Northeastern University
College of Engineering

INFO 6250 Web Development Tools and Methods

Course Information
Course Title: Web Development Tools and Methods
Course Number: INFO 6250
Term and Year: Spring 2022
Credit Hour: 4
Course Format: On-Ground

Instructor Information
Full Name: Brett Ritter
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Course Prerequisites
Graduate level INFO 5100 Minimum Grade of B-

Course Description
Explores advanced server-side technologies and tools necessary to design and engineer complete web-based enterprise applications quickly. Designed to build on previous experience to cover the life cycle of a web-based application. Focuses on MVC web development frameworks to build server-side, data-intensive, and multitier web applications. Additionally, discusses designing rich internet applications (RIA) using AJAX and service-oriented architecture (SOA) using REST.

Standard Learning Outcomes

Learning outcomes common to all College of Engineering Graduate programs:

1. *An ability to identify, formulate, and solve complex engineering problems.*
2. *An ability to explain and apply engineering design principles, as appropriate to the program's educational objectives.*
3. *An ability to produce solutions that meet specified end-user needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.*

The Information Systems Program accepts students of different engineering backgrounds with minimum programming skills and produces first class Information Systems engineers that operate at the intersection of real-world complexity, software development, and IT management. Graduating students will be able to construct end-to-end advanced software applications that meet business needs.

Specific Learning Outcomes for the Information Systems program:

1. *Create a strong technical foundation through diverse, high-level courses*
2. *Built crucial interpersonal skills needed to succeed in any industry*
3. *Foster a deep level of applied learning through project based case studies*

Course Outcomes and Assesment Standards

This course covers Web Development, focusing on both the fundamentals and from them modern development practices for the web. The class will use Javascript on both the front- and back-ends of web application development, but the lessons learned will be applicable to many languages.

What is NOT covered

- How to program in general HTML and CSS details Languages other than Javascript Mobile development
- Accessibility (a11y), Internationalization (i18n), or Localization (l10n) SQL/NoSQL usage or database architectures/maintenance

Grading: I reserve the right to adjust based on your final demonstration of applied knowledge.

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20% Assignments, Participation, Quizzes
60% Exams (3 Exams, 20% each)
20% Final Project
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Basic Requirements and Expectations:

- Basic familiarity with CSS and HTML is assumed (see https://developer.mozilla.org/en-US/docs/Learn) Basic exposure to programming concepts (variables, functions, looping) is assumed
- You will have to use git and github.com following the instructions given
- There is no textbook for the class, but a number of online articles will be shared.
- Many topics will be introduced in class but require you to perform additional research/experimentation
- Additional software (without cost) is required. Installation and configuration is your responsibility (Mac, Windows, or *nix) Students should ask questions where anything is unclear
- A great deal of work will be done online, in and out of class
- A more detailed listing of requirements and expectations will be shared in the class github repository

Expected Class Schedule (subject to change):

Section 1: Web Fundamentals

- Protocols, Web, HTTP, servers/webservers, browsers, clients, URL/URI, HTTP as stateless, request/response, headers/body
- The role of HTML, CSS, and JS
- the DOM, semantic HTML, MDN, the Browser Wars, evergreen browsers, the unreliability of not-that-old information HTML best practices, CSS best practices
- absolute vs relative paths/URLs multiple-page web applications
- static vs dynamic assets, client-side/server-side cookies, localStorage
- programming languages as communication, idioms, static/dynamic languages, weak/strong typing Javascript syntax, NodeJS, npm/yarn, package.json, global vs local installs, JSON
- debugging JS, unit tests, testing pyramid, TDD
- functions as objects, prototypes, 'this'(context), callbacks, threads, try/catch, closures, scopes Object Oriented Programming, Procedural programming, Functional Programming
- templates, Model-View-Controller(MVC) application state, state in model vs state in DOM

At the end of Section 1 you should be able to write a simple multiple page web application using NodeJS that serves semantic HTML and styles with CSS. You will receive from github repository updates and submit your work via Pull Requests (PRs) in the same fashion that many employers conduct their work.

Section 2: The Recent Web

- HTTPS/SSL, public-key encryption, certificates, Authentication, Authorization
- asynchronous events (async), Promises, XHR/fetch/AJAX, HTTP verbs (methods), REST, GraphQL, services/endpoints polyfills, minifiers, linters, bundlers, transpilers, CSS preprocessors, builds
- Frontend frameworks/libraries, React, virtual DOM, JSX, Single Page Applications (SPA)props vs state, Pure components vs stateful components, render props, Higher Order Components Same Origin Policy(SOP), CORS, XSS, XSRF/CSRF
- Application state management

At the end of Section 2 you should be able to write a simple single page web application (SPA) calling RESTful, external services, and use NodeJS to provide those service endpoints

Section 3: The Modern Web Industry

- Databases, CRUD, SQL and NoSQL, SQL Injection, OWASP Progressive Web Apps (PWA)
- as-a-service (PaaS, FaaS)
- Agile, change management, Software Patterns Mockups, wireframes, prototypes Obfuscation, copyrights, and
- module licensing Password hashing/salting, JWT, Oauth, OIDC Isomorphic/Universal Javascript
- JS on other platforms, websockets

At the end of Section 3 you should be able to analyze provided designs to matching write a complex single

page web application (SPA) and prior to actual coding identify potential problems with development due to insufficient/poor requirements.

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is very important to the College of Professional Studies. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at **https://neu.evaluationkit.com**. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your HuskyMail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit http://www.northeastern.edu/drc/getting-started-with-the-drc/.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for Education specific resources, visit http://subjectguides.lib.neu.edu/edresearch.

24/7 Blackboard Technical Help

For immediate technical support for Blackboard, call 617-373-4357 or emailhelp@northeastern.edu

Within Blackboard, open a support case via the red support button on the right side of the screen, click Create Case

myNortheastern, e-mail, and basic technical support
Visit the Information Technology Services (ITS) Support Portal
Email: help@northeastern.edu
ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion

Northeastern University is committed to equal opportunity, affirmative action, diversity and social justice while building a climate of inclusion on and beyond campus. In the classroom, member of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice.

Please visit http://www.northeastern.edu/oidi/ for complete information on Diversity and Inclusion

TITLE IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

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In case of an emergency, please call 911.

Please visit www.northeastern.edu/titleix for a complete list of reporting options and resources both on- and off-campus.