

**The University of Michigan  
College of Engineering  
Curriculum Committee**

**Agenda  
December 4, 2007  
1:30-3:00 p.m.  
GM ROOM 4<sup>th</sup> Floor  
Lurie Engineering Center**

1. Approval of Minutes from 11-20-07 Meeting
2. Course Approvals
3. Physics 135 and 235 for Engineering Students—Tim McKay
4. Proposed ME/IOE SGUS Program

**University of Michigan  
College of Engineering  
Curriculum Committee Meeting  
Tuesday November 20, 2007  
1:30-3:00 p.m.  
Lurie Engineering Center GM Room  
Minutes**

Toby Teorey called the meeting to order at 1:40 p.m.

Members Present: T. Teorey, L. Bernal, J. Boyd, M. Epelman, J. Holloway, E. Jankowski, E. Larsen, M. Moghaddam, S. Montgomery, J. Pan, T. Perakis, R. Robertson, R. Sulewski, G. Wakefield, M. Wooldridge

Members Absent: J. Everett, J. Hu, A. Hunt, M. Krug

Guests: Stacie Edington, Brian Gilchrist, Henia Kamil, Kathleen Vargo, Mark Van Oyen, Pete Washabaugh

**The minutes of the last meeting (November 20) were approved**

**Course Approval Forms**

Toby Teorey called for a motion to approve the following courses. This was moved and seconded.

**These Courses were Approved with Several Small Modifications**

AUTO 512    New Course

ENGR 480    New Course

MFG 502    New Course

MFG 503 Modification—Changed Prerequisite from: 501, TMI, PIM *to: MFG 502, PIM*;  
Changed from: graded *to: S/U*

**Proposed ChE/MSE SGUS Program**

Information regarding this proposal was included in the meeting packet. Susan Montgomery introduced this program. There was some discussion regarding this Program. Toby asked for a motion to approve this Program. Moved and Seconded. Approved.

**Proposed ME/AOSS SGUS Program**

Information regarding this proposal was included in the meeting packet. This proposed SGUS program has been on the agenda for the past few meetings, waiting for someone from one of the two departments (ME/AOSS) to speak to this proposal. James Boyd gave some information about this proposal. There was some discussion regarding this and some modifications suggested. Toby Teorey asked for a motion to approve this proposed SGUS program Contingent on modifications (deleting the restrictions on not pursuing EGL and SGUS).

Moved and Seconded. Approved.

### **Multidisciplinary Design Minor—Updated**

The Multidisciplinary Design Minor was approved at the last (November 20, 2007) Curriculum Committee meeting. Since this Minor was approved, but not unanimously, Brian Gilchrist wanted to address this Committee again to clarify some issues. There was some discussion regarding this and some Committee members felt better regarding this Minor. This Minor will be brought to the College of Engineering Faculty Meeting on December 4 for vote.

### **Proposed ME/IOE SGUS Program**

Information regarding this proposed program was passed out at the meeting. After some discussion, it was decided to table this proposal until the next (December 4) meeting.

**Adjournment:** Motion to adjourn was made and seconded  
**Motion carried (approved)**

**Next Meeting: December 4, 2007 GM Room (4<sup>th</sup> Floor Lurie Engineering Center)**

**COURSE APPROVAL FORM**

**For December 4, 2007 CoE CC Meeting**

AOSS 441    New Course



Action Requested

- New Course
- Modification of Existing Course
- Deletion of Course

Complete the following sections:

New Courses - B & C completely  
 Modifications - A modified information, B & C completely  
 Deletions - A & C completely

Date 11/7/2007

Effective Fall 2007

A. CURRENT LISTING

B. REQUESTED LISTING

<p>Home Department _____ Div # _____ Course Number _____</p> <p>Cross Listed Course Information _____</p> <p>Course Title _____</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">TITLE ABBREVIATION</td> <td style="width: 15%;">Time Sched Max = 19 Spaces</td> <td style="width: 70%;"></td> </tr> <tr> <td></td> <td>Transcript Max = 20 Spaces</td> <td></td> </tr> </table> <p>Course Description _____</p> <p><b>PROGRAM OUTCOMES:</b>  <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k</p> <p><b>Degree Requirements</b>  <input type="checkbox"/> Degree Requirement <input type="checkbox"/> Tech Elective  <input type="checkbox"/> Core Course <input type="checkbox"/> Other  <input type="checkbox"/> Free Elective</p> <p>Prerequisites _____  <input type="radio"/> Enforced <input type="radio"/> Advised</p> <p>Credit Restrictions _____</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"> <b>Level of Credit</b>  <input type="checkbox"/> Undergrad only  <input type="checkbox"/> Rackham Grad  <input type="checkbox"/> Non-Rckhm Grad  <input type="checkbox"/> Ugrad or Rckhm Grad  <input type="checkbox"/> Ugrad or Non-Rckhm Grad             </td> <td style="width: 30%;"> <input type="checkbox"/> All Credit types  <input type="checkbox"/> Rckhm Grad w/add'l Work             </td> <td style="width: 10%;"> <b>Credit Hours</b>                  Min _____ Max _____             </td> <td style="width: 10%;"> <b>Contact Hrs/Wk</b> _____  <b>Number of Wks</b> _____             </td> </tr> </table>	TITLE ABBREVIATION	Time Sched Max = 19 Spaces			Transcript Max = 20 Spaces		<b>Level of Credit</b> <input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rckhm Grad <input type="checkbox"/> Ugrad or Rckhm Grad <input type="checkbox"/> Ugrad or Non-Rckhm Grad	<input type="checkbox"/> All Credit types <input type="checkbox"/> Rckhm Grad w/add'l Work	<b>Credit Hours</b> Min _____ Max _____	<b>Contact Hrs/Wk</b> _____ <b>Number of Wks</b> _____	<p>Home Department <u>Atmospheric, Oceanic, &amp; Space Sciences</u> Div # <u>AOSS</u> Course Number <u>441</u></p> <p>Cross Listed Course Information _____</p> <p>Course Title <u>Meteorology and Climate of the Rockies</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">TITLE ABBREVIATION</td> <td style="width: 15%;">Time Sched Max = 19 Spaces</td> <td style="width: 70%;"><u>Met &amp; Clim Rockies</u></td> </tr> <tr> <td></td> <td>Transcript Max = 20 Spaces</td> <td><u>Met &amp; Clim Rockies</u></td> </tr> </table> <p>Course Description for Official Publication (Max = 50 words)  <u>This course introduces principles of atmospheric and environmental sciences using the Rocky Mountains as a field laboratory. Students will develop an understanding of meteorological processes to explain variations in microclimates, and the importance of mountainous regions on the earth's climate. Students will gain field-based knowledge of mountain climates and instrumentation.</u></p> <p><b>PROGRAM OUTCOMES:</b>  <input checked="" type="checkbox"/> a <input checked="" type="checkbox"/> b <input type="checkbox"/> c <input checked="" type="checkbox"/> d <input type="checkbox"/> e <input checked="" type="checkbox"/> f <input checked="" type="checkbox"/> g <input checked="" type="checkbox"/> h <input checked="" type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k</p> <p><b>Degree Requirements</b>  <input type="checkbox"/> Degree Requirement <input type="checkbox"/> Tech Elective  <input type="checkbox"/> Core Course <input type="checkbox"/> Other  <input type="checkbox"/> Free Elective</p> <p>Prerequisites <u>AOSS 320, AOSS 321, AOSS 323</u>  <input type="radio"/> Enforced <input checked="" type="radio"/> Advised</p> <p>Credit Restrictions _____</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"> <b>Level of Credit</b>  <input type="checkbox"/> Undergrad only  <input type="checkbox"/> Rackham Grad  <input type="checkbox"/> Non-Rckhm Grad  <input type="checkbox"/> Ugrad or Rckhm Grad  <input type="checkbox"/> Ugrad or Non-Rckhm Grad             </td> <td style="width: 30%;"> <input checked="" type="checkbox"/> All Credit types  <input type="checkbox"/> Rckhm Grad w/add'l Work             </td> <td style="width: 10%;"> <b>Credit Hours</b>                  Min <u>3</u> Max <u>3</u> </td> <td style="width: 10%;"> <b>Contact Hrs/Wk</b> <u>48</u>  <b>Number of Wks</b> <u>3</u> </td> </tr> </table>	TITLE ABBREVIATION	Time Sched Max = 19 Spaces	<u>Met &amp; Clim Rockies</u>		Transcript Max = 20 Spaces	<u>Met &amp; Clim Rockies</u>	<b>Level of Credit</b> <input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rckhm Grad <input type="checkbox"/> Ugrad or Rckhm Grad <input type="checkbox"/> Ugrad or Non-Rckhm Grad	<input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rckhm Grad w/add'l Work	<b>Credit Hours</b> Min <u>3</u> Max <u>3</u>	<b>Contact Hrs/Wk</b> <u>48</u> <b>Number of Wks</b> <u>3</u>
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<p>Repeatability (Indi Research, Dir. Study, Dissertation):                  Is this course repeatable? <input type="radio"/> Yes <input checked="" type="radio"/> No                  Maximum Hours? _____ Maximum Times? _____                  Can it be repeated in the same term? <input type="radio"/> Yes <input checked="" type="radio"/> No</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"> <b>Class Type(s)</b>  <input type="checkbox"/> Lec  <input type="checkbox"/> Rec  <input type="checkbox"/> Sem  <input type="checkbox"/> Lab  <input type="checkbox"/> Dis  <input type="checkbox"/> Ind  <input checked="" type="checkbox"/> Other _____             </td> <td style="width: 15%;"> <b>Graded Section</b>  <input type="checkbox"/> Lec  <input type="checkbox"/> Rec  <input type="checkbox"/> Sem  <input type="checkbox"/> Lab  <input type="checkbox"/> Dis  <input type="checkbox"/> Ind  <input checked="" type="checkbox"/> Other _____             </td> <td style="width: 15%;"> <b>Grading</b>  <input checked="" type="checkbox"/> A-E  <input type="checkbox"/> CR/NC  <input type="checkbox"/> S/U  <input type="checkbox"/> P/F  <input type="checkbox"/> Y             </td> <td style="width: 15%;"> <b>Location</b>  <input type="checkbox"/> Ann Arbor  <input type="checkbox"/> Biological Station  <input checked="" type="checkbox"/> Camp Davis  <input type="checkbox"/> Extension             </td> </tr> </table>	<b>Class Type(s)</b> <input type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input checked="" type="checkbox"/> Other _____	<b>Graded Section</b> <input type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input checked="" type="checkbox"/> Other _____	<b>Grading</b> <input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y	<b>Location</b> <input type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input checked="" type="checkbox"/> Camp Davis <input type="checkbox"/> Extension	<p><b>Printing Information (Optional)</b>  <input checked="" type="checkbox"/> Print the course in the Bulletin  <input checked="" type="checkbox"/> Print the course in the Time Schedule</p> <p>Terms &amp; Freq. of Offering <input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input checked="" type="checkbox"/> IIIb <input type="checkbox"/> III Half term <input type="checkbox"/> 1st <input type="checkbox"/> 2nd  <input checked="" type="checkbox"/> Yearly <input type="checkbox"/> Alter Years <input type="checkbox"/> Even Years <input type="checkbox"/> Odd Years</p> <p>Cognizant Faculty Member: <u>Gerald J. Keeler</u> Title <u>Professor</u></p> <p>Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty</p>																
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Approval

Curriculum Comm. \_\_\_\_\_

Faculty \_\_\_\_\_

Rackham \_\_\_\_\_

Cross listed Unit 1 \_\_\_\_\_

Cross listed Unit 2 \_\_\_\_\_

Submitted By:  Home Dept.  Cross-listed Dept.

Name, Signature & Department  
 Home Dept. AOSS John Boyd *John Boyd*

Cross-listed Dept(s). \_\_\_\_\_

**SUPPORTING STATEMENT**

The Department of Atmospheric, Oceanic and Space Sciences prides itself on graduating students who have real-world experience in their chosen field of study. The ESSF Meteorology program provides an opportunity during the summer semester to get hands-on experience setting-up meteorological stations and analyzing climate data in the beautiful Teton Mountains of Wyoming. Students will apply the knowledge gained through their first two-three years of classes to working in teams on projects that help them understand the complex meteorology of the Rockies. Interdisciplinary assessment of the unique aspects of the mountain environment and integration of materials from the geological and ecological sciences will help the students understand the complex interplay between these areas. Assessment will occur through oral and written presentations of the team projects as well as through regular examinations.

Course Outcomes:

1. Understand the basics of geology, ecology, and meteorology of the Rockies
2. Understand the basics of climate and the unique aspects of mountainous climates
3. Ability to design and conduct experiments, as well as to analyze and interpret data
4. Ability to function on multidisciplinary teams
5. Ability to communicate effectively
6. Understand the impact of engineering solutions in a global/societal context
7. Understand contemporary issues related to climate change

Are any special resources or facilities required for this course?  Yes  No

Detail the Special requirements

The field class will be offered at Camp Davis in Wyoming. The availability of atmospheric measurement equipment for probing the atmospheric boundary layer and the unique setting provided at the Geological Sciences Field Camp are the two main special requirements. Vans for travel to and from field camp will be required to transport the students and GSI to Camp Davis as well as the instrumentation that will be brought to field camp.

## Course Outline

1. Geology of the Rockies
2. Climate of the Rockies
  - a. Mountain Glaciers
3. Mountain Meteorology Basics
  - a. Flow Interactions with Topography
  - b. Thermally-driven Circulations
4. Mountain Waves
5. Planetary Boundary Layer in Complex Terrain
6. Diurnal Mountain Wind Systems
7. Basics of Meteorological Instrumentation
8. Instrumentation for Probing the PBL
9. High-Resolution Meteorological Modeling in Complex Terrains
  - a. 4-D Model Applications
  - b. Field Validation Experiments
10. Aerosol and Gaseous Compound Measurements
11. Upper atmospheric processes and structure
12. Class Wrap-up

## SEQUENTIAL GRADUATE/UNDERGRADUATE STUDY (SGUS)

### B.S.E.[ Mech. Engin.] and the M.S.E. [Indus. Oper. Engin]

#### **Admission to SGUS ME/IOE (Intent Form)**

By the end of the junior year (80-85 hours) the student must meet with the ME UG student advisor to discuss the SGUS program. The Intent Form must be filed at this time with a copy given to the IOE graduate program office. This form actually outlines what credits are to be double counted and what courses can be possibly transferred to the graduate degree.

- 3.5 cumulative GPA required at time of filing Intent Form and at time of admission to the IOE graduate program.
- may double count a maximum of 6 approved graduate credits graded "B" or better from the advanced technical elective or general electives.
- may transfer a maximum of 6 acceptable graduate credits graded "B" or better not used for BSE.
- must take IOE265, IOE316 and IOE366. [IOE265 may be used as General Electives and IOE316, IOE 366 as Advanced Mathematics in the Mechanical Engineering program
- must enroll the IOE graduate program in the subsequent full term upon completing the BSE; no BSE requirements are waived.
- may dual enroll in undergraduate/graduate program early if within 6 hours of completing the BSE. (Details to be worked out on a case-by-case basis).

#### **Advanced Mathematics**

Due to preparation requirements in probability and statistics for the IOE graduate program, students must complete IOE265 "Engineering Probability and Statistics", IOE316 "Introduction to Markov Processes", and IOE 366 "Linear Statistical Models". Because these course are at the undergraduate level, they are NOT eligible for double counting. Substitutions for these classes may be possible but will require approval by the IOE/ME departments.

#### **Restrictions**

The EGL and SGUS programs are independent and mutually exclusive.

#### **GRE**

Students may enter this SGUS program without taking the GRE .

Approved by ME UG Program Committee: 3-12-07

Approved by AOSS SGUS Advisor: 3-19=07

Approved by the ME faculty: 4-30-07

Approved by the CoE faculty:

**SEQUENTIAL GRADUATE/UNDERGRADUATE STUDY (SGUS) PROGRAM  
LEADING TO THE B.S.E. DEGREE IN PARTICIPATING ENGINEERING  
DEPARTMENTS AND THE M.S.E. DEGREE IN INDUSTRIAL AND  
OPERATIONS ENGINEERING (IOE)**

Prepared by W. Monroe Keyserling  
SGUS Advisor  
Department of Industrial and Operations Engineering

APPROVED by the IOE Faculty, March 8, 1995  
REVISED January 14, 1996 (to reflect minor wording changes suggested by Rackham)  
APPROVED by the College of Engineering, February 6, 1996  
REVISED January 2000 (to reflect COE SGUS Guidelines)  
REVISED July 2002 (to reflect change to “Sequential”)  
REVISED March 2006 (to clarify definition of two full terms)

### **Introduction and Summary**

Description: The Department of Industrial and Operations Engineering (IOE) has established a five-year Sequential Graduate/Undergraduate Study (SGUS) program that allows outstanding students in the College of Engineering (COE) to receive their BSE degree from a participating COE department followed by the MSE degree in IOE after completing a minimum of 152 credit hours. This is accomplished by allowing students to “double-count” six credit hours of prior approved graduate-level courses in order to satisfy all requirements for both the BSE and MSE degrees. Double-counted courses appear as transfer credit on the student’s Rackham transcript.

Eligibility: Students who have reached the second term of their junior year with a minimum cumulative GPA of 3.5 may apply for provisional admission to the program. This allows sufficient time for the student to be advised appropriately regarding undergraduate and graduate course selections. Students who do not meet the GPA requirement may petition the IOE Graduate Admissions and Financial Aid Committee for provisional admission by providing other credentials such as letters of recommendation from faculty and/or other evidence of special accomplishments. Finally, the student must include a nomination letter from his/her Undergraduate Program Advisor as part of the SGUS application.

Tuition Requirements: SGUS students must enroll in Rackham for at least two full (9 credit) terms, paying full Rackham tuition with no other U of M registration. Normally, this will be the final two terms of enrollment in the five-year program.

### **Background**

College of Engineering undergraduate programs require students to complete 128 credit hours consisting of core engineering courses, departmental core courses, and a combination of technical and unrestricted electives. While these programs provide

students with an excellent, focused technical education in their chosen engineering discipline, the 128 credit hours provide only a limited opportunity for students to pursue topics in systems design and integration that are covered in IOE courses at the 400-600 level. By pursuing a coordinated graduate/undergraduate study program, students are offered the opportunity to take graduate IOE courses and obtain the IOE Masters degree as part of an uninterrupted, five-year program.

There are several reasons why non-IOE engineering students pursue the IOE Masters degree. Some students use it as the first step toward the IOE Ph.D. degree. Other students pursue the degree to expand their knowledge base in order to enhance their qualifications for professional engineering careers. Among this group, most students select their IOE courses in order to specialize in one or two of the following areas:

- Engineering Management
- Ergonomics/Safety
- Financial Engineering
- Operations Research
- Production/Manufacturing Systems
- Statistical Decision Making/Quality Engineering

The BSE/MS-IOE SGUS program encourages some of our very best undergraduates to stay at Michigan for an extra year. It also serves the engineering community by providing better-trained engineers at the entry level of the profession.

## **Program Description and Degree Requirements**

### Requirements for the BSE Degree

SGUS students must complete all requirements for their BSE degree as established by their department and published in The University of Michigan College of Engineering BULLETIN. Due to preparation requirements in probability and statistics for the IOE graduate program, students must complete IOE 265 “Engineering Probability and Statistics” (4 credit hours), IOE 316 “Introduction to Markov Processes” (2 credit hours), and IOE 366 “Linear Statistical Models” (2 credit hours). Because these courses are at the undergraduate level, they are NOT eligible for double counting, but may be used as electives toward the BSE degree. (Note: Courses equivalent to IOE 265, 316, and 366 are acceptable to fulfill probability and statistics preparation requirements.) Up to six credit-hours of undergraduate courses may be “double-counted” and transferred to the student’s Rackham transcript, *provided that these courses are eligible for credit in the IOE Masters degree curriculum*. Normally, double-counted courses are selected from the “Unrestricted Elective” category of the BSE degree requirements.

Students considering the SGUS program should work closely with the Undergraduate Program Advisor from their BSE department as well as the IOE SGUS Advisor when choosing elective courses. Any student wishing to enter the SGUS program must include a nomination letter from his/her Undergraduate Program Advisor as part of the Rackham application.

## Requirements for the MSE (IOE) Degree

SGUS students must complete 30 credit-hours of approved graduate-level courses in order to receive the MSE (IOE) degree. Specific requirements are established the The University of Michigan College of Engineering BULLETIN. Information regarding which 400-level and 500-level courses are eligible for IOE graduate credit is summarized on the “Masters Counseling Information” flyer available from the IOE Graduate Program Office. Other questions regarding the eligibility of courses will be answered by the IOE Graduate Program Advisor.

Because six credit-hours of BSE courses are double-counted, SGUS students must complete 24 credit-hours beyond the BSE degree requirements for a total of 152 credit hours in the combined program.

**The key to designing a SGUS program that can be completed with the minimum 152 credit hours is careful management of undergraduate elective courses. Students considering the SGUS program must “reserve” at least 8 credit hours for undergraduate probability and statistics coursework and 6 elective credit hours for courses that are eligible for credit in the IOE Masters degree program.**

## **Admission Procedures**

Undergraduate students from participating departments who have maintained a GPA of at least 3.5 are eligible to apply for provisional admission to the SGUS program during their senior year. The student must submit the standard Rackham application form and a cover letter stating that he/she is applying for provisional admission as an SGUS student. In addition, the student must submit a nomination letter from the Undergraduate Program Advisor for his/her BSE degree.

Formal admission to Rackham will not occur until the student is within 6 credits of completing the B.S.E. degree. Normally, students will enroll in Rackham for the final two terms of the combined program.

## **Administrative Policies and Practices**

The student’s BSE department will maintain the undergraduate record. Following formal acceptance into Rackham, the IOE Graduate Program Office will maintain a separate folder for all graduate records. Both folders will be tagged to indicate SGUS status.

Audits for both degrees will be performed in the normal manner by the appropriate Undergraduate and Graduate Program Advisors.