CMSC 426: Software as a Service

Fall 2024 Syllabus

Catalog Listing:	CMSC 426 - Software as a Service
Course Level:	Undergraduate
Prerequisites:	CMSC 355 with a grade of C or better
Instructor:	Dr. Kosta Damevski (http://damevski.github.io)
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TA:	Rahat Rizvi Rahman
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TA Office Hours:	Tuesdays, 4:30pm - 5:30pm
TA Office:	East 4222
Class Hours:	Monday and Wednesday – 3:30pm - 4:45pm
Classroom:	Temple Building – Room 1165
Class Website:	on Canvas
Office Hours:	Monday and Wednesday – 2:30pm - 3:30pm (or by appointment)
Source Code:	https://github.com/damevski/saas_demos

1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Prerequisite: CMSC 355, with a minimum grade of C. Studies the challenges, opportunities and open problems of software-as-a-service, deployed on commodity cloud computing platforms. Covers relevant software architectures, API design principles. Includes concepts of modern software frameworks for software development, cloud computing for software deployment, and software operations. Students participate in projects that use modern tooling to develop, deploy and monitor a software application.

2.0 – Course Structure:

- Lecture hours/week – 3
- Lab hours/week – 0

3.0 – Course Goals

Upon successful completion of this course, students will be able to:

1. Design and implement full stack Web applications based on several communicating services, following modern principles and using modern frameworks;
2. Demonstrate the principles of designing effective, sustainable APIs to be used to external parties;
3. Discuss the characteristics of software architectures commonly used in service-oriented applications;
4. Deploy applications to cloud platforms that make efficient use of available resources;
5. Apply principles of effective application stress testing;
6. Monitor deployed applications for both functional and non-functional properties;

4.0 – ABET Criteria Addressed:

- (1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- (2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

5.0 – Major Topics Covered:

- Principles of Software as a Service (SaaS)
- Service-Oriented Architectures (REST)
- Using Modern Software Frameworks
- Object-Relational Mapping and Data Management
- Basic of Interactive Web-based User Interfaces
- Software Architectures for SaaS
- API Design
- Deploying SaaS Applications to the Cloud
- Stress Testing SaaS Applications
- Achieving Scalability and Availability
- Cloud Deployment and Monitoring

6.0 – Textbook(s):

- Optional
    - "Engineering Software as a Service" - Fox and Patterson (1st Edition)
    - "Flask Web Development" - Miguel Grinberg
    - "Building Microservices" - Sam Newman

7.0 – Grading and Attendance Policy:

General Instructions:

There are several individual assignments in this course. Significant amount of time outside class meetings will likely be required for the successful completion of the assignments, including appropriate communication with the teaching staff. Students will be directed to online resources and tutorials to supplement course lectures.

Category	Percentage Weight
Midterm #1 Exam	25%
Midterm #2 Exam	25%
Assignments + Quizzes	50%

Grading scheme:

A: >= 90%
B: >= 80% and < 90%
C: >= 70% and < 80%
D: >= 60% and < 70%
F: < 60%

Late policy: Assignments that are late will lose 10% of the grade per late day

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Important Note: Students should visit http://go.vcu.edu/syllabus and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.

8.0 – Class Schedule:

Week	***Date***	***Lecture***
1	08/21	Introduction to SaaS
2	08/26	REST APIs
	08/28	More on REST APIs
3	09/02	*Labor Day - No Class*

	09/04	*Class Canceled*
4	09/09	GraphQL
	09/11	Data and Transactions
5	09/16	Deployment
	09/18	Testing Web Services
6	09/23	Debugging Web Services
	09/25	Flask for Websites
7	09/30	Flask for Websites 2
	10/02	AJAX
8	10/07	Midterm Review and Discussion
	10/09	*Midterm Exam*
9	10/14	CI/CD
	10/16	DevOps
10	10/21	Containers
	10/23	Ansible
11	10/28	Reliability, Scalability and Maintainability
	10/30	Replication
12	11/4	Partitioning
	11/6	Dataflow and Streams
13	11/11	*Class Canceled*
	11/13	Service Security
14	11/18	LLM as a Service
	11/20	LLM as a Service 2
15	11/25	Thanksgiving Break
	11/27	Thanksgiving Break
16	12/2	LLM as a Service 3

	12/3	Course Summary
17	12/9	Midterm Exam #2