

MEC 539: Introduction to Finite Element Method Spring 2021

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Lecture: Mon./Wed., 10:30 a.m.~11:50 a.m. at A312

Office Hours: Mon./Wed., 3:30 a.m.~5:00 p.m. (or by appointment)

Course Learning Objectives: This course will introduce the mathematical and physical formulation of finite element methods (FEM). An introduction to the theory of finite element methods and their application to structural analysis problems. Matrix operations, force and displacement methods. Derivation of matrices for bars, beams, and solids. Use of these elements to model actual structural problems. Weighted residual techniques and extension of the finite element method into other areas such as heat transfer and mass transport. Computer laboratory projects consisting of the solution and evaluation of a structural problem is required. Physical problems will be taken from a variety of fields.

Pre-requisite:

Mechanics of Materials, Materials Science and Engineering, Strength of Materials, Theory of Elasticity.

Textbook: A First Course in the Finite Element Method (6th SI Edition). Daryl L. Logan. ISBN 978-0-495-66825-1.

Suggest References

- Finite Element Modeling for Stress Analysis. Robert D. Cook, John Wiley & Sons, 1995.
- The finite element methods: Linear static and dynamic finite element analysis. T.J.R. Hughes. Dover Publications, 1987.
- Finite element procedures. K.J. Bathe. Prentice Hall, 1996.
- An Introduction to the Finite Element Method, J. N. Reddy, McGraw-Hill, 2005.
- A first course in finite elements, Jacob Fish and Ted Belytschko, Wiley, 2007.

Grading: Your grade in this course will be assessed by homework, class participation, in-class-

exercises, exams and lab project reports.

Homework: 20%

Exam 1: 25%

Exam 2: 25%

Lab/project reports: 30%

Exams: All exams are open book and open notes.

Homework:

1. Homework will be assigned and collected on the Blackboard.
2. Late homework will not be accepted.
3. All homework assignments require individual effort, unless otherwise specified.
4. Homework problems should be neat, professional and well organized.

Course Content:

1. Introduction
2. Building A FEA Model
3. Spring and Truss Elements
4. Beam element
5. Frames
6. Linear Elasticity and Energy Method
7. Finite Elements for 2D Plane Problem
8. Isoparametric Elements
9. Integration scheme
10. Heat Transfer

Blackboard

It is required that you use the Blackboard for this course (<https://blackboard.stonybrook.edu/>).

Blackboard is used for facilitation of communications between faculty and students, submission of assignments, posting of the course materials, important announcements, and grades.

SUNY Korea Attendance Policy

- (1) All SUNY Korea students are required to attend every class.
- (2) Unexcused absences will significantly affect seriously the student's final course grade.
- (3) Students who are absent without a valid excuse (see below) from more than 20% of scheduled class meetings will receive a grade of "F" for the course as follows:

- i) For 150-minute classes meeting once a week, the 4th unexcused absence
 - ii) For 75-minute classes meeting twice a week, the 7th unexcused absence
 - iii) For 50-minute classes meeting three times a week, the 10th unexcused absence
 - iv) For Intensive English (IEC) Courses, students who miss more than 40 hours during a semester will receive a grade of “F” for the course.
- (4) Students should report the reason for absences to the instructor in advance, or immediately after the absence.
- (5) Absences may be classified as “excused” at the instructor’s discretion.
- (6) For an absence to be “excused,” the student must provide the instructor with acceptable documentation for the reason for the absence.
- (7) The course instructor may excuse the absence if the submitted documentation fulfills the conditions below:
- i) Extreme emergencies (e.g., death in the family)
 - ii) Major medical reasons with doctor’s note (not minor ailments)
 - iii) Very important events (e.g., national conferences, official school events)
- (8) At the end of semester, the course instructor will submit the class attendance record to the Academic Affairs Office.

Disability Support Services (DSS) Statement:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

In addition, this statement on emergency evacuation is often included, but not required: Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and One-Stop Service Center.

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person’s work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the [academic judiciary website](#).

Critical Incident Management Statement:

The State University of New York, Korea expects students to respect the rights, privileges, and

property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

Subject to Change Notice

All material, assignments, and deadlines are subject to change with prior notice. It is your responsibility to stay in touch with your instructor, review the course site regularly, or communicate with other students, to adjust as needed if assignments or due dates change.

Syllabus Disclaimer

The instructor views the course syllabus as an educational understanding between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or in the course site Announcements. Please remember to check your email and the course site Announcements often.