

ISC 3313: Introduction to Scientific Computing Programming Language: Fortran

This course offers introduction to science of computations using the Fortran programming language and programming environment of the Linux system. Elements of Fortran language, data structures, concepts of modular and object oriented programming, implementation and solution verification, practical methods of debugging, and code performance evaluation and optimization are introduced using basic numerical algorithms.

Prerequisites: MAC 2311 (Calculus with Analytic Geometry I)

Co-requisites: MAC 2312 (Calculus with Analytic Geometry II)

Lectures: TR 2pm-3:15pm, HCB 217 (152 DSL)

Instructor: Dr. Tomasz Plewa

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TA: none

Office: N/A

E-mail: N/A

Office hours: TR, 3:15pm-3:00pm (or by appointment), 415 DSL.

Textbooks

Required: Suely Oliveira, David Stewart, *Writing Scientific Software: A Guide to Good Style* (Cambridge University Press), 2006, 1st edition, ISBN-10: 0521675952

Optional: Michael Metcalf, John Reid, Malcolm Cohen, *Modern Fortran Explained* (Oxford University Press), 2011, 4th edition, ISBN-10: 0199601429, ISBN-13: 978-0199601424 (3rd edition is also acceptable)

Website:

https://campus.fsu.edu/webapps/blackboard/execute/courseMain?course_id=_6417371_1

Credit: 3 semester hours

Course Objectives

At the end of the course, the student will be able to

- describe the components of scientific computing;
- describe the process of code design;

- describe activities of code implementation and solution verification;
- implement elementary algorithms of interpolation, numerical differentiation, root finding, integration, and sorting using Fortran language;
- document the code;
- apply the above algorithms implementations to solve elementary problems in science, and present the results in a format suitable for their interpretation (Computer Competency component of the course; see below).

Computer Competency Requirement

In order to fulfill FSU's Computer Competency Requirement, the student must earn a grade C- or better in the course, and in order to receive a grade C- or better in the course, the student must earn at least a grade C- on the computer competency component of the course. If the student does not earn a grade C- or better on the computer competency component of the course, the student will not earn an overall grade of C- or better in the course, no matter how well the student performs in the remaining portion of the course.

Course Topics

- Elements of modern science: observations, theory, computations
- Elements of numerical analysis: stability, consistency, convergence
- Elementary linear algebra
- Algorithms: interpolation (linear, splines), differentiation (finite differences, first and second derivatives), root finding (bisection, Newton's method, secant method), numerical integration (rectangle rule, trapezoidal rule), data sorting (bubble sort)
- Fortran: language elements, data types, expressions and assignments, data transfer, execution flow control, program units, arrays and array operators, vector programming, dynamic memory allocation, pointers, type extensions, dynamic types, parallel programming with OpenMP

Grading

The course grade will be based on class mini-quizzes (about 4 in total, 40% points toward the final grade), series of computer lab-like assignments (40%), and one integrated computer lab project (20% of points). The scale for the grades will be A (95-100%), A- (90-94%), B+ (85-89%), B (80-84%), B- (75-79%), C+ (70-74%), C (65-69%), C- (60-64%), D+ (57-59%), D (54-56%), D- (50-53%), and F (<50%).

Homework Submission

Each homework assignment or project must be submitted as a single pdf document via email to the Instructor (tplewa@fsu.edu).

University Attendance Policy

Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

Academic Honor Policy

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at <http://dof.fsu.edu/honorpolicy.htm>.)

Americans With Disabilities Act

Students with disabilities needing academic accommodation should: (1) register with and provide documentation to the Student Disability Resource Center; and (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact the: Student Disability Resource Center
874 Traditions Way 108
Student Services Building
Florida State University
Tallahassee, FL 32306-4167
(850) 644-9566 (voice) (850) 644-8504 (TDD)
sdrc@admin.fsu.edu
<http://www.disabilitycenter.fsu.edu/>

Free Tutoring from FSU

For tutoring and writing help in any course at Florida State University, visit the Academic Center for Excellence (ACE) Tutoring Services' comprehensive list of tutoring options - see <http://ace.fsu.edu/tutoring> or contact tutor@fsu.edu for more information. High-quality tutoring is available by appointment and on a walk-in basis. These services are offered by tutors trained to encourage the highest level of individual academic success while upholding personal academic integrity.

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.