Proposal Form For Addition And Revision Of Courses

1. Proposing College / School: Samuel Ginn College of Engineering
   Department: Polymer and Fiber Engineering

2. Course Prefix and Number: PFEN 5300

3. Effective Term: Fall 2012

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

5. Requested Action:
   - Renumber a Course
   - Add a Course
   - Revise a Course

6. Course Credit:
   Contact/Group Hours   Scheduled Type (e.g.: Lab, Lecture, Practicum, Directed Study)
   Weekly or Per Term?   Credit Hours   Anticipated Enrollment
   Maximum Hours
   (Repeatability): 3   3   Lecture   Weekly   3   45
   Total Credit Hours: 3

7. Grading Type:
   - Regular (ABCDF)
   - 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.
   MATH 2630, ENGR 2200 or MECH 3030, or Departmental Approval.

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)
   Covers the most important aspects of elementary modern rheology, including elastic solids, viscoelastic behavior of polymeric systems, composite systems, concentrated solutions and suspension rheology.

11. May Count Either: Program Type or Program Title
   (e.g.: minor, major, etc.) (e.g.: MS in Chemistry, Performance Option, Minor in Art)
   Requirement or Elective?
   Major Bachelor of Mechanical Engineering Elective
   Minor Tribology Elective

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

13. Overlapping or Duplication of Other Units’ Offerings:
   (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)
   - Applicable
   - Not Applicable
14. Justification: How fluid properties can be changed with chemical composition and structure is a very important topic for engineers, especially those working in manufacturing and materials development (such as lubricants). This course is therefore an important elective for Tribology Minor students and other engineering students.

(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: None - no additional course-load is expected. This course will be added to the schedule of rotating technical electives. If demand increases enough that it needs to be taught more frequently, external funds will be used to purchase faculty time.

(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: To provide undergraduate student with an understanding of deformation and flow of polymeric materials such as polymeric liquids, suspensions, melts, lubricants, colloids, foams, gels, etc.
To enable students to understand and apply information from the latest rheological literature to their own operations and systems.
To provide students with the essential criteria for selecting the best test types for various applications, accurately interpreting results, and determining other areas where rheology and rheological phenomena may be useful in their work.

(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:
- Week 1 Introduction to Rheology
- Week 2 Elastic Solids
- Week 3 Viscous Liquid
- Week 4 Viscoelastic Behavior of Polymeric Systems: Linear Viscoelasticity
- Week 5 Viscoelastic Behavior of Polymeric Systems: Non linear
- Viscoelasticity: Dependence of Viscoelastic Behavior on Temperature and Pressure
- Lab 1: Safety training
- Week 6 Measurements: Shear Rheometry I
- Week 7 Measurements: Shear Rheometry II
- Week 8 Measurements: Extensional Rheometry
- Lab 2: Introduction to rheological characterization
- Week 9 Rheo-Optics - Flow Birefringence
- Week 10 Applications: Dilute Solutions
- Lab 3: Testing a Dilute solution
- Week 11 Applications: Undiluted amorphous polymers and concentrated solutions: Network and Entanglements
- Lab 4: Testing an amorphous polymer and a concentrated solution.
- Week 12 Review / Examination 1
- Week 13 Applications: Crosslinked and uncrosslinked polymers. Crystalline Polymers
- Lab 5: Testing a Crosslinked and uncrosslinked polymers, a crystalline polymer and a composite Systems
- Week 14 Applications: Concentrated solutions, Plasticized Polymers and gels. Suspension Rheology
- Lab 6: Testing a concentrated solution and a gel
- Week 15 Review
- Final Examination Period

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

18. Assignments / Projects: Grading and Evaluation Procedures:
- Examination 1: 30%
Presentation: 20%
Laboratories: 20%
Final Exam: 30%
Class activities: students will be asked to prepare short summaries of reading material, solve problems (homeworks) in groups or on their own during class time, find relevant information from polymer databases via the internet or the library.
Presentation: students will present for approximately 15-20 min on a course related topic (PowerPoint format).
Course Policy Statements: Class attendance is not required. However, students are strongly encouraged to attend lectures and reminded that lecture material is essential for understanding of the field as well as to complete homework and exam questions.
Attendance is mandatory for all laboratories. Each laboratory unexcused absence will result in the deduction of fifty (50) points from the final lab grade. Students are responsible for everything that is covered or announced in the class.

(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:
Grades will be assigned as follows (T=% of total points):

- T ≥ 90% A
- 89% ≥ T ≥ 80% B
- 79% ≥ T ≥ 70% C
- 69% ≥ T ≥ 60% D
- T ≤ 59% 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:
NA

(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 Tiger Cub, 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 see the Tiger Cub 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 Tiger Cub 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 special accommodations in class, as provided for by the Americans With Disabilities Act, should arrange for a confidential meeting with the instructor during office hours in the first week of classes (or as soon as possible if accommodations are needed immediately). The student must bring a copy of their Accommodation Letter and an Instructor Verification Form to the meeting. If the student does not have these forms, they should make an appointment with the Program for Students with Disabilities, 1288 Haley Center, 844-2096 (V/T).

(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)
1. **Course Number:** PFEN 5300  
   **Course Title:** Polymer Rheology  
   **Credit Hours:** 3  
   **Prerequisites:** Math 2630, ENGR 2200 or MECH 3030, or departmental approval  
   **Co-requisites:** None

Date Prepared: February 2012

**Course Coordinator(s):** Maria L. Auad, Assistant Professor - Polymer and Fiber Engineering

2. **Required Textbook:**

**Recommended References:**

**Course Description:** This Polymer Rheology course covers the most important aspects of elementary modern rheology at undergraduate level. This course provides extensive background on: elastic solids, viscoelastic behavior of polymeric systems, experimental observations, undiluted amorphous polymers and concentrated solutions, dilute solutions, uncrosslinked polymers, crosslinked polymers and composite systems, crystalline polymers, concentrated solutions and suspension rheology. The class also introduces the theory and practice of friction, wear and lubrication.

3. **Course Objectives:**
- To provide graduate student with an understanding of deformation and flow of polymeric materials such as polymeric liquids, suspensions, melts, lubricants, colloids, foams, gels, etc.
- To enable students to understand and apply information from the latest rheological literature to their own operations and systems.
- To provide students with the essential criteria for selecting the best test types for various applications, accurately interpreting results, and determining other areas where rheology
and rheological phenomena may be useful in their work.

5 Class Participation:
This class is intended to include significant interactive discussion of the latest research related to polymer Viscoelasticity and rheology. Therefore, reading assignments, laboratories and homework will be made every week. Active participation in these discussions is a key part of the performance expected in the class.

6 ABET Outcomes:
a-An ability to apply knowledge of mathematics, science and engineering.
b-An ability to design and conduct experiments, as well as analyze and interpret data.
e-An ability to identify, formulate and solve engineering problems.

7 Course Content and Schedule:

<table>
<thead>
<tr>
<th>Week 1</th>
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<tbody>
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Note: the labs are included during class schedule

8 Grading and Evaluation Procedures:

Lecture: 100%  
Examination 1: 30%  
Presentation: 20%  
Laboratories: 20%  
Final Exam: 30%

Grades will be assigned as follows (T=% of total points):

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Attendance is mandatory for all laboratories. Each laboratory unexcused absence will result in the deduction of fifty (50) points from the final lab grade. Students are responsible for everything that is covered or announced in the class.

11 Accommodations for Students with Disabilities: It is the policy of Auburn University to provide accessibility to its programs and activities and reasonable accommodation for qualified students with disabilities. Students desiring additional information should contact the Program for Students with Disabilities, 1244 Haley Center, Voice (334) 844-2096. Students requiring special accommodations are asked to arrange a meeting during office hours of the first Class of classes. If a conflict with the office hours occurs, alternate time can be arranged. Bring a copy of the Accommodation Memo and an Instructor Verification Form to the meeting.

12 Academic Integrity: The highest standards of academic integrity are expected. You are free to consult with one another to solve the homework problems, but the solutions are expected to be your individual efforts. Consult the Tiger Cub, or speak to me if there are any questions.

Prepared by Maria L. Auad, February 2012