Course Approval Form

For approval of new courses and deletions or modifications to an existing course.

registrar.gmu.edu/facultystaff/curriculum

Action Requested:

- [x] Create new course
- [ ] Inactivate existing course
- [ ] Modify existing course (check all that apply)
  - [ ] Title
  - [ ] Credits
  - [ ] Repeat Status
  - [ ] Grade Type
  - [ ] Prereq/coreq
  - [ ] Schedule Type
  - [ ] Restrictions
  - [ ] Other:

Course Level:

- [ ] Undergraduate
- [x] Graduate

College/School: COS **Department:** SPACS
Submitted by: Chi Yang **Ext:** 3-4077 **Email:** cyang@gmu.edu

Subject Code: CSI **Number:** 690
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term: [x] Fall [ ] Spring [ ] Summer *Year* 2013

Title:
Current
Banner (30 characters max including spaces)
New: CSI 690 Numerical Methods

Credits: (check one) [3] Fixed [ ] Variable — [x] or [ ] to

Repeat Status: (check one)
- [x] Not Repeatable (NR)
- [ ] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)

Maximum credits allowed:

Grade Mode: (check one)
- [x] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type: (check one) LEC can include LAB or RCT
- [x] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s):
MATH 203 and 214 or equivalent, and some programming experience

Corequisite(s):

Instructional Mode:
- [x] 100% face-to-face
- [ ] Hybrid: ≤ 50% electronically delivered
- [ ] 100% electronically delivered

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code.

Are there equivalent course(s)?
[x] Yes [ ] No
If yes, please list: Equivalent to MATH 685/OR 682

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)

Indicate number of contact hours: Hours of Lecture or Seminar per week: ____ Hours of Lab or Studio: ____
When Offered: (check all that apply) [ ] Fall [ ] Summer [ ] Spring

Approval Signatures

Department Approval Date

College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Courses Only

Graduate Council Member Provost Office Graduate Council Approval Date

For Registrar Office's Use Only: Banner_____Catalog_____

revised 11/8/11

Course Proposal Submitted to the Curriculum Committee of the College of Science

1. COURSE NUMBER AND TITLE: CSI 690 Numerical methods

Course Prerequisites: MATH 203 and 214 or equivalent, and some programming experience

Catalog Description: Covers computational techniques for solving science, engineering problems. Develops algorithms to treat typical problems in applications, emphasizing types of data encountered in practice. Covers theoretical development as well as implementation, efficiency, and accuracy issues in using algorithms and interpreting results. When applicable, uses computer graphical techniques to enhance interpretation.

Rationale for number change; By lowering the number to the 600-level courses, undergraduate students, primarily those in accelerated master programs, can register and take advantage of the content that the course brings to their programs. The course with its new number will continue crosslisted with two 600-level courses, MATH 685 and OR 682.

2. COURSE JUSTIFICATION:

Course Objectives: This is a required core course in the COMP masters, CSI PhD and CTA graduate certificate. It is a fundamental course for these three academic programs. There is no change in the objectives.
Course Necessity: The course is required. No change in the necessity by changing its number.
Course Relationship to Existing Programs: This is a required core course

Course Relationship to Existing Courses: Equivalent to MATH 685/OR 682

3. APPROVAL HISTORY:

4. SCHEDULING AND PROPOSED INSTRUCTORS: The course new number will be corrected in all courses where it enters as a prerequisite.

Semester of Initial Offering with New Number: Fall 2013

Proposed Instructors: Chi Yang

5. TENTATIVE SYLLABUS: see the existing CSI700 syllabus below

CSI 700/ Math 685/ OR 682: Numerical Methods

Lecture: Mondays 4:30 – 7:10 pm
Classroom: Research Hall, # 249

Instructor

- Prof. Chi Yang
- Phone: 703-993-4077
- Fax: 703-993-9300
- E-mail: cyang@gmu.edu
- Office: Research Hall, #341
- Office Hours: Thursdays 2:30 – 4:00pm, and by appointment

Textbook

Michael T. Heath, "Scientific Computing – An Introductory Survey," Second Edition, McGraw-Hill, 2002.

Course Description

Scientific computing is playing an increasingly important role in almost all fields of science and engineering. This course serves as a foundation class for scientific computing and is designed to train you if you are pursuing a career in computational sciences and engineering. This course presents a broad overview of numerical methods for solving all the major problems in scientific computing, including linear and nonlinear equations, least squares, eigenvalues, optimization, interpolation, integration and differentiation, ordinary differential equations. Students will learn how computational methods are constructed, and how they are used to solve problems arising from the sciences and engineering.

Prerequisites

Sufficient recall of undergraduate linear algebra, differential equations and computer literacy including familiarity with MATLAB. The homework and project are expected to be done with MATLAB.

Lecture Notes

Lecture notes provided by the author of the required textbook can be downloaded from the textbook website: http://www.mhhe.com/engcs/compsci/heath/

Course Schedule

The following table contains the schedule for the course. It will basically cover Chapters 1-10 of the textbook, as well as some additional material.

Week	Contents	Sections
1	Introduction	1.2, 1.3
2	No Class (Labor Day)	
3	Systems of Linear Equations	2.1, 2.2, 2.3
4	Introduction to MATLAB	
5	Systems of Linear Equations	2.4, 2.5, 2.6
6	Linear Least Squares	3.1, 3.2, 3.3, 3.4,
7	Linear Least Squares	3.5, 3.6, 3.7
8	Eigenvalue Problems	4.1, 4.2, 4.4, 4.5
9	Nonlinear Equations	5.1, 5.2, 5.3, 5.4, 5.5, 5.6
10	Optimization	6.1, 6.2, 6.3, 6.4, 6.5, 6.6
11	Interpolation	7.1, 7.2, 7.3, 7.4
12	Numerical Integration and Differentiation	8.1, 8.2, 8.3, 8.4, 8.5, 8.6
13	Initial Value Problems for ODEs	9.1, 9.2, 9.3
14	Initial Value Problems for ODEs	9.4, 9.5
15	Boundary Value Problems for ODEs	10.1, 10.2, 10.3, 10.4, 10.5, 10.6
16	Final Exam	

Grading
Students will complete weekly homework assignments, consisting of exercises from the textbook and computational projects to be completed in Matlab. There will be a final exam.

Homework:	50%
Project:	20%
Final Exam:	30%

Matlab Computing Environment
The software package Matlab will be used for analysis and presentation of data. Matlab is a computing environment with programming capability, good graphics, and powerful library functions. It is available on campus on the Mason cluster and several Unix computer labs. Alternatively, a PC or Macintosh version can be purchased at the bookstore.

Matlab Tutorial Links
The following are some of Matlab tutorial links:

MATHWORKS: http://www.mathworks.com/academia/student_version/
Indiana University: http://www.indiana.edu/~statmath/math/matlab/
University of Florida:
http://www.math.ucsd.edu/~bdriver/21d-s99/matlab-primer.html
http://www.math.ufl.edu/help/matlab-tutorial/
University of Michigan (Control Tutorials for Matlab): http://www.engin.umich.edu/class/ctms/

The manual which comes with the PC version is also very complete. Further information on Matlab can also be found from http://math.gmu.edu/introtomatlab.htm

Academic Integrity
All students will be expected to abide by the Honor Code: Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

References

- Steven C. Chapra, "Applied Numerical Methods with MATLAB for Engineers and Scientists," 2nd Edition, McGraw Hill, 2008.
- Ward Cheney and David Kincaid, "Numerical Mathematics and Computing," 6th Edition, Thomson Brooks/Cole, 2008.
- Amos Gilat and Vish Subramaniam, "Numerical Methods for Engineers and Scientists: An Introduction with Applications Using MATLAB," J. Wiley, 2008.Amos Gilat , "MATLAB – An Introduction with Applications," J. Wiley, 2008.