

**Catalog Description:**

Credits: 4; Computer programming, use of computers, numerical methods as applied to civil engineering problems, and civil engineering software.

**Prerequisites:** Prereq: STA 3032, must be at least 3 EG classification.

**Course Objectives:** The student should become proficient in developing computer programs that requires several skills including; 1) familiar with programming concepts 2) able to decompose a given problem into a series of smaller sub-problems 3) efficiently to develop a logical, step-by-step series of simple modules to represent each sub-problem in step 2 4) assembling modules with a main program 6) debugging and verifying the program with simple analytical solutions 7) understanding the theory of numerical methods and applications

**Goals:** The purpose of this class is to teach programming skills that can be used in practical application of computers as an engineering tool through the numerical solution of engineering problems. Thus, upon successful completion of this course, the student will become efficient in use of state-of-art problem solving tool and programming techniques that is necessary for contemporary engineering practice. No prior programming experience is assumed, but basic knowledge of engineering mechanics and linear algebra is expected.

**Instructor:** Jae Chung, Ph.D. (Office) Weil 480B (Email) JCHUN@CE.UFL.EDU (Phone) 352-392-9537 x 1495

**Course Web:** <http://users.ce.ufl.edu/~jchun/CGN3421/intro.html>

**Office hours:** Monday (1:30 pm – 3:00 pm) Tuesday (1:30 pm – 3:00 pm)

**TA's office hours:** TBA (Office) Weil 465 (Email) (Phone)

**Class meeting times:****Mon., Wed., and Fri.**

Section 7607: 8:30 am – 9:20 am (2nd period) at Turlington room 2353

Section 0860: 10:40 am – 11:30 am (4th period) at CSE room E121

**Lab:**

Section 0860 **Wed.** 3:00-6:00 pm (Weil 410 and Weil 200)

Section 7607 **Fri.** 2:00-5:00 pm (Weil 410 and Weil 200)

We will use the Circa Lab (Weil 410) and the CE Lab (Weil 200) – the total number of machines available = 42. Please bring your laptop computers if you have. Lab hours will be useful for understanding MathCAD programming related to homework problems.

Exams will be given during the lab periods (3:00 pm-6:00 pm) and the meeting places for exams are as follows: HPNP G301 (for Section 0860) and HPNP 312 (for Section 7607)

**Text:** Numerical Methods for Engineers, Chapra and Canale, 5<sup>th</sup> Eds. 2005.

ISBN 0-07-291873-X. **Class notes** that have been developed by the instructor will be posted at the class web site

**Software:** MathCAD 13 Student Option Agreement (SOA) version or MathCAD 12 (full version) - Required

The SOA is a MathCAD license specifically for students to use their own computers. There is no upgrade or maintenance service for the SOA by MathSoft. Once students purchase the SOA for their own computers, they may keep it **only** for the duration of their academic careers.

**Grading & Expectation:** The final grade will be determined from

Homework (15%), Exam #1 (30%), Exam#2 (30%) and Exam #3 (25%) or

Homework (10%), Exam #1 (30%), Exam#2 (30%) and Exam #3 (25%) if pop quizzes (5 %) are given. A pop quiz would be given during the class if attendance were low.

**Grading Scale:** 91~100 (A) 88-90 (B+) 81~87 (B) 78~80 (C+) 71~77 (C) 66~70 (D) 65 or below (E)

**Homework:** Homework will be assigned each Wednesday and will be collected on the following Wednesday except for an exam week. There is a **strict format** for turning in programming homework. Download the homework template file from the web page: <http://users.ce.ufl.edu/~jchun/CGN3421/downloads.html>

**Incomplete homework** will be returned with zero grades.

**Late Policy: Late homework** (submission after Wednesday class) will be accepted with a **50%** reduction of homework grade. No late homework will be accepted for assignments due the Monday of an exam week.

**Academy Honesty:** Encourage you to work on homework and study in groups to help each other. Expect you to turn in your own work. Any two assignments submitted with sufficient resemblance will be returned with **Zero** grade. Any cheating on homework and exams will have consequences. Refer to the UF Honesty Policy below.

**Honesty Policy:** All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

### **Exam Schedule:**

**Exam 1** (MathCAD basics & Programming, closed book and closed notes) during the 8<sup>th</sup>~10<sup>th</sup> period on Wednesday, Feb. 22

**Exam 2** (Numerical Methods & MathCAD Programming, accumulative, closed book and closed notes) during the 8<sup>th</sup>~10<sup>th</sup> period on Wednesday, Mar. 22

**Exam 3** (Numerical Methods #2 & MathCAD Programming, accumulative, closed book and closed notes) during the 8<sup>th</sup>~10<sup>th</sup> period on Wednesday, Apr. 26

**Pop Quiz** might be given during the class (depends on attendance)

**Course Outline and schedule:**

Dates	Topics
Jan. 9, 11, 13	Introduction to programming concept, MathCAD basic features
Jan. 18, 20	Review of Linear Algebra, 1-D & 2-D arrays, MathCAD basic operation, introduction to MathCAD programming (HW #1)
Jan. 23, 25, 27	Control structures (HW#2)
Jan. 30, Feb. 1, 3	Control structures, loops, functions (HW#3)
Feb. 6, 8, 10	Modular programming, plotting (HW#4)
Feb. 13, 15, 17	Algorithm development, swapping/sorting routines (HW#5)
Feb. 20, 22, 24	Algorithm development, introduction to numerical methods; <b>Exam #1 (Wednesday),</b> solving systems of linear equations
Feb. 27 Mar. 1, 3	Introduction to numerical methods; solving systems of linear equations (HW#6)
Mar. 6, 8, 10	Iterative methods; solving systems of linear equations and MathCAD implementation, accuracy and convergence, Numerical errors (HW#7)
Mar. 20, 22, 24	Matrix properties: Condition number and norms <b>Exam #2 (Wednesday),</b> Root finding and MathCAD implementation
Mar. 27, 29, 31	Root finding and MathCAD implementation, Convergence and tolerance, Numerical analysis and application to engineering problems (HW#8)
Apr. 3, 5, 7	Root finding and MathCAD implementation (HW#9)
Apr. 10, 12, 14	Root finding and Numerical integration/differentiation MathCAD implementation (HW#10)
Apr. 17, 19, 21	Numerical integration/differentiation, solving O.D.E. (HW#11)
Apr. 24, 26	Problem review, <b>Exam #3 (Wednesday)</b>

\*\*No Classes: January 16: Martin Luther King Jr. Day, March 11-18: Spring Break

**Make-up Exam Policy:** No make-up exams will be given except for valid medical reasons or unless prior arrangements have been made.

**Contributions of Course to Meeting the Professional Component for ABET:**

This course contributes four (4) credit hours toward meeting the minimum 48 credit hours of Engineering Topics in the basic-level curriculum for the Bachelor of Science Degree in Civil Engineering

**Relationship of Course to Program Outcomes:**

From the list of (a) through (k) program outcomes listed below, this course addresses outcomes (e) and (k).

**ABET Program Outcomes**

- (a) Apply knowledge of mathematics, science, and engineering*
- (b) Design and conduct experiments, as well as analyze and interpret data*
- (c) Design a system, component, or process to meet desired needs*
- (d) Function on multi-disciplinary teams*
- (e) Identify, formulate, and solve engineering problems***
- (f) Understand professional and ethical responsibilities*
- (g) Communicate effectively*
- (h) Understand the impact of engineering solutions in a global and societal context*
- (i) Recognize the need for, and engage in life long learning*
- (j) Understand contemporary engineering issues*
- (k) Use the techniques, skills, and modern engineering tools necessary for engineering practice***

**Accommodation for Students with Disabilities:**

Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

**UF Counseling Services:** Resources are available on-campus for students having personal problems or lacking clear career and academic goals.

The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

**Software Use:** All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.