

Course Syllabus

Sample Syllabus

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COVID-19 Announcement: This course can be taken fully remote or can be taken in-person (as long as it is permitted by the University). The optional lab sections are the only in-person part of the class anyway. These are a bit like extended office hours where you can ask for help with the various assignments in the course. The lectures were always scheduled to be web-based even before COVID-19. In any case, please try to have a strong internet connection since we use servers located at University Park to connect to for software tools. If you have any questions or concerns, please reach out to the instructors.

Thanks,

Professor Kraft and Professor Grauer

Title: Introduction to Modern Computational Tools for Mechanical Engineering

Prerequisites: None

Text: Not required.

Time & Place: All lectures will be delivered online (released on MWF at 9 am). Lab sections are optional to attend (they are like office hours with TA). Virtual options will be provided for the labs. The instructor will rotate their attendance in the lab sections since they run all day T/Th.

Instructors: Dr. Reuben Kraft & Dr. Sam Grauer

Office Hours: By email

Course Objectives: This course is aimed at giving students perspective and introductory skills on the use of modern computational tools for solving mechanical engineering problems. The course has two main thrusts focused on finite element analysis for structural/thermal mechanics and computational fluid dynamics. Upon completion of the course students will:

- Demonstrate the application of computational tools to solve fundamental problems associated with statics, dynamics, mechanics of materials, heat transfer, fluid dynamics. (Assignments will focus on fundamental topics covered in other core required courses within the Penn State Mechanical Engineering Program.)
- Compare and reflect on simulation predictions as compared to analytical solutions and use the computational tools to parametrically study the solution space that enables informed design strategies.
- Create engineering reports on simulation and analytic results in clear and meaningful ways.

Planned Topics

*Introduction to SolidWorks Simulation (Week 1)**Structural and Thermal Topics (Weeks 2-8)*

1. Beam bending and deflection
2. Stress concentrations and Multiaxial stress
3. Large deflection analysis (such as in springs)
4. Modal analysis of unstressed and stress structures
5. Dynamic response
6. Buckling
7. Heat conduction & convection

Thermal and Fluid Dynamics Topics (Weeks 9-15)

1. Inviscid converging-diverging incompressible flow
2. Laminar pipe flows/cylinder
3. Flow over a cylinder
4. Airfoil
5. Boundary layer solutions
6. Heat convection over a boundary layer
7. Turbulent pipe

Grading:

| | |
|--------------------------------------|---------------------------------------------------------------|
| Homework | 75% (15 total, 5% each) |
| Participation in weekly applications | 15% (to be collected each week each worth 1 percentage point) |
| Quizzes | 10% (4 quizzes each worth 2.5 percentage points) |
| TOTAL | 100% |

Grading Scale:

| Grade | Range |
|--------------|-------------------|
| A | 100 % to 92.0% |
| A- | < 92.0 % to 88.0% |
| B+ | < 88.0 % to 84.0% |
| B | < 84.0 % to 80.0% |
| B- | < 80.0 % to 76.0% |
| C+ | < 76.0 % to 72.0% |
| C | < 72.0 % to 68.0% |
| D | < 68.0 % to 64.0% |
| F | < 64.0 % to 0.0% |

Course website: Canvas will be used to post homework, solutions and all other announcements.

Homework: No late homework will be accepted. Individual exceptions may be granted on a case-by-case basis.

Attendance and Lateness: Attendance is required unless excused by instructor.

[_\(<http://www.identity.psu.edu/services/authentication-services/two-factor/self-service-portal>\)](http://www.identity.psu.edu/services/authentication-services/two-factor/self-service-portal)

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

[_\(<http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx>\)](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) [_\(<http://www.psu.edu/ufs/policies/47-00.html#49-20>\)](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) [_\(<http://www.psu.edu/dept/oue/aappm/G-9.html>\)](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 330 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>

[_\(<http://equity.psu.edu/ods/faculty-handbook/syllabus-statement>\)](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> [_\(<http://equity.psu.edu/ods>\)](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.

Course Summary:

| Date | Details | due by 11:59pm |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Fri Jan 22, 2021 |  Week 0 Participation https://psu.instructure.com/courses/2115098/assignments/12520081 | due by 11:59pm |
| Fri Jan 29, 2021 |  Week 0 Participation Copy https://psu.instructure.com/courses/2115098/assignments/12529644 | due by 11:59pm |
| Wed Feb 3, 2021 |  FEA HW #0 https://psu.instructure.com/courses/2115098/assignments/12520063 | due by 11:59pm |
| Fri Feb 5, 2021 |  FEA Participation #1 https://psu.instructure.com/courses/2115098/assignments/12520071 | due by 11:59pm |
| Wed Feb 10, 2021 |  FEA HW #1 https://psu.instructure.com/courses/2115098/assignments/12520064 | due by 11:59pm |
| Fri Feb 12, 2021 |  FEA Participation #2 https://psu.instructure.com/courses/2115098/assignments/12520072 | due by 11:59pm |
| Wed Feb 17, 2021 |  FEA HW #2 https://psu.instructure.com/courses/2115098/assignments/12520065 | due by 11:59pm |
| Fri Feb 19, 2021 |  FEA Participation #3 https://psu.instructure.com/courses/2115098/assignments/12520073 | due by 11:59pm |
| Wed Feb 24, 2021 |  FEA HW #3 https://psu.instructure.com/courses/2115098/assignments/12520066 | due by 11:59pm |
| Fri Feb 26, 2021 |  FEA Participation #4 https://psu.instructure.com/courses/2115098/assignments/12520074 | due by 11:59pm |
| Sun Feb 28, 2021 |  FEA HW #4 https://psu.instructure.com/courses/2115098/assignments/12520067 | due by 11:59pm |
| Sun Feb 28, 2021 |  FEA Quiz #1 https://psu.instructure.com/courses/2115098/assignments/12520078 | due by 11:59pm |

| Date | Details | |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Wed Mar 3, 2021 |  FEA Participation #5 (https://psu.instructure.com/courses/2115098/assignments/12520075) | due by 11:59pm |
| Fri Mar 5, 2021 |  FEA HW #5 (https://psu.instructure.com/courses/2115098/assignments/12520068) | due by 11:59pm |
| Wed Mar 10, 2021 |  FEA Quiz #2 (https://psu.instructure.com/courses/2115098/assignments/12520048) | due by 11:59pm |
| Fri Mar 12, 2021 |  FEA HW #6 (https://psu.instructure.com/courses/2115098/assignments/12520069) | due by 11:59pm |
| |  FEA Participation #6 (https://psu.instructure.com/courses/2115098/assignments/12520076) | due by 11:59pm |
| Wed Mar 24, 2021 |  CFD Participation #1 (https://psu.instructure.com/courses/2115098/assignments/12520056) | due by 11:59pm |
| |  CFD HW #1 (https://psu.instructure.com/courses/2115098/assignments/12520050) | due by 11:59pm |
| Fri Mar 26, 2021 |  FEA HW #7 (https://psu.instructure.com/courses/2115098/assignments/12520070) | due by 11:59pm |
| |  FEA Participation #7 (https://psu.instructure.com/courses/2115098/assignments/12520077) | due by 11:59pm |
| Wed Mar 31, 2021 |  CFD Participation #2 (https://psu.instructure.com/courses/2115098/assignments/12520057) | due by 11:59pm |
| Fri Apr 2, 2021 |  CFD HW #2 (https://psu.instructure.com/courses/2115098/assignments/12520051) | due by 11:59pm |
| Wed Apr 7, 2021 |  CFD Participation #3 (https://psu.instructure.com/courses/2115098/assignments/12520058) | due by 11:59pm |
| Fri Apr 9, 2021 |  CFD HW #3 (https://psu.instructure.com/courses/2115098/assignments/12520052) | due by 11:59pm |
| Wed Apr 14, 2021 |  CFD Participation #4 (https://psu.instructure.com/courses/2115098/assignments/12520059) | due by 11:59pm |

| Date | Details | |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Fri Apr 16, 2021 |  CFD HW #4 (https://psu.instructure.com/courses/2115098/assignments/12520053) | due by 11:59pm |
| Wed Apr 28, 2021 |  CFD Participation #5 (https://psu.instructure.com/courses/2115098/assignments/12520060) | due by 11:59pm |
| Fri Apr 30, 2021 |  CFD HW #5 (https://psu.instructure.com/courses/2115098/assignments/12520054) | due by 11:59pm |
| Wed May 5, 2021 |  CFD Participation #6 (https://psu.instructure.com/courses/2115098/assignments/12520061) | due by 11:59pm |
| Fri May 7, 2021 |  CFD HW #6 (https://psu.instructure.com/courses/2115098/assignments/12520055) | due by 11:59pm |
| |  FEA Extra Credit (https://psu.instructure.com/courses/2115098/assignments/12520062) | |
| |  FEA Honors Credit (https://psu.instructure.com/courses/2115098/assignments/12520079) | |