The University of Michigan
College of Engineering
Curriculum Committee

Agenda
November 9, 2004
1:30-3:30 p.m.
GM Room
Fourth Floor Lurie Engineering Center

1. Approval of Minutes from October 12, 2004 Meeting

2. Appointment of Representative for the Interdisciplinary Program: Discussion

3. Change in CS-Engineering Program

4. Triple Degrees in CoE ?

5. Further Triage of Curriculum Committee Approved Proposals

6. 3/2 Impact and # of Credits at U of M

7. Revisit the Pass/Fail Policy (if the A.R.W.G. submits a Proposal)

8. Course Approval Forms

University of Michigan
College of Engineering
Curriculum Committee Meeting
Tuesday October 12, 2004
1:30-3:30 p.m.
Lurie Engineering Center GM Room
Minutes

Jeff Fessler called the meeting to order at 1:40 p.m.

Members Present: J.Fessler, C.Cesnik, J. Day, James Holloway, C. Lastoskie, G. Herrin, S. Holleran, J. Holloway, G. Hulbert, S. Montgomery, M. Parsons, J. Patel, H. Peng, R. Robertson, P. Samson, S.Takayama

Members Absent: S. Pang, L. Thompson

Guests: Henia Kamil, Honor Passow

Motion to approve the minutes of the last meeting

The minutes of the last meeting were approved

Business from the last meeting (C-/D grades)

Jeff Fessler passed out in information regarding the wording related to C-/D grades in the Bulletin. A straw vote was taken in the last meeting and a majority was in favor of following the recommendation of the Academic Rules Working Group (ARWG) to raise the bar and having students required to receive a "C-" grade or better in all of the College core courses.

Jeff reworded the proposed revised wording and he submitted this draft to the Committee.
The main change is that a grade of "D+" or lower would not be acceptable any more in College core courses, even if they aren't a prerequisite for something else.
Discussion.
Jeff asked for a motion to approve the revised wording in which the following amendments have been made: ***The first "D" has been replaced with by a "D" in the first sentence, and the rest of the sentence that starts with: unless waived by is removed.***
Moved and Seconded. **Motion Carried (approved)**

Proposal for M.Eng. Degree Program in Structural Engineering

Christian Lastoskie said that the M.Eng Degree Program in Structural Engineering had been approved in the last faculty meeting in Civil Engineering.
Jeanne Murabito noted that any new program needs to go to the Presidents' Council.
This program is scheduled to begin in Fall, 2005.

Jeff Fessler asked for a motion to approve this Degree Program. Moved and seconded. Discussion. 13 approved, 1 abstained. **Motion Carried (approved)**

CoE Requirements for Pass/Fail Courses

Jeff Fessler noted that this Pass/Fail issue was discussed at the last CoE Curriculum Committee meeting and the conclusion was that the ARWG should discuss this. In the meantime, the Scholastic Standing Committee had discussed this and submitted a proposal by e-mail, which was included in the meeting packet. Discussion.

It was concluded that this still needs work and it should be sent back to the ARWG. It was hoped that they would have a revised proposal for the next meeting.

Revised SUGS Proposal BS BME in Pharmaceutical Engineering – Henia Kamil

A revised proposal based on the current BME program had been included in the meeting packet.

The other issue which came up previously was the technical electives that can be double counted. This was also addressed by including a list of some of the courses.

Jeff Fessler asked for a motion to approve this Program. Moved and Seconded.
Motion Carried (approved)

Course Approval Forms

Jeff Fessler called for a motion to approve the following courses. This was moved and seconded.

AOSS 598 New Course

CEE 445 ***for information only*** Modification – Changed terms from: Fall ***to: Winter and Fall***

CEE 519 New Course

CEE 619 New Course

CEE 811 New Course

EECS 527 Modification – Changed description; Changed prerequisites from: EECS 478 ***to: EECS 281 or EECS 478 or Graduate Standing***; added discussion to class type.

IOE 810 Deletion

IOE 815 Deletion

IOE 825 Deletion

IOE 843 Deletion

IOE 873 Deletion
Motion Carried (approved)

Data to Support Undergraduate Curricular Decision Making – Jeanne Murabito & Honor Passow

Information on this presentation was sent as a separate PDF along with the meeting packet.

Jeanne Murabito and Honor Passow presented this information.
Jeanne said that they had given an update to the chairs on October 5, and this was a quick rundown on where the College is on preparation for ABET and what the Program and Chair responsibilities are. The Chairs were asked to meet soon and regularly with the ABET coordinators.
There is a website which was launched on September, 2003.

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

ADDITIONAL NOTE
After the meeting ended Henia Kamil noted some errors in certain course titles in the proposed MEng in Structural Engineering. These were communicated to the Civil Engineering Department.

Next Meeting
Tuesday, November 9, 2004
1:30-**3:30** p.m.
GM Room – Fourth Floor LEC

UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
ELECTRICAL ENGINEERING & COMPUTER SCIENCE

1301 BEAL AVE.
ANN ARBOR, MI 48109-2122
734 764-2390 FAX 734 763-1503

October 25, 2004

TO: Professor Jeff Fessler, Chair
College of Engineering Curriculum Committee

FROM: Professor Gregory H. Wakefield, Chair
Electrical Engineering and Computer Science (EECS) Curriculum Committee

RE: Change in CS-Engineering Program to delete Math 425 from Group Requirement

When the CS-Engineering program was evaluated by ABET for accreditation in 2003, one of the concerns was that the program did not include any statistics. To correct this problem we asked the Mathematics Department to consider adding a significant statistics component to Math 425. Their answer was that they did not want to change the course, but they said they would allocate sufficient faculty to teach an increased enrollment in Statistics 412 to accommodate our students who needed to take it in the future. Note that students can also take IOE 265 to satisfy the probability and statistics requirement, but enrollment restrictions in IOE make Statistics 412 a more attractive alternative.

Consequently we are requesting that Math 425 be deleted from the probability and statistics group requirement for CS-ENGR, and that Stat 412 and IOE 265 be kept as the remaining alternatives.

Dual majors between CS-ENGR and other disciplines will be able to satisfy this requirement with Math 425 so that there is no impact of this change in those programs, especially EE or CE. If that happens, we would encourage dual majors to take a statistics course in addition to Math 425, but not require it at this time.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Sample Schedule
B.S.E. Computer Science

Credit Hours	Terms 1	2	3	4	5	6	7	8
Subjects required by all programs (55 hrs.)								
Mathematics 115, 116, 215, and 216 16	4	4	4	4	-	-	-	-
ENGR 100 4	4	-	-	-	-	-	-	-
ENGR 101. 4	-	4	-	-	-	-	-	-
[1]Chemistry 125/126/130 or Chemistry 210/211 5	5	-	-	-	-	-	-	-
Physics 140 with Lab 141; 240 with Lab 241 10	-	5	5	-	-	-	-	-
Humanities and Social Sciences 16	4	4	-	4	4	-	-	-
Program Subjects (28 hrs.)								
EECS 203, Discrete Mathematics 4	-	-	4	-	-	-	-	-
EECS 280, Programming & Elem. Data Structures 4	-	-	4	-	-	-	-	-
EECS 281, Data Structures & Algorithms 4	-	-	-	4	-	-	-	-
EECS 370, Intro to Computer Architecture 4	-	-	-	-	4	-	-	-
[2]Math 425 or Stat 412 or IOE 265 3	-	-	-	3	-	-	-	-
EECS 376, Foundations of Computer Science 4	-	-	-	-	-	4	-	-
EECS 496, Major Design Experience Professionalism 2	-	-	-	-	-	-	2	-
[3]TCHNCLCM 281 1	-	-	-	1	-	-	-	-
[3]TCHNCLCM 496 2	-	-	-	-	-	-	2	-
Technical Electives (30 hrs.)								
[4]Flexible Technical Electives 14	-	-	-	-	4	4	-	6
[5]Advanced CS Technical Electives 16	-	-	-	-	-	4	8	4
[6]Upper Level Flexible Technical Electives 8	-	-	-	-	-	-	-	8
Free Electives (15 hrs.) 15	-	-	-	-	3	4	4	4
Total 128	17	17	17	16	15	16	18	14

Notes:

[1]Chemistry: Students who qualify are encouraged to take Chem. 210 (4 hrs.) & Chem. 211 (1 hr.) as a replacement for Chem. 130 (3 hrs.), Chem. 125 (1 hr.), and Chem. 126 (1 h.r)

[2]Probability/Statistics Course: IOE 265 is a 4 credit course; if this is elected, the extra credit is counted toward free electives.

[3]Technical Communication: TCHNCLCM 281 must be taken with EECS 281. TCHNCLCM 496 must be taken with a Major Design Experience (MDE) course.

[4]Flexible Technical Electives (FTEs): Computer Science courses* at the 200+ level, or approved courses at the 200+ level that are required by a program/concentration in Engineering, Math, or Science. Advanced CS Technical Electives can also be used as FTEs. See the EECS Undergraduate Advising Office for the current list. At least 2 credits in CS.

[5]Advanced CS Technical Electives: Computer Science courses* at the 300-level or higher (excluding EECS 398, 498, 499, 598, 599). This may include an approved Major Design Experience (MDE) course. See the Undergraduate Advising Office for the current list. Preapproved MOE courses include EECS 481, 482, 483, 494, and 497. Other courses may be acceptable with prior approval of the Chief Program Advisor.

*Computer Science (CS) Courses: A complete list of CS courses is available in the EECS undergraduate advising office, 3415 EECS.

A maximum of 4 credits of EECS 499 may be applied to Flexible Technical Electives. Anything beyond 4 credits will be applied toward Free Electives.

Sample Schedule
B.S.E. Computer Engineering

Credit Hours	Terms 1	2	3	4	5	6	7	8
Subjects required by all programs (55 hrs.)								
[1]Mathematics 115, 116, and 216 12	4	4	-	4	-	-	-	-
Mathematics 215 4	-	-	-	-	4	-	-	-
ENGR 100. 4	4	-	-	-	-	-	-	-
ENGR 101. 4	-	4	-	-	-	-	-	-
[1]Chemistry 125/130 or Chemistry 210/211 5	-	5	-	-	-	-	-	-
Physics 140 with Lab 141; 240 with Lab 241 10	5	-	5	-	-	-	-	-
Humanities and Social Sciences 16	4	4	-	4	-	4	-	-
Program Subjects (32 hrs.)								
EECS 203, Discrete Mathematics 4	-	-	4	-	-	-	-	-
[1]EECS 206, Signals and Systems 4	-	-	-	4	-	-	-	-
[1]EECS 215, Introduction to Circuits 4	-	-	-	-	4	-	-	-
EECS 270, Intro to Logic Design 4	-	-	4	-	-	-	-	-
EECS 280, Programming & Elem. Data Structures 4	-	-	-	4	-	-	-	-
EECS 370, Intro to Computer Organization 4	-	-	-	-	4	-	-	-
[2]EECS 401 or Math 425 or Stat 412 3	-	-	-	-	-	3	-	-
[3]TCHNCLCM 215 or 281 1	-	-	-	-	1	-	-	-
[4]TCHNCLCM 496 and EECS 496 4	-	-	-	-	-	-	-	4
Technical Electives (28 hrs.)								
[5]Flexible Technical Electives 7	-	-	-	-	-	-	4	3
EECS Elective 3	-	-	-	-	-	-	3	-
[6]Core Electives 8	-	-	-	-	-	8	-	-
[7]Upper Level CE Electives 10	-	-	-	-	-	-	4	6
Free Electives (13 hrs.) 13	-	-	3	-	3	-	4	3
Total 128	17	17	16	16	16	15	15	16

Notes:

[1]TCHNCLCM 215 or 281: Must be elected concurrently with EECS 215 or EECS 281 respectively.

[2]TCHNCLCM 496 and EECS 496: Must be elected concurrently with a Major Design Experience (MDE) course.

[3]Technical Electives: At least one of these classes must be a Major Design Experience Course in some ABET accredited program in the College of Engineering.

[4]Flexible Technical Electives (FTEs):The flexible technical elective requirement may be fulfilled by taking selected courses in EECS, other engineering departments, biology, chemistry, economics, math or physics.

[5]EECS Elective: The EECS elective must be fulfilled by taking a selected course in EECS.

[6]Core Electives: 8 credits from the following list: EECS 281, 306, 312, 373.

[7]Upper Level CE Electives: 10 credits from the following list: EECS 427*, 452*, 461, 470*, 478, 482, 483*, 489*, 527, 570, 573, 578, 582, 583*, 589, 627. Must include at least one Major Design Experience course taken concurrently with EECS 496 and TCHNCLCM 496 (MDE courses are indicated with an *). Other courses may be acceptable with prior approval of the Chief Program Advisor.

A maximum of 4 credits of EECS 499 may be applied to Technical Elective requirements and only in the area of EECS Technical Electives. Anything beyond 4 credits will be applied toward Free Electives.

Lists of "selected courses" for the various Technical Electives can be found in the EECS advising office.

MEMORANDUM

TO: CoE Curriculum Committee
Academic Rules Working Group

FROM: Sharon Burch, Director
Office of Recruitment and Admissions

DATE: October 26, 2004

RE: Transfer Credit Data and Summary for Consideration of Transfer Credit Changes for Residency Rule

A review of advanced credit for students transferring to the College of Engineering as undergraduates for the past five terms (Fall 2002 – Fall 2004) includes the following:

Group	**Number**	**Average Number of Credit Hours**
All	707	68
External Transfers	406	69.4 *(17.7% transferred >= 85 hours)*
Cross Campus Transfers	301	49 *(16.2% transferred >= 85 hours)*

Dual Degree and Other Collaborative Programs

Students entering the CoE as a part of Dual Degree in Engineering programs (or "Three-Two" programs) transfer in with a large number of credit hours. This is due to the number of credits taken to complete the BS degree from the liberal arts school of origin. An example of this is the dual degree program with the schools of the Atlanta University Center. Because the students still need to complete approximately 60 credit hours of engineering courses, they are likely to complete four to five terms in the CoE.

Students transferring from SJTU also have been enrolling consistently with a large number of credit hours although they do not receive a BS for the original institution. This has been noted and is being discussed for clarification on the intent of the program's objectives.

Other Situations

We also receive applications from students who are pursuing engineering as a second degree. The advanced credit process attempts to include only those courses that can be used toward the engineering degree as opposed to transferring all possible credit; e.g. an English major that has 25 – 40 English credits would not transfer all of the credit because it cannot all be used for the engineering degree.

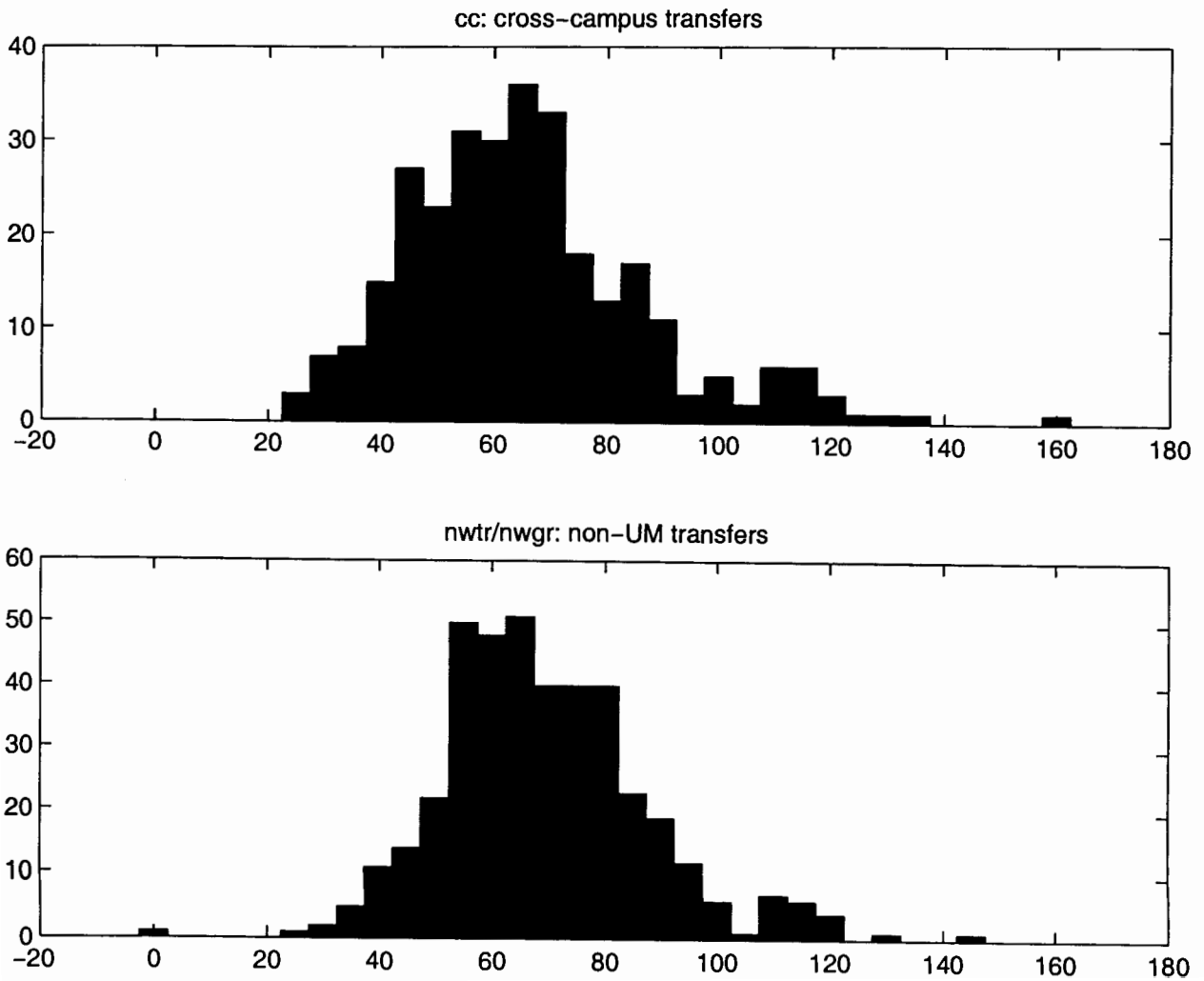
Prescribed Program

Students applying with less than 30 – 40 credits remaining to receive a BSE are referred to the department for consultation and decision. If the decision to admit, the student is admitted via a *prescribed program.* Refer to page 20 of the 2004-05 bulletin.

Recommendations

Based on the data and trends that we have seen, the recommendation for the residency rule as it includes consideration for the circumstances for transfer students is somewhere in the range of 52 or 54 of the last 60 credit hours to be taken on the UM campus.

Thank you for the opportunity to provide input.


cc: cross-campus transfers
40
30
20
10
0
-20
0
20
40
60
80
100
120
140
160
180
nwtr/nwgr: non-UM transfers
60
50
40
30
20
10
0
-20
0
20
40
60
80
100
120
140
160
180

Purpose

The **Curriculum Committee** shall examine all educational programs of the College, graduate and undergraduate, and all proposed changes, and encourage full discussion of the proposals by the members before they take action. The Committee, moreover, shall initiate changes by asking departments to reexamine their programs or specific course offerings. Program Committees shall administer by the departments or the degree programs. The **Curriculum Committee** advises, suggests, coordinates, stimulates, and in general acts for the best interest of the College. Its recommendations regarding changes in programs, college-wide curriculum requirements, and changes in classes used in the program requirements of more than one department shall be brought before the faculty for approval. The Committee will have the authority to approve by a 2/3 vote all other curriculum-related change without a vote of the faculty.

COURSE APPROVAL FORMS

For November 09, 2004 CoE CC Meeting

AOSS 565	Modification – Changing Title, Changing Description; Changing Credit & Contact Hours from: 3 ***to: 4***.
EECS 571	Modification – Changing Credit & Contact Hours from: 3 ***to: 4***.
EECS 580	New Course
EECS 755	Modification – Changing Title Abbreviation; Changing Level of Credit from: Rackham Grad ***to: All Credit types***

THE UNIVERSITY OF MICHIGAN – COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number **1453**

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 10/25/2004
Effective Winter 2005

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Div # / Course Number	Home Department: Atmospheric, Oceanic, & Space Sciences / Div #: AOSS / Course Number: 565
Cross Listed Course Information	Cross Listed Course Information
X Course Title: Planetary Atmospheres	Course Title: Planetary Science
TITLE ABBREVIATION — Time Sched Max = 19 Spaces:	TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Planet Sci
TITLE ABBREVIATION — Transcript Max = 20 Spaces:	TITLE ABBREVIATION — Transcript Max = 20 Spaces: Planet Sci
X Course Description: Radiative, photochemical, thermodynamical and aeronomical processes in the atmospheres and and ionospheres of the planets and satellites, with the objective of understanding the compsoition, structure, origin and evolution of the atmospheres, theoretical and empirical results, including planetary observatins by space probes.	Course Description for Official Publication (Max = 50 words): Solar system formation; giant planets and origin of their atmospheres; biogeochemical evolution of terrestrial planet atmospheres; radiative transfer, internal energy and thermal structure; thermochemical cloud formation; radiative and charged particle energetic processes for neutrals and ions; origin of satellite atmospheres; extrasolar planets; life in the universe; planetary exploration.
PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐l	PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k
Degree Requirements: ○ Degree Requirement ○ Tech Elective ○ Core Course ○ Other ○ Free Elective	Degree Requirements: ○ Degree Requirement ○ Tech Elective ◉ Core Course ○ Other ○ Free Elective
☐ Prerequisites: Graduate Standing ○ Enforced ⊙ Advised	Prerequisites: ○ Enforced ⊙ Advised
☐ Credit Restrictions	Credit Restrictions
☒ Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Worl; Credit Hours Min 3 Max 3; Contact Hrs/Wk 3; Number of Wks 14	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 4 Max 4; Contect Hrs/Wk 4; Number of Wks 14
C. Repeatability (Indi Research, Dir. Study, Dissertation): Is this course repeatable? ○ Yes ⊙ No; Maximum Hours? ____ Maximum Times? ____; Can it be repeated in the same term? ○ Yes ○ No	Printing Information (Optional): ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule
☐ Class Type(s): ☒ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other ____; Graded Section: ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other; Grading: ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y; Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension	Terms & Freq. of Offering: ☐ I ■ II ☐ IIIa ☐ IIIb ☐ III; ■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years; Half term ☐ 1st ☐ 2nd
	Cognizant Faculty Member: Sushil K. Atreya; Title Professor
	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

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. Perry Samson
Cross-listed Dept(s) _____

Form Number

1453

SUPPORTING STATEMENT

1. Change the title of AOSS 565 to "Planetary Science", and
2. Increase the number of Credit Hours to four (4).

The above changes are necessary to correctly represent the nature of the course, and to do justice to the amount of material covered.

Justification of the proposed changes is given below.

The sheer bulk of knowledge about the planets has increased dramatically in the past two decades as a result of exploration of the solar system by multiple spacecraft, earth orbiting satellites and ground-based telescopes. Very definitive results on the atmospheres of satellites have become available. And, more than one hundred twenty extrasolar planets have been discovered. The presentation of this material, including the assimilation of new knowledge into theories, computer models, and measurement techniques. The volume of knowledge to be presented requires more time than what can be reasonably done in a three credit hour course.

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

Detail the Special requirements

Planetary Science
Winter 2005
Class Time and Place: M & W 1-3 pm or 3-5 pm; SRB
Professor Sushil K. Atreya
atreya@umich.edu
Office Hours: Thursdays: by appointment

Course Outline

1. Formation of the solar system (1 week).

2. Origin, composition, and evolution of "sun-like" atmospheres, i.e. the gas giant and icy giant planets: theoretical development and measurements (1.5 weeks).

3. Origin, composition, and evolution of atmospheres on terrestrial planets; role of geological and biological processes (1.5 weeks).

4. Energy balance, radiative transfer, thermal structure, and atmospheric mixing of terrestrial and giant planets: theoretical development and measurements (2 weeks).

5. Thermochemistry and clouds of the inner and outer planets: theoretical development and measurements (1week).

6. Chemical transformation by the solar and charged particle energetics and by extraplanetary material: theoretical development and measurements (2 weeks).

7. Ionospheric aeronomy: theoretical development and measurements (1.5 weeks).

8. Uniqueness of satellite atmospheres: Titan, Triton, Io (1.5 weeks).

9. Extrasolar planets, and Life in the Universe (1 week).

10. Exams, Reviews, Term Papers (1 week).

Course Grading Scheme

One Mid-Term Exam of 2 hours	30%
One Final Exam of 2 hours	30%
Homework and Term Projects	40%

Course Reading Material

Will consist of a combination of hand-outs of recent publications etc., and certain chapters from the following recommended books:

1. Atmospheres and Ionospheres of the Outer Planets and their Satellites, S. K. Atreya, Springer-Verlag, New York-Berlin.
2. Origin and Evolution of Planetary and Satellite Atmospheres, S. K. Atreya and J. B. Pollack, eds., Univ. of Arizona Press.
3. Planetary Science, I. dePater, J. Lissauer, Cambridge Univ. Press.

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

[redacted]

Form Number **1454**

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 10/27/2004
Effective Fall 2005

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Div # / Course Number	Home Department: EECS / Div #: 252 / Course Number: 571
Cross Listed Course Information	Cross Listed Course Information
Course Title	Course Title: Principles of Real-Time Computing
TITLE ABBREVIATION — Time Sched Max = 19 Spaces	TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Prin R T Comp
TITLE ABBREVIATION — Transcript Max = 20 Spaces	TITLE ABBREVIATION — Transcript Max = 20 Spaces: Pr R T Comp
Course Description	Course Description for Official Publication (Max = 50 words): Principles of real-time computing based on high performance, ultra reliability and environmental interface. Architectures, algorithms, operating systems and applications that deal with time as the most important resource. Real-time scheduling, communications and performance evaluation.
PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k	**PROGRAM OUTCOMES:** ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k
Degree Requirements O Degree Requirement O Core Course O Free Elective O Tech Elective O Other	**Degree Requirements** O Degree Requirement O Core Course O Free Elective O Tech Elective O Other
Prerequisites O Enforced O Advised	Prerequisites: EECS 470, EECS 482 or Permission of instructor O Enforced ⊙ Advised
Credit Restrictions	Credit Restrictions
Level of Credit ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Worl	**Level of Credit** ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work
Credit Hours Min 3 Max 3	Credit Hours Min 4 Max 4
Contact Hrs/Wk 3 Number of Wks 14	Contact Hrs/Wk 4 Number of Wks 14
X	
C. Repeatability (Indi Research, Dir. Study, Dissertation): Is this course repeatable? O Yes ⊙ No; Maximum Hours? ____ Maximum Times? ____; Can it be repeated in the same term? O Yes O No	**Printing Information (Optional)** ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule
Class Type(s) ☒ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other ____ **Graded Section** ⊙ Lec O Rec O Sem O Lab O Dis O Ind O Other **Grading** ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y **Location** ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension	Terms & Freq. of Offering ■ I ☐ II ☐ IIIa ☐ IIIb ☐ III ■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years; Half term ☐ 1st ☐ 2nd
	Cognizant Faculty Member: Kang G. Shin **Title** Professor
	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

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. EECS
Cross-listed Dept(s). _____

Form Number

1454

SUPPORTING STATEMENT

Over the last 3-4 years, the course EECS 571 Principles of Real-Time Computing has become project-heavy. Students are required to design, implement and evaluate time-sensitive systems, such as voice over IP, responsive Internet servers, automotive powertrain control, embedded real-time OS, etc. Moreover, students must participate in a mini-conference of project presentations along with final written reports. The term projects account for 55% of the total course grade.

The workload in EECS 571 is commensurate with the workload in other 4-credit graduate courses requiring a large amount of research and programming project work: EECS570, 582, 583, and 584.

In addition to the projects, students must do biweekly homework, each of which usually consists of traditional problem solving and paper reading and critiquing (and sometimes in-class presentation). Midterm and final exams are also required.

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

Detail the Special requirements

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

[redacted]

Form Number **1432**

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 9/1/2004
Effective Winter 2005

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Div # / Course Number	Home Department: EECS / Div #: 252 / Course Number: 580
Cross Listed Course Information	Cross Listed Course Information
Course Title	Course Title: Advanced Computer Graphics
TITLE ABBREVIATION — Time Sched Max = 19 Spaces	Adv Comp Graphics
TITLE ABBREVIATION — Transcript Max = 20 Spaces	Adv Comp Graphics
Course Description	Course Description for Official Publication (Max = 50 words): Geometric modeling: spline curves and surfaces, subdivision surfaces, polygonal meshes, point-based and implicit surfaces. Real-time rendering: fixed and programmable pipeline, shadows. Acceleration algorithms: culling and level-of-detail. Collision detection. Delaunay triangulations and Voronoi diagrams. Non-photorealistic rendering. Pattern synthesis. Image-based rendering.
PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k	**PROGRAM OUTCOMES:** ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k
Degree Requirements ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	**Degree Requirements** ⊙ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other
Prerequisites ○ Enforced ○ Advised	Prerequisites: EECS 487 (or equivalence) Or Graduate standing ⊙ Enforced ○ Advised
Credit Restrictions	Credit Restrictions
Level of Credit ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min ___ Max ___; Contact Hrs/Wk ___; Number of Wks ___	**Level of Credit** ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 4 Max 4; Contact Hrs/Wk 4; Number of Wks 14
C. Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ⊙ No; Maximum Hours? ___ Maximum Times? ___; Can it be repeated in the same term? ○ Yes ○ No	**Printing Information (Optional)** ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule
Class Type(s) ☒ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other ___; **Graded Section** ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other; **Grading** ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y; **Location** ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension	Terms & Freq. of Offering ☐ I ■ II ☐ IIIa ☐ IIIb ☐ III; ■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years; Half term ☐ 1st ☐ 2nd
	Cognizant Faculty Member: Igor Guskov, Lee Markosian; Title: Asst. Professor, Asst. Professor
	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

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. EECS
Cross-listed Dept(s). ___

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Form Number

1432

SUPPORTING STATEMENT

This is the first graduate-level course in Computer Graphics. It will focus on introducing students to modern techniques in Computer Graphics. This course will be crucial for graduate students doing research in computer graphics. Currently there is no course that covers this material. The preliminary version of the course was taught in the Winter of 2004 (EECS 598-1/498-5) with enrollment of 19 students.

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

Detail the Special requirements

Access to 3D lab in Media Union.

EECS 580: Advanced Computer Graphics

Supporting statement

We would like to introduce a graduate-level course in Computer Graphics. It will focus on introducing students to modern techniques in Computer Graphics. This course will be crucial for graduate students doing research in computer graphics. Currently there is no course that covers this material. A preliminary version of the course was taught in the Winter of 2004 (EECS 598-1/498-5) with enrollment of 19 students.

Course information

This is the first graduate-level course in Computer Graphics, with emphasis on geometric modeling and real-time rendering techniques. Intended audience for this course includes CSE graduate students interested in graphics, as well as undergraduate students who took EECS 487 but would like to learn more. Basic knowledge of OpenGL and working knowledge of C/C++ is assumed.

Prerequisites

EECS 487 (or equivalent) or graduate standing

Course objectives

The course will give an overview of current research topics in Computer Graphics, and introduce several topics in depth. The selection of topics is defined by their relevance to the research of current graphics faculty, one purpose of this course is to prepare the incoming graduate students for active research. In particular, a large part of the course will concentrate on geometric modeling and real-time rendering.

- Modern geometric modeling uses a wide variety of shape representations from polygonal meshes and point clouds to implicit surfaces. In practice, it is important to be able to choose an appropriate shape representation for a given geometric modeling problem. The course will give an overview of current shape representations; their advantages and limitations will be discussed. Necessary background material from mathematics, computational geometry, and advanced data structures will be presented. Students will get practical experience working with polygonal meshes and subdivision surfaces.
- Understanding of real-time rendering pipeline is crucial for the development of interactive graphical applications. In recent years, rapid progress in the performance and the functionality of graphics processors brought about an abundance of novel rendering techniques that create life-like imagery in real time. Current graphics processors are able to process hundreds of millions of vertices and has been successfully used for general purpose processing. The course will introduce the fundamentals of programmable graphics pipeline, and its applications to rendering and computational tasks. Students will get practical experience implementing vertex and fragment shaders for modern GPUs. The course will also cover a number of acceleration techniques important for real-time rendering, such as level-of-detail and culling methods.

In addition to the two core areas of geometric modeling and real-time rendering, the course will cover a number of topics of current interest from recent research publications. These topics can include, for

instance, non-photorealistic rendering, pattern synthesis, and image-based rendering.

Course topics

- Geometric modeling
  - Polygonal meshes
  - Point and surfel clouds
  - Spline curves and surface
  - Implicit surfaces, distance functions, radial basis function representations
  - Subdivision surfaces and multiresolution representations
  - Surface acquisition and reconstruction
  - Meshing quality, Delaunay triangulations and Voronoi diagrams
- Real-time rendering
  - Fixed and programmable rendering pipeline, vertex and fragment shaders
  - Advanced texturing and shading
  - Precomputed radiance transfer
  - General purpose computing on graphics processors
  - Acceleration algorithms: culling and level-of-detail
  - Collision detection and response
  - Shadows
- Current topics
  - Non-photorealistic rendering
  - Pattern synthesis. X-by-example techniques.
  - Image-based rendering and light fields

Course materials

- Textbook: Real-time Rendering by Akenine-Moeller and Haines
- Siggraph 2000 Subdivision course notes by Zorin et al.
- Papers from ACM Siggraph proceedings of recent years

Assignments

- **Programming assignments (35%)**
  - **PA1:** Loop subdivision scheme implementation. **Brief description:** implementation of Loop subdivision scheme with boundaries, limit surface position and normal evaluation, and quasi-interpolation of the input control polygonal mesh. The basic mesh data structures and rendering code is given. The students are asked to fill in the algorithms and data structures for the subdivision itself. The quasi-interpolation requires understanding of irregular base mesh data structures.
  - **PA2:** Vertex and fragment programs for real-time per pixel lighting. **Brief description:** implementation of complex surface material model with bump mapping and reflective environment mapping on modern GPUs. The code template was given that loads and renders an animated MD3 game character model. The students were asked to write two shaders in a special shading language that implemented the mix of the bumpy diffuse and bumpy reflective material.
- **Final project (35%)**
  - Can be done in groups of up to three people, or individually. The group would choose a recent paper from Siggraph (or other) proceedings, present it in class, and implement a

significant part of it.
    - The following projects were presented in Winter 2004 when the course was taught as the EECS598-1/498-5 class with the enrollment of 19 students (graduate and undergraduate): "Monte-Carlo Raytracer", "Template matching", "View-Dependent Displacement Mapping", "Multi-scale Optical Flow", "Terrain Simplification Made Easy", "Volumetric shape representation", "Discrete Shells", "ROAM terrain simplification", "Soft Shadow algorithms", "Raytracing on GPU", "Image space suggestive contours", "Suggestive contours: image and object space based", "Texture Quilting"
- **Paper summaries and written homework (15%)**
- **Final exam (15%)**
    - in-class written examination on a broad range of topics covered in class and in the textbook

EECS 580: Weekly topics outline

- Geometric modeling
  - Week 1:
    Polygonal meshes, mesh data structures, manifoldness property, subdivision zoo
  - Week 2:
    Spline subdivision, Bezier curves, blossoming, NURBS introduction, multiple knots
  - Week 3:
    Subdivision scheme analysis, eigenanalysis, primal/dual schemes, multiresolution editing
  - Week 4:
    Surface acquisition, point and surfel clouds, mesh denoising, signed distance volumes, surface reconstruction, implicit functions, radial basis function representations
  - Week 5:
    Polygonal simplification, Garland-Heckbert quadrics, curvature computation on meshes, progressive meshes, terrain simplification methods
  - Week 6:
    Mesh quality measures, remeshing, surface meshing, Delaunay triangulations and Voronoi diagrams, patch clustering
- Real-time rendering and current topics in graphics research
  - Week 7:
    Real-time rendering pipeline, graphics APIs, OpenGL review, advanced texturing and shading, BRDFs, shadows
  - Week 8:
    Fixed and programmable pipeline overview, vertex and fragment shaders, precomputed-radiance transfer, GPU computing
  - Week 9:
    Acceleration algorithms: culling and level-of-detail, spatial data structures, collision detection
  - Week 10:
    Non-photorealistic rendering, silhouette detection and rendering, tone mapping and HDR imaging
  - Week 11:
    Pattern synthesis: texture-by-example, image analogies. Image-based rendering, light fields, global illumination methods
- Week 12 and 13: Student final project paper presentations

Assignments and exams schedule

- Programming assignment 1: subdivision surface modeling is given out during week 1 and is due during week 5
- Written homework on splines and subdivision analysis is given out during week 2 and is due during week 4
- Programming assignment 2: vertex and fragment shaders is given out during week 6 and is due during week 8
- Paper summaries will be assigned for the material in weeks 4, 5, 6, 10, 11.
- Final project proposal is due during week 9
- Final exam covers course material

THE UNIVERSITY OF MICHIGAN – COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

[redacted]

Form Number **1435**

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 9/14/2004
Effective Winter 2005

	A. CURRENT LISTING	B. REQUESTED LISTING
	Home Department / Div # / Course Number	Home Department: EECS / Div #: 252 / Course Number: 755
	Cross Listed Course Information	Cross Listed Course Information
X	Course Title	Course Title: Special Topics in Signal Processing
	TITLE ABBREVIATION — Time Sched Max = 19 Spaces	Spec Top Sig Proc
	TITLE ABBREVIATION — Transcript Max = 20 Spaces	Top Sig Proc
X	Course Description: None	Course Description for Official Publication (Max = 50 words): Advanced topics in Signal and/or image processing. The specific topics vary with each offering. (in signal)
	PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k	PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k
	Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ◉ Tech Elective ○ Other
	Prerequisites: ○ Enforced ○ Advised	Prerequisites: Permission of instructor ○ Enforced ◉ Advised
	Credit Restrictions	Credit Restrictions
X	Level of Credit: ☐ Undergrad only ☒ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 1 Max 4; Contact Hrs/Wk; Number of Wks	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 1 Max 4; Contact Hrs/Wk; Number of Wks
C.	Repeatability (Indl Research, Dir. Study, Dissertation): Is this course repeatable? ◉ Yes ○ No; Maximum Hours?; Maximum Times?; Can it be repeated in the same term? ◉ Yes ○ No	Printing Information (Optional): ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule
X	Class Type(s): ☒ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other; Graded Section: ◉ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other; Grading: ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y; Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension	Terms & Freq. of Offering: ☐ I ☐ II ☐ IIIa ☐ IIIb ☐ III Tobearranged; Half term ☐ 1st ☐ 2nd; ☐ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years
		Cognizant Faculty Member: Jeff Fessler; Title: Professor
		Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

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. EECS [signature]
Cross-listed Dept(s). _____

Form Number
1435

SUPPORTING STATEMENT

This course is a special topics course that is different every time it is taught, so students should be allowed, indeed encouraged, to take it more than once. The important change here is to allow the course to be repeated.

We are also allowing "all credit types" since there seems to be no reason to constrain it.

We are also specifying the term "to be arranged" since it is offered on an irregular basis.

We have also adjusted the abbreviation to be more sensible.

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

Detail the Special requirements