FAU
FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department Mathematical Sciences

College Charles E. Schmidt College of Science
*(To obtain a course number, contact **erudolph@fau.edu**)*

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix MAD **Number** 6404	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Course Title** Computational Mathematics
Credits *(Review Provost Memorandum)* 3 **Effective Date** *(TERM & YEAR)* Fall 2017	**Grading** *(Select One Option)* **Regular** ◉ **Sat/UnSat** ○	**Course Description** *(Syllabus must be attached; see Guidelines)* An introduction to some of the fundamental tools and methods of computational mathematics and their applications.

Prerequisites	**Corequisites**	**Registration Controls** *(Major, College, Level)*
Graduate Standing or Instructor's Permission		

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course:	**List textbook information in syllabus or here**
Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	Numerical Analysis, 8th ed. by Burden and Faires (2005), Or: Matrix Computations, 4th ed. by Golub & Van Loan (2012)
Faculty Contact/Email/Phone Stephen C. Locke/LockeS@fau.edu/(561)297-3350	**List/Attach comments from departments affected by new course**

Approved by	***Date***
Department Chair R. Kleinmark	3-1-17
College Curriculum Chair	3-23-17
College Dean for Charles Robert	3-23-17
UGPC Chair	
Graduate College Dean	
UFS President	
Provost	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

College of Science
Course Syllabus

Course title/number, number of credit hours

Course Title: Computational Mathematics	
Term: Fall 2017	Credit hours: 3
CRN(optional): TBA	Course number: MAD 6404

Course prerequisites:

COURSE PREREQUISITES: Graduate Standing or Instructor's Permission

Permission of the instructor is required: Yes ☐ or No ☑	

Instructor contact information

Instructor: Stephen C. Locke	Office: SE 237
Office Hours: TBA	Office Phone: 561-297-3350
E-mail Address: LockeS@fau.edu	

TA contact information (if applicable)

TA Name:	Office:
Office Hours:	Office Phone:
E-mail Address:	

Course description

An introduction to some of the fundamental tools and methods of computational mathematics and their applications.

Course objectives/student learning outcomes

There are two basic goals for this class:

gain introductory knowledge of some basic methods of computational mathematics,

gain experience in the mathematical design, analysis, and implementation of computational algorithms through a final project.

Course evaluation method

Itemized list of evaluation tools with % of course grade totaling 100%

Grades will be determined by written exercises (approx 50%), class participation including attendance and in-class presentations (approx 25%), and a final presentation (approx 25%).

Students will be expected submit written solutions to exercises, including multiple revisions. Class participation points for meaningful contributions. Final presentation may be a suitable computer project or presentation of a mathematical research paper.

Course topical outline

Including dates for exams/quizzes, other graded projects, breakdown of topics covered by day or week

Date	Topic	Assignments
Week #1	Floating point arithmetic	R (B&F 1.1,1.2,1.3); E;
Week #2	Gaussian Elim. Eigenvalues	R (B&F 6.1-6.4,); E;
Week #3	Gauss-Seidel; Finite Elem	R *B&F 8.1-8.3); E;
Week #4	Eigenvalue determination	R (B&F 8.4-8.5); E;
Week #5	Fast poly & matrix mult	R (AHU 7.2,6.1); E;
Week #6	Linear Programming	R (C 1-5); E;
Week #7	Dual LP; Column Gen.	R (C 5-7); E;
Week #8	Comp. Slackn. & Example	R (C 1-7 & journal); E;
Week #9	NP-complete; 3-SAT	R (AHU 10.1-10.6); E;
Week #10	Ham. cycles; DFS	R (AHU 10.1-10.6); E;
Week #11	Isomorphism Testing; R;E	Isomorphism Testing; R;E
Week #12	Interpolation	R (B&F 3.2,3.5); E;
Week #13	Sorting	R (AHU 3.1-3.4); E;
Week #14	Presentations	
Week #15	Presentations	
Final Exam slot	Presentations	
		R;=readings
		E=Exercises in readings

Course grading scale (optional-needed if it differs from the catalog grading scale)

Cumulative Performance	Grade
>94%	A
>90% - 94%	A-
>87% - 90%	B+
>83% - 87%	B
>80% - 83%	B-
>75% - 80%	C+
>65% - 75%	C
>60% - 65%	C-
>57% - 60%	D+
>53% - 57%	D
>50% - 53%	D-
<50%	F

Policy on makeup tests, late work, and incompletes (if applicable)

Missed classes will lower grade; multiple missed classes will lower grade severely. Missed presentations will result in non-passing grade.

Special course requirements (if applicable)

Required texts/readings

Text: Numerical Analysis, 8th ed. by Burden and Faires (2005)
Or: Matrix Computations, 4th ed. by Golub & Van Loan (2012)

Supplementary/recommended readings (if applicable)

Linear Programming, V. Chvatel (1983)
Design and Analysis of Computer Algorithms, Aho, Hopcroft, Ullman (1975)
A first Course in Graph Theory, Chartrand and Zhang (Dover)

Instructor and student selected (recent) research papers.

Classroom etiquette policy (if applicable)

University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

Disability policy statement

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) - in Boca Raton, SU 133 (561-297-3880); in Davie, MOD 1 (954-236-1222); in Jupiter, SR 117 (561-799-8585); or at the Treasure Coast, CO 128 (772-873-3305) – and follow all OSD procedures.

Honor Code policy statement

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University ommunity, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf

Additional Information

Fast polynomial and fast matrix multiplication: Fast Fourier transform; Strassen's method.

Trapezoid Method and Romberg-Richardson; Power series analysis of error terms; Introduction to numerical solution of differential equations; Lipschitz condition.

Interpolation: Lagrange Interpolation; Hermite Interpolation (as limit of Lagrange Interpolation); Splines

A graph theory conjecture from automata theory: Cerny's Conjecture

Analysis of Algorithms: NP-Completeness; 3-SAT is NP-Complete; Hamilton cycle problem is NP-complete. Depth-First Search.

Additional Graph-Theoretic topics chosen from: Myhill-Nerode Theorem; Depth-First Search; block-cutnode decomposition; Random Generation of Graphs; Recursive Programming (Nim Game Variant); Generating All Trees on n Edges; Generating Many Super-Edge-Graceful Graphs; Dan Younger's Algorithmic Proof of Seymour's 6-flow Theorem; Working with Permutations [Rubik's Cube]

Some topics may be expanded and others reduced according to the instructor's and student's interests.