Spring 2022 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:

Mona Rizvi

Prof. Rizvi received her Ph.D. in Computer Science from Old Dominion University, and has been an Adjunct Associate Professor at the Texas Tech University, San Jose, Costa Rica prior to joining JMU. Her interests include Computer Science education, mobile networks, and pervasive computing. Prof. Rizvi will be teaching two sections of CS 149 in the fall.

Isaac Wang

Prof. Wang is scheduled to receive his Ph.D. in Human-Centered Computing from the University of Florida, Gainesville this summer. His interests include Human-Computer Interaction, Virtual Agents, Natural User Interfaces, Virtual/Augmented Reality, and Computer Vision. Prof. Wang will be teaching two sections of CS 149 in the fall.

New Class: CS 343 – Application Development

We have created a new elective class: CS 343 – Application Development, which gives an introduction to web development. For details about the course, please see its full description in the Electives section of this newsletter. CS 343 is the **new prerequisite class** for CS 347 (Web-Based Information Systems), CS 374 (Database Systems), and CS 447 (Interaction Design), and replaces CS 345 (Software Engineering) as the prerequisite. If you are planning to enroll in CS 374 this semester and are not enrolled in CS 240 or have already completed it, you will need to contact Prof. Buchholz for an override into the class, if you have credit for CS 345 or are taking it now.

We are offering two sections of CS 343 this coming fall. The class will not be open to students who have credit for CS 347.

Statistics prerequisites

We have added a statistics requirement for a **grade of C- or better** in MATH 220, MATH 229, or MATH 318 to the following CS classes:

- CS 354 (Introduction to Autonomous Robotics)
- CS 412 (Applied Algorithms)
- CS 444 (Artificial Intelligence)
- CS 452 (Design and Analysis of Algorithms)

This means that you will need to complete your CS major statistics requirement at the very latest the semester before you plan on taking your Algorithms course. If you have already taken one of the three MATH statistics classes and did not receive a grade of C- or better, you will need to re-take the class.

Early Enrollment

Registration for fall classes begins Monday, April 11$^{\text{th}}$. 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 11th, 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.

Paige Normand is offering drop-in advising during enrollment week, which you can schedule here: `https://jmu-cs.as.me/advisor`

The CS Department is hosting an Enrollment Fest April8th from 1:00-3:15 in King 259 – feel free to drop by and get scheduling advice (and pizza).

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 applications must be received by the last day of classes (Thursday, May 5th, 2022).

We have made a change to the admissions requirements, starting with applications this spring: you will no longer lose guaranteed admission to the major or minor if you have repeated CS 149.

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 CS 159. 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 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/ARXgAZr8U1`

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 fall 2022 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.

Electives

CS 343 Application Development (Profs. Kirkpatrick and Stewart)

Overview of application software development fundamentals and their use in building stand-alone applications, visualizing and interacting with complex data representations, and controlling the Internet of Things. This course provides an introduction to the technologies used to create modern user interfaces (e.g., web technologies), establishing a common foundation for later application-focused courses.

Prerequisite: Fully admitted Computer Science majors or minors only and a grade of C- or better in CS 159.

CS 354: Introduction to Autonomous Robotics (Prof. Sprague)

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 and either MATH 220 or MATH 229 or MATH 318.

CS 374: Database Systems (Prof. 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 343 or equivalent

CS 432: Compilers (Prof. 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 (Prof. Molloy)

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.

CS 450 Operating Systems (Prof. 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: Grade of C- or better in CS 361.

This course counts as a system elective.

CS 455 Advanced Computer Networking (Prof. Aboutabl)

Do you aspire to become the senior network engineer at your future organization? Are you eager to know how the protocols that govern computer networks internally work (or fail)? Are you interested in analyzing the traffic captured during some network activity to learn how you can better operate / understand your network? Would you like to learn how the routers of a big network collaborate to route/deliver Internet traffic? Have you ever wondered how it is feasible to reliably deliver data across a network that is inherently unreliable? Would you like to learn the design and implementation approaches for a networked, e.g. client-server, application? Are you a strong C programmer who prefers coding over sleeping/eating? If you answer "YES!" to all of the above, then this class is built for you. Yes, YOU!

Prerequisite: Grade of C- or better in CS 361

This course counts as a system elective.

CS 457: Computer Security (Prof. 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.

CS 482: Special Topics in Information Security – Security Seminar (Prof. Tjaden)

This course will be a seminar that will allow us to read and discuss some of the current research being done in the field of security. We will discuss cryptocurrency, cyberwarfare, network security, cloud security, intrusion detection, forensics, malware, and many other topics.

The course will be organized around in-class discussions. Each week there will be a number of papers assigned. Students will be responsible for thoroughly reading and understanding the papers for a given week and participating in the in-class discussion of them. If there are particular topics you would like to discuss, just let me know and I'll try to find papers on those topics.

Upon completion of this course, students should have an understanding of some of the open questions currently in the field of security as well as some of the approaches that are being pursued.

Prerequisites: Grades of C- or better in CS 240 and CS 261