Information Systems Department

University of Maryland Baltimore County

Baltimore Maryland 21250

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IS 709/809 Computational Methods for IS Research
Fall 2018

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Course Delivery Site http://mpsc.umbc.edu/cmisr/
Office Hours: ITE 421 Thursday 10:00 AM – 12:00 PM

Meeting Times: Tuesday 7:10pm – 9:40pm; Room: Sherman Hall 011

Textbook:
Data Structures and Algorithm Analysis in C++ (4th Edition) by Mark Allen Weiss, Addison-Wesley, 2013 (Amazon.com)

Fundamentals of Queueing Theory, 4th Ed., by Donald Gross & John F. Shortle & James M. Thompson & Carl M. Harris. John Wiley & Sons, Inc, 2008 (Amazon.com)

Course Description and Rationale: Computational methods are inevitable tools for many facets of information systems research. These methodologies are used as fundamental tools and techniques in research and advanced practice in information systems, with particular focus on networking hardware and software technologies that deal with data and systems. Data becomes useful when it provides meaningful information through data analysis and mining, pattern recognition and learning, information extraction and visualization. System becomes useful when it meets the required end performance metrics through the governing policies and procedures and underlying models and simulations. Sophisticated data analysis and system performance measurements require a mixture of skills ranging from algorithmic foundation, data mining, machine learning, computational modeling, and information systems performance evaluation. This course covers the mixture of these skills with the goal of providing information science graduate and masters students with the ability to employ them in future research. The course is project-based, allowing students to understand the use of computational methods to pursue research objectives and interests.

Prerequisites: IS 698 (Smart Home Health Analytics) or IS 733 (Data Mining) or consent of the instructor.

Course Objectives: The purpose of this course is to provide a comprehensive foundation to apply computational research methods in solving problems in Information Systems. This course should enhance students' reasoning, problem-solving and modeling abilities, particularly in dealing with algorithmic problems. More specifically, the course has the following objectives:

- Familiarize students with the concepts and applications of computational techniques (machine learning, data science, graph theory, computational complexity, information and communication technology, operational managements etc) to solve computational problems.

- Teach students how to think and formalize problems algorithmically and experimentally.

We will not assume any background beyond high school level mathematics and familiarity with programming concepts. However, students are expected to spend time in learning the concepts in this course, many of which will be covered in detail.

Course Topics:

- Algorithmic Complexity
- System Modeling and Performance Measurement
- Computational Techniques for Cyber-Physical Systems
- Computational Techniques for Smart Service Systems
- Information and Communication Technology
- Applications

Instructional Methods: Classroom Lectures

Attendance and Participation: Regular and punctual attendance is expected of all students. In the case of absence due to emergency (illness, death in the family, accident), religious holiday, or participation in official College functions, it is the student's responsibility to confer with the instructor about the absence and missed course work.

Class Preparation and Student Success: All of the reading assignments should be completed before the class in which the material is to be discussed. Students should expect that for every 3 credit hour course they are devoting at least 9 additional hours preparing and studying course materials which are required or suggested. Students should contact the instructor for additional information about how to best achieve the goals and meet the academic expectations for this course. Additional support may be available through university or department resources in order to guide students toward success.

Course Requirements and Grading:

Course Participation + Research Reflection + Individual Paper Presentation	15%
Homework	20%
1 Midterm Exam	30%
Testbed Development + Individual/Group Research Project + Final Project Report	35%

Exams: There will be 1 Midterm Exam. The exam will result in a total of 30% of your semester grade. Exam is 100 points. You may not use calculators for exam. You must bring picture ID. Exam may include any type of question or exercise covering any aspect of the course currently under discussion or assignment.

Grading Standards: IS instructors are expected to have exams and evaluations, which result in a reasonable distribution of grades. With respect to final letter grades, the University's Undergraduate Catalogue states that, "A, indicates superior achievement; B, good performance; C, adequate performance; D, minimal performance; F, failure" There is specifically no mention of any numerical scores associated with these letter grades. Consequently, there are no pre-defined numerical demarcations that determine final letter grades. These numerical demarcations that determine final letter grades can only be defined at the end of the semester after all numerical grades have been earned. At that point, numerical demarcations for final letter grades can be defined such that final letter grades in this course conform to the University's officially published definitions of the respective letter grades. In accordance with the published University grading policy, it is important to understand that final letter grades reflect academic achievement and not effort. While mistakes in the arithmetic computation of grades and grade recording errors will always be corrected, it is important to understand that in all other situations final letter grades are not negotiable and challenges to final letter grades are not entertained. Historical data suggest an "A" may be in the 91-100 range, "B"'s may be from 81-90 and "C" grades range from 70-80.) All points from assignments and exams are additive for the semester. Each student starts at zero points which is an "F", any other grade must be earned. There will be no extra credit assignments available.

Due Dates: All assignments are to be handed in by the due date. If an assignment is not in on time it may possibly be accepted the following class with an accompanying reduction of 50% of the earned grade. Due to some scheduling issues some late assignments may not be accepted at all with a result in a total loss of points.

Make-up Policy: Exams: No make-up exams except through arrangement with the instructor prior to the exam date: and then for reasons deemed valid enough to warrant the making of a new, and potentially harder, test.

Just In Case: Diminished mental health can interfere with optimal academic performance. The source of symptoms might be related to your course work; if so, please speak with me. However, problems with other parts of your life can also contribute to decreased academic performance. UMBC provides cost-free and confidential mental health services through the Counseling Center to help you manage personal challenges that threaten your personal or academic well-being.

Remember, getting help is a smart and courageous thing to do — for yourself and for those who care about you. For more resources get the Just in Case mental health resources Mobile and Web App. This app can be accessed by clicking http://counseling.umbc.edu/justincase

The UMBC Counseling Center is in the Student Development & Success Center (between Chesapeake and Susquehanna Halls). Phone: 410-455-2472. Hours: Monday-Friday 8:30am-5:00pm.

Academic Integrity: By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabricating, plagiarism, and helping others to commit these acts are all forms of academic dishonesty and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. Full policies on academic integrity should be available in the UMBC Student Handbook, Faculty Handbook, or the UMBC Directory.

Student Disability Services (SDS): UMBC is committed to eliminating discriminatory obstacles that may disadvantage students based on disability. Services for students with disabilities are provided for all students qualified under the Americans with Disabilities Act of 1990, the ADAA of 2009, and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that would allow for students to have equal access and inclusion in their courses. If you have a documented disability and need to request academic accommodations, please refer to the SDS website at sds.umbc.edu for registration information or visit the SDS office in the Math/Psychology Building, Room 212. For questions or concerns, you may contact us at disAbility@umbc.edu or (410) 455-2459. If you require accommodations for this class, make an appointment to meet with me to discuss your SDS-approved accommodations.

Student Support Services (SSS): UMBC is committed to eliminating discriminatory obstacles that disadvantage students based on disability. Student Support Services (SSS) is the UMBC department designated to receive and maintain confidential files of disability-related documentation, certify eligibility for services, determine reasonable accommodations, develop with each student plans for the provision of such accommodations, and serve as a liaison between faculty members and students regarding disability-related issues. If you have a disability and want to request accommodations, contact SSS in the Math/Psych Bldg., room 213 or at 410-455-2459. SSS will require you to provide appropriate documentation of disability. If you require accommodations for this class, make an appointment to meet with me to discuss your SSS-approved accommodations.

COURSE SCHEDULE

Lecture Dates	Material Covered	Work Due
9/04	Course overview, logistics, etc.	
9/11	Introduction to Algorithm Analysis and System Modeling	
9/18	Math Review for Computational Methods and Algorithm Analysis	
9/25	Computational Complexity	
10/02	Sorting Algorithm Analysis	
10/09	Research Paper Presentation	
10/16	Research Paper Presentation	
10/23	Introduction to Graph Algorithms, Topological Sort	
10/30	Shortest Paths; Network Flow; Minimum Spanning Tree Applications	
11/06	Cyber-Physical Systems Performance Evaluation, Queueing Theory	
11/13	Erlang Concept, Basic Model & Notation, Little's Theorem Poisson process & Exponential distribution, Markovian Property, Memorylessness, Stochastic Process, Markov Process	
11/20	Birth & Death process, Markovian Systems Single Server system: M/M/1-Queue; steady state probabilities, M/M/1 performance measures Exam Review	
11/27	Exam	
12/04	Final Research & Development Project Presentation	
12/11	Final Research & Development Project Presentation	

Inclement Weather: Any work or test due on a class date that has been canceled due to inclement weather will be due the next class meeting. (If the semester's last exam is postponed, it will be given during the time period assigned during the University's official Final Exam week.)