3. Special Consideration
   Dwight Look College of Engineering
   Certificate in Polymer Specialty

New Courses

**AERO 406. Polymer Nanocomposites and their Applications. (3-0). Credit 3.** Recent advances and methodologies in processing and characterization of nanostructured polymers and nanocomposites, as well as their commercial applications; investigate polymers filled with nanometer-size inclusions, including nanoparticles, nanotubes, nanofibers, and nanoclays; macroscale, microscale and nanoscale characterizations investigated in relation to properties of interest. Prerequisites: Senior classification or approval of the instructor; junior or senior classification.

**BMEN 482. Polymeric Biomaterials. (3-0). Credit 3.** Preparation, properties, and biomedical applications of polymers including: polymerization; structure-property relationships; molecular weight and measurement; morphology; thermal transitions; network formation; mechanical behavior; polymeric surface modification; polymer biocompatibility and bioadhesion; polymers in medicine, dentistry, and surgery; polymers for drug delivery; polymeric hydrogels; and biodegradable polymers. Prerequisite: BMEN 342 or approval of instructor; junior or senior classification.

**MEEN 451. Viscoelastic Materials. (3-0). Credit 3.** Mechanical and mathematical basis for modeling linear viscoelastic materials which focus on polymeric solid materials; characterization of viscoelastic material properties from experimental tests; applications of stress and deformation relationships for viscoelastic structural members subjected to axial, torsional, and bending loads. Prerequisites: CVEN 305; junior or senior classification.
MEMORANDUM

TO: Linda Lacey
FROM: Jo W. Howze
SUBJECT: Proposed 2006-2007 Undergraduate Certificate Program in Polymer Specialty

The Dwight Look College of Engineering is proposing an undergraduate certificate program in Polymer Specialty. The proposed certificate has been developed by Drs. Denis O’Neal, Ken Hall, and Helen Reed. This package includes:

- Proposed Undergraduate Certificate Program in Polymer Specialty
- New Course Request for AERO 406 Polymer Nanocomposites and their Applications
- New Course Request for BMEN 482 Polymeric Biomaterials
- New Course Request for MEEN 451 Viscoelastic Materials
TEXAS A&M UNIVERSITY
DWIGHT COLLEGE OF ENGINEERING

Proposed Undergraduate Certificate Program
in Polymer Specialty

Reason for Being

The annual world wide production of the polyolefins exceeds 120,000,000,000kg. Polyolefins production in Texas alone represents 70 percents of the U.S. market, 18 percent of the world market, and is a $26 billion per year industry. Given the huge importance the polyethylene, polypropylene, polystyrene and other engineering polymers, a very important goal of the Texas A&M University is to educate and train workforce in the State of Texas to provide necessary knowledge regarding polymer structure-property relationship, catalysis, polymer chemistry, mechanical properties, barrier properties, processing, and modeling.

Currently there are no schools in the State of Texas that offer a formal polymer curriculum, despite the significant role the polymer industry plays in the state’s economy. Many of the engineers graduating from Texas A&M University will find themselves working with polymers in one form or another. Companies specializing in polymer synthesis and manufacturing (e.g., Dow Chemical, ExxonMobil, Innovene, Engelhard, Solvay, etc.) strongly desire engineers with a strong polymer background. The proposed polymer certificate program will provide this knowledge, which will reduce training time required to turn Texas A&M students into productive members of the industrial workforce in Texas. This emphasis in polymers will give our students a significant edge over those from other universities who have no documented polymer knowledge. TAMU students will be able to fill jobs in Texas that often go to students from out of state schools with established polymer curricula (e.g., Southern Mississippi, University of Akron, UMass, etc.). Ultimately this certificate program will serve to keep native Texans in Texas by better preparing them for the State’s job market.

It is because of the great demand in Polymer understanding that the Faculty of the Polymer Technology Center (PTC) at Texas A&M University (TAMU) is proposing a Polymer Specialty Certificate Program. The objective of this certificate is to provide an interdisciplinary educational program for undergraduate students interested in pursuing a polymer career. Polymer students at TAMU benefit from the distinguished research, education, and industrial outreach that comprise the PTC. This program will be the first of its kind offered in the State of Texas. Students will be able to structure an individualized program from a selection of courses to meet their career objectives.

The object of the Polymer Specialty Certificate would be to provide a framework for engineers and suitably prepared science major to gain exposure to polymer dominated course work from several science and engineering disciplines with an added commitment to introduce sustainable development into all courses included as electives in the program.
Who and What the Program is Designed For

The Undergraduate Polymer Specialty Certificate is intended to address the interests of industry in educating engineering BS graduates with an interdisciplinary understanding of the importance of polymer to any engineering applications. The elective courses for the certificate program have been selected with the following criteria in mind:

1. Senior level course
2. Minimal course prerequisites to allow the majority of engineering or science disciplines to take the course
3. Commitment to develop engineered sustainable principles into the course materials over time

The Polymer Specialty Certificate Program would be accessible to most engineers and many science majors, particularly Chemistry, Chemical, Aerospace and Mechanical Engineering majors with sufficient science exposure. The ability to offer the certificate to non-engineering majors helps to increase the number of graduates with substantial exposure to polymer thinking.

Benefits

The value of the certificate to the student will be to broaden his or her exposure to a diverse polymer science and engineering curriculum and thereby differentiate the student from peers.

Industry will value graduates with the Polymer Specialty Certificate because they will have a more diverse background in polymers. Further, the graduates will have a focus that would foster entrepreneurial thinking and expand the employment horizons beyond the traditional industrial jobs.

Description

The proposed undergraduate Polymer Specialty Certificate Program will consist of (4) three-hour courses for a total of 12 credit hours. Two of the courses will be core curriculum which may count for 6 credits toward the student’s departmental degree. Core courses will include MEEN 458 (Processing & Characterization of Polymers) and CHEM 466 (Polymer Chemistry). An additional six hours will be comprised of (2) three-hour science or engineering electives. Completion of 12 semester credit hours of the following courses earn a Polymer Certificate and the specialty is recorded on the student’s permanent University record.

Required Courses - 6 semester credit hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor</th>
<th>When Offered</th>
<th>Frequency Offered</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEEN 458</td>
<td>Processing &amp; Characterization of Polymers</td>
<td>Jaime Grunlan</td>
<td>Spring 2006</td>
<td>Annually/Spring</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 466</td>
<td>Polymer Chemistry</td>
<td>Stephen A. Miller</td>
<td>Spring 2006</td>
<td>Annually/Spring</td>
<td>3</td>
</tr>
</tbody>
</table>
Elective Courses – 6 or more semester credit hours from the polymer courses listed below. Up to 3 hours of coursework can be substituted with research emphasizing polymers (provided polymer coursework has been initiated – research must receive prior approval)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor</th>
<th>When Offered</th>
<th>Frequency Offered</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEN 451</td>
<td>Intro to Polymer Engineering</td>
<td>Michael Bevan</td>
<td>Fall 2005</td>
<td>Annually/Fall</td>
<td>3</td>
</tr>
<tr>
<td>MEEN 455</td>
<td>Engineering with Plastics</td>
<td>Hung-Jue Sue</td>
<td>Fall 2006</td>
<td>Annually/Fall</td>
<td>3</td>
</tr>
<tr>
<td>MEEN 471</td>
<td>Elements of Composite Materials</td>
<td>Terry S. Creasy</td>
<td>Spring 2006</td>
<td>TBA</td>
<td>3</td>
</tr>
<tr>
<td>AERO 406</td>
<td>Polymer Nanocomposites and Their Applications</td>
<td>Zoubeida Ounales</td>
<td>Spring 2007</td>
<td>TBA</td>
<td>3</td>
</tr>
<tr>
<td>MEEN 451</td>
<td>Viscoelastic Solids</td>
<td>Anastasia Muliana</td>
<td>Fall 2005</td>
<td>TBA</td>
<td>3</td>
</tr>
<tr>
<td>MEEN/CHEN/AERO/CHEM 485</td>
<td>Individual Research</td>
<td>PTC Faculty</td>
<td>Spring 2008</td>
<td>Every Semester</td>
<td>3</td>
</tr>
<tr>
<td>BMEN 482</td>
<td>Polymeric Biomaterials</td>
<td>Melissa A. Grunlan</td>
<td>Spring 2006</td>
<td>TBA</td>
<td>3</td>
</tr>
<tr>
<td>CHEN 642</td>
<td>Colloidal &amp; Interfacial</td>
<td>Michael Bevan</td>
<td>Spring 2006</td>
<td>Even years/Spring</td>
<td>3</td>
</tr>
</tbody>
</table>

A grade of C or above is required in all of the above courses.

Courses Included:

Aerospace Engineering
AERO 406 – Polymers and Composites

Biomedical Engineering
BMEN 482 & 682 – Polymeric Biomaterials

Chemical Engineering
CHEN 451 – Introduction to Polymer Engineering
CHEN 642 – Colloidal & Interfacial

Chemistry Engineering
CHEM 466- Polymer Chemistry

Mechanical Engineering
MEEN 455 – Engineering with Plastics
MEEN 458 – Processing and Characterization of Polymers
MEEN/CHEN/AERO/CHEM 485 – Individual Research
MEEN 471 – Elements of Composite Materials
MEEN 451 – Viscoelastic Solids
Expected number of students

This program is open to science and engineering undergraduate students enrolled at TAMU. Interested students should consult with their advisors and the PTC Program Coordinator. Typically we will have about 40 students for the undergraduate courses and 20 students for the graduate courses.

Resources

No new resources are needed. Members of the Polymer Technology Industrial Consortium support the effort of creating the Undergraduate Polymer Specialty Program.

List of Faculty

Aerospace Engineering
  Zoubeida Ounaies, AERO 406
Biomedical Engineering
  Melissa Grunlan, BMEN 482
Chemical Engineering
  Michael Bevan, CHEN 451, CHEN 642
Chemistry Department
  Stephen A. Miller, CHEM 466
Mechanical Engineering
  Hung-Jue Sue, MEEN 455
  Jaime Grunlan, MEEN 458
  PTC Faculty, MEEN/CHEN/AERO/CHEM 485
  Terry Creasy, MEEN 471
  Anastasia Muliana, MEEN 451

State whether the certificate is depended upon conferral of degree

The proposed undergraduate Polymer Specialty Certificate Program will be conferred upon completion of the BS degree in engineering or the BS degree in science and award of the diploma.

Course syllabi

See Attached Exhibit A

Letters of Support for the Polymer Technology Center Certificate Program

See Attached Exhibit B
EXHIBIT A

COURSE SYLLABI
Texas A&M University  
Departmental Request for a New Course  
Undergraduate • Graduate • Professional  
Submit original form and 2 copies. Attach a course syllabus to each.

1. This request is submitted by the Department of [Aerospace Engineering]_.

2. Course prefix, number and complete title: AERO 406 Polymer Nanocomposites and Their Applications.

3. Course description (not more than 50 words): This course focuses on recent advances and methodologies in processing and characterization of nanostructured polymers and nanocomposites, as well as their commercial applications. We will investigate polymers filled with nanometer-size inclusions, including nanoparticles, nanotubes, nanofibers and nanoclays. Macroscale, microscale, and nanoscale characterizations are investigated in relation to properties of interest.

4. Prerequisite(s): Senior standing or permission of the instructor. Cross-listed with [Course Name]. Cross-listed courses require the signatures of both department heads.

5. Is this a variable credit course? ☐ Yes ☐ No If yes, from _____ to _____.

6. Is this a repeatable course? ☐ Yes ☐ No If yes, this course may be taken _____ times. Will the course be repeated within the same semester/term? ☐ Yes ☐ No

7. Has this course been taught as a 489/689? ☐ Yes ☐ No If yes, how many times? [1] Indicate the number of students enrolled for each academic period it was taught: [Spring 2007]

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

B.S. in Engineering pursuing Specialty Polymer Certificate

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix | Course # | Title (exclude punctuation)
     AERO | 406 | POLYM | NANOCOMP & APPL |

<table>
<thead>
<tr>
<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>Subject Matter Content Code</th>
<th>Admin. Unit</th>
<th>Acad. Year</th>
<th>FICE Code</th>
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<td>Level</td>
<td></td>
</tr>
</tbody>
</table>

Do not complete shaded area.

Approval recommended by:

[Signature] [Name] [Date]
Head of Department

[Signature] [Name] [Date]
Chair, College Review Committee

[Signature] [Name] [Date]
Dean of College

Head of Department (if cross-listed course) [Date]

Submitted to Coordinating Board by:

[Signature] [Name] [Date]
Dean of College

[Signature] [Name] [Date]
Director of Academic Support Services

[Signature] [Name] [Date]
Effective Date

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.
OAR/AS-504

8 of 24 F
Aerospace Engineering 489 (temporary—new application in progress)
Polymer nanocomposites and their applications
Credit 3: (2-2), Technical Elective

Instructor: Dr. Zoubeida Ounaies, Assistant Professor
Department of Aerospace Engineering, HRBB 741A;
phone: 458-1330, e-mail: zounaies@tamu.edu

Course Materials: Lecture notes and articles from the current literature.

Prerequisites: Senior standing or permission of the instructor.

Course Description: Nanostructured systems are of high scientific and technological interest and their development is a rapidly expanding multidisciplinary area. This course focuses on recent advances and new methods in processing and characterization of nanostructured polymers and polymer nanocomposites, as well as their commercial applications. Polymer nanocomposites are polymers filled with nanometer-size inclusions, including nanoparticles, nanotubes, nanofibers and nanoclays. Macroscale characterization as well as novel microscale and nanoscale characterization of the behavior of polymer nanocomposites is investigated in relation to properties of interest. The following properties are studied: rheological, thermal, short and long term mechanical behavior (stress-strain, fracture behavior, dynamic modulus, durability etc.), electrical, optical, and electromechanical. The following methods are specifically considered: nanoindentation, atomic force microscopy, dielectric spectroscopy, Raman spectroscopy, Scanning electron microscopy, dynamic mechanical analysis, and actuation and sensing techniques. Applications of polymer nanocomposites to automobiles, aerospace, biomedical, microelectronics, coatings, sensors, and actuators will be covered.

Learning Objectives: The overall course objective is to develop student awareness in the emerging multidisciplinary area of polymer nanocomposites. Specifically, the course has the following objectives:

1. Introduce students to basic principles of polymers and polymer composites.
2. Develop an understanding of the physical (mechanical, electrical, optical, and thermal) properties of polymer
nanocomposites and how they relate to the polymer-nanoinclusion structure and morphology.
3. Demonstrate basic principles of polymer nanocomposite processing and how it differs from traditional polymer composite processing.
4. Use emerging characterization tools for analysis of nanocomposite properties and structure.
5. Describe the four main groups of polymer nanocomposites.
6. Understand electrical and dielectric properties and relate to nanocomposite structure.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental polymer chemistry</td>
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<tr>
<td>The physics of polymers: structure/property characterizations</td>
<td>3</td>
</tr>
<tr>
<td>Nanoscale effects: surface to volume ratio; interfacial area</td>
<td>2</td>
</tr>
<tr>
<td>Polymer-nanoparticle composites</td>
<td>2</td>
</tr>
<tr>
<td>Polymer-nanotube composites</td>
<td>2</td>
</tr>
<tr>
<td>Polymer-nanofiber composites</td>
<td>2</td>
</tr>
<tr>
<td>Polymer-nanoclay composites</td>
<td>2</td>
</tr>
<tr>
<td>Mechanical behavior</td>
<td>4</td>
</tr>
<tr>
<td>Electrical and Dielectric phenomena</td>
<td>4</td>
</tr>
<tr>
<td>Smart polymers and nanocomposites</td>
<td>2</td>
</tr>
<tr>
<td>Applications</td>
<td>6</td>
</tr>
<tr>
<td>Project/lab</td>
<td>10</td>
</tr>
<tr>
<td>Midterms and quizzes</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total hours</strong></td>
<td><strong>45</strong></td>
</tr>
</tbody>
</table>

**GRADING POLICY**

- Homework: 25%
- Labs/projects: 30%
- Midterm exams: 15%
- Quizzes: 10%
- Final: 20%
- Total: 100%
Americans with Disabilities Act (ADA) Policy Statement

The following ADA Policy Statement (part of the Policy on Individual Disabling Conditions) was submitted to the University Curriculum Committee by the Department of Student Life. The policy statement was forwarded to the Faculty Senate for information.

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room B118 of Cain Hall or call 845-1637.

Academic Integrity Statement

All syllabi shall contain a section that states the Aggie Honor Code and refers the student to the Honor Council Rules and Procedures on the web.

Aggie Honor Code

"An Aggie does not lie, cheat, or steal or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information please visit: www.tamu.edu/aggiehonor/.

On all course work, assignments, and examinations at Texas A&M University, the following Honor Pledge shall be preprinted and signed by the student:

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and 25 copies. Attach a course syllabus to each.*

1. This request is submitted by the Department of Biomedical Engineering

2. Course prefix, number and complete title BMEN 482 Polymeric Biomaterials

3. Course description (not more than 50 words) Preparation, properties, and biomedical applications of polymers including: polymerization; structure-property relationships; molecular weight and measurement; morphology; thermal transitions; network formation; mechanical behavior; polymeric surface modification; polymer biocompatibility and bioadhesion; polymers in medicine, dentistry, and surgery; polymers for drug delivery; polymeric hydrogels; and biodegradable polymers.

4. Prerequisite(s) BMEN 342, or instructor approval Cross-listed with

5. Is this a variable credit course? ☐ Yes ☐ No If yes, from _______ to _______. Cross-listed courses require the signatures of both department heads.

6. Is this a repeatable course? ☐ Yes ☐ No If yes, this course may be taken _______ times. Will the course be repeated within the same semester/term? ☐ Yes ☐ No

7. Has this course been taught as a 489/689? ☐ Yes ☐ No If yes, how many times? 1. Indicate the number of students enrolled for each academic period it was taught, as 689, once, 11/08A

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography) B.S. in biomedical engineering

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix Course # Title (exclude punctuation)

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (exclude punctuation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMEN</td>
<td>482</td>
<td>Polymeric Biomaterials</td>
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</table>

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<th>Lect.</th>
<th>Lab</th>
<th>SCH</th>
<th>Subject Matter Content Code</th>
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<th>FICE Code</th>
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<td>03</td>
<td>03</td>
<td>03</td>
<td>36</td>
</tr>
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</table>

Do not complete shaded area.

Approval recommended by:

Head of Department: [Signature] 03/08/06
Chair, College Review Committee: [Signature] 1-13-06
Dean of College: [Signature] 1-13-06

Submitted to Coordinating Board by:

Dean of College: [Signature] Date

Director of Academic Support Services: [Signature] Date

Effective Date: [Signature]

*Attach a syllabus according to the guidelines on the Internet site oar-aas.tamu.edu. To have this form reviewed, please send to Linda F. Lacey, Director of Academic Support Services, 1265 TAMU or fax to 847-8737.

OAR/AS-5/01

12 of 24 F
Course Number: BMEN 482
Course Name: Polymeric Biomaterials

Instructor/Professor: Melissa A. Grunlan, Ph.D.
Office: Zachry Engineering Center 336A
(979) 845-2406
mgrunlan@tamu.edu

Course Description:
Preparation, properties, and biomedical applications of polymers including:
polymerization; structure-property relationships; molecular weight and
measurement; morphology; thermal transitions; network formation; mechanical
behavior; polymeric surface modification; polymer biocompatibility and
bioadhesion; polymers in medicine, dentistry, and surgery; polymers for drug
delivery; polymeric hydrogels; and biodegradable polymers.

Interscience, 1993)

Additional References:
M.P. Stevens, Polymer Chemistry: An Introduction: 3rd Ed. (Oxford University
Press, 1999)
L. H. Sperling, Introduction to Physical Polymer Science: 3rd Ed. (Wiley-
Interscience, 2001)
Selected journal publications

Prerequisites:
BMEN 342, or instructor approval.

Course Objectives:
1. Develop a fundamental understanding of polymer preparation and properties
2. Gain familiarity with polymeric biomaterials used in biomedical applications

Summary of Lecture Topics:

<table>
<thead>
<tr>
<th>Weeks</th>
<th>1-4</th>
<th>1. Fundamental Concepts in Polymer Science</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td>1-4</td>
<td>2. Preparation of Polymers</td>
<td>6</td>
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<tr>
<td>Weeks</td>
<td>1-4</td>
<td>3. Polymer Behavior</td>
<td>5</td>
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<tr>
<td>Weeks</td>
<td>5-6</td>
<td>4. Characterization/Measurement</td>
<td>4</td>
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<tr>
<td>Weeks</td>
<td>7-8</td>
<td>5. Polymer Networks</td>
<td>5</td>
</tr>
<tr>
<td>Week</td>
<td>9</td>
<td>6. Polymeric surface modification</td>
<td>2</td>
</tr>
<tr>
<td>Weeks</td>
<td>10-14</td>
<td>7. Biomedical Applications/Topics</td>
<td>16</td>
</tr>
<tr>
<td>Week</td>
<td>15</td>
<td>8. Final</td>
<td></td>
</tr>
</tbody>
</table>

Total ........................................................................................................ 42
Term Paper:
Topic: A medical device that primarily uses polymeric materials OR review of the biomedical applications of a particular polymeric material
Length: 10 pages of text
Format: Title page; Part 1: discussion of the polymeric material being studied (structure, properties; Part 2: summary of current research on topic; (3) Part 3: Critical analysis of problems and suggested solutions; references; figures/tables etc.
References: primarily recent journal articles
Presentation: None
Grading: adherence to format, clarity, and technical content.

Grading:
15 % Homework**
20 % Paper
20 % Exam 1
20 % Exam 2
25 % Final Exam (Comprehensive)

** Homework will include problem sets, journal article reading assignments, in-class demonstration participation, and attending specified seminars.

Americans with Disabilities Act (ADA) Policy Statement
The following ADA Policy Statement (part of the Policy on Individual Disabling Conditions) was submitted to the University Curriculum Committee by the Department of Student Life. The policy statement was forwarded to the Faculty Senate for information.

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room B118 of Cain Hall or call 845-1637.

Academic Integrity
“Aggies do not lie, cheat, or steal, nor do they tolerate those who do.”

“It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty.” (20. Scholastic Dishonesty (Revised: 2002), http://student-rules.tamu.edu/)
Texas A&M University  
Departmental Request for a New Course  
Undergraduate • Graduate • Professional  
Submit original form and 25 copies. Attach a course syllabus to each.  

1. This request is submitted by the Department of Mechanical Engineering  

2. Course prefix, number and complete title MEEN 451. Viscoelastic Materials  

3. Course description (not more than 50 words) Mechanical and mathematical basis for modeling linear viscoelastic materials which focus on polymeric solid materials; characterization of viscoelastic material properties from experimental tests; applications of stress and deformation relationships for viscoelastic structural members subjected to axial, torsional, and bending loads.  

4. Prerequisite(s) CVEN 305; junior or senior standing  

5. Is this a variable credit course? ☐ Yes ☐ No  
If yes, from ________ to ________.  

6. Is this a repeatable course? ☐ Yes ☐ No  
If yes, this course may be taken ______ times. Will the course be repeated within the same semester/term? ☐ Yes ☐ No  

7. Has this course been taught as a 489/689? ☐ Yes ☐ No  
If yes, how many times? ________ Indicates the number of students enrolled for each academic period it was taught.  

8. This course will be:  
a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)  
Students pursuing the Polymer Specialty Certificate Program  
b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)  
B.S. in Mechanical Engineering  

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.  

10. Prefix Course # Title (exclude punctuation)  

<table>
<thead>
<tr>
<th>MEEN 451 VISCOELASTIC MATERIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lect.</td>
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<tr>
<td>0</td>
</tr>
</tbody>
</table>

Do not complete shaded area.  

Approval recommended by:  

Head of Department  
Date  

Chair, College Review Committee  
Date  

Head of Department (if cross-listed course)  
Date  

Submitted to Coordinating Board by:  

Dean of College  
Date  

Director of Academic Support Services  
Date  

Effective Date  

* Attach a syllabus according to the guidelines on the Internet site www.tamu.edu/admissions/omars. To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.
MEEN 451: Viscoelastic Materials

Course description: Mechanical and mathematical basis for modeling linear viscoelastic materials, which focus on polymeric solid materials; characterization of viscoelastic material properties from experimental tests; applications of stress and deformation relationships for viscoelastic structural members subjected to axial, torsional, and bending loads.

Course goals: To provide the mechanical and mathematical basis for modeling linear viscoelastic materials, which focus on polymeric solid materials.

Prerequisite: Mechanics of Materials (CVEN 305, or equivalent)

Instructor: Anastasia Muliana
Office: Engineering Physics Building (ENPH), Room 224
e-mail: amuliana@neo.tamu.edu

Grading: Weekly homework 30%, Mid-term exam 40%, and Final project 30%

Other relevant books are listed below:

Topic list (14 week semester):

Week 1-2: Fundamental viscoelastic phenomena: to introduce several responses of viscoelastic materials, i.e. creep, relaxation, and their relations. (Chapters 1 and 4)

Week 3-6: Constitutive model of linear viscoelastic materials (One Dimensional Model): to use differential equations (spring-dashpot mechanical analogs), hereditary integrals, and correspondence principle (Laplace transform) to form linear viscoelastic constitutive models. (Chapters 2, 3, and 5)

Week 7: Sinusoidal loading on linear viscoelastic materials (one dimensional problem): to determine stress and strain histories under sinusoidal loadings. (Chapter 6)

Week 8-10: Constitutive model for three dimensional responses of linear isotropic viscoelastic materials: to determine shear and bulk (volumetric) mechanical properties of viscoelastic materials, understand stress and strain histories, and study effect of viscoelasticity on stress and strain principal directions. (Chapter 7)

Week 11: Measurement of viscoelastic behavior: to learn how to characterize viscoelastic material properties from the experimental tests (creep, relaxation, and dynamic mechanical measurements).

Week 12-13: Temperature effects on viscoelastic material behavior: to understand mechanical responses of viscoelastic materials at different temperatures, introduce the time-temperature superposition principle, and form constitutive material models of thermo-viscoelastic material models. (Chapter 11)
Week 14: Viscoelastic responses in structures: to determine stress and deformation relationships for viscoelastic structural members subjected to axial, torsional, and bending loads. (Chapter 8)

Americans with Disabilities Act (ADA) Policy Statement

The following ADA Policy Statement (part of the Policy on Individual Disabling Conditions) was submitted to the University Curriculum Committee by the Department of Student Life. The policy statement was forwarded to the Faculty Senate for information.

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room B118 of Cain Hall or call 845-1637.

Academic Integrity Statement

Aggie Honor Code

"An Aggie does not lie, cheat, or steal or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information please visit: www.tamu.edu/aggiehonor/.
EXHIBIT B

SUPPORT LETTERS
November 10, 2005

Professor Hung-Jue Sue  
Polymer Technology Center  
Department of Mechanical Engineer  
Texas A&M University  
215 Engineering/Physics building  
College Station, TX 77843-3123  

Dear Professor Hung-Jue Sue:

The Dow Chemical Company fully supports your creation of the Polymer Specialty Certificate program at Texas A&M University.

The curricula proposed will introduce and educate future engineers and scientists to the polymer industry. Polymer science and technology, and its associated industries, are vital to our nation’s economy and security, and the growth of a diverse education and research base is key to its success. Dow Chemical looks forward to seeing the Polymer program strengthen and grow at Texas A&M.

Should you require additional information, please feel free to contact me.

Sincerely,

Cora Leibig (AS)
Cora Leibig  
Global Thermosets Product Development Leader  
979-238-4397  
CMLeibig@dow.com
November 8, 2005

Professor Hung-Jue Sue
Department of Mechanical Engineering
215 Engineering/Physics Building
Texas A&M University
College Station TX 77843-3123

Dear Professor Hung-Jue Sue:

The South Texas Section of the Society of Plastics Engineering (STX-SPE) fully supports your creation of the Polymer Specialty Certificate program at Texas A&M University. The companies that sponsor the STX-SPE have long sought engineers and scientists that have more than just a passing knowledge of plastics and polymer materials. Your proposed program looks that it will fill the need of having potential engineering and scientific employees with a basic knowledge level in this field.

Should you require additional information, I shall be pleased to assist you.

Sincerely,

[Signature]

Mark W. Demark, Education Chair
South Texas Section - Society of Plastics Engineers
Alvin Community College
3110 Mustang Road
Alvin TX 77511
281-756-3785
mdemark@alvincollege.edu

cc: Isabel Cantu, Program Coordinator, Polymer Technology Center, Texas A&M
Isabel Cantu

From:  hj.sue [hj.sue@mac.com]
Sent:  Friday, November 11, 2005 6:01 PM
To:  neil.oreilly@engelhard.com
Cc:  Isabel
Subject: Re: Texas A&M Polymers' Certificate

Hi, Neil, thanks for taking the time to write the endorsement letter. Have a nice weekend...

Dear Professor Sue,

I have learned through Engelhard's participation in the PTIC of the proposal to begin offering a Polymers' Certification program covering polymers' courses taken in a variety of departments [Chemistry, Mechanical Engineering etc.].

I think this is an excellent proposal and is something which is long overdue and sorely needed in the State of Texas.

To be honest I was somewhat in disbelief when I heard that such a program does not already exist in our whole state. Given the size of the polymer's business and it's significance to our economy it is hard to fathom how this has been absent so far.

Texas A&M is showing tremendous leadership with this program, and is demonstrating once again that it pays close attention to the current and future needs of our great state, the industries which fuel it, and our nation.

You have my full and whole hearted support, and I trust that of all member companies of the PTIC, which in itself is already a great contribution.

I wish you well in concluding the approval process and in commencing the program. Please feel free to share this letter with those at A&M involved in considering the approval of the certificate program.

Sincerely,

Neil O'Reilly

Dr. Neil J. O'Reilly
Director of Technology, Process Technologies
Engelhard Corporation
10001 Chemical Rd, Pasadena, TX 77507

neil.oreilly@engelhard.com
Off: 713-982-5203,
Nov. 2nd, 2006

Dr. Hung-Jue Sue
Professor and Director of Polymer Technology Center
Department of Mechanical Engineering
Texas A&M University
208 Engineering/Physics Building
College Station, TX 77843-3123

Subject: Support the Polymer Certificate Program

Dear Hung-Jue,

I am very excited to learn that the Polymer Technology Center, Mechanical Engineering Dept of TAMU would like to offer your students with a systematic training on polymer science and engineering. Your university is getting more polymer faculty members than before and it is the right time to offer the Polymer Certificate Program. If the students who graduate with a certificate of the polymer education, they will have a better chance to find a polymer career in Texas state to contribute to the growth of our polymer industries.

I would strongly support the polymer Certificate Program in your University. Even, you should consider forming a Polymer Science and Engineering inter-departmental Program to offer good polymer education to the students.

Sincerely yours,

Benjamin T. A. Chang

Benjamin T. A. Chang, Ph.D., P.E.
President
November 7, 2005

Isabel Cantu
Program Coordinator of the Polymer Technology Center
Texas A&M University
Dept. of Mechanical Engineering
208 Engineering/Physics Bldg.
College Station, TX 77843 3123

Re: Polymer Specialty Certification Program

To Whom It May Concern

Polyolefin production in Texas makes it the center of this industry for the United States and the world. Plastics, which are derived from the polymers produced, is one of the most vital industries in the world. It is only proper that the leading engineering school in Texas has a significant, if not leading position, in this industry.

Alamo Supply Co. LTD and its predecessor has been a pioneer in the industry over the last 20 years. It has developed the mechanism to thermally spray the new plastics easily and conveniently in the production of coatings for corrosion resistance, wear resistance, and barrier coatings for a variety of industries. For every large company, such as Dow Chemical and ExxonMobil, there are dozens of companies that make this application of science and technology possible.

The curricula proposed will introduce and educate future engineers and scientists to the polymer industry. The further development of polymerization catalysts, and enhanced polymers can follow. From these endeavors the practical application will follow that will benefit various industries through better products and more productive lives in the long term.

Sincerely,

Thomas H. Fanning
President
November 11, 2005

Professor Hung-Jue Sue, Director
Polymer Technology Center
Department of Mechanical Engineering
Texas A&M University
College Station, TX  77843-3123

Dear Professor Sue:

I am writing this letter on behalf of Sunoco Chemicals in order to endorse Texas A&M University’s proposal to launch an Undergraduate Polymer Specialty Certificate Program in the Polymer Technology Center.

Sunoco Chemicals is the third largest manufacturer of polypropylene in North America (2.5 billion lb/y). Over half of Sunoco’s production originates out of Texas (Bayport and LaPorte). In addition, Sunoco is also a member company of Texas A&M University’s Polymer Technology Industrial Consortium (PTIC).

Sunoco recognizes the value of the vital link connecting the training of polymer science professionals and the future needs of the chemicals industry. More specifically, the needs as they pertain to polyolefin manufacture, product development, and applications there from.

Texas A&M University’s Polymer Technology Center is positioned to effectively deliver well-trained graduates in the Texas area because of: (a) talented faculty well-connected with industry, (b) relevant collaborative research programs often tailored to industrial interests, and (c) active Consortia with industry (PTIC and Scratch). The proposed Undergraduate Polymer Specialty Certificate Program in the Polymer Technology Center can be a superb and exciting vehicle to help meet the demand for an even better trained future workforce via a formal polymer curriculum.

If there are any questions regarding Sunoco’s endorsement of Texas A&M University’s proposed Polymer Specialty Certificate Program, please let me know.

Thanks.

Jeffrey S. Salek, Ph.D.
Staff Scientist
Sunoco Chemicals – Polymers Division
Phone: 412-208-8204