 87% B+, 83% B, 80% B-, 77% C+, 73% C, 70% C-, 66% D+, 61% D, 56% D-.

**WELCOME**

Welcome to Aerospace Structures II (ARO3271)!

This class is the second of two strength classes required for Aerospace Students. These classes have been engineered to provide you with everything you need to be a productive aerospace strength engineer on the first day of your job or internship. This means the content is engineered to hit the most important topics, and to cover them in a way that is practical, understandable and usable. This class is loaded with content to achieve this goal, but if you apply yourself fully and are able to master these principles to a passing level, you will reap the benefits later when you find yourself well-armed to productively contribute in your aerospace structures internship or job.

I hope you find this journey towards engineering greatness enjoyable.

**INTRODUCING YOUR INSTRUCTOR**

**Name:** Todd Coburn, PhD, PE, DER  
**Office:** 17-2111  
**Office Hours (F2F):** 10-11 am M-Th  
**YouTube Link:** <https://www.youtube.com/c/ToddCoburn>

**Website:** <http://toddcoburn.com/CPP>  
**E-Mail:** [tdcoburn@cpp.edu](mailto:tdcoburn@cpp.edu)  
**Zoom Link:** <https://cpp.zoom.us/j/9025008018>

**COURSE INFORMATION****Course Description:**

Plastic Bending. Fatigue under cyclic & fluctuating stresses. The endurance limit. Miner's rule. Fracture Mechanics. Fasteners. Analysis of 2D fastener patterns & welded connections. Static & fatigue analysis of preloaded bolted joints. Fatigue of welded joints. Shear resistant beams. Stability of flat & curved plates & cylinders. Crippling. Effective width of thin sheet. Euler Johnson Allowable. Aerospace nomenclature & applications.

**Prerequisites, Co-Requisites & Necessary Skills:**

- C or better in ARO 3261 or C or better in ARO 326 and ARO 327.
- It is critical that students master the principles of equilibrium, equivalent force systems, free-body diagrams, and the like from statics (ARO2041), & basic stress calculation techniques from ARO3261. Failure to master these principles will likely leave students ill-prepared to master this course, and may mean significant additional effort will be needed to keep up with the pace of this course.

**Required (Hardcopy) Text:**

- Aerospace Strength Handbook, Vol. II, 1<sup>st</sup> Edition, by Todd Coburn, KDP. 10 March 2021.

**Recommended Supplemental Texts (Hardcopy Recommended):**

- Bruhn. Analysis & Design of Flight Vehicle Structures. S.R. Jacobs & Associates. 1973.
- Peery. Aircraft Structures. Dover. 2011. (Previously from McGraw-Hill in 1950).
- Flabel. Practical Stress Analysis for Design Engineers. Lake City Publishing. 2013.

**Required Tools:**

- Pencil, Paper (Quad or Quint Pad Recommended)
- Engineering or Scientific Calculator
- Computer with strong, stable and reliable internet connection & camera for zoffice.
- Efficient Scan-to-pdf capability for tests & homework.

**Class Format & Expectations:**

This class is a face-to-face (F2F) class and all students are required to attend each class session.

In the event that the university reverts to online teaching due to unplanned events, then the class will revert to online format. This syllabus covers both events, and will be modified as needed to adjust to current events and class updates & improvements. Be sure to keep the latest copy of this syllabus on-hand.

Canvas will be used to deliver information about the course, including information about lectures, homework, quizzes and tests. In the event of an unplanned switch to online, Canvas will also be used to identify precisely which aspects of the class will change, and this syllabus will be updated accordingly. Announcements in Canvas will also be used to provide up-to-date information about the course, including any significant changes to the course, syllabus, or grading scales.

The primary aspects and flow of this course will be as follows:

#### Attendance:

- Attendance is required at all class meetings.
- Any students not present when role is called on the first week of class will be dropped from the course.
- Class meetings will be face-to-face in the assigned classroom.
- In the event of an unscheduled switch to Online Format, Canvas will be used to communicate what changes will be made to the course.
- In the event of an unscheduled switch to online format, class meetings will likely revert to virtual format using zoom. Watch Canvas communications for emergent updates.
- Any & all Zoom classes will utilize the zoom link above (also shown in header).

#### Lectures:

- Lectures will be delivered F2F during class-time, unless changed thru Canvas communication.
- Lectures for the course are also available on YouTube (see link above).
- YouTube lectures can be used to get a head start on the material & for reviewing concepts & topics.
- For best results, watch each YouTube lecture a time or two to reinforce the F2F lecture.

#### Homework:

- Homework (HW) is required for each lecture, and will be delivered & collected thru Canvas.
- HW must be worked by hand in a clear, step-by-step fashion.
- Students are encouraged to create excel spreadsheets where appropriate for repetitive calculations.
- Answers to HW problems are provided so students can evaluate the accuracy of their solutions.
- HW is expected to be worked immediately & completed before the next lecture.
- HW must be graded before submittal according to the grading metric below.
- Completed & graded HW must be uploaded to Canvas in a legible pdf before the due date.
- HW is due by the following class but will be collected as a single scan of one or more assignments.
- HW collected in bunches must be given a title page that is identified and scored as detailed below.
- Late HW is not accepted.
- HW must be neat and clear to receive full credit. Sloppy or unclear work will be docked 5-30%.
- Missed HW will be scored as -20% points.

#### Quizzes

- Unannounced Quizzes will occur nearly every F2F lecture. Be in class on time so you don't miss them.
- Online quizzes will also be administered, as announced in Canvas.
- Quizzes will be comprehensive, including simple content from prerequisite courses, and may cover material from any prior lecture.
- Online Quizzes will be scheduled in Canvas. Read Canvas carefully for all deliverables.
- No make-up Quizzes will be administered.
- F2F quizzes are open book & closed notes. Students may use their textbook and/or any of the recommended texts, and a standard calculator. They may not use notes, computers, ipads, laptops, or other devices. No electronic texts allowed.
- Online quizzes are open book and open notes. Students may use their textbook and/or the recommended textbooks, their own work, and their computer, including excel. They may not use any homework, excel, or other content generated by other students.
- Students using excel for online quizzes need to take special care that solutions show sufficient step-by-step detail that their approach and solution can be verified easily. Otherwise full credit will not be given.
- Students are not allowed to communicate with others during any F2F quiz, nor to communicate about the content of any online quiz while its window for taking it is open.
- Students are not allowed to distribute Quiz questions to others before, during or after Quizzes.
- Missed quizzes will be scored as -20% points.
- During F2F Quizzes, students must remain in their seat except to turn in their work. Getting out of their seat for any other reason without permission will result in a score of zero for the quiz.

**Tests**

- Tests are shown in the syllabus and also in Canvas.
- Tests will be F2F unless announced differently in Canvas.
- F2F tests are open book & closed notes. Students may use their textbook and/or any of the recommended texts, and a standard calculator. They may not use notes, computers, ipads, laptops, or other devices. No electronic texts allowed.
- During F2F Tests, students must remain in their seat except to turn in their work. Getting out of their seat for any other reason without permission will result in a score of zero for the test.
- Online tests are open book and open note. Students may use their textbook and/or the recommended textbooks, their own work, and their computer, including excel. They may not use any homework, excel, or other content generated by other students.
- Online tests will be available only during the open test window noted in Canvas.
- Online tests will require hand analysis for many problems. This hand work must be scanned or uploaded to a legible pdf & submitted to Canvas within 15 minutes of the close of the Test window.
- Hand solutions (whether for F2F or as pdf scan for online test) must be legible, complete, and provide a step-by-step solution of each problem in the order presented. Any Excel analysis used must also be scanned, and should provide the same clarity and quality as a hand solution.
- Sloppy work, incomplete work, difficult-to-read excel or solution procedures will be docked 5-80%.
- Answers for online tests without supporting hand work in the pdf scan will score a maximum of half credit.
- Canvas scores online tests automatically, and provides no partial credit. I will review all Test answers and adjust scores for partial credit as appropriate.
- No make-up Tests will be administered.
- Students using excel for virtual tests need to take special care that solutions show sufficient step-by-step detail that their approach and solution can be verified easily. Otherwise 5% to 80% will be deducted.
- Students are not allowed to communicate with others during any F2F or online test, nor to communicate about the content of any test while its online window for taking it is open.
- Students are not allowed to distribute test questions to others before, during or after tests.
- Missed tests will be scored as -20% points.

**Office Hours while Class is F2F**

- Office hours are held F2F in my office unless class reverts to online.

**Office Hours if Class reverts to Online**

- If class reverts to online, office hours will revert to virtual thru zoom. Watch Canvas for updates.
- Any Zoffice sessions will utilize this link: (<https://cpp.zoom.us/j/9025008018>)
- Zoffice will start as scheduled & will generally remain open until all student questions are addressed.
- Once all questions have been addressed, Zoffice will close for the remainder of the day.
- If no students show in first 5 minutes, the window will be closed for the remainder of the day.
- Zoffice often addresses important information and clarifications. Students without questions can benefit from hearing other student questions and responses. Call in to maximize your learning.

**Communications about Class:**

- The first and best method to communicate with the instructor of this class is during Zoffice hours.
- Technical course questions will only be addressed in Zoffice. Questions about the course itself can be raised in zoffice or E-Mail.
- E-Mail is intended for communication about the class itself, and will not be used for technical course-related questions, as these should be raised in zoffice.

**E-Mail Communications:**

- E-Mails for this class should have "ARO3271-Sx" in the subject line, where "x" is the section number.
- E-Mails for this class must have your full name in the signature line.
- Each E-Mail should only address a single question or topic.
- Use separate E-Mails to communicate on different topics.
- E-Mails that do not have the proper Subject line or signature will not be answered.
- Folks asking technical questions thru E-Mail will be invited to zoffice to pose their questions.

**Make-Up & Late Work**

- No make-up work will be offered and no late work will be accepted.
- Pay attention to deliverables and align your schedule accordingly.

**Emergencies**

- Students with emergency situations should contact me as soon as possible by Email with a brief description of the situation & with any documentation at hand. Be sure to title the E-Mail appropriately.

**Updates**

- Due to my consistent work and intent to improve the course, all course material, communications, scoring, and measurement exercises are subject to change.
- Any changes will be communicated through Canvas, and will be updated in the syllabus. Watch Canvas carefully to stay abreast of any changes.

**ACADEMIC INTEGRITY**

Aerospace is a powerful & dangerous field and requires the highest ethical conduct and acceptance of personal responsibility.

Any form of cheating is unacceptable and will result in immediate failure of the class.

Cheating includes the following:

- Receiving help from another individual during tests or quizzes.
- Looking at anyone's work but your own during a test or quiz.
- Communicating with other students during an exam or quiz regarding the content of that exam or quiz.
- Lying about work performed or claiming credit that was not earned.
- Distributing or sharing quiz or exam problems to others before, during or after this class.
- Sharing or viewing quiz or test materials for the class on social media sites such as Discord.

Discord Use:

- Some students find discord helpful, but it has also been abused as a platform for cheating by many.
- It is required that any discord channel for this class includes the professor (me) as a member.
- If any cheating is discovered on a Discord channel for this course, all students found on the channel will immediately drop 20% of the class cumulative points, unless I am also a member of the channel.
- Any students found cheating, as well as the discord organizer, will receive a failing grade in the class, will be reported to Judicial Affairs, and may be kicked out of the aerospace program.
- The discord organizer will not be held responsible for cheating on their discord channel only if I am a member of their channel and if they have also taken appropriate steps to prohibit & inhibit cheating.
- Sharing current or past quizzes or tests on Discord is considered cheating.
- All members of a Discord site are expected to report suspected cheating or will be held responsible as well.

Penalties of Cheating:

- Any form of cheating will result in immediate failure of the class and will be reported to academic affairs.
- Cheating on Discord will result in immediate failure of the class and other penalties, as discussed above.

Additional resources on student conduct are as follows:

- CPP Student Conduct & Integrity: <https://www.cpp.edu/studentconduct/student-conduct-code.shtml>

**ONLINE TEST PROCEDURES & EXPECTATIONS**

Tests are intended as F2D, but may revert to online if needed. Any changes will be announced in Canvas.

The following outlines procedures and expectations if online tests are used.

For online tests, each test window will generally coincide with class time, as noted in the syllabus. Be sure to start your exam early enough to get your full allotted time before the test window closes.

Each online test will consist of two parts, (1) submitting your answers in Canvas, & (2) submitting your hand solution to Canvas. Submission of your Canvas answers must occur within the allotted time window for the exam. Submission of your hand solution supporting your answers must occur within 15 minutes of the close of the exam window (this means if you start your test early you will have more time to submit your hand solution).

The following procedure summarizes how online tests can/should be completed.

- A few days before the exam, be sure to have the following:
  - A computer with a stable internet connection.
  - Engineering paper.
  - An engineering calculator capable of solving simultaneous equations.
  - Your text and handbook.
  - An efficient means to scan your work into a pdf.
  - A quiet place to work where you will not be interrupted by children, parents, pets, students, or anything/anyone else who can disrupt your focused thinking.
  - Optionally... excel, MATLAB, and/or other programs.
- When ready, and with ample time to use the full allotted time before the test window closes, open your exam in Canvas.
- Read each question carefully, and solve it systematically on your engineering paper. Be sure to list each step in the solution process. Feel free to use your calculator, excel, MATLAB, or other programming created by you to solve any systems of equations that you encounter, but be sure to set the equations up on your paper and to refer to whatever method you used to solve. Any programming used must have been created by you and cannot be shared with other students. Any programming used will later need to be included in pdf of work.
- Once you have solved each problem, check your work carefully, then enter your result in Canvas, being careful to use the units and significant figures indicated (use 5+ if not indicated).
- After systematically solving and answering each question in Canvas, submit your Canvas exam within the allotted time.
- After submitting your Canvas exam, write your name on each page of your hand solution and then organize your work sequentially. Scan your work, including any programs and program output used, to a single pdf document.
- All test work should be presented in order, including all hand work, excel files, etc used to solve the problem. Solutions should include a step-by-step procedure that is clear and easy to follow.
- Submit your pdf of your hand solution to Canvas.
- Be sure to submit the pdf of your work within 15 minutes of the close of the test window.
- Only neat, sequential, step-by-step solutions will score full credit for the scan. Sloppy work, work that is or faint or is otherwise difficult to read, and work that skips steps will not receive full credit.
- Once rested and recovered, study class homework, videos, lectures, and the text to reinforce any principles you felt you hadn't fully mastered.

Additional test notes:

- Unless otherwise directed, all test questions must be solved using hand analysis techniques.
- The pdf of your work will also be scored based on its quality and clarity.
- Although the pdf of your work is only worth a few points, sloppy or insufficient pdfs could result in penalties in scoring your Canvas entries up to and including loss of all credit for a problem.
- This means you need to answer the questions correctly and you need to have a clear engineering solution to support your work.

If you have any questions, please call in to Zoffice hours to discuss.

**HOMEWORK PREPARATION & GRADING EXPECTATIONS**

Each student must grade their own homework prior to submittal using a colored pen or marker that stands out from your work. Any ungraded or unidentified work will not be scored, & will show a zero in my gradebook. Detailed grading procedure as follows.

**Identifying Homework:**

- HW must have the student's name written legibly at the top of the cover sheet and also on the top of each page.

**Homework Grading Procedure:**

- Score each problem as follows:
  - **SETUP:** Score 3 point if all the following is present in your solution:
    - Name, Class, & HW Number clearly legible on the top of each page.
    - Problem Number - Identified (1, 2, 3, etc) & circled
    - Given, Find, & Solution are clearly marked & appropriate pertinent data recorded within.
    - Work is neat and comprehensive and complete (worked to solution).
    - All pertinent equations are presented as needed to support analysis.
    - Sketches & FBD's present as needed to support work.
    - Problem is worked to completion & all answers are boxed.
  - **ACCURACY:** Score 0, 1, or 2 additional points, as follows.
    - If all answers of a problem are boxed & match the answer provided, score 2 points.
    - In only some of the answers provided match the solution, score 1 point.
    - If no answer is provided, score 0 points (as if you got it right).
- This means each problem score will range from 1 to 5 based on the above.
- Sum your scores to the top of the first page with the total points earned over the total possible (5 times the number of problems), and circle the total score conspicuously.
- If you want me to see or score something, write "See XYZ" & I will take a look & evaluate.
- I will make any modifications to the grades as needed, and may score punitive point reductions if I feel the scoring is intentionally misleading.
- Any ungraded homework or HW without a name will not be scored, and will show a zero in my gradebook.
- Mis-graded homework will receive zero points, or will be heavily penalized.
- Take your time and grade your own work accurately.
- I may deduct points on any HW that is not neat and clear and that does not follow a reasonable solution approach. Make your work neat, clear, logical, and correct.
- Engineering is an exact science requiring attention to detail. Be sure to score your work accordingly.

**Clarity & Neatness:**

- Communication of solution procedure and legibility of work is important in engineering.
- Sloppy and/or indecipherable work will be penalized 5-30%.

**When Multiple Assignments are due together:**

- When multiple HW assignments are due at one time, each assignment must show its own circled score (scored/possible) on its first page, AND a cover sheet must be provided that shows the circled total score for all assignments (scored/possible). Improperly shown scores will lose credit.

If there are questions, see me.

**UNIVERSITY STUDENT SUPPORT**

A number of resources for students are offered by the university. The following lists a few of these.

- [IT Resources](#) for students
- [Learning Resource Center for tutoring in many courses](#)
- [Library Resource Guides](#)
- [LinkedIn Learning](#)
- [Student Health and Wellbeing](#) - this website leads you to many student services including [Counseling](#), the [Disability Resource Center](#), [Health Services](#), the [Integrated Care Network](#), [Survivor Advocacy Services](#), and the [Bronco Wellness Center](#)
- [Student Success Central](#) - this website leads you to many resources including those related to COVID19.
- [Veterans Resource Center](#)

**CONCLUDING REMARKS**

The foregoing contains a lot of information that is critical for mastering structural analysis procedures and for performing in the class. Read this syllabus carefully, and refer to it as needed to remain abreast of the expectations for the course. Watch Canvas diligently to remain abreast of changes, corrections, and clarifications for the class.

While diligence and personal initiative are critical for maximizing academic performance, be sure to monitor your attitude and outlook so that you enjoy your time invested mastering this material. Also, try to imagine the dividends that the mastery of these concepts will pay into your future career, and into the lives of your family in the future.

May the Lord bless you as you endeavor to master this material.