COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CMPS 356 Web Applications Design and Development
Fall 2022

Instructor Information

Name: Dr. Abdelkarim Erradi
Academic title: Associate Professor
Office: 132 Female Engineering Building
Phone: 4403 4254
Email: erradi@qu.edu.qa
Office Hours:
Female: **Sunday 12:15-1:15pm** at *C07-132 Female Engineering Building*
Male: **Tuesday 12:15-1:15pm** at *E104 - CSE Meeting Room*

TA Information

TBD

Class/Laboratory Schedule

Two hours theory and three hours embedded laboratory.

Coordinator Information

Same as the instructor.

Course Information

Catalog Description:
This course focuses on the principles, architectures, and technologies for designing and developing modern web applications using client-side and server-side frameworks, web access to data sources and cloud services, development and integration of web services. It also includes Hands-on lab using latest web development frameworks and tools to design, implement, test, deploy, scale, and secure web applications.

Credits:
3 Credit hours

Contact Hours:
2 Lecture hours
3 Lab hours
Prerequisites:

- CMPS 350 - Web development Fundamentals

Textbook(s):

- React.js – Key Concepts, 1st Edition, Maximilian Schwarzmüller, ISBN: 978-1803234502, 2022, Packt Publishing

- Real-World Next.js, 1st Edition, Michele Riva, ISBN: 9781801073493, 2021, Packt Publishing

References:

- *React: Up & Running, 2nd Edition, Stoyan Stefanov, ISBN: 1492051462, 2021, O'Reilly Media*
- *React Hooks in Action*, 2nd Edition, John Larsen, ISBN 9781617297632, 2021, Manning Publications.
- React.js https://reactjs.org/
- Next.js https://nextjs.org/
- JavaScript for impatient programmers (ES2022 edition), Dr. Axel Rauschmayer, https://exploringjs.com/impatient-js/index.html
- Mozilla Developer Network https://developer.mozilla.org

Course Objectives:

- Engineer effective web applications using established software architectures and design patterns.
- Design and implement modular, efficient and scalable web applications.
- Employ best practices and state-of-the art application frameworks and development tools to design, implement and deploy Web applications.

Course Learning Outcomes (CLO):

1. Design web applications based on established design patterns and best practices.
2. Construct a web application using various server-side and client-side programming frameworks.
3. Demonstrate understanding of common security threats for web applications.
4. Work in groups to design, implement, test, deploy and scale a web application using latest web development frameworks and tools.

Relationship of Course Outcomes to Student Outcomes (SO):

Course Learning Outcomes (CLO)	Related Student Outcomes (SO)					
	1	2	3	4	5	6
1		√				√
2		√				√
3		√				
4		√	√		√	√

Student Outcomes (CS-SO):

- Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- Design, implement, and evaluate a computing-based solution to meet a given set of computing

requirements in the context of the program's discipline.
- Communicate effectively in a variety of professional contexts.
- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
- Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
- Apply computer science theory and software development fundamentals to produce computing-based solutions.

Topics Covered:

Topics	Chapter	Weeks	Assessment
Web Dev Review & React Introduction	T1 -	1	
Single-Page Application (SPA) using React	T1-	3	A1 (week 3)
Next.js: client-side rendering (CSR), static site generation (SSG), server-side rendering (SSR), and incremental static regeneration (ISR)	T2 -	3	A2 (week 5)
Testing Web Apps	T2 -	1	A3 (Week 7)
Midterm Exam		**1**	**Lab Midterm (Week 9)**
Securing Web applications: authentication, authorization, and confidentiality.	T2 -	1	A4 (Week 10)
Securing Web applications: OWASP Top 10	Online readings	2	A5 (Week 12)
Deploy and scale Web applications: Cloud deployment, Docker Containers, Kubernetes, and Microservices	Online readings	1	A6 (Week 14)
WebSockets for real-time communication		1	Lab Exam
Total			
		14	

Method of Instruction

The course learning outcomes will be achieving using:
- Active Learning: Teaching will be through in-class lectures, demos, activities and discussion, and a project. Throughout the course, students complete hands-on lab activities and assignments that build their practical knowledge and skills to design, implement and test Web applications.
- Class Discussions: Students are expected to participate in discussions about the lecture material.
- Project: There will be an integrative application development project. Students will need to allocate time outside of class to work on the project to practice and reinforce the concepts and skills introduced in the lectures.

Learning Activities

To achieve the course learning outcomes, students will carry out several learning activities:

1. **Readings**: The lectures will follow the topics listed in the course schedule. The students are expected to read the assigned textbook chapter, online resources and slides. The reading assignments will elaborate on information presented in the lectures. **Each student is responsible for reading all related material prior to each lecture.** Students are expected to learn independently as much as needed in order to complete the course requirements.
2. **Lectures**: Lectures will cover theoretical concepts and principles related to Web application development in project-based and example-driven way. Extensive examples will be used to illustrate the taught principles. Students are expected to attend every lecture; this is where the course material will be discussed and ambiguities clarified. Class participation is highly encouraged. The technologies to be applied in the project and the assignments will be presented in the lectures via examples and demos. Students are required to practice and extend the examples and the demos provided.
3. **Lab Activities**: A weekly lab session will include hands-on in-lab activities and assignments to enable students to practice and apply the material learned in class. Multiple practical Lab activities on web application development are carried out individually.
4. **Exams**: The midterm and the final exams have a theoretical part and a practical programming part to build a solution to a simplified problem.
5. **Project**: Students will complete a web application project with significant use cases. The course project involves designing, implementing and testing a web application delivered in 2 phases. The project is carried out in groups of three students and it will require the students to leverage the material learned during the course to design and implement a real-world web application. The project is used as a tool to help the students reinforce concepts and gain a hand-on experience. It also offers an opportunity to study covered concepts in more depth and to apply them to realistic scenarios.

Assessment Methods and Grading Policy

Theory:

Midterm Exam:	10%
Final Exam:	10% (Consult final exams timetable)
Project Phase 1:	15%
Project Phase 2:	15%

Lab:

Lab Assignments:	25% (5 out of 6)
Midterm Lab Exam:	12.5%
Final Lab Exam:	12.5% (During the last Lab)

ABET Contribution of Course to Professional Component

Math & Basic Science : 20%

Engineering : 80%
Engineering Design :
General Education :

Computer/Software Usage

VS Code
Node.js
MongoDB
Visual Paradigm UML tool

Laboratory Projects

Two-phase project to develop an interactive dynamic website.

Course Ground Rules

- University attendance policies will be enforced. Attendance will be taken during each class meeting. Please arrive on time. You are responsible for all material covered and all announcements made in class. Classes will start on time. No one should be more than 5 minutes late.
- Use of electronic devices such as smartphones and tablets are strictly prohibited during the lecture. Switch off mobile phones during lecture time, pay utmost attention to lecture. Please try your best to minimize distraction for your classmates.
- Do not hesitate to ask if you have any question about any of the material discussed during the lecture.
- Academic Honesty such as plagiarism (cheating on an exam, submitting work that is not your own) will not be tolerated. The university rules will be enforced in case of cheating and plagiarism. Students must submit their own work without copying from the Internet or from other students. Students could be asked to explain their implementation. A student who shares code with another student will be treated the same as the person who does the copying. Outsourcing or getting external help to complete assignments is strongly prohibited, and disciplinary actions will be taken if outsourcing is confirmed.

University Code of Conduct

QU expects its students to adopt and abide by the highest standards of conduct in their interaction with professors, peers, staff members and the wider university community. Moreover, QU expects its students to act maturely and responsibly in their relationships with others. Every student is expected to assume the obligations and responsibilities required from them for being members of the QU community.

As such, a student is expected not to engage in behaviors that compromise their integrity, as well as the integrity of QU. Further information regarding the University Code of Conduct may be found on the web at http://www.qu.edu.qa/students/code-of-conduct

Academic Support and Learning Resources

The University Student Learning Support Center (SLSC) provides academic support services to male and female students at QU. The SLSC is a supportive environment where students can seek assistance with academic coursework, writing assignments, transitioning to college academic life, and other academic issues. SLSC programs include: Peer Tutoring, the Writing Lab, Writing

Workshops, and Academic Success Workshops. Students may also seek confidential academic counseling from the professional staff at the Center.

Contact Information for Students Support and Learning Resources:
Tel: (00974) 4403 3876
Fax: (00974) 4403 3871
Location: Female Student Activities Building
E-mail: learningcenter@qu.edu.qa

Student Complaints Policy

Students at Qatar University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the student handbook.

Declaration

This syllabus and contents are subject to changes in the event of extenuating circumstances. The instructor (with approval of the Head of Department) reserves the right to make changes as necessary. If changes are necessitated during the term of the course, the students will be notified by email communication and posting the notification on the online teaching tool Blackboard. It is the student's responsibility to check on announcements made while they were absent.

Faculty Name: Abdelkarim Erradi
Last Modified: 21/08/2022
Date: 21/08/2022