IT Curriculum Committee

Agenda Summary
April 20, 2010

Full agenda is on the web site: http://www.aem.umn.edu/~shield/itcc/

1. Approval of Feb. 2, 2010 meeting Minutes – see web site.

2. Tentative: Meeting Schedule for 2010-11 (watch web site for updates)

    - 2:30 on Tuesday 2010-9-21

    - 2:30 on Tuesday 2010-12-7

    - 2:30 on Tuesday 2011-2-1

    - 2:30 on Tuesday 2011-4-19

3. Items for Information only (already approved in ECAS/PCAS):
    a. For course changes see web site.
    b. New Program: Bachelor of Earth Sciences
    c. Biomedical Engineering B.Bm.E. changes for PHSL course changes.
    d. Physics B.A. correction to number of credits due to previous change
    e. Computer Engineering adding three possible tech electives
    f. Electrical Engineering adding three possible tech electives

4. Items for Approval without Objection (already approved in ECAS):

    a. BBE 4523/5523 - Ecological Engineering Design: remove lab component

    b. CHEM 2301 - Organic Chemistry I: add prereq. choice of *Grade of at least B in 1031H and Concurrent registration in 1032H is required*

    c. CHEM 4101 - Intermediate Analytical Chemistry Lecture: Change title to *Modern Instrumental Methods of Chemical Analysis Lecture*

    d. CHEM 4111W - Intermediate Analytical Chemistry Lab: Change title to *Modern Instrumental Methods of Chemical Analysis Lab*

    e. CSCI 1107 – FORTRAN: Change to transfer credit only, no longer taught

    f. Deactivate: CSCI 1121 – Introduction to the Internet 1, CSCI 5541 – Natural Language Processing and CSCI 5116 – GUI Toolkits and Their Implementation

    g. EE 4341 - Microprocessor and Microcontroller System Design: Change title to *Embedded System Design* and rewrite description (no change to course content)

    h. EE 5164 - Semiconductor Properties and Devices II: drop IT grad student prereq. and enforced prereq.

    i. HSCI 3333W - Issues in American Science and Technology in the Past Century: New course, but same as HSCI 3333V without honors.

5. Action Items (new course syllabi are below or separate handouts):
    a. CE 5511 - Urban Hydrology and Land Development: New Course (see below)

b.   GEO 1012 - Natural Hazards and Disasters: New Course (see handout)
c.   GEO 3425 - Atmospheric Composition and Chemistry: New Course (see below)
d.   MATH 4603/4 – Advanced Calculus I and II: New Courses (see below)

6. New Business

7. Adjourn

New Courses Syllabi

CE 5511 Urban Hydrology and Land Development, 4 credits

Prerequisite: CE 4501 – Hydrologic Design

Catalog Description: The impervious cover associated with land development alters the hydrologic cycle by reducing infiltration, increasing volume and peak runoff, and adding a variety of chemical pollutants and pathogens to stormwater runoff. This course will address the special case of urban hydrology for small watersheds and the management of stormwater quality and quantity.

Text: *Water Resources Engineering*, by Larry W. Mays

Outline   Reading
    I.   Storm Systems and the Urban Landscape   7.1 - 7.2
    II.   Quality of Stormwater Runoff   6.1 - 6.3
    III.   Stormwater Drainage   15.1 - 15.3
    IV.   Stormwater Detention and Sedimentation of Pollutants   15.4.1 - 15.4.4, 16.1
    MIDTERM EXAM
    V.   Volume Control through Infiltration   7.4, 15.4.5
    VI.   Filtration for Water Quality Enhancement   Handouts
    VII.   Bio-remediation for Water Quality Enhancement   Handouts
    VIII. Pollutant Load Computations   Handouts
    FINAL EXAM

Grades:
    Home Problems, Quizzes and Assignments   40%
    Midterm   20%
    Final   40%

You may discuss the home problems with your classmates. However, the solution and the write-up of the solution must be completed individually. All other work is individual unless otherwise stated by the instructor in writing.

GEO 3425 - Atmospheric Composition and Chemistry, 3 credits

Equivalent to ESPM 3425 - Atmospheric Composition: From Smog to Climate Change

Course prerequisites: Chemistry (1021 & 1022), Physics (1101) and Math (1271) or equivalents, or instructor consent. ESPM 1425 helpful but not required.

Catalog description: Introduction to the processes governing the chemical makeup of Earth's atmosphere and implications for air pollution, climate, and human welfare. The evolution of the atmosphere; atmospheric transport; biogeochemical cycles of C, N, O, mercury; the greenhouse effect; aerosols; ozone hole; oxidizing power of the atmosphere; smog.

Syllabus:

Welcome to ESPM 3425! This course provides an introduction to the processes governing the chemical makeup of Earth¿s atmosphere and their implications for air pollution, climate, and human welfare. We will address the question: ¿What is the composition of the atmosphere, and why is it changing?¿ Students will gain an understanding of topics including: evolution of the atmosphere; atmospheric structure and transport; biogeochemical cycles of carbon, nitrogen, oxygen, mercury; the greenhouse effect; aerosols; stratospheric ozone loss; oxidizing power of the atmosphere; smog.

Course goals and student learning outcomes:
Upon completing this course, students will have:
- An understanding of atmospheric radiation and the greenhouse effect (1, 2, 3)
- Familiarity with the basic tools, techniques, and analytical methods used to study atmospheric composition (1, 2, 3, 6)
- An understanding of the geochemical cycles of carbon, nitrogen, oxygen and mercury, the budgets of key greenhouse gases, and their role in Earth¿s climate (1, 3)
- An appreciation for the role of scientific creativity, discovery, and uncertainty in terms of current understanding in this discipline (6)
- Knowledge of atmospheric composition and chemistry in polluted and pristine air (1, 3)
- An overview of atmospheric aerosols and their role in air quality and climate change (1, 3)
- Knowledge of tropospheric ozone and its role as a pollutant and a greenhouse gas (1, 3)
- An understanding of the ozone hole (1, 3)
- Increased their ability to critically evaluate scientific questions and claims related to atmospheric science (2, 5, 7)
- Acquired skills to apply this knowledge to a variety of other atmospheric and Earth system science processes (7)
These expectations (coded above) are related to the following seven broad learning outcomes that all undergraduate students are expected to achieve by graduation as established by The University of Minnesota. At the time of receiving a bachelor's degree, students
1. Can identify, define, and solve problems
2. Can locate and critically evaluate information
3. Have mastered a body of knowledge and a mode of inquiry
4. Understand diverse philosophies and cultures within and across societies
5. Can communicate effectively
6. Understand the role of creativity, innovation, discovery, and expression across disciplines
7. Have acquired skills for effective citizenship and life-long learning

Required textbook: *Introduction to Atmospheric Chemistry*, Daniel J. Jacob, Princeton University Press, 1999. Available at Walter Library. $49.57 on www.amazon.com as of 11/4/2009.

Other useful resources:
- *Climate Change 2007: The Physical Science Basis*, edited by S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor, and H.L. Miller, Cambridge University Press, New York. Available online at http://www.ipcc.ch/.
- *Scientific Assessment of Ozone Depletion*: 2006, World Meteorological Organization (WMO), Geneva, 2006. Available online at http://ozone.unep.org.
- *Biogeochemistry, An Analysis of Global Change* W.H. Schlesinger, 2nd ed. 1997. Available at UMN library.
- *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change* J.H. Seinfeld, S.N. Pandis, 2nd Ed. 2006. Hardcopy and e-copy available through UMN library.
- *Chemistry of the Upper and Lower Atmosphere* B.J. Finlayson -Pitts and J.N. Pitts, Jr., Academic Press, 2000. Available at UMN library.

Tentative Lecture Schedule
  Date Topic Readings
  January 19, 2010 Course introduction and overview
  January 21, 2010 Atmospheric composition: Mass and structure Assigned
  January 26, 2010 Evolution of the atmosphere Ch. 6
  January 28, 2010 Atmospheric pressure Ch. 2
  February 2, 2010 Box models Ch. 3
  February 4, 2010 Box and puff models Ch. 3
  February 9, 2010 General circulation of the atmosphere Ch. 4
  February 11, 2010 Vertical motions and stability Ch. 4
  February 16, 2010 Water vapor and clouds Ch. 4
  February 18, 2010 Principles of geochemical cycling, nitrogen cycle Ch. 6
  February 23, 2010 Oxygen cycle Ch. 6
  February 25, 2010 Carbon cycle Ch. 6
  March 2, 2010 Blackbody radiation, UV, IR Ch. 7
  March 4, 2010 The greenhouse effect Ch. 7
  March 9, 2010 Radiative forcing Ch. 7
  March 11, 2010 Midterm
  March 15-19, 2010 Spring Break
  March 23, 2010 Aerosol effects on climate Ch. 8
  March 25, 2010 Photochemical processes Ch. 9
  March 30, 2010 Chemical kinetics Ch. 9
  April 1, 2010 Oxygen chemistry in the stratosphere Ch. 10
  April 6, 2010 Catalytic cycles for stratospheric ozone loss Ch. 10
  April 8, 2010 The ozone hole Ch. 10
  April 13, 2010 Tropospheric chemistry: sources, sinks, species Ch. 11
  April 15, 2010 Oxidizing power of the atmosphere Ch. 11
  April 20, 2010 Tropospheric ozone Ch. 11, 12
  April 22, 2010 Tropospheric nitrogen oxides Ch. 11
  April 27, 2010 Photochemical air pollution Ch. 12

April 29, 2010 Biosphere-atmosphere interactions Assigned
May 4, 2010 Aerosol smog Ch. 8
May 6, 2010 Mercury Assigned

MATH 4603/4 – Advanced Calculus I and II

Math 4603: Advanced Calculus I, 4 credits

Catalog Description: Axioms for the real numbers. Techniques of proof for limits, continuity, uniform convergence. Rigorous treatment of differential/integral calculus for single-variable functions.

Prerequisites: ((2243 or 2373) and (2263 or 2374)) or 2574 or #
Equiv: 01072 - Math 4606/Math 5615/Math 5616

Syllabus:

This is the first semester of a treatment of mathematical analysis based on definitions, theorems and complete proofs---but also with illustrative important examples. It is expected that students in Math 4603 will have already successfully completed courses in single-and multi-variable calculus, as well as a course involving a significant about of linear algebra (such as a semester course treating both linear algebra and differential equations)

In Math 4603, the major topics will be: mathematical induction; limits of both sequences and functions: continuity, differentiation, and integration in a single-variable setting; infinite series of numbers and functions.

Textbook: *Introduction to Analysis* (Revised Fifth Edition), by Edward D. Gaughan., Brooks/Cole, Pacific Grove, CA, 2009.

Summary outline of the topics by week:

Week 1: Relations, functions, and mathematical induction
Week 2: The real numbers, convergence of sequences, and subsequences
Week 3: Limits of monotone sequence, limits of functions
Week 4: Algebra of limits, Enrichment and review based on first 3 chapters
Week 5: Continued review and enrichment, First mid-term
Week 6: Continuous functions
Week 7: Differentiation of functions
Week 8: Single-variable inverse function theorem, Riemann integral
Week 9: Riemann integral, Riemann-Stieltjes integral (from class notes)
Week 10: Enrichment and review based on weeks 6-10
Week 11: Second mid-term, infinite series
Week 12: Infinite series, Taylor's formula, sequences of functions
Week 13: Sequences and series of functions
Week 14: Enrichment and review based on weeks 11-13 and review of entire course

Note: The teacher for Fall 2010 has found it useful to move quite quickly through chapters---and then in the week before a test to go back both for review and further teaching of some things that had been given too little time earlier. The above schedule reflects this, but other teachers could use different strategies that work for them.

MATH 4604: Advanced Calculus II, 4 credits

Catalog Description: Sequel to Math 4603. Topology of n-dimensional Euclidean space. Rigorous treatment of multi-variable differentiation and integration, including chain rule, Taylor's Theorem, implicit function theorem, Fubini's Theorem, change of variables, Stokes' Theorem.

Course Prerequisites: 4603 or 5615 or #
Equiv: Math 5616

Syllabus:
This is the second semester of a rigorous treatment of mathematical analysis, building on the first semester, Math 4603. It is expected that students in Math 4604 will have already completed Math 4603 or Math 5615 or a similar course.

In Math 4604, differentiation and integration theorems for functions of several variables will be the central topic. As time permits, additional topics may include convergence properties for sequences and series of functions of several variables.

Student grades will be determined by examinations (two midterm exams and a final examination), as well as regular homework assignments.

Textbook: *Advanced Calculus of Several Variables*, by C.H. Edwards, Jr., Dover Publications, New York, 1994.

Summary outline of the topics by week:
Week 1: Review of n-dimensional vectors. Vector algebra, inner products, linearity.
Week 2: Basic topics in matrices and determinants.
Week 3: Topology and convergence in n-space.
Week 4: Curves, velocities and potentials. General derivatives of functions on n-space.
Week 5: The chain rule and its consequences. Optimization and Lagrange multipliers.
Week 6: Taylor's Formula, Newton's Method.
Week 7: The Implicit Mapping Theorem.
Week 8: Area and Integration. Fubini's Theorem.
Week 9: Fubini's Theorem, Change of Variable.
Week 10: Arc-length, line integrals, notion of a linear differential form.
Week 11: Multilinear Functions. Surface area.
Week 12: The classical versions of the Divergence Theorem and the Theorem of Stokes.
Week 13: Multilinear differential forms.
Week 14: The General Theorem of Stokes.