# Department of Scientific Computing Classes **SPRING 2019**

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| **ISC 3313**<br>3 Credit Hours | ***Introduction to Scientific Computing*** | KYLE SHAW | This course introduces the student to the science of computations. Topics cover algorithms for standard problems in computational science, as well as the basics of an object-oriented programming language, to facilitate the student's implementation of algorithms. The computer language will be Java. Prerequisites: MAC 2311, MAC 2312. | **M W F 1:25-2:15**<br>**152 DSL** |
| **ISC 4220C**<br>4 Credit Hours | ***Continuous Algorithms for Science Applications*** | SACHIN SHANBHAG | Basic computational algorithms including interpolation, approximation, integration, differentiation, and linear systems solution presented in the context of science problems. The lab component includes algorithm implementation for simple problems in the sciences and applying visualization software for interpretation of results. Corequisite: ISC 3222; Prerequisite: MAC 2312. | **M W F 9:05-9:55**<br>**152 DSL**<br>**T 3:30-6:00 (Lab)**<br>**152 DSL** |
| **ISC 4234C/5247C**<br>3 Credit Hours | ***Geometric Morphometrics*** | DENNIS SLICE | Morphometrics, or shape analysis, contributes to many diverse research areas. The shape of an organ or organism may affect its function and can reflect developmental state, ecological adaptation, and/or evolutionary history. We'll examine the methods and tools of shape analysis with emphasis on the latest geometric methods, especially coordinate-based methods for analysis of anatomical landmark locations. Prerequisites: STA 2122, STA 2171, or equivalent. | **T R 11:00-12:15**<br>**152 DSL** |
| **ISC 4304C**<br>4 Credit Hours | ***Programming for Science Applications*** | PETER BEERLI | Provides knowledge of a scripting language that serves as a front end to popular packages and frameworks, along with a compiled language such as C++. Topics include the practical use of an object-oriented scripting and compiled language for scientific programming applications. There is a laboratory component for the course; concepts learned are illustrated in several science applications. Prerequisites: MAC 2312, COP 3014 or ISC 3313. | **T R 9:30-10:45**<br>**152 DSL**<br>**M 2:30-5:00 (Lab)**<br>**152 DSL** |
| **ISC 4933/5318**<br>3 Credit Hours | ***High-Performance Computing*** | XIAOQIANG WANG | Introduces high-performance computing, which refers to the use of parallel supercomputers, computer clusters, as well as software and hardware to speed up computations. Students learn to write faster code that is highly optimized for modern multi-core processors and clusters, using modern software development tools and performance analyzers, specialized algorithms, parallelization strategies, and advanced parallel programming constructs. Prerequisite: ISC 5305 or equivalent or instructor permission. | **T R 2:00-3:15**<br>**152 DSL** |
| **ISC 4933/5935**<br>3 Credit Hours | ***Iterative and Direct Solvers for Linear Systems*** | BRYAN QUAIFE | Linear systems play a central role in countless problems including partial differential equations, inverse problems, and data analysis. Performing a matrix-vector multiplication, matrix inversion, or matrix factorization is computationally expensive if applied in its textbook form. This course will explore iterative and direct algorithms that accelerate these basic tasks. Examples of algorithms that may be covered include multigrid, fast summation methods, preconditioners, incomplete LU, interpolative decomposition, randomized algorithms, and low-rank factorizations. | **M W F 10:10-11:00**<br>**152 DSL** |
| **ISC 5227**<br>3 Credit Hours | ***Survey of Numerical Partial Differential Equations*** | TOMASZ PLEWA | This course provides an overview of the most common methods used for numerical partial differential equations. These include techniques such as finite differences, finite volumes, finite elements, discontinuous Galerkin, boundary integral methods, and pseudo-spectral methods. | **T R 11:00-12:15**<br>**422 DSL** |
| **ISC 5316**<br>4 Credit Hours | ***Applied Computational Science II*** | TOMASZ PLEWA | Provides students with high performance computational tools to investigate problems in science and engineering with an emphasis on combining them to accomplish more complex tasks. Topics include numerical methods for partial differential equations, optimization, statistics, and Markov chain Monte Carlo methods. Prerequisite: ISC 5315. | **T R 9:30-10:45**<br>**422 DSL**<br>**R 3:00-6:00 (Lab)**<br>**152 DSL** |
| **ISC 5473**<br>3 Credit Hours | ***Introduction to Density Functional Theory*** | CHEN HUANG | The course is designed for materials scientists, chemists, physicists, and applied mathematicians who are seeking to know both the basic concept and certain advanced topics in density functional theory. Density functional theory is widely used nowadays in both industry and academia to simulate various properties of materials and molecules, such as electronic properties, crystal structures, and chemical reactions. In this course, we will learn how to solve realistic materials problems using density functional theory and the underlying theories. | **T R 12:30-1:45**<br>**152 DSL** |