Date: June 10, 2010
Course Number: GNE 160
Course Title: Computing Methods for Engineers and Scientists

☐ New Course OR ☒ Changes in existing course (check all that apply):

☐ Prefix
☐ Number
☐ Credits
☐ Title

☐ Description
☐ Pre-requisite(s)
☐ Co-requisite(s)

☒ Shared Resources
☒ Course Format
☒ Content
☒ Semester Offered

This course meets the General Education standards in the following knowledge and skills area (check all that apply):

☐ American History
☐ Humanities
☐ Other World Civilizations

☐ The Arts
☐ Mathematics
☐ Social Sciences

☐ Basic Communication
☐ Natural Sciences
☐ Western Civilization

Prequisites or co-requisite requirements:

☐ Prerequisites:

☐ Co-requisites:

Institutional Impact:

Anticipated Enrollment: 90 per semester

Technology and Classroom Resource Demands: Classroom with overhead projector, computer, and computer projector. Classroom computer needs access to course software listed below.

Teaching assistants for 3 3-hour laboratories is needed.

Computing Resources:

Word, email, web access, course website.

Engineering software packages:
Matlab with Simulink
Microsoft Excel with Visual Basic for Applications
Mathcad

Sufficient licenses for concurrent use of 30 students simultaneously is needed (i.e., 3 sections of 30 students each).
Library Resources: None above current resources. Listing provided to library faculty.

Transportation Requirements: None.

Forest Properties or Field Practicum Facilities Required: None.
Health and Safety Considerations:

Conditions or situations present in association with the course? Yes / No

1. Will substances with any of the following properties be used during instruction: flammability, toxicity, corrosivity, reactivity, registered pesticide, legally controlled, or other characteristics with the potential to cause harm or injury? No

2. Will any physical hazards be present during instruction? (e.g., machines that need safety guards; razor blades or syringes; compressed gases, etc.). No

3. Will any biological hazards be present during instruction? (e.g., handling animals (rabies or hantavirus); cultures or stocks of infectious agents (fungal spores, viruses, bacteria, etc.). No

4. Will any radiation hazards be present during instruction? (e.g., radioisotopes, X-rays, ultraviolet rays, lasers, etc.). No

5. Will any electrical equipment that, due to its design, location, or method of use, pose any threat to safety during instruction? (Give considerable thought to electrical use outdoors, or any potentially wet location.). No

6. Will there be any personal safety issues related to the class? (e.g., due to time of day or location, at the end of any organized class exercise, will students be in danger of physical assault, etc.). No

7. Will any students be driving official state or research sponsored land or water vehicles during any class or instructional exercise? No

8. Will any type of personal protective equipment be necessary during class exercises? (e.g., hard-hats, eye/face protection, hearing protection, hand/foot protection, lab coat, visibility clothing, etc.) No

If the answer was “Yes” to any of the HEALTH AND SAFETY questions, please explain:

N/A

CATALOG DESCRIPTION (Please provide using the precise format currently used in the ESF catalog, please do not exceed 500 characters):

Two hours lecture and three hours laboratory per week. Introduction to algorithm design, programming structures, and data structures. Engineering calculation software including programming languages, spreadsheets, and simulation software. Application of computing methods to engineering problems and data analysis. Fall.
COURSE: GNE 160 - Computing Methods for Engineers and Scientists
3 Credit Hours – Fall Semester
2 Hours Lecture and 3 hour lab per week
Prerequisite(s): none

SCOPE:

1. Level of Instruction:
   a. Introductory level course at the freshman level. The skills learned in this course will be applicable to many of their subsequent courses in their programs.

2. Relation to curriculum or to other ESF or Syracuse University courses:
   a. Required for all students in Paper Engineering, Paper Science, Bioprocess Engineering, and Environmental Science. Open to students in other programs as an elective.
   b. Shared resource requirements: none, a graduate offering is not planned.

Although this is a college-level introductory course has no college-level prerequisites, a certain amount of background knowledge is expected for this course. Specifically, each student should have a basic knowledge at the high-school level in the areas listed below.

A. Computer and Information Technology
   1. General computer knowledge and skills (how to turn it on, how to start applications, how to log in to laboratory computers...)
   2. Internet (how to access the internet, find web pages, search the web, ...)
   3. Email (how to use your student account, send and receive messages, attachments...)
   4. Word processor (how to prepare documents, format and print them ...)
   5. Spreadsheets (how to enter data, perform simple calculations...)
   6. How to use your calculator (basic functions, using the memories, creating graphs, editing entries...)

B. Mathematics
   1. Mathematical computation and order of precedence (which comes first, multiplication or addition)
   2. Basic algebra and trigonometry (how to solve for a variable, basic functions, logarithms)
   3. Solving systems of linear equations (solve a 3 equation system by hand...)
   4. Matrix algebra (add, multiply, transpose, and invert matrices)

STUDENT LEARNING OUTCOMES:

After completing this course the student should be able to:

1. Design structured algorithms using systematic problem solving techniques;
2. Implement their algorithm in a high-level programming language (e.g., Matlab, Visual Basic) and a programmable calculator language;
3. Solve problems using spreadsheets (e.g., Excel) and other software (e.g., Mathcad);
4. Properly document their solutions to problems both internally and externally.
5. Properly choose the appropriate software tool to solve a problem.

MAJOR CONCEPTS OR METHODOLOGIES:

Engineers and physical science majors will learn basic computing concepts and methods of using computing, especially programming, to solve problems in their disciplines. They will learn or refine problem-solving skills (from accurately describing a problem to converting the description to mathematical algorithms, to using or writing software to solve it, to testing and documenting the solution). They will use applications software as necessary.
Students will use personal computers to write programs to solve basic problems. Emphasis will be on logical skills (devising solution algorithms, drawing flowcharts, writing code, and checking solutions) and on interacting with computer applications. Students will learn structured programming and be expected to apply the appropriate syntax and techniques to multiple programming languages.

Specifically, the following concepts will be addressed in the class:

1. Structured programming.
2. Top-down design.
4. Software documentation (both internal and external).
5. Data structure design.
6. Applications of appropriate software to engineering problems and data analysis.

The methodology used in the course will be a combination of lectures (2 hours per week) and a laboratory (3 hours per week) to be held in a computer laboratory. The course concepts will be presented in the lectures with computer demonstrations of the concepts. In the laboratory sessions, the students will be given problem exercises to solve with the instructor and/or teaching assistant available for consultation and clarification. Homework assignments will build on the lecture material and laboratory exercises.

CATALOG DESCRIPTION

GNE 160. Computing Methods for Engineers and Scientists (3)

Two hours lecture and three hours laboratory per week. Introduction to algorithm design, programming structures, and data structures. Engineering calculation software including programming languages, spreadsheets, and simulation software. Application of computing methods to engineering problems and data analysis. Fall.

COURSE HISTORY:

Last approved:

APM 153 is a new course, the idea for which arose from discussion about the Freshman Initiative during the 1989-90 academic year. See the description of APM 155, the companion course for Foresters and Biologists. Approved by Faculty Action 2/7/91.

GNE 160 replaces APM 153.