



Proposal Form For Addition And Revision Of Courses

1. Proposing College / School:
Department:

2. Course Prefix and Number: **3. Effective Term:**

4. Course Title:
Abbreviated Title (30 characters or less):

5. Requested Action:

Renumber a Course — Current Course Number:
 Add a Course — Proposed Course Number:
 Revise a Course — Type of Revision:

6. Course Credit:

Contact/Group Hours	Scheduled Type (e.g.: Lab, Lecture, Practicum, Directed Study)	Weekly or Per Term?	Credit Hours	Anticipated Enrollment
3	Lectures	Weekly	3	25
			Total Credit Hours:	<input type="text" value="3"/>

Maximum Hours (Repeatability):

7. Grading Type: Regular (ABCD) Satisfactory/Unsatisfactory (S/U) Audit

8. Prerequisites/Corequisites:
Use "P:" to indicate a prerequisite, "C:" to indicate a corequisite, and "P/C:" to indicate a prerequisite with concurrency.

9. Restrictions: *List specific restriction in space above.* College Major Standing Degree

10. Course Description:
(20 Words or Less; exactly as it should appear in the Bulletin)

11. May Count Either: or *(Indicate if this particular course cannot be counted for credit in addition to another)*

Program Type (e.g.: minor, major, etc.)	Program Title (e.g.: MS in Chemistry, Performance Option, Minor in Art)	Requirement or Elective? (required or optional?)
Graduate	MS in Aerospace Engineering	Elective
Graduate	PhD in Aerospace Engineering	Elective

12. Affected Program(s): *(Respond "N/A" if not included in any program; attach memorandum if more space is required)*

13. Overlapping or Duplication of Other Units' Offerings: Applicable Not Applicable
(If course is included in any other degree program, is used as an elective frequently by other unit(s), or is in an area similar to that covered by another college/school, attach correspondence with relevant unit)

14. Justification:

Turbulence is a prevalent phenomena in fluid dynamics that affects a large number of aerospace applications ranging from low-speed flight to space launch vehicles. A proper understanding of the physical underpinnings of turbulence and turbulence models is essential for modern aerospace engineers working in the fields of experimental or computational fluid dynamics.

(Include a concise, yet adequate rationale for the addition/revision of the course, citing accreditation, assessments (faculty, graduate, and/or external) where applicable)

15. Resources:

No additional resources are required.

(Indicate whether existing resources such as library materials, classroom/laboratory space, and faculty appointments are adequate to support the proposed addition/revision; if additional resources are required, indicate how such needs will be met, referencing the appropriate level of authorization -- i.e.: Dean -- where necessary; if no additional resources or shifting of resources will be necessary, respond "Not Applicable")

16. Student Learning Outcomes:

1. Understand the physical source of turbulence
2. Know and apply basic statistical representations of turbulent flow fields
3. Understand the role of viscosity in the growth, evolution and dissipation of turbulent kinetic energy in turbulent flows
4. Be able to derive and understand the Reynolds Averaged Navier-Stokes equations
5. Have an understanding of basic turbulence models
6. Understand the principles of the energy cascade

(State in measurable terms (reflective of course level) what students should be able to do when they have completed this course)

17. Course Content Outline:

Textbook: P. A. Davidson, Turbulence: An introduction for scientists and engineers, Oxford University Press, 2004.

Course content (Week/Topic):

1. Introduction; Common themes
 2. Scales of turbulence; Closure problem;
 3. Navier-Stokes equations; Total derivative
 4. Vorticity equation and vorticity dynamics
 5. Non-linearity and chaos
 6. Dissipation
 7. Statistics (Midterm Exam)
 8. Statistics
 9. Reynolds Averaged Navier-Stokes
 10. Wall-bounded shear flows
 11. Free shear flows; Heat transfer
 12. Taylor, Richardson and Kolmogorov
 13. Taylor, Richardson and Kolmogorov
 14. Student Oral Presentations
 15. Student Oral Presentations
- Final Exam

(Provide a comprehensive, week-by-week breakdown of course content, including assignment due dates)

18. Assignments / Projects:

The course will consists of traditional homework assignments, exams and a course project as follows.

Midterm Exam 20 %

Final Exam 20%

Homework 30 %

Project/Presentation 30 %

The object of project/presentation is three fold:

- To provide students with the opportunity to learn more in-depth about a topic related to turbulence that is not covered in class.

The course instructor will work with the Engineering Graduate Outreach Program office to conduct lectures in a video studio classroom.

Engineering Outreach will deliver video content to distance learning students. The instructor will use Canvas to communicate with students, provide learning materials, and post assignments and grades. Engineering

Outreach will arrange exam proctoring services.

- To improve students writing skills with an emphasis on technical writing.
- To improve students presentation skills with an emphasis on oral technical presentations.

(List all quizzes, projects, reports, activities and other components of the course grade -- including a brief description of each assignment that clarifies its contribution to the course's learning objectives)

19. Rubric and Grading Scale:

Midterm Exam 20 %
Final Exam 20%
Homework 30 %
Project/Presentation 30 %
90-100% A
80-89% B
70-79% C
60-69% D
<60% F

(List all components of the course grade -- including attendance and/or participation if relevant -- with point totals for each; indicate point totals and ranges or percentages for grading scale; for S/U grading, detail performance expectations for a passing grade)

20. Justification for Graduate Credit:

The course material provides the student with a very deep and rigorous treatment of the basic concepts of turbulence and turbulence modeling. The topics covered in this course are not discussed in the prerequisite course AERO 7120: Dynamics of Viscous Fluids course.

(Include a brief statement explaining how the course meets graduate educational standards (i.e.: rigorous standards for evaluation, development of critical thinking and analytical skills, etc.))

(Included below are standard statements regarding course policies. If necessary, a statement may be altered to reflect the academic policies of individual faculty members and/or the academic unit or department, provided that there is no conflict with the [Student Policy eHandbook](#), Faculty Handbook, or any existing university policy.)

POLICY STATEMENTS

Attendance: Although attendance is not required, students are expected to attend all classes, and will be held responsible for any content covered in the event of an absence.

Excused Absences: Students are granted excused absences from class for the following reasons: illness of the student or serious illness of a member of the student's immediate family, the death of a member of the student's immediate family, trips for student organizations sponsored by an academic unit, trips for university classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance, and religious holidays. Students who wish to have an excused absence from class for any other reason must contact the instructor in advance of the absence to request permission. The instructor will weigh the merits of the request, and render a decision. When feasible, the student must notify the instructor prior to the occurrence of any excused absences, but in no case shall such notification occur more than one week after the absence. Appropriate documentation for all excused absences is required. Please consult the [Student Policy eHandbook](#) for more information on excused absences.

Make-Up Policy: Arrangement to make up a missed major examination (e.g.:hour exams, mid-term exams) due to properly authorized excused absences must be initiated by the student within one week of the end of the period of the excused absence(s). Except in unusual circumstances, such as the continued absence of the student or the advent of university holidays, a make-up exam will take place within two weeks of the date that the student initiates arrangements for it. Except in extraordinary circumstances, no make-up exams will be arranged during the last three days before the final exam period begins.

Academic Honesty Policy: All portions of the Auburn University student academic honesty code (Title XII) found in the [Student Policy eHandbook](#) will apply to university courses. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.

Disability Accommodations: Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by e-mail. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).

Approvals

Joe Majdel

Department Chair / Head

1/13/15

Date

Steve R. Dub

College / School Curriculum Committee

Date

1/22/15

[Signature]

College / School Dean

Date

1/22/15

Dean of the Graduate School *(for Graduate Courses)*

Date

Assoc. Provost for Undergraduate Studies *(for Undergraduate Courses)*

Date

Contact Person: Steve Gross

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