

Course Syllabus



Sample Syllabus

Penn State University

Department of Mechanical Engineering

ME 461 – FINITE ELEMENT ANALYSIS

Course Objectives: This is an introductory course in the Finite Element Method. The *mathematical formulation of the method* will be presented and then applied to problems in elasticity and heat transfer. A combination of commercial finite element packages and programming exercises will be assigned and applied to demonstrate and teach the finite element method. Upon completion of this course, students should be able to:

1. Understand fundamentals of FE theory. This includes understanding: the strong to weak form, total potential energy and Galerkin approaches for solution methods, the use of shape functions, isoparametric formulation, gaussian quadrature the and derivation of finite element matrices.
2. Given a general engineering problem, demonstrate the ability to develop a finite element model using a commercial code.
3. Demonstrate the ability to solve simple one- and two-dimensional problems using the finite element method.
4. Understand the programming format and reasoning of some basic finite element code.
5. Interpret results better through improved understanding of basic mechanics, and enhanced math and computer skills.
6. Demonstrate the ability to clearly communicate finite element simulation results in a report format.

Instructor: Reuben Kraft, Ph.D., Professor

320 Leonhard Bldg., University Park, PA 16802

Email: reuben.kraft@psu.edu (mailto:reuben.kraft@psu.edu),

Website: <https://psucompbio.org> ↗ (https://psucompbio.org)

Text: T.Chandrupatla and A. Belegundu. Introduction to Finite Elements in Engineering, 4th Edition, Prentice Hall, 2001. ISBN-13: 978-0132162746, Link to Amazon: <http://a.co/jfh3akY> ↗ (<http://a.co/jfh3akY>). The 3rd edition will also work.

Time & Place: Time and place for lectures can be found on lionpath. You need to do what lionpath says. If it is in-person, then you need to attend the class in the building and room specified. If you are in a web version of the course then lectures will be released on MWF at around 9am. You can view them at any time, just be sure to keep up.

Teaching Assistant: Keelson Engles kle5411@psu.edu (mailto:kle5411@psu.edu)

Target Course Schedule: See topics and dates in the modules section.

Office hours: By appointment. Just email and we will arrange a time to meet.

Grading:

Two Exams	15% (split evenly)
Homework	40% (split evenly)
Participation	40% (Evaluated using quizzes and Abaqus Screenshots)
Final Exam	5%
TOTAL	100%

Grading Scale:

Name:	Range:
A	100 % to 94.0%
A-	< 94.0 % to 90.0%
B+	< 90.0 % to 87.0%
B	< 87.0 % to 84.0%
B-	< 84.0 % to 80.0%
C+	< 80.0 % to 77.0%
C	< 77.0 % to 74.0%
C-	< 74.0 % to 70.0%
D+	< 70.0 % to 67.0%
D	< 67.0 % to 64.0%
D-	< 64.0 % to 61.0%
F	< 61.0 % to 0.0%


Course website: I will use Canvas to post homework, solutions and all other announcements.

Homework: No late homework will be accepted unless authorized. For Abaqus/FE you must use the Institute for Computational and Data Sciences (ICDS) account (described below).

Institute for Computational and Data Sciences (ICDS) Roar Collab Supercomputer

For in-class applications, we will use the Institute for Computational and Data Sciences "Roar Collab" Supercomputer. You can find out more information about ICDS/Roar Collab here:

<https://www.icds.psu.edu/roar-collab-user-guide/>  (<https://www.icds.psu.edu/roar-collab-user-guide/>)


To request an account on Roar go to: <https://www.icds.psu.edu/how-to-transition-from-roar-to-roar-collab/>.  (<https://www.icds.psu.edu/how-to-transition-from-roar-to-roar-collab/>) Under #1 Activate your Roar Collab account, click the link "Sign up for your account". You will need to provide some information for the account request. Here are the options you can enter:


Sponsor Account: rhk12

Research Description: "ME461:Finite Element Analysis"


Computational and Data Requirements: No more than 8 standard cores. Open Queue.


In order to use ICS/ACI, you will also need to turn on 2-factor authentication for your Penn State account. Here is the link to do that:


2-Factor Authentication: <http://www.identity.psu.edu/services/authentication-services/two-factor/self-service-portal>  (<http://www.identity.psu.edu/services/authentication-services/two-factor/self-service-portal>)


You access Roar Collab cluster using this link in a browser: <https://rcportal.hpc.psu.edu/>  (<https://rcportal.hpc.psu.edu/>)

Academic Integrity - <http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx>  (<http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx>)

The University defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (refer to [Senate Policy 49-20](http://www.psu.edu/ufs/policies/47-00.html#49-20)  (<http://www.psu.edu/ufs/policies/47-00.html#49-20>)).

Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Office of Student Conduct for possible further disciplinary sanctions (refer to [Senate Policy G-9](http://www.psu.edu/dept/oue/aappm/G-9.html)  (<http://www.psu.edu/dept/oue/aappm/G-9.html>)). You are encouraged to discuss the homework and design projects with your peers. However, *each individual is responsible for submitting his or her own **unique** assignment*. It is essential to your success in ME 461 that you make a mature effort to understand the homework problems. Careful consideration of each problem, even if by trial and error, develops your ability to solve real-world problems facing you upon graduation. Your colleagues may help you, but ultimately the responsibility is your own.

Disability - <http://equity.psu.edu/ods/faculty-handbook/syllabus-statement>  (<http://equity.psu.edu/ods/faculty-handbook/syllabus-statement>)

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: <http://equity.psu.edu/ods/dcl>. For further information, please visit the Office for Disability Services Web site: <http://equity.psu.edu/ods>  (<http://equity.psu.edu/ods>).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <http://equity.psu.edu/ods/doc-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.