The University of Michigan
College of Engineering
Curriculum Committee
Faculty Meeting Report
April 3, 2012

Agenda Items

For Vote

1. Elimination of prescribed program and establishment of rules and guidelines for students returning to university for a second bachelor's degree.
2. Creation of College of Engineering Honors Program
3. Changes to the program requirements for the Bachelors of Engineering (Chemical Engineering)
4. Changes to the program requirements for the Bachelors of Engineering (Nuclear Engineering & Radiological Sciences)
5. Changes to the program requirements for the Bachelors of Engineering (Engineering Physics)

For Information

1. Changes in policy for granting credit by test for foreign language

MICHIGAN ENGINEERING
UNIVERSITY of MICHIGAN ■ COLLEGE of ENGINEERING

JAMES PAUL HOLLOWAY
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Date: February 29, 2012
From: James Paul Holloway
Associate Dean for Undergraduate Education
To: CoE Curriculum Committee
Re: Proposal related to prescribed program & students admitted for a second bachelor's degrees
Proposal:

1. Eliminate the Prescribed Program (and delete associated text in the CoE bulletin)
   http://www.engin.umich.edu/bulletin/admissions/noncanidate.html#section-4
   http://www.engin.umich.edu/bulletin/rules/graduation.html#section-2
2. Adopt the rules and guidelines enumerated below for second bachelor's programs (this text will be placed in the CoE bulletin where the Prescribed program is currently described)
   http://www.engin.umich.edu/bulletin/admissions/noncanidate.html#section-4

Bachelors degree holders seeking a second bachelors degree

The College of Engineering welcomes students already in possession of a bachelors degree, who are seeking a second bachelors degree in engineering. Students who already possess a bachelor's degree in engineering or closely aligned field such as physics should however consider a master's degree in an engineering discipline. For most students this will provide better value. Please consult with the graduate chair in the department of interest to explore admission to a masters degree program.

For students who have previously earned a bachelor's degree and who do elect to pursue admission for an additional bachelor's degree, the following rules and policies apply:

- Students may not be admitted to pursue a CoE bachelor's degree that is substantially similar to a degree of the same or lower level (bachelor's or master's) as one they already hold, or declare into such a similar degree program after admission. The Office of the Associate Dean for Undergraduate Education will have ultimate authority to decide if a candidate's prior degrees are too similar to a proposed degree to allow admission or declaration.
- In order to be qualified for admission for a second bachelor's degree, candidates should have taken Calculus 1 and 2, Physics 1, Chemistry, English Composition and/or introductory Technical Communications, and introductory Programming at an institution of higher education and have an academic record that suggests high levels of accomplishment. These courses can have been completed as part of their original degree, but could also have been taken for other reasons. They should have been completed no more than 10 years before admission, and ideally less than 7 years prior to admission.
    - Students who completed such courses less recently must demonstrate advanced proficiency in math, science, composition and programming, generally through the successful recent completion of more advanced coursework.

    - These accomplishments will be part of a holistic review for admission that considers the many factors addressing likelihood for success in the UM CoE.
    - Students will not be admitted to the CoE (as either degree seeking or non-candidate-for-degree students) for the purpose of becoming qualified for admission.
- Coursework from the student's previous academic record, including credits used to satisfy requirements for a previous degree, will be eligible for entry on the UM academic record. Credits will not be transferred if they were used to satisfy more than one prior degree (no counting of credits between 3 or more degrees).
    - Note: Students can request that credits be transferred from the previous record to the UM transcript at any time, but credits will be shown on the UM transcript as taken prior to the first term of UM enrollment. This can have a retroactive tuition impact. Transferred courses will not be removed from the transcript for the purpose of lowering tuition.
- To graduate, students must successfully complete all of the degree requirements in place at their term of admission, using the appropriate combination of transfer and UM credit. Program advisors can allow substantially equivalent substitutions from transferred courses. Students with a previous engineering degree must complete an additional 14 credit hours in pertinent technical subjects in addition to meeting all degree requirements.

Background for this Proposal:

Second Bachelor's candidates are defined to be those applicants who already possess a bachelor's degree and are seeking admission into one of the undergraduate programs offered at the College of Engineering. At present the CoE bulletin contains only the following rules directly addressing these students:

> **Admission of Graduates of Other Colleges/Admission of Students Via Prescribed Program**
>
> Students who have completed an undergraduate degree program or applicants for transfer admission who have completed a substantial number of the requirements for the bachelor's degree in engineering can be admitted via a *Prescribed Program*. The Prescribed Program is a detailed outline of the courses that must be taken for completion of the engineering degree and is determined by the program advisor for students who could satisfy requirements in 30-40 credit hours at Michigan (at least 30 of which must be at the 300-level or higher). The student must obtain a grade of "C" or better in each course of the prescribed program. For questions, contact the Office of Recruitment and Admissions.

This program is uncomfortably loose. It allows (at least as practiced) a student to receive a UM degree without meeting all of our degree requirements. In particular, it explicitly ignores the 50 credit hour residency requirements, and in application has sometimes ignored the 30 credit residency requirement. Recently it has been used (or at least explored) to provide Masters students with a bachelors degree

“picked up along the way…” This program is also unnecessary. The first provision of the current proposal is therefore to strike this text from the bulletin and eliminate the Prescribed program.

Instead**,** all students should meet all of the degree requirements for the degree they are seeking, including residency rules, 128 credit hour rule, etc., with due credit given for transferred courses. The prescribed program does not need to be replaced; second degree students and students with substantial numbers of credits from previous higher education can be admitted with transfer credits from their previous academic experience, much like traditional transfer students.

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Date: March 26, 2012
From: James Paul Holloway
Associate Dean for Undergraduate Education
To: CoE Curriculum Committee
Re: Proposal for an Honors Program within the CoE

The attached document describes the academic elements of a proposed honors program for the College of Engineering. This program will give our highest achieving students the opportunity to take advantage of a creative community of similarly driven and academically talented students, and to leverage the UM's primary distinction of excellence across breadth. We wish to create another opportunity for students to develop as scholars, leaders and innovators.

I request approval of:

1. The academic framework described on the following pages.
2. Permission to work with the Registrar and Secretary of the University (Regent's Office) to develop an appropriate notation for the diploma

Because this program will serve undergraduate students across all departments, the Office of the Associate Dean for Undergraduate Education (ADUE) will be ultimately responsible for the program, including provision of necessary resources to afford success to students in the program.

The ADUE will provide an administrative appointment to the honors program faculty advisor, and charge an Honors Academic Board to oversee and advise the program.

Because designated housing will not be available, the establishment of an honors lounge to provide a collaborative community space is also essential; the CoE will explore appropriate space. In addition, the CoE is already working on a fundraising plan for the honors program.

Note: Approved by CoE Curriculum Committee, March 27, 2012

College of Engineering Honors Program

The College of Engineering Honors Program identifies highly talented students who demonstrate extraordinary academic ability, intellectual curiosity, and clear potential to make a difference as a leader in their field. Honors Program students pursue challenging coursework and enrich their academics through significant engagement beyond the classroom. The program is intended to inspire and enable highly motivated students to reach beyond the traditional curriculum in both breadth and depth.

Students must choose a capstone experience area, such as research, entrepreneurship, design, global operations, business, or public service, and are required to develop academic breadth and leadership experience:

Core Academic Requirements:

- Maintenance of a **cumulative GPA of 3.6**
- Completion of 9 credits of advanced electives in an identified **focus area**, selected in consultation with the capstone supervisor.
  These credits cannot be required by the minor or specifically required by the major. They can include technical elective credit. (CoE departments are encouraged to provide recommended sets of focused electives for honors students to pursue.)
- Completion of an **honors capstone experience** (e.g. a project, research experience, thesis, etc.)
  This capstone can draw on the major design experience, but must extend beyond that experience to demonstrate the student's individual scholarly or professional work. Each student will identify a capstone supervisor to oversee this experience. See below for more details.

Academic Breadth and Leadership Requirements:

- Participation in an **honors seminar** each year.
  The honors seminar will center on leadership development, community building, and discussion related to the student's focus area. Portions of the seminar will be required for all honors students, while other topics offered will be specific to a student's focus area. Existing seminars and colloquia will also be leveraged.
- Development of academic breadth through the completion of a **UM minor**.

Additional Rules:

- Courses counting toward the Honors Program cannot be elected as pass/fail.
- Students must apply for the program at least a year and a half before they plan to graduate, so that they can participate in the critical leadership seminars and the community building experience.
- The honors program faculty advisor may approve specialized curriculum plans in both the core and breadth components of the Honors Program.

Admission criteria and process: In order to be admitted, students must

- Have completed two full-time terms at UM (or, for transfer students, one term).
- Have declared a major within the College of Engineering.
- Maintain a 3.6 minimum GPA.
- Submit an e-portfolio, including an individual development plan.

- Be interviewed and recommended for admission by an admission committee (comprising the honors program faculty advisor, a representative of the Honors Academic Board, a staff advisor, and a student representative).

Honors capstone process and completion:

Each student will identify a capstone supervisor (a CoE faculty member) to oversee the honors capstone experience. Honors capstone proposals must be approved by the student's capstone supervisor, the honors program faculty advisor, and the Honors Academic Board; these parties will ensure that sufficient rigor is present in the proposed project. Students should meet regularly with their capstone supervisor to assess progress and establish goals throughout the duration of the project. The project will be considered complete once it has been publicly presented and the capstone supervisor and honors program faculty advisor have certified its completion. The Honors Academic Board will work with the honors program faculty advisor to establish criteria for ensuring the quality of capstone projects. Students must display their capstone project during the Honors Capstone Showcase event, which includes a poster session and an interactive presentation forum, and the project must be published online in the Honors Capstone Library.

Program completion:

Students who complete the program will receive a notation on their transcript. A designation on the diploma will also be pursued.

Engineering Global Leadership Honors Program

The Engineering Global Leadership (EGL) Honors Program is an overlay on the Honors Program. Students in the Honors Program who choose a global operations focus may apply to the Tauber Institute for Global Operations & an engineering Masters degree. Students who complete all 3 of these programs (honors with a global operations focus, Tauber Institute Project & Masters) will be considered EGL graduates.

UNIVERSITY OF MICHIGAN
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DEPARTMENT OF CHEMICAL ENGINEERING

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March 13, 2012

To: College Curriculum Committee
From: Susan Montgomery, UG Program Advisor and ChE UG Program Committee
Re: Substitutions for quantum chemistry course in ChE curriculum
Date: March 13, 2012

It has come to our attention that the following courses address material covered in the one credit course Chemistry 261, Quantum Chemistry, required in our program:

Physics 390	Introduction to Modern Physics, 3 credits
MatScie 242	Physics of Materials , 4 credits

Accordingly, the Chemical Engineering faculty voted to approve these courses as acceptable replacements for Chemistry 261. The number of students affected would be minimal, as both of these courses are more credits than 261, but it would allow students completing Physics minors or Materials Science and Engineering concentrations to avoid duplication of technical content.

We appreciate your consideration of this program change. The updated sample schednle is attached, as are the course descriptions for the three courses.

Sample Schedule 2011

Chemical Engineering

	Total Credit Hours	Terms: 1	2	3	4	5	6	7	8
Subjects Required by all Programs:									
Mathematics 115+, 116+, 215+, 216+	16	4	4	4	4	-	-	-	-
Engineering 100, Introduction to Engineering +	4	4	-	-	-	-	-	-	-
Engineering 101, Introduction to Computers +	4	-	4	-	-	-	-	-	-
Chemistry 130 +	3	3	-	-	-	-	-	-	-
Physics 140 with Lab 141 +	5	-	5	-	-	-	-	-	-
Physics 240 with Lab 241 +	5	-	-	-	5	-	-	-	-
Intellectual Breadth (COE start Fall 2011) or Humanities/Social Science (COE start prior to Fall 2011) (to include a micro or macro economics)	16	4	-	-	-	4	-	4	4
Advanced Chemistry:									
Chemistry 210/211, Structure and Reactivity I and Lab +	5	-	5	-	-	-	-	-	-
Chemistry 215/216, Structure and Reactivity II and Lab +	5	-	-	5	-	-	-	-	-
Chemistry 261 Introduction to Quantum Chemistry+ [3]	1	-	-	-	-	1	-	-	-
Related Technical Subjects									
Biology/Life Science Elective[1]	4	-	-	-	-	-	4	-	-
Materials Elective (MSE 250 or MSE 220) +	4	-	-	-	-	-	-	4	-
Engineering Electives[2]	3	-	-	-	-	-	-	-	3
Program Subjects									
CHE 230 Material and Energy Balances +	4	-	-	4	-	-	-	-	-
CHE 330 Chemical and Engineering Thermodynamics +	4	-	-	-	4	-	-	-	-
CHE 341 Fluid Mechanics +	4	-	-	-	4	-	-	-	-
CHE 342 Mass and Heat Transfer +	4	-	-	-	-	4	-	-	-
CHE 343 Separation Processes +	4	-	-	-	-	4	-	-	-
CHE 344 Reaction Engineering and Design +	4	-	-	-	-	-	4	-	-
CHE 360 Chemical Engineering Laboratory I +	4	-	-	-	-	-	4	-	-
CHE 460 Chemical Engineering Laboratory II +	4	-	-	-	-	-	-	-	4
CHE 466 Process Dynamics and Control	3	-	-	-	-	-	-	3	-
CHE 485 Chemical Engineering Process Economics +	1	-	-	-	-	-	1	-	-
CHE 487 Chemical Process Simulation and Design	5	-	-	-	-	-	-	-	5
General Electives	12	-	-	3	-	3	3	3	-
Total	128	15	18	16	17	16	16	14	16

Notes:

[1] See department list for courses that satisfy the Biology/Life Science elective requirement

[2] Engineering courses are to be at the 200 or higher level and cannot include seminar courses. Engineering research credits at the 400 level or higher may be used to satisfy this requirement. Up to 8 credits of ChE 490 or ChE 695 research may be taken for a grade. Beyond that, ChE 490 or 695 credits must be take pass/fail.

[3] Physics 390 and Materials Science 242 can be taken as replacements for Chemistry 261.

(+) Students must earn a "C-" or better in prerequisite courses indicated by the (+)

COURSE PROFILE

Science Curriculum for Engineering Students **Date: May, 2005**

Prepared by: LSA –Chemistry Department

COURSE #: Chemistry 261	**COURSE TITLE:** Introduction to Quantum Chemistry
TERMS OFFERED: Fall, Winter	**For each prerequisite below, "E" denotes Enforced and "A" denotes Advised.**
TEXTBOOKS/REQUIRED MATERIAL: The Elements of Physical Chemistry, 3rd Edition.	**PREREQUISITES:** Chem 215 (A)
INSTRUCTOR(S): Walter, Geva	**COGNIZANT FACULTY:** Prof. Brian P. Coppola
BULLETIN DESCRIPTION: HEM 261 is an introduction to the quantal nature of matter (the Schrödinger equation and the mathematical machinery of quantum mechanics) and the fundamental principles necessary to understand spectroscopy (electronic, vibrational, and rotational). CHEM 261 is intended for Chemical Engineering students. This course, together with Chem Engin 330, provides the prerequisites necessary for enrollment in CHEM 302. Grading is based on problem sets and one hour exam. CHEM 261 meets only for the first third of the term.	**COURSE TOPICS:** Quantum Mechanics and Atomic States Interaction Between Atoms Interaction Between Light (EM radiation) and Matter
COURSE STRUCTURE/SCHEDULE Lecture: 3 per week @ 50 minutes	

COURSE OBJECTIVES	See information in catalog description.
CONTRIBUTION OF COURSE TO PROFESSIONAL COMPONENT	This course partially fulfills the basic science requirement within the Professional Component, Criterion 4.
RELATIONSHIP OF COURSE TO PROGRAM OBJECTIVES	This course provides a solid grounding in general chemistry that is essential for engineers and increasingly important for everyday life.

UNIVERSITY OF MICHIGAN

Lecture, Assignment, and Exam Schedule

Chemistry 260/261

Winter 2012

#	Date	Lecture Topic(s)	Lecturer	Reading	Assignments
	January				
1	W 04	*course introduction*, classical chemistry: forces and potentials	Both	*syllabus*, Ch. 3 ✯ 3.2, 3.5, 3.6	
2	F 06	facing the (quantum) facts	Al-Hashimi	Chs. 4.1-4.4	
3	M 09	waves, wave functions, and Schrödinger's theory	Al-Hashimi	Chs. 5, 6 (H)	***Problem Set 1***
4	W 11	Schrödinger's equation and the postulates of quantum mechanics	Al-Hashimi	Chs. 4.5-4.7	
5	F 13	Solving the Scrodinger equation	Dunietz	Ch. 4.7-5.1 pp. 169-174	
	M16	***Martin Luther King, Jr. Day. No Regular Classes.***			
6	W 18	Quantum modeling the hydrogen atom	Dunietz	Chs. 5.1	***Problem Set 2 (owl ch4)***
7	F20	many-electron atoms and the periodic table of elements	Dunietz	Chs. 5.2-5.4	
8	M23	periodic properties and electronic structure	Dunietz	Ch. 5.5	
9	W 25	quantum description of the chemical bond: VB theory	Dunietz	Chs. 6.1, 6.4	***Problem Set 3*** (owl ch5)
10	F27	quantum description of the chemical bond: MO theory	Dunietz	Ch. 6.2	
11	M30	the interaction of molecules with light	Al-Hashimi	Ch. 20.1-20.2	
	February				
12	W 01	rotational and vibrational spectroscopy	Al-Hashimi	Ch. 20.3	***Problem Set 4*** (owl ch6)
13	F 03	electronic spectroscopy	Al-Hashimi	Ch. 20.5	
14	M06	electronic spectroscopy (continued) or NMR	Al-Hashimi	Ch. 20.5, 20.7	
15	W08	***course connections: structure, bonding, and spectroscopy***	Both		***Problem Set 5*** (owl ch2(
	Th09	**MIDTERM EXAM 1: 6:00 – 8:00 pm, ROOM xxx (CHEM 261 ENDS)**			

Instructor: Emmanouil (Manos) Kioupakis
Phone: 734-764-3321
Office: 2106 HH Dow
Homepage:
Textbook:
Cognizant Faculty: Goldman, Millunchick, Mansfield, Shtein, Yalisove
Description:

Basic principles of modern physics and quantum mechanics as pertain to solid state physics and the physical behavior of materials on the nanometer scale. Applications to solid state and nano-structured materials will be emphasized including band structure, bonding and magnetic, optical and electronic response.

Course Topics:

1. Failure of classical physics; black-body radiation, Planck Postulate (TR 1, TR 3)
2. Early experiments exhibiting quantum effects: photo-electric effect, Davisson-Germer results, Compton shift, x-ray production. (TR 3)
3. Early models of the atom: Thompson, Rutherford and Bohr models, their successes and shortcomings. (TR 4)
4. Wave-particle duality; de Broglie postulate and Einstein relation. (TR 5)
5. Introduction to the wave equation and Fourier series analysis. (TR 5)
6. The Heisenberg uncertainty principle. (TR 5)
7. Probability density, expectation values, energy and momentum operations. (TR 5, TR 6)
8. Schrödinger equation, solutions for step, barrier and well potentials (TR 5, TR 6)
9. Scanning Probe Microscopy (TR 6)
10. Periodic well potentials: Kronig-Penney model (TR 11.1 + supplements)
11. Solution of the Schrödinger equation for the hydrogen atom (TR 7)
12. Atomic Physics and the Pauli Exclusion Principle (TR 8)
13. Classical and Quantum Statistics: Bose-Einstein and Fermi-Dirac statistics (TR 9)
14. Origin of Spectra (TR 10)
15. Stimulated Emission and Lasers (TR 10)
16. Thermal and Magnetic Properties (TR 10)
17. Superconductivity (TR 10)
18. Band Theory (TR 11)
19. Semiconductor Devices : Diodes, Transistors and Photovoltaics (TR 11 + supplements)

Additional Examples of the application of quantum theory in the context of materials science and engineering. May include: Quantum Devices, Quantum Computing, Magnetic Media, Spintronics

Course Objectives:

1. To teach sophomore engineering students the historical experimental results and theoretical developments which led to the formulation of quantum mechanics and solid state physics.
2. To teach students the solutions of the time independent Schroedinger?s equation for various potentials.
3. To teach students energy bands in solids and the origin of electronic conduction in metals and

semiconductors.
4. To teach students crystal structure and the Miller index and reciprocal lattice descriptions of crystallography.
5. To teach students Fourier methods and the application to diffraction effects in solids.
6. To teach students diffraction methods for crystallographic and defect analysis in pure and alloyed materials.
7. To provide students with examples of devices and applications for solid state phenomena and materials.

Course Outcomes:

1. Given the energy (E) of a wave/particle, students will be able to determine the de Broglie wavelength and the Einstein frequence for the wave description of the wave/particle.
2. Students will be able to estimate position-momentum and energy-time uncertainties for particles in the quantum size limit.
3. Students will be able to solve Schroedinger?s equation for step, barrier and well potentials, and find energy values for the solution eigenfunctions.
4. Students will be able to describe and sketch the valence and conduction band structure of monovalent, bivalent and trivalent metals, and describe the relative electrical conduction of each type of metal.
5. Students will be able to describe and sketch the band structure of pure and doped semiconductors, and illustrate direct band gap and indirect band gap transitions.
6. Students will be able to provide the Miller indices for arbitrary crystallographic planes and directions in cubic and hexagonal crystal systems.
7. Students will be able to index the reciprocal space lattices for cubic and hexagonal crystal structures.
8. Given a real space lattice students will be able to determine the corresponding Fourier transform reciprocal space latticce.
9. Given an unknown single phase solid material, students will be able to describe the characterization methods required in order to determine the identity and crystal structure of the host element, the single- or poly-crystalline nature of the material, the grain size (if applicable, and the relative defect level.
10. Students will be able to identify the solid state phenomena which provide the basic functionality in many contemporary microelectronic devices.

Assessment Tools:

1. Class ombudspersons will provide continuing feedback from class to the instructor.
2. Weekly homework assignments will test objectives #1-6, results will be discussed in class discussion.
3. Two closed-book mid-term exams will test objectives #1-6.
4. Course mid-term evaluation by CRLT personnel will allow for active feedback to instructor in order to identify areas for greater emphasis and improvement in course presentation.
5. Student reports on microelectronic solid state devices and systems will be presented to entire class (objective #7).

Physics 390, Winter 2008: Introduction to Modern Physics

Room: 1230 USB
Time: MWF 11am-12pm

Instructor: Mark Newman
Office: 322 West Hall
Office hours: Thursdays 2-4pm
Email: mejn@umich.edu

Grader: Justin Wedes
Email: jwedes@umich.edu

Problem session leader: Robert Wilson
Email: roberthw@umich.edu

Description: This course provides an introduction to the physics of the 20th and 21st centuries. The first half of the course deals with the fundamental theory of quantum mechanics, which underlies essentially all of recent physics. The second half deals with applications of quantum mechanics, including atomic physics, statistical and condensed matter physics, nuclear physics and particle physics.

Textbook (required): *Modern Physics, 5th edition*, Paul A. Tipler and Ralph A. Llewellyn, Freeman, New York (2008), ISBN 0-7167-7550-6. There is also an accompanying web site that goes with the book here. The web site was actually created for the old fourth edition of the book, but the editions are similar enough that the web site is still useful. The publisher also has a "preview" web site for the new edition here, which you can look at if you're interested.

Course work and grading: There will be problem sets most weeks. They will be handed out on Fridays and due in a week later in class. Due dates are noted on the schedule below. No late homeworks will be accepted. The problem sets will also be available in electronic form for download from this web site no later than the Friday morning on which they are handed out.

There will be one mid-term and a final. The mid-term will take place on Wednesday, February 20 from 11am to 12pm in 1230 USB (the usual time and place). The final will take place on Tuesday, April 22 from 1:30pm to 3:30pm in 1230 USB (the usual classroom). Both exams will be open-book, meaning you may bring your copy of Tipler & Llewellyn, but you may not use written notes or solutions to coursework problems. Grade for the course will be 35% on the problem sets, 30% on the mid-term, and 35% on the final.

Problem sets

- Homework 1 – Quantization of light and charge
- Homework 2 – Rutherford scattering and the Bohr model
- Homework 3 – De Broglie waves and wave functions
- Homework 4 – The Schrodinger equation
- Homework 5 – The hydrogen atom

- Homework 6 – Systems with many particles
- Homework 7 – Statistical mechanics
- Homework 8 – Solid state physics
- Homework 9 – Nuclear physics

The list of stable nuclei for Homework 9 is here.

Course schedule:

Date	Topic	Reading	On-line resources	Notes
Friday, Jan. 4	Intro and concept review		Relativity review	Take-home math quiz
Monday, Jan. 7	Quantization of mass and charge	3.1		
Wednesday, Jan. 9	Black body radiation	3.2		
Friday, Jan. 11	Photoelectic and Compton effects	3.3-3.4		Homework 1 handed out
Monday, Jan. 14	Atomic spectra	4.1		
Wednesday, Jan. 16	Rutherford scattering	4.2	Animation of Rutherford scattering	
Friday, Jan. 18	The Bohr model of the atom	4.3	Animation of Bohr model	Homework 1 due, Homework 2 handed out
Monday, Jan. 21	**No class**			Martin Luther King Day
Wednesday, Jan. 23	X-ray spectra	4.4-4.5	Animation of x-ray production	
Friday, Jan. 25	De Broglie waves	5.1-5.2		Homework 2 due, no new homework this week
Monday, Jan. 28	Wave functions and wave packets	5.3-5.4	Animation of a wave packet	
Wednesday,	The uncertainty	5.5-5.7		

Jan. 30	principle			
Friday, Feb. 1	The Schrodinger equation	6.1		Homework 3 handed out
Monday, Feb. 4	The square well	6.2		
Wednesday, Feb. 6	Pure states and combinations	6.3	Combination of states applet	
Friday, Feb. 8	Operators	6.4		Homework 3 due, Homework 4 handed out
Monday, Feb. 11	The simple harmonic oscillator	6.5	Solution of the harmonic oscillator	
Wednesday, Feb. 13	Reflection and transmission	6.6		
Friday, Feb. 15	The potential barrier		Potential barrier applet	Homework 4 due, no new homework this week
Monday, Feb. 18	Review session		Summary of topics for exam	
Wednesday, Feb. 20	**Mid-term exam**			Open-book, but no class notes allowed
Friday, Feb. 22	**No class**			
Winter Break	**No class**			Have a great break!
Monday, Mar. 3	Quantum mechanics in 3D	7.1		
Wednesday, Mar. 5	The hydrogen atom	7.2		
Friday, Mar. 7	Angular momentum	7.3		Homework 5 handed out
Monday, Mar. 10	Spin	7.4-7.5		

Wednesday, Mar. 12	More than one electron	7.6		
Friday, Mar. 14	The periodic table	7.7-7.8		Homework 5 due, Homework 6 handed out
Monday, Mar. 17	Statistical mechanics	8.1		
Wednesday, Mar. 19	Quantum statistics	8.2-8.3		
Friday, Mar. 21	The Fermi gas	8.5		Homework 6 due, Homework 7 handed out
Monday, Mar. 24	Structure of solids	10.1		
Wednesday, Mar. 26	Electrical conduction	10.3-10.4		
Friday, Mar. 28	Magnetism, band structure	10.5-10.6		Homework 7 due, Homework 8 handed out
Monday, Mar. 31	Structure of the nucleus	11.1-11.2		
Wednesday, Apr. 2	Nuclear decay	11.3-11.4		
Friday, Apr. 4	The liquid drop and shell models	11.5-11.6	Liquid drop model handout	Homework 8 due, Homework 9 handed out
Monday, Apr. 7	Fundamental particles and forces	12.1-12.2		
Wednesday, Apr. 9	Conservation laws and operators	12.3		
Friday, Apr. 11	Symmetries and quantum numbers	12.4		Homework 9 due
Monday, Apr. 14	Review session		Summary of topics for exam	
	End of classes			

Tuesday, Apr. 22	**Final exam**		List of practice problems for exam	1:30pm–3:30pm in 1230 USB

Mark Newman

The University of Michigan
College of Engineering
Nuclear Engineering and Radiological Sciences

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Ed Larsen
Chair, NERS Curriculum

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TO; College of Engineering
Curriculum Committee

FROM: Ed Larsen
Chair, NERS Curriculum Committee

DATE: March 15, 2012

RE: NERS Curriculum Changes

Attached is a request for changes in the NERS Undergraduate Curriculum. By adding NERS 320 as a required course, it will allow students to be better prepared for summer internships and their senior level required courses. By removing NERS 484 as a requirement, students will have greater flexibility in the selection of NERS elective courses. Students will take at least 2 courses from the following list: NERS 421, NERS 461, NERS 471 or NERS 484.

The effective date for the program change will be Fall 2012. The proposed changes have been approved by the NERS faculty.

If you have any questions or need additional information, please do not hesitate to contact me.

Sample Schedule with requestd Program changes										
Effective Fall 2012										
Nuclear Engineering and Radiological Sciences										
	Credit hrs	Terms								
Subjects required by all programs (52-55 hrs)		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Math 115, 116, 215, and 216	16	4	4	4	4					
Engr 100, Intro to Engr	4	4								
Engr 101, Intro to Computers	4		4							
Chemistry 125/126 and 130 or Chem 210 and 211[1]	5	5								
Phys 140 with 141; Phys 240 with 241[2]	10		5	5						
Intellectual Breadth	16	4	4		4			4		
Advanced Mathematics (3 hrs)										
Math 454, Boundary Val Probl for Partial Dif Equ	3					3				
Related Technical Subjects (18 hrs)										
MSE 250, Princ of Eng Materilas or MSE 220, Intro to Materials and Manf	4			4						
CEE 211, Statics and Dynamics	4				4					
EECS 215, Intro to Circuits or EECS 314 Electr Circ, Systems and Appl	4					4				
CEE 325, Fluid Mechs, or ME 320, Fluid Mech[3]	4						4			
ME 235, Thermodynamics I	3					3				
Program Subjects (38 hrs)										
NERS 250, Fundamentals of Nuclear Eng	4				4					
NERS, 311, Ele of Nucl Eng & Rad Sci I	3					3				
NERS 312, ele of Nucl Eng & Rad Sci II	3						3			
NERS 315, Nuclear Instr Lab	4						4			
NERS 320, Prob in Nucl Eng & Rad Sci	3						3			Add as a required course. See new course supporting statement
NERS 441, Nuclear Reactor Theory	4							4		
~~NERS 484, Red Hlth Eng Fundamentals~~										Delete as a requirement. Students can take as a NERS Elective
NERS Laboratory Course (above NERS 315)[4]	4								4	
Design Course[5]	4								4	
NERS Electives[6]	9							6	3	
Technical Electives (3 hrs)	3							3		
Unrestricted Electives (10 hrs)	10			3			3		4	

	128	17	17	16	16	13	17	17	15	
Notes:										
[1]If you have a satisfactory score or grade in Chemistry AP, A-Level, IB Exams or transfer credit fromanother institution for Chemistry 130/125/126 you will have met the Chemistry Core Requirement for CoE.										
[2]If you have a satisfactory score or grade in Physics AP, A-Level, IB Exams or transfer credit from another institution for Physics 140/141 and 240/241 you will have met the Physics Core Requirement for CoE.										
[3]If CEE 325 (4 hrs) is elected, additional credit hour will be used as a general elective.										
[4]Laboratory Course (above NERS 315) select one from the following: NERS 425, 575, 586. (NERS 575 needs program advisor's consent.)										
[5]Design Course select one: NERS 442, 554.										
[6]Two courses must be selected from the following: NERS 421, NERS 462, NERS 471 and NERS 484. A maximum of 3 credit hours of independent study (NERS 499) can count as a NERS elective. All credit above 3 can only be counted as a general elective										Added to footnote for NERS electives. Students muc now take 2 courses from list of 4 NERS courses

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TO; College of Engineering
Curriculum Committee

FROM: Ed Larsen
Chair, NERS Curriculum Committee

DATE: March 15, 2012

RE: Engr Physics Curriculum Changes

Attached is a request for changes in the Engr Physics Undergraduate Curriculum. Summary of change are requested as follows:

- PHYS 401 (Intermediate Mechanics) is required because of the importance of the physics approach to EP students. There is significant overlap between PHYS 401and the engineering statics/dynamics courses. Therefore, the requirement of statics/dynamics has been eliminated. Exception: students who pursue a concentration in ME can substitute CEE 211 or ME 240 for PHYS 401 in order to satisfy ME prerequisites.
- Students used to be given the choice of ME 320 (fluids) or PHYS 406 statistical and thermal physics). These courses cover different topics. Unlike materials or circuits, knowledge of fluids is not essential to all students. PHYS 406 is very important to a physics-based education. Therefore, a) the requirement of ME 320 has been eliminated, b) PHYS 406 is now an added requirement under "Program subjects, c) The ME 235 requirement has been eliminated because its concepts are a subset of those in PHYS 406 (ME 235 has a larger practical component).
- The advanced math requirement has been reduced from 8 to 6 credits to reflect the fact that most MATH courses are 3 credits.
- An additional category has been added: "Flexible Technical Electives," with a total of 7-10 credits. It allows students more flexibility in selecting courses related to their concentration (Eng. Tech. Electives). Courses in this category are in math, physics or engineering at 300 level or higher. The faculty advisor may approve a 200 level course if it is a co- or prerequisite for an upper-level Eng. Tech. Elective.

The effective date for the program change will be Fall 2012. The proposed changes have been approved by the NERS faculty.

If you have any questions or need additional information, please do not hesitate to contact me.

Students attending the EP Program Meeting make recommendations on changes in the EP curriculum. These changes will better meet the needs of the EP students and allow for greater flexibility in the EP Program. This program is administered by the NERS Department. These changes have been approved by the NERS faculty.

CURRENT Required Technical Subjects		PROPOSED CHANGES Required Technical Subjects		Comments
MSE 250, Prin of Engr Materials	(4)			
CEE 211, Statistics and Dynamics or ME 240, Intro to Dynamics	(3/4)	~~CEE 211, Statistics and Dynamics or ME 240, Intro to Dynamics~~	~~(3/4)~~	Delete as requirement For students pursuing ME in Engr Tech Elective, CEE 211 or ME 240 is a substitute for Physics 401
ME 235, Thermodynamics I	(3)	~~ME 235, Thermodynamics I~~	~~(3)~~	Delete as a requirement Phys 406 will be a replacement
ME 320, Fluid Mechanics or, Phys 406, Stat/Thermal Phys	(3)	~~ME 320, Fluid Mechanics or, Phys 406, Stat/Thermal Phys~~	~~(3)~~	Delete as a requirement Physics 406 will be a required physics subject
EECS 314, Circuit Analy and Electr or EECS 215, Intro to Circuits	(4)			
Total	(17/18)		(8)	

Physics Technical Subjects		Physical Technical Subjects		
Phys 340, Waves, Heat and Light	(3)			
Phys 390, Intro to Modern Phys or NERS 311, Elements of NERS I	(3)			
Phys 401, Inter Mechanics	(3)			
Phys 405, Inter Electr and Magn	(3)			
		Phys 406, Stat and Thermal Phys	(3)	Replacement for ME 235
Phys Elective (300L +)	(3)			
Phys Lab Elective (or Directed Study)	(2)			
Total	(17)		(20)	

Advanced Math	(8)	Advanced Math	(6)	Reduction of credits to be consistent with the math courses offered (typically 3 cr hr courses)

Flexible Technical Electives**	(7-10)	Additional credits of technical electives allows students more flexibility in selecting courses related to engr technical electives. Courses must be a 300L+ Math, Physics or Engineering. The faculty advisor may approve a 200L course if course is a pre- or co-requisite of an upper level course.

** Students will be advised to elect ME 235 and ME320 if pursuing ME in Engr Tech Electives

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All other requirements will remain the same:

Common Requirements	36-39
Elective Humanities/Social Sciences	16
General Electives	12
Engineering Technical Electives	20

Sample Schedule 2012 (with program chnages)									
Engineering Physics									
To be effective Fall 2012									
	Total	**Term:**							
	Credit Hrs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Subjects required by all programs (52-55 hrs)									
Mathematics 115, 116, 215, and 216	16	4	4	4	4	-	-	-	-
Engr 100, Intro to Engr	4	4	-	-	-	-	-	-	-
Engr 101, Intro to Com;puters	4	-	4	-	-	-	-	-	-
Chemistry 125/126 and 130 or Chemistry 210 and 211[1]	5	5	-	-	-	-	-	-	-
Physics 140 with Lab 141; Physics 240 with lab 241[2]	10	-	5	5	-	-	-	-	-
Intellectual Breadth	16	4	4	4	4	-	-	-	-
Advanced Mathematics (6 hrs)									
Mathematics Electives[3]	6	-	-	-	-	-	3	3	-
Related Technical Subjects (8 hrs)									
Matsci 250, Princ of Engr Materials	4	-	-	4	-	-	-	-	-
EECS 314, Elect Cir, Sys, and Appl or EECS 215, Intro to Circuits	4	-	-	-	4	-	-	-	-
Physics Technical Subjects (20 hrs)									
Physics 340, Waves, het and Light	3	-	-	-	3	-	-	-	-
Physics 390, Intro to Modern Physics or NERS 311, Ele of Nucl Engr & Rad Sci I	3	-	-	-	-	3	-	-	-
Physics 401, Inter Mechanics[4]	3	-	-	-	-	-	3	-	-
Phys 405,Int Elect and Mag	3	-	-	-	-	-	-	3	-
Physics 406, Stat/Thermal Physics	3	-	-	-	-	-	-	-	3
Physics Elective (300 level+)	3	-	-	-	-	-	-	-	3
Physics Lab Elective or Directed Study with Research lab Component	2	-	-	-	-	2	-	-	-
Engr Technical Electives (20 hrs)									
Engineering Electives[5]	16	-	-	-	-	4	4	4	4
Engineering Laboratory Elective (400 level +)	4	-	-	-	-	-	-	-	4
Flexible Technical Electives (7-10 hrs)									
Mathematics, Physics or Engr Courses (300 level +)[6]	7-10	-	-	-	-	3	4	-	-
General Electives (12 hrs)	12	-	-	-	-	3	3	3	3
Total	128	17	17	17	15	15	17	13	17
Notes:									
[1]If you have a satisfactory score or grade in Chemistry AP, A-level, IB Exams or transfer credit from another institution for Chemistry 130/125/126 you will have met the Chemistry Core Requirement for CoE.									
[2]If you have a satisfactory score or grade in Physics AP, A-Level, IB Exams or transfer credit from another institution for Physics 140/141 and 240/241 you will have met the Physics Core Requirement for CoE.									
[3]Math Electives must be 300-level or higher.									
[4]For students pursuing ME in Engr Tech Electives, CEE or ME 240. ME440 or ME 540 can be substituted with faculty program advisor approval.is a substitute for Physics 401.									

[b]Engineering Electives are to be chosen in consultlatono with the facutly advisor to form a coherent sequence that clearly defines professinoal goals for the student. Sample elective sequences for a number of different subject areas are available fro theh academic or faculty counselors.									
[b] For students pursuing ME in Engr Tech Electives, students will be advised to take ME 235 and ME 320 as Flexible Tech Electives. For students pursuing Aero in Engr Tech Electives, students will be advised to take Aero 225 and Aero 325 as Flexible Tech Electives.									

Proposed: December 15, 2011 Revised: 12/16/11, 2/16/12

Problem: The CoE currently grants 100 and 200 level credit to students for taking a language test, even when they were educated in that language, or spoke that language at home during their primary and secondary education.

New Bulletin Text:

The CoE will grant credit for students passing a language placement test offered by the College of LSA provided the student has previously studied the fundamentals of that language, as a foreign language, in a course in their secondary education. This will be verified using their high school transcripts. AP language credit will also be granted.

Study of a language in a course means, in this context, that a student took coursework designed to teach them the fundamental vocabulary, grammar, pronunciation, and writing system of that language as a foreign language, as opposed to a class in literature, argumentative or essay writing, or creative writing in a language whose fundamentals they already knew. Dialects of a language will be grouped together for the purpose of applying this standard, as will languages using a common writing system.

The CoE values the study of language, so even when credit might not be granted, students are encouraged to take any language placement test for which they may be qualified, so that they can be properly placed in a more advanced language course.

Comments:

- This is in alignment with our general principle that we do not give college credit for life experience, but do give credit for documented educational experiences. In this case we are extending this to say that LSA certifies that the skill level is appropriate for the granting of college credit, even if the education was in high school.
- We treat fluency in English as a requirement for admission, so we do not grant credit for students who may study English as a language (as opposed to literature or composition or the similar subjects taught in our English Department) at another institution.
- Students transferring from another institution of higher education can transfer language coursework via the normal transfer process. They cannot earn language credit by placement test.