Spring 2021 Computer Science Advising Newsletter

New Hires in the Department

So far, the Computer Science Department was able to hire 2 new faculty members for the next academic year! Starting next fall, the following professors will be joining us:

Md Munirul (Sunny) Haque

Prof. Haque received his Ph.D. in Computational Sciences from Marquette University, and has been an Assistant Professor at the University of Indianapolis prior to joining JMU. His interests lie in Mobile Computing, Security and Privacy, as well as Data Analytics. Prof. Haque will be teaching two sections of CS 149 in the fall.

Siddharth Bhaskar

Prof. Bhaskar received his Ph.D. in Mathematics from the University of California, L.A., and is currently completing a postdoctoral position in the Computer Science department at the University of Copenhagen, Denmark. His interests lie in Complexity Theory, Programming Language Theory, and Logic. Prof. Bhaskar will be joining the department in January 2022.

Early Enrollment

Registration for fall classes begins Friday, April 16$^{\text{th}}$. You can find your enrollment window (the time you are allowed to register) on MyMadison.

If you are in CS 159 then you will not be able to enroll in any more CS classes until you are fully admitted to the CS major or minor. This will not occur until after final grades for CS 159 are posted at the end of the semester. Therefore, you will have to register for CS classes in May, not during early enrollment in April. Leave space in your schedule for CS 240, CS 261, or CS 345. Because there are so many students coming into the CS major, we usually have to apportion people into these classes, so when you are admitted into the major, you will likely also be told which one or two of these three classes to enroll in for the fall; you can enroll in the other ones in the following semester.

Newly Admitted Students

If this spring semester is your first as a fully admitted CS major, then you are probably taking one or more of CS 240, CS 261, and CS 345. In the fall, you should probably take whichever of these you have not already taken, and possibly also CS 327 if you have had CS 240, or maybe CS 361 if you have had both CS 240 and CS 261. Exactly what to take is a topic you can discuss with your advisor.

Advising Appointments

The CS advising team wants to see every non-graduating student this semester:

Freshmen – Please make an appointment to see your advisor individually.

Sophomores and Juniors – Registration for the fall semester begins April 16th, so you need to discuss your plans for next semester (and thereafter) with your advisor to make sure that you are on track to graduate on time

Seniors You may want to get in touch and let us know how your job search or graduate school application process is going.

Applications for Full Admission

If you are taking CS 159 this semester and want to continue in the CS major or minor, you have to apply for full admission to the major or minor this semester. All application must be received by the last day of classes (Thursday, April 29th, 2021).

You will be guaranteed full admission to the CS major or minor, if your average grade in CS 149 and CS 159 is a 3.0 or better, and if you have not repeated either of the two courses. If you took CS 149 in Spring 2020 and received a grade of CR, then you need a grade of B or better in CS 159. If you took CS 149 or CS 159 in Spring or Fall 2020 and needed to repeat it in the next semester, then we are not counting this as a repeat. Students who are not guaranteed full admission will be granted full admission to the CS major or minor as space permits based on their GPA in CS 149 and CS 159 and faculty evaluation of their potential to succeed in the CS major or minor.

All students who want to be fully admitted to the major or minor must apply, regardless of whether or not you will be guaranteed admission! The application is done electronically through an online survey (see link below). You will need to upload a PDF file of your unofficial transcript along with the other information we request, so make sure you have that ready.

`https://jmu.questionpro.com/t/ARXgAZlotf`

When you complete the application, you will receive an email confirmation, which you should review to make sure all the information is correct.

Spring Schedule

The spring schedule for CS courses is attached with this newsletter. It can also be accessed on the CS Wiki. You will see that there are several electives, many of which are described below. Depending on whether or not the department will be able to make another hire, we may or may not offer Sections 4 and 5 of CS 345: Software Engineering.

Electives

CS 280: Web Interface Development (Kirkpatrick)

The world of web application design has changed dramatically in recent years. Early front-end web development practices focused on the use of HTML and CSS to format static web pages of text and images. In contrast, modern front-end web development also leverages Javascript to interact with the objects in a web page, creating a platform that can be used for dynamic, stand-alone applications. The goal of this course is to explore the technologiesHTML, CSS, and Javascriptthat define the structure, presentation, and interactions for modern web applications. In addition to learning how these tools work together, we will explore how browsers issue and process requests, how to work with mobile web browser constraints, how to design accessible web sites, and how to use automated tools to test and validate web applications. After completing this course, you will have a solid foundation to continue learning more advanced web development techniques used in other Computer Science courses.

Prerequisite: Grade of C- or better in CS 159.

Note that this class does not count as a Computer Science elective class. This class is not open to students who have credit for CS 347.

CS 347 Web-Based Information Systems (Profs. Johnson and Stewart)

This course is an opportunity to learn about full stack web development. In our fast-paced class we will work to develop web applications using a client-server architecture. The clients will be written in HTML+CSS+JS, and the server-side application will expose a REST API with which the client can interact. The server will persist data to a database. Students completing this class will be able to build their own web applications.

Prerequisites: Grades of C- or better in CS 159 and CS 345.

CS 354 Introduction to Autonomous Robotics (Molloy)

Until recently, robots that can act independently in complex environments have only existed in research labs and science fiction films. That situation is changing. Self-driving cars are already being tested on the roads. NASA's rovers autonomously navigate across the surface of Mars.

The focus in this course is on learning to program autonomous robots. Specific topics will include localization, mapping, kinematics, path planning and computer vision. This will be a hands-on programming course with a substantial final project. Note that this course will not address the problems of designing or building robots. We will work with existing robots that are programmed using a high-level development environment.

Prerequisite: Grade of C- or better in CS 240.

CS 374: Database Systems (Profs. Mayfield and Richards)

Databases are essential to nearly every business today. The goal of CS 374 is to give you an understanding of how data should be stored and used in real world contexts along with hands-on experience with fundamental data management techniques. We will focus mainly on the relational model and the use of SQL, a declarative programming language for writing queries. You will learn how to use standard database systems, which may include PostgreSQL, MySQL, SQLite, and Oracle. We may also explore NoSQL systems like MongoDB and Neo4j in the second half of the semester...

The course will focus on data modeling and database development with some application development. The knowledge and skills you acquire in CS 374 will open the door to solving interesting and challenging problemsnot to mention summer internships and networking opportunities. Database programming and database administration in an exciting and growing job sector.

Prerequisites: Grade of C- or better in either CS 240 or CS 345 or equivalent

CS 432 Compilers (Lam)

Have you ever wondered how the "javac" or "gcc" compilers work? Compilers are complex software systems that apply many areas of computer science theory to the very concrete systems-level problem of automatic program translation. Among other topics, we will discuss finite state machines, recursive descent and shift/reduce parsing, intermediate representations, type checking, code generation, optimization, and register allocation. We will also discuss pipelined software system design and other relevant aspects of software engineering. As a semester-long project, you will complete an actual compiler for a simple Java-like language, giving you valuable experience working on a larger-scale project. At the end of the semester, you will be able to use your compiler to translate high-level programs to assembly code that you can then run using the interpreter you wrote in CS 261!

Prerequisites: CS 327 and CS 361 with C- or better.
This course counts as a system elective.

CS 445 Machine Learning (Sprague)

An introduction to machine learning. Explores the differences between correlation and causation, feature selection and dimensionality reduction, classification, regression, neural networks, deep learning, unsupervised learning/clustering, anomaly detection, and associative learning. Course work includes a significant programming component using the Python programming language.

Prerequisite: Grade of C- or better in CS 327 and MATH 318, MATH 220 or MATH 229.

This class is not open to students who received credit for CS 480 (Machine Learning) in Fall 2019.

CS 450 Operating Systems (Buchholz)

Have you ever wondered how thousands of processes can seemingly run concurrently on a single computer? Are you interested in learning how all those processes can share the limited resources available (memory, disk space, processor time)? Are you taking CS 361 right now and asked yourself, "I wonder how semaphores actually work in an operating system"?

If you answered yes to any of these questions, it sounds like Operating Systems will be the right class for you. We are looking at a computing system from a resource-management point-of-view and learn what needs to be done to enable multiprocessing and multi-threading on computer systems. The class is largely project-based, where we take an existing, bare-bones operating system (PintOS), and add functionality to it to enable user programs and improved scheduling of processes. We will also learn about scheduling policies, concurrency, deadlocks and deadlock detection, file systems, memory management, and security aspects of modern operating systems.

Prerequisite: CS 361 with a C- or better.
This course counts as a system elective.

CS 457 Information Security (Aboutabl)

Did you know that the Internetas originally createdis not secure? Have you ever wondered how, nonetheless, we are able to use such medium to conduct security-sensitive tasks, e.g. online banking, and the protection of our national infrastructure? Are you interested in learning security-enabling protocols such as IPsec and TLS? How about algorithms for symmetric / asymmetric encryption, digital signature, key-exchange? Have you met The-Man-In-The-Middle? Do you have the muscle to beat him? Would you like to learn how to embed security services, e.g. encryption and

authentication, into the applications you develop for your clients? Would you like to design the security requirements of an organization? Are you a very skilled C programmer? If these questions entice you for becoming a security engineer, then join me in this course. There will be many challenges and lots of programming, ending with the utmost pleasure when the mission is accomplished.

Corequisite: CS 361.

This course is the first in a 3-course sequence that makes you eligible for the Information Security Certificate offered by the Computer Science department.