

Course Policies and Procedures
BCN 2405C Construction Mechanics

Prerequisites

MAC 3233, PHY 2004, and PHY 2004L

Description

Structural behavior of loads resisting members in buildings. Properties of structural materials. Primarily for Building Construction majors.

Objectives

To study forces, materials and their strengths particular to construction, to include analysis for structural systems: beams, columns, frames, trusses. Students will also learn axial stress, strain, properties of materials, beam analysis, shear and moment diagrams, bending and shearing stress, deflection and design of typical building beams.

Course Learning Outcomes

Upon completion of the course students will demonstrate their ability to:

1. Understand various types of measurement systems for force, area, length etc., and scalar and vector quantities for construction materials. ACCE SLO 19
2. Understand various force systems, e.g., con-current, non-concurrent and parallel force systems and equilibrium to explain forces in structures and behavior of construction materials. ACCE SLO 19
3. Apply the concepts of structural mechanics to understand beam reactions, bending, shear, deflection, compression and tension, as applicable, in beams, columns, trusses, walls and footings. ACCE SLO 19
4. Quantify and analyze the internal and external forces acting within and upon a structural component under various anticipated loading conditions. ACCE SLO 19
5. Understand effects of moments of inertia, sectional modulus, radius of gyration and modulus of elasticity on axial stress, strain, shear, moment, bending and shearing stresses, and deflection of various structural systems. ACCE SLO 19
6. Understand basic principles of equilibrium and structural behavior of beams, frames, footings, trusses and columns. ACCE SLO 19
7. Understand basic material properties of concrete, steel and timber for design and selection of beams, frames, trusses and columns. ACCE SLO 8.

Required Texts

Applied Statics and Strength of Materials, Sixth Edition, Limbrunner and Craig T. D’Allaird, Pearson Prentice Hall, 2016.

Class Teaching Assistant

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| Mr. | Mehdi Tadayon | RNK 328 |
| Phone | | 273-1179 |
| E-mail | | tadayon@ufl.edu |
| Office hours | | TBA |

Mehdi will be teaching lab. classes, once a week, on Fridays or Mondays. Mehdi will maintain the course website, grade homework assignments and help students with the assigned HW. Course website will be used for homework and exam grades, attendance grades, homework solutions, exam solutions and important announcements. Please contact him for discussing homework and exam grades as well.

Instructor

Dr. Ajay Shanker, PE, RNK 331 Rinker Hall, 273-1162, shanker@ufl.edu.

| Grading | Points |
|--------------------|---------------|
| Best 4 Exams | 400 |
| Attendance | 50 |
| Best 5 Pop Quizzes | 100 |
| Homework | 100 |
| Total | 650 |

Students are advised to adhere to highest norms of honesty as spelled out in the student honor code during exams. Students should also avoid any action that may even lead to perception of cheating or dishonesty in exams. Therefore, talking, exchanging books or notes, sitting close to another student in exams, wearing sunglasses or caps is strictly prohibited during exams. Instructor may assign seating to a specific student before or during an exam.

All exams are open books, open notes and have equal weight. One extra (make-up) exam and two extra quizzes will be scheduled for absences because of medical reasons, school-related activities, family issues, emergencies, work-related issues and other unforeseen circumstances. No make-up exams or quizzes will be given. If a student misses more than one exam or more than two quizzes; for valid school related or medical reasons; alternate arrangements will be made. The fifth exam will be scheduled in the finals week. Best four exam grades out of possible five exam grades will be used for the final grade calculation. The dates of exams are listed in the course outline but can change at instructors' discretion. To complete the course syllabus in time, exam solutions will be posted on the Internet. All matters about change of grade for exam/quiz/HW should be initiated within a week with the class TA by e-mail after grades or solutions are posted. Depending on raw scores instructor may choose to curve any or all exams.

All absences in exams will incur a zero. Students are, therefore, advised not to miss any exam especially during first five exams. If a student were to miss more than one exam for valid and well documented reasons, for example, taking part in school related activities or medical conditions etc., final exam grade will be used for missed exams as well.

An extra (makeup) exam is already scheduled; no additional makeup exam will be given to any student under any circumstance. Exams cannot be administered before or after the scheduled time.

Grading Scale

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|---------------------|---------------------|--------------------|---------------------|---------------------|--------------------|
| 0-389 E ; | 390-410 D- ; | 411-431 D ; | 432-454 D+ ; | 455-475 C- ; | 476-496 C ; |
| 497-519 C+ ; | 520-540 B- ; | 541-561 B ; | 562-584 B+ ; | 585-616 A- ; | 617-650 A . |

Office Hours

Many office-hour issues can be dealt by e-mail in a very efficient manner. Increasingly, I am spending more and more time answering students' e-mails. So please e-mail if you have any questions. Always write **BCN 2405C, Section Number, and your Name** in the subject line.

For help with lectures and homework please come during office hours after making an appointment day or two before by an e-mail. Please keep your appointment time to 15 minutes, (e.g., 12:45PM - 1:00PM). Also suggest one or two alternate times for scheduling other student requests. I will send you an e-mail about the appointed time. The office hours are given below:

Mondays 1:00 PM to 2:00 PM
Wednesdays 1:00 PM to 2:00 PM
Thursdays 3:00 PM to 5:00 PM

ASSESSMENT METHODS

| Assessment | SLO 08 | SLO 19 |
|------------|--------|--------|
| Exam 1 | | X |
| Exam2 | | X |
| Exam 3 | | X |
| Exam 4 | X | X |
| Exam 5 | X | X |

| Assessment | Target |
|------------|-------------------------------------|
| All Exam | At least 80% receive a C- or better |
| Homework | At least 70% receive C- or better |

Scanner

Documents can be scanned in all on-campus computer labs. Alternately, students may find it advisable to buy an 8.5 in. x 11in. sheet scanner or a flat-bed scanner. The prices have dropped significantly and many scanners for scanning 8.5in. X 11in. sheets are available between \$65 -\$80.

Homework

- **Assigned homework should be uploaded to the course website by 5PM every Wednesday as one pdf file.**
- In case the server is not working an e-mail with attachment (in pdf file format) to tadayon@ufl.edu can be sent.
- If TA's e-mail is not working then you may send the HW to shanker@ufl.edu
- If you submit HW by e-mail, the subject line should be 'BCN 2405C, HW No. ____, and Your Name_____'

We will try to post the HW solutions before 9:00AM on Thursday. Students are required to check their HW and make any corrections themselves. The TA will assign HW grade to all submissions within a week. Because of this arrangement, late homework will not be accepted under any circumstances. Problems should be worked on the engineering paper with 0.5-mm pencil before scanning the HW as a pdf file. Please use not more than 300 dpi resolution to make small files. All sketches should be neatly drawn using a ruler. All answers should be underlined.

The teaching assistant appointed by the school for this course would be in-charge of the homework grade part of this course. As many students are enrolled in this class, students should realize the potential of errors or omissions on part of teaching assistant and resolve it directly with her by e-mail. Homework grade may be assigned based on overall attempt or detailed checking, therefore, full points on any homework does not imply that solution is correct. Students are responsible for reviewing correct homework solutions, exams and homework grades that are posted on the Internet.

Attendance and Discipline

Students are not allowed to use laptops, iPods or other electronic devices at all. All cell phones must be turned off during classes. The attendance is compulsory. Students who are more than five minutes late will not be allowed to attend class. Attendance for lecture classes and labs will carry 50 points and will be based on the attendance record for the days instructors choose to take attendance.

Student Responsibilities

Attend all classes and send-in homework when due. Be aware of all the announcements or changes in the course policies or coverage made by the instructor. Read the text assignment before the class and come prepared with questions. Work extra problems to understand each topic. Students are required to pick-up their exams within two weeks from the instructor after it is returned. Instructor will ask a student to leave the classroom if he is talking or engaging in other disruptive behavior in class. Food or drinks are not allowed in classes. Honor Code will be strictly enforced. Seek timely help if not making satisfactory progress. Students needing accommodations for learning differences and other physical conditions need authorization from appropriate UF offices and submit the paperwork to instructor at-least one-week prior to exams otherwise no accommodation will be provided. Tell instructor if you withdraw from this course or end your activity in this course. Be aware of the Honor System of University of Florida. All students in this course are subject to the requirements of the University of Florida's Honor Code. *We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*

BCN 2405C Course Outline

| Week | Topics and Coverage | Reading Assignments |
|------|---|---|
| 1 | Introduction of Course; Introduction to Statics Force, Units, Types | 1-1 thru 1-6 2-1 thru 2-4 |
| 2 | Scalar and Vector Quantities Principle of Transmissibility, Force Systems Resultants & Components of Forces | 2-5 2-6 thru 2-8 |
| 3 | Resultant of Two Concurrent Forces Resultant of Three or More Forces Moment of Force & Varignon's Theorem Parallel Force Systems Couples & Non-concurrent Force Systems | 3-1 3-2 3-3 thru 3-4 3-5 3-6 thru 3-7 |
| 4 | Equilibrium of Concurrent Force Systems Equilibrium of Parallel & Non-concurrent Forces | 4-1 thru 4-4 4-5 thru 4-6 |
| 5 | Trusses, Types, Behavior and the Method of Joints The Method of Sections | 5-1 thru 5-4 5-5 |
| 6 | Analysis of Frames Center of Gravity Centroids and Centroidal Axes | 5-6 7-1, 7-2 7-3 |
| 7 | Centroids & Centroidal Axes of Composite Areas Moment of Inertia & Transfer Formula Moment of Inertia of Composite Areas | 7-4 8-1 thru 8-3 8-4 thru 8-6 |
| 8 | Tensile, Compressive, Shear Stresses & Deformations Hooke's Law, Tension Test & Factor of Safety | 9-1 thru 9-4 9-6, 10-1 thru 10-7 |
| 9 | Poisson's Ratio, Thermal Stresses Beams Types, Loads, Reactions | 11-1, 11-2 13-1 thru 13-3 |
| 10 | Introduction of Shear Force & Bending Moment Shear Force & Bending Moment Diagrams | 13-4 thru 13-5 13-6 |
| 11 | Sections of Max Moment Stresses due to Bending, Flexure Stresses due to Bending & General Shear Formulas | 13-7, 13-7 14-1, 14-2 14-3 thru 14-7 |
| 12 | Beam Analysis & Deflections Beam Deflections | 14-7, 15-4 15-4 |
| 13 | Design of Steel Beams Design of Timber Beams | 16-1 thru 16-2 16-3 |

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| 14 | Columns: Intro., Ideal Columns & Effective Length Design of Columns | 18-1 thru 18-4 18-5 thru 18-8 |
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| Exam 1 | Friday, September 11 |
| Exam 2 | Friday, October 9 |
| Exam 3 | Friday, November 13 |
| Exam 4 | Friday, December 4 |
| Exam 5 (Final Exam) | Wednesday, December 16, 3:00 – 5:00PM |

Depending on the instructors' availability and schedules Exams 2, 3 and 4 may be shifted to the following Mondays. Announcements will be made in class; via e-mail as well thru the course website

Chapter 1 HW Problems due Wednesday Sept 30 (upload or E-mail by 5PM)

1-5, 1-7, 1-11, 1-13, 1-17, 1-19, 1-23, 1-25, 1-27, 1-29, 1-31, 1-35, 1-37, 1-39, 1-41