Department of Scientific Computing Classes SPRING 2021

ISC 1057 3 Credit Hours	***Computational Thinking***	SACHIN SHANBHAG	This introductory course considers the question of how computers have come to imitate many kinds of human intelligence. The answer seems to involve our detecting patterns in nature, but also in being able to detect patterns in the very way we think. We will look at some popular computational methods that shape our lives, and try to explain the ideas that make them work. This course has been approved to satisfy the Liberal Studies Quantitative/Logical Thinking requirement.	ONLINE
ISC 2310 3 Credit Hours	***Introduction to Computational Thinking in Data Science with Python***	JANET PETERSON	This course investigates strategies behind popular computational methods used in data science. In addition, many of the algorithms are implemented using the programming language Python. No prior programming experience is required so the course presents the basics of the Python language as well as how to leverage Python's libraries to solve real-world problems in data science. Prerequisite: MAC 1105 or equivalent.	ONLINE
ISC 4220C 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. Prerequisites: ISC 3222, MAC 2312.	M W F 9:20-10:10 T 3:05-5:35 (Lab) Hybrid REMOTE/F2F
ISC 4304C 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 2311, COP 3014 or ISC 3313.	T R 9:45-11:00 M 3:05-5:35 (Lab) REMOTE
ISC 5935 3 Credit Hours	***Uncertainty Quantification in the PDE Setting***	MAX GUNZBURGER	Quantifying uncertainties in systems governed by partial differential equations is an important endeavor in simulation, design, and control in all areas of science and engineering. Monte Carlo methods are in very common use but are limited by their high cost. Alternatives methods are discussed that reduce costs by lowering the number and/or cost of the PDE solves used. The course is self contained: short presentations about PDEs, their finite element approximation, and notions from probability are discussed.	T R 3:05-4:20 REMOTE
ISC 4933/ISC 5227 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 11:35-12:50 REMOTE
ISC 4933/ISC 5238C 3 Credit Hours	***Scientific Computing for Integral Equation Methods***	BRYAN QUAIFE	This course covers key algorithms that are required when solving integral equations. Prerequisites: MAD 3703 and MAP 4341; ISC 4232; or instructor permission.	M W F 1:20-2:10 Hybrid REMOTE/F2F
ISC 4933/ISC 5318 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.	M W F 10:40-11:30 REMOTE
ISC 4943 3 Credit Hours	***Practicum in Computational Science***	ANKE MEYER-BAESE	This practicum allows students to work individually with a faculty member throughout the semester and meet with the course instructor periodically to provide progress reports. Written reports and an oral presentation of work are required. May be repeated to a maximum of six semester hours, with a maximum of only three semester hour credits allowed to be applied to the Computational Science degree.	T R 1:20-2:35 REMOTE
ISC 5316 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 R 3:30-6:00 (Lab) REMOTE
ISC 5473 3 Credit Hours	***Introduction to Density Functional Theory***	CHEN HUANG	For materials scientists, chemists, physicists, and applied mathematicians who want to know both the basic concept and certain advanced topics in density functional theory. Density functional theory is widely used in both industry and academia to simulate various properties of materials and molecules, such as electronic properties, crystal structures, and chemical reactions. We will learn how to solve realistic materials problems using density functional theory and the underlying theories.	T R 1:20-2:35 Hybrid REMOTE/F2F