

ARO3261 AERO STRUCTURES I**SYLLABUS**Dr. Todd D. Coburn. tdcoburn@cpp.edu. (909) 869-2235. Office 17-2111.

Office Hours: 9:45 am-11:15 am MW, 11:30 am-Noon TuTh (2020 S).

| Class | Section | Number | Lecture | Location |
|---------|---------|--------|------------------------|--------------------|
| ARO3261 | 1 | 34550 | 11:30 am – 12:45 pm MW | Bldg 13, Room 1229 |

CLASS SCHEDULE for Section 1 (MW)

| Week | Date | Day | Lecture | Topics | Chapters | | HW Due |
|------|--------|-----|---------|--|--------------|----------------|--------|
| | | | | | TDC | B&J | |
| 1 | 20-Jan | M | - | Holiday | --- | --- | - |
| | 22-Jan | W | 1 | Axial Force vs Deflection & Stress vs Strain | 1.0-2.9, A-F | 1 & 2 excerpts | - |
| 2 | 27-Jan | M | 2 | Deflections, Thermal, Running Loads & Energy | 2.10-2.16 | 1 & 2 excerpts | 1 |
| | 29-Jan | W | 3 | Stress Concentrations for Axial Loads | 2.17-2.18,C | 2.10-2.11 | - |
| 3 | 3-Feb | M | 4 | Pure Shear Stress & Strain | 3.0-3.4 | 1, 2.7 | 2-3 |
| | 5-Feb | W | 5 | Stresses at Fasteners: Shear, Bearing & Tear-Out | 4.0-4.6 | 1.2, 2 | - |
| 4 | 10-Feb | M | 6 | Torsion of Circular Sections | 5.0-5.2 | 3.1-3.5 | 4-5 |
| | 12-Feb | W | - | Test #1 (Lectures 1-5) | --- | --- | - |
| 5 | 17-Feb | M | 7 | Torsion & Twist of Non-Circular Sections | 5.3 | 3.6-3.10 | 6 |
| | 19-Feb | W | 8 | Torsion & Twist of Thin Closed Sections | 5.4 - 5.6 | 3.6-3.10 | - |
| 6 | 24-Feb | M | 9 | Bending: Symmetric Sections & Lumped Sections | 6.1, 6.13 | 4.1-4.3 | 7-8 |
| | 26-Feb | W | 10 | Bending: Sections of Multiple Materials | 6.2-6.3 | 4.4 | - |
| 7 | 2-Mar | M | 11 | Bending: Eccentric & Unsymmetric Loading | 6.8 | 4.7-4.9 | 9-10 |
| | 4-Mar | W | - | Test #2 (Lectures 1-10) | --- | --- | - |
| 8 | 9-Mar | M | 12 | Beams: w, V & M Diagrams & Singularity Functions | 6.11-6.13 | 5.1-5.5 | 11 |
| | 11-Mar | W | 13 | Beam Deflection & Slope: The Elastic Curve | 7.0-7.3 | 9.1, 9.3 | - |
| 9 | 16-Mar | M | 14 | Beam Deflection & Slope: Indeterminate | 7.5 | 9.2, 9.4 | 12-13 |
| | 18-Mar | W | 15 | Beam Deflections: Use of Canned Equations | 7.4 | 9.2, 9.4 | - |
| 10 | 23-Mar | M | 16 | Shearing Stresses in Beams | 8.0-8.2 | 6.1-6.3 | 14-15 |
| | 25-Mar | W | 17 | Shear in Thin-Walled Open Sections | 8.3 | 6.4 & 6.6 | - |
| 11 | 30-Mar | M | - | Holiday - Spring Break | --- | --- | - |
| | 1-Apr | W | - | Holiday - Spring Break | --- | --- | - |
| 12 | 6-Apr | M | - | Test #3 (Lectures 1-16) | --- | --- | 16-17 |
| | 8-Apr | W | 18 | Shear Center | 8.4 | 6.4 & 6.6 | - |
| 13 | 13-Apr | M | 19 | Stability of Columns | 9.0-9.4 | 10.1 | 18 |
| | 15-Apr | W | 20 | Oblique, 3D & Principal Stresses | 10.0 - 10.4 | 7.1-7.4 | - |
| 14 | 20-Apr | M | 21 | Stress Transformations & Mohr's Circle | 10.5 - 10.6 | 7.1-7.4 | 19-20 |
| | 22-Apr | W | 22 | Thin-Walled Pressure Vessels Plus | 11.0-11.5 | 7.6 | - |
| 15 | 27-Apr | M | 23 | Failure Theories & Interaction Equations | 12.0-12.6 | 7.5 | 21-22 |
| | 29-Apr | W | 24 | Castigliano's Theorem | 13.0-13.4 | 11.1,2,7,8 | 23 |
| 16 | 4-May | M | - | Test #4 (Lectures 1-22) | --- | --- | 24 |
| | 6-May | W | 25 | Review | 13.0-13.4 | 11.1,2,7,8 | - |
| F | 11-May | M | - | Final Exam (cum) 11:00 AM - 12:50 PM | --- | --- | - |

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

GRADING SCALE & WEIGHTS

Grade Weights: 15% Homework, 15% Quizzes, 60% Tests (15% Each), 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-.

IMPORTANT INFORMATION & EXPECTATIONS**Required (Hardcopy) Text:**

- Aerospace Strength Handbook, Vol. I, r4, by Todd Coburn, Bronco Copy'n Mail. 6 January 2020.

Recommended Supplemental Texts (Hardcopy Recommended):

- Beer, Johnson, DeWolf & Mazurek. Mechanics of Materials. 7th. McGraw Hill. 2015.
- 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

Prerequisites:

- C or better in ARO2040, and MAT 1161.

Course Description:

Fundamental concepts of stress & strain, including transformation equations & Mohr's circle. Mechanical properties of aerospace materials. Elastic stress-strain relations. Analysis of stress and deformation in members subject to axial, torsional, bending, shearing, and combined loading. Statically indeterminate analysis. Introduction to strain energy & Castigliano's Theorem. Shear, bending & twist of single & multi-celled beams. Aerospace nomenclature & applications.

Communications about Class:

- E-Mail communication for this class should have "ARO3261 Sx" in the title, where "x" is the section number.
- Each E-Mail should only address a single question or topic. Use separate E-Mails to communicate on different topics.

Attendance:

- Attendance is required. Every class has deliverables which will result in loss of points if missed.
- Be on time to class. Late arrival will result in loss of homework, project & quiz points.
- Students who are absent or late during the add/drop period will be dropped from the class.

In-Class Expectations:

- Cell phones & laptops may not be used in class at any time. Each use will result in -10 points.
- Eating, drinking & sleeping are not allowed in the classroom. Each violation will result in -10 points.
- Cheating is unacceptable and will result in immediate failure of the class.

Identifying Work:

- All student work (HW, Quiz, Test, etc) must have the student's name written legibly at the top, AND ALSO have the first three letters of their last name written in large capital letters at the uppermost left corner of the first page.
- Missing name or 3-letters will score -2 points each.

Participation & Extra Credit:

- Participation in class is desired, recommended, and rewarded.
- Extra credit (XC) is given for a number of reasons to encourage participation.
- Extra credit is announced by E-Mail, Blackboard (Bb), and verbally in class. Be careful to follow instructions to claim your extra credit, when applicable.
- To claim extra credit verbally announced in class, claim it by writing "+x XC for xyz" (where "x" is the number of points announced and "xyz" is a brief description for what it was for) after your HW score on HW following the XC award,
- For example, if the instructor is late or lectures overtime, +1 XC is often awarded per minute late or over (overtime is common, late is rare). This award is not obligatory nor guaranteed, but will be announced by instructor in class if applicable. Students are welcome to request this in-class when it applies. If for example, the instructor lectures 5 minutes overtime and announced +5 OT EX, students should write "+5 XC for OT" following HW score on the next HW turned in. Students who neglect to claim this XC on the following HW, or who record it incorrectly, will not receive the XC.

Homework Expectations & Guidelines:

- Homework (HW) due-dates are shown in the Syllabus.
- Missing HW assignments will score -5 points (that means zero minus 5, not the score minus 5).

- Homework is due at the start of class.
- Any HW turned in during class, but after the official start of class will lose between 1 and 5 points.
- HW turned in after class ends, but the same day, will only receive half credit.
- HW turned in one or more days late will be scored as zero, but this will remove any negative score for the missing assignment.
- Collaboration on homework is recommended. Copying is considered cheating.
- Homework must be graded by student per grading procedure shown below prior to submittal.
- Ungraded & misgraded homework submittals will be heavily penalized, and may receive zero points. Grade accordingly.

Blackboard (Bb) Homework & Quiz Expectations:

- There will be a number of Bb HW & Quiz assignments. These assignments and their due dates will be announced by Bb must be submitted on time for credit.
- Bb homework & quizzes must be taken within the allotted time. No make-ups will be offered.
- Electronic glitches can happen. Take each exercise early.
- Bb & online quizzes must be taken individually without collaboration or help from others.
- Scores for Bb HW & Quizzes will be announced thru Bb and/or within the assignment.
- HW will often allow between 1 and unlimited tries, and scores will generally be the high score or the average score, as announced.
- Quizzes will often allow between 1 and 3 tries, and scores may be the first try, average, or last score, as announced.
- Watch for details of the number of tries and the scoring within each Bb assignment.
- Many of the HW Bb sets are designed to teach simple concepts that are bolstered by repetition and/or by evaluation of nuance and variation of the concept. Many of these will allow students to take the assignment multiple times (sometimes allowing 1, 2, 5... even unlimited attempts). This allows students who understand a concept to dispatch the assignment and to move on, while enabling students who have not mastered the concept to practice until they have mastered it. Students are encouraged to take these as many times as needed until mastery is achieved.

Quiz & Test (In-Class) Expectations & Guidelines:

- Quizzes will be given nearly every class. Expect them & be prepared.
- Quizzes will usually be given at the start of class. Late arrival will likely miss the quiz.
- No make-up quizzes or exams will be administered, except for pre-arranged excused absences.
- Students missing quizzes without prior notification to instructor will be scored zero -5 points.
- Most quizzes & exams will be open book (hardcopy or Paperbound only) & closed notes. No self-bound or electronic texts are allowed during exams.
- Students missing exams without prior notification to instructor will be scored zero -20 points.
- No electronic devices (including electronic texts) except calculators will be allowed during exams or quizzes.
- Seating will be rearranged for every test & some quizzes. Plan to sit alone & to do your own work.
- During quizzes & tests, talking, communicating, sharing with other students, and getting out of seat without permission are not allowed and will result in a score of zero for the quiz or exam.
- Raise your hand to be recognized if you need something during a quiz or test and do not get out of your seat without permission except to turn in your completed work. Violations will result in zero points for subject work, and may result in failure of class.
- Sloppy work will be penalized with -1 to -full credit for each problem. Be neat & show all work.

Syllabus Updates:

- The syllabus is your roadmap to the course.
- Updates to the content & order of topics may be made and will be posted as needed.
- Changes to the Syllabus will be announced in class and/or thru Bb.
- Each student is responsible to have the latest copy, to be aware of the content, and to be prepared for each class, assignment, quiz and test.

HOMEWORK GRADING PROCEDURE

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, AND ALSO have the first three letters of their last name written in large capital letters at the uppermost left corner of the first page.
- Missing name or 3-letters will score at least -2 points each, and may receive a score of zero if instructor cannot determine author.

Homework Grading Procedure:

- Score each problem as follows:
 - **SETUP:** Score 1 point if all the following is present in your solution:
 - Problem Number - Identified (1, 2, 3, etc) & circled
 - Given, Find, & Solution - Clearly marked & appropriate pertinent data recorded.
 - Sketch – Pertinent sketch of problem shown.
 - Neatness – Setup is legible & clear.
 - *This point is only available if you also attempt to solve the problem. There are no points offered for simply setting up the problem without also attempting to solve it.*
 - **WORK:** Score 2 additional points if all the following is present in your solution:
 - Equations – All pertinent equations needed and/or used are shown
 - Sketches & FBDs – Includes sketch of problem or idealization & FBDs showing applied loads and reactions wherever possible.
 - Neatness – All work is legible and clear.
 - Complete - 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. Penalty can range from -1 point to loss of entire assignment score.

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.

ADDITIONAL HELPS**Library Resource Center:**

The Learning Resource Center (LRC) in the library offers one-on-one and group tutoring for the Graduation Writing Test (GWT), writing assignments, and science, engineering, math, business, and music courses. They also schedule workshops throughout the semester on various topics. Study habits and notetaking skills are also offered through their Learning Strategists. They offer drop-in, appointment, and online services. For more information, please visit their website or contact them directly. Standard hours & contact info are as follows:

- Website: www.cpp.edu/lrc
- Location: 15-2921 & 2919 (library's second floor)
- Phone: (909)869-3502
- Hours: Mon-Thur 9 am to 7 pm, and Fri 9 am to 4 pm

Supplemental Instruction:

Technology-Assisted Supplemental Instruction (TASI or simply SI) is a program to provide supplemental instruction to students in the hopes of improving passing rates in bottleneck courses. This service is offered for ARO3261 this semester on Tuesdays and Thursdays from 12 noon to 1 pm in room 9-243 starting February 3rd. Jonathan Nguyen, one of my prior top performers in this class, will be leading the SI Session.

Study sessions may include lectures, but will more often consist of group activities solving problems or discussing solution approaches. Students who attend are invited to keep a detailed record of their attendance (only full attendance in a day counts) for extra credit. In order to score your extra credit, you will need to E-Mail your record of attendance to me by COB April 29th. I will award +2 XC per full session attended. I will check your personal attendance record versus the official record received from TASI. Any discrepancies may result in negative points being awarded (I am sure this will never happen).

Immersing yourself in this subject with others for an additional hour or two per week may be just what you need to really nail this material.

- Contact: Jonathan Nguyen, jvn@cpp.edu
- Location: 9-243
- Time: TuTh 12-1 pm