COMPUTER SCIENCE (CS)

CS-601 Programming Methods for Data Science 4 Credits
Prerequisites: None
Introduction to computer science concepts and basic programming skills that are specifically geared toward data science, and forms a part of the introductory coursework for a Data Science & Data Analytics degree. Course emphasizes writing programs that are capable of retrieving and manipulating large amount of data. The first half of the course focuses on Python as a first programming language, while the second half of the course covers selected advanced topics such as data visualization, web scraping, database access and others.
Lecture: 4, Lab 0, Other 0

CS-625 Parallel Programming and Algorithms 4 Credits
Prerequisites: None
Parallel computing has long played a vital role in addressing the performance demands of high-end engineering and scientific applications. Over the last decade, parallel computing has become important to a much broader audience as nearly all computer systems are being built using chips with multiple processor cores. The goal of CS-625 is to introduce students to the foundations of parallel computing including the principles of parallel algorithm design, analytical modeling of parallel programs, programming models for shared- and distributed-memory systems, parallel computer architectures, along with numerical and non-numerical algorithms for parallel systems. The course will include material on emerging multicore hardware, shared-memory programming models, message passing programming models used for cluster computing, data-parallel programming models for GPUs, and problem-solving on large-scale clusters using MapReduce. A key aim of the course is for students to gain a hands-on knowledge of the fundamentals of parallel programming by writing efficient parallel programs using some of the programming models learned in class. There will be different projects in CS-425 and CS-625. Students may not receive credit for both CS-425 and CS-625.
Lecture: 4, Lab 0, Other 0

CS-641 Foundations of Data Science 4 Credits
Prerequisites: CS-601
The concepts, principles, issues and techniques for big data and cloud computing are introduced in this course. This course will provide a foundation in data science based on data curation and statistical analysis. The primary goal of this course is to introduce data analysis concepts and techniques that facilitate making decisions from a rich data set. Students will investigate big data concepts, metadata creation, interpretation, and basics of information visualization. Students may not receive credit for both CS-441 and CS-641.
Lecture: 4, Lab 0, Other 0

CS-651 Cloud Computing: Architecture & Applications 4 Credits
Prerequisites: CS-601
A comprehensive overview of cloud computing and its application to big data and data science. Current technologies that comprise the concept of cloud computing are discussed. Exploration of major Cloud frameworks that support large data storage and applications that support data analytics.
Lecture: 4, Lab 0, Other 0

CS-661 Database Systems 4 Credits
Prerequisites: CS-601
Database design and implementation, entity-relationship model, relational model, relational query languages, physical data organization, XML, distributed database concepts, Big Data technologies, enhanced data models.
Lecture: 4, Lab 0, Other 0

CS-665 Information Retrieval and Data Mining 4 Credits
Prerequisites: CS-601
Information retrieval and data mining topics, including information storage and retrieval, file structures, precision and recall, probabilistic retrieval, search strategies, automatic classification, automatic text analysis, decision trees, genetic algorithms, nearest neighbor method, and rule induction.
Lecture: 4, Lab 0, Other 0

CS-681 Artificial Intelligence 4 Credits
Prerequisites: CS-601
Topics covered include: Types of intelligence, knowledge representation, cognitive models, Heuristic and algorithmic techniques in problem solving, knowledge representation, reasoning under uncertainty, and learning. Selected topics from natural language processing, vision processing, game playing, pattern recognition, speech recognition, robots, and other current topics in artificial intelligence. There will be different projects in CS-481 and CS-681. Students may not receive credit for both CS-481 and CS-681.
Lecture: 4, Lab 0, Other 0

CS-682 Machine Learning 4 Credits
Prerequisites: CS-601
This course provides an introduction to machine learning. Topics include: supervised learning including generative, discriminative learning, parametric and non-parametric learning, neural networks, support vector machines; unsupervised learning including clustering, dimensionality reduction, kernel methods; learning theory bias/variance trade-offs; VC theory; large margins; reinforcement learning. The course will also include applications of machine learning to big data.
Lecture: 4, Lab 0, Other 0

CS-683 Algorithms for Deep Learning 4 Credits
Prerequisites: CS-601
This course provides students with the knowledge to implement the key algorithms related to deep learning. Deep learning is a branch of machine learning concerned with the development and application of modern neural networks. Deep learning is behind many recent advances in AI, including Siri's speech recognition, Facebook's tag suggestions, etc. Students will cover a range of topics including the foundational algorithms and data structures of neural networks, belief networks, generative learning models, convolutional and recurrent network structures, as well as overcoming issues with training and security. Graduate students will go into greater depth on certain topics and have additional readings and homework assignments, and a more complex project. Students may not receive credit for both CS-483 and CS-683.
Lecture: 4, Lab 0, Other 0

CS-690 Data Science Capstone Project 4 Credits
Prerequisites: None
Lecture: 4, Lab 0, Other 0

CS-691 Data Science Special Topics 4 Credits
Prerequisites: None
Current topics in Data Science are discussed and analyzed.
Lecture: 4, Lab 0, Other 0

CS-693 Internship in Data Science 4 Credits
Prerequisites: None
Guided professional practicum experience for on-campus graduate students serving as an extension of the curriculum that facilitates the development of knowledge and skills in the application of theory to real-world problems in a non-classroom setting. This experiential learning engagement builds upon, applies, and assesses the concepts that are developed through the curriculum and advances the student's professional growth through a meaning full real-world job experience. Requires prior approval of the organization in which the internship will be done and by the Department Head of Computer Science. Four-credit hour enrollments in this course will be considered as full-time status. The course can be repeated a second timefor a total of eight credit hours. Internships are graded on a Satisfactory/Unsatisfactory basis, to be entered by the Department Head upon the student's completion of all internship requirements.
Lecture: 0, Lab 0, Other 4

CS-695 Thesis in Data Science 4 Credits
Prerequisites: None
Lecture: 0, Lab 0, Other 0

CS-699 Computer Science Independent Study 4 Credits
Prerequisites: None
Graduate level Independent Study.
Lecture: 4, Lab 0, Other 0