CS 8530, Cloud Computing II (Fall 2019)

Instructor: Dr. Prasad Calyam (calyamp@missouri.edu)

Lectures: Two 75-minute lecture sessions

Course Description: This course covers advanced principles of distributed system models and enabling technologies relating to cloud computing; latest advances in management and security of virtual machines and virtualization of clusters, networks and data centers will be studied; Additionally, students will survey research literature and perform cloud programming, cyber defense, science gateway development as well as performance evaluation experiments on applications within available cloud platforms. Finally, students will learn project-based: problem solving, collaborative programming, technical writing and presentation skills.

Prerequisite: CS 4530/7530 Cloud Computing or Instructor Consent

Textbook (Optional): Cloud Computing for Science and Engineering - by Ian Foster and Dennis B. Gannon

Course Topics: This course will explore advanced principles related to the design, programming, security and application of distributed systems and cloud platforms. Topics include:

- Cloud Resource Optimization
  - Modeling performance, security, and energy efficiency issues
  - Multi-tenancy, cost-benefit analysis, microservices
- Cloud Engineering
  - Structures/tools and scheduling mechanisms for networks and data centers
  - Hybrid cloud setup, monitoring service level agreements, service pricing
- Cloud Applications
  - Programming for software-defined networks and data centers
  - Approaches for Application development on real cloud platforms based on Big Data Analytics, Internet-of-Things (IoTs), Mobile Edge Clouds
  - Application case studies: Precision Health, Public Safety
  - Technology platforms: Virtual Reality, Blockchain
- Cloud Security
  - Cyber attacks for data exfiltration and resource exfiltration
  - Federated identity and access management
  - Intercloud web services security and trust management
  - Cyber defense using software-defined networking, data science, UX design
- Cloud Standards
  - Current and emerging standards
  - Compliance and risk assessment (NIST, ISO/IEC, HIPAA)
Assignments: There will be Homeworks of research papers reading, Labs on advanced concepts in available cloud platforms, and Final Project assigned during the course.

Homework assignments will be assigned to deepen understanding of concepts and will require students to read conference and journal papers from major cloud computing research publication venues. As part of each Homework and Lab assignment, students will need to submit answers for select questions by performing work individually. The solutions to all homework and Lab assignments will be discussed in class.

To develop students’ programming and performance evaluation skills and to reinforce the understanding of major concepts discussed in the course, student team projects will be assigned that will require use of either C/C++ or Java, as well as cloud-platform specific tools and applications. Each project team will be required to submit a written report along with literature survey, an experimental evaluation and an oral presentation in class.

Grading:

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<thead>
<tr>
<th>ASSIGNMENTS</th>
<th>%</th>
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<tbody>
<tr>
<td>Homeworks</td>
<td>15%</td>
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<tr>
<td>Lab Sessions</td>
<td>20%</td>
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<tr>
<td>Midterm Exam</td>
<td>15%</td>
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<tr>
<td>Final Project</td>
<td>40%</td>
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<tr>
<td>Class Attendance</td>
<td>10%</td>
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Grading Scale:

Passing grades (A/B/C) ≥ 65%; +/- grades (A+, A-, B+, B-, C+, C-)

- A+ (97-100), A (93-96), A- (89-92)
- B+ (85-88), B (81-84), B- (77-80)
- C+ (73-76), C (69-72), C- (65-68)
- F (< 65)

Team Work: Teams for labs and final project will be created in this course to develop team work and planning skills of students, as they are an important part of the engineering profession. Therefore, dividing the problem into parts and assigning parts to team members is not only proper, but advised. However, each member of the team is responsible for understanding all aspects about the lab sessions and final project.

Academic Dishonesty: Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person’s work has been responsibly and honorably acquired, developed, and presented.
Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor. Any student found to have cheated during an exam will be given a 0 grade for that exam and the evidence will be sent to the Provost’s Office. Students submitting the same or similar solutions to homework or programming assignments will be given a 0 for the assignment and the evidence will be sent to the Provost's Office for determination of possible disciplinary action. Unless an assignment is specifically structured as a group project, duplicate homework written in collaboration with others is not acceptable. Although it is permissible to discuss the homework with others, these discussions should be of a general nature. All work at a detailed level must be done on your own. Students submitting the same or similar solutions to the homework will be considered as having cheated. No statements or actions made by anyone can alter this policy.

**ADA statement:** If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class, or at my office. To request academic accommodations (for example, a notetaker), students must also register with the Office of Disability Services, (http://disabilityservices.missouri.edu), S5 Memorial Union, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and instructors, as needed and consistent with course requirements. For other MU resources for students with disabilities, click on “Disability Resources” on the MU homepage.

**Intellectual Pluralism:** The University community welcomes intellectual diversity and respects student rights. Students who have questions or concerns regarding the atmosphere in this class (including respect for diverse opinions) may contact the Departmental Chair or Divisional Director; the Director of the Office of Students Rights and Responsibilities (http://osrr.missouri.edu/) or the MU Equity Office (equity@missouri.edu; http://equity.missouri.edu/). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.