Course Syllabus

COMP 324/424 - Client-side Web Design

Dr Nick Hayward

Semester - Fall 2019

Overview

- Lecturer: Dr Nick Hayward
- 2.5 hours weekly taught class
- Units: 3
- Graduate course

Sample course website is currently available at the following URL,

- http://csteach424.github.io/

Sample course GitHub repositories can be found at the following URL,

- https://github.com/csteach424

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Description & Technologies

This course studies the design, development, and publication of client-side web applications.

Students will acquire an awareness of different client-side design and development methods, technologies, and techniques suitable for the development of web applications.

The course has been structured to provide logical groupings of common technologies, which complement each other in the development of modern client-side applications. The student will begin by developing fundamental skills and knowledge in HTML5, CSS, JavaScript (JS), and JSON. This allows a student to then progress to the more advanced implementations of current client-side technologies including React, D3.js, and other suitable JS based libraries.

We shall also consider client-side usage of tools and technologies such as Node.js, Express, and Mongoose. These technologies will be considered primarily from the client-side perspective with complementary introductions to data stores such as Redis, MongoDB, and Firebase.

Goals

The study of such technologies provides the students with the opportunity to consider and develop project-based applications. An example project is developed using a combination of HTML5, CSS, JS, and JSON.

A project may then be modified and updated using applicable updates from technologies such as Node.js, React, D3.js, &c..

The final goal of the course is to develop a demonstrable, working web application with a combination of the above technologies.

These goals will be demonstrated in separate presentations to the overall class. Such presentations will be given at relevant points during the applicable semester. Final assessment will include a combination of these presentations, and other suitable exercises and demos.

Course Assessment

Course assessment will include a combination of group exercises throughout the semester, a development (or DEV) week project, and a final project demonstration and report.

Weekly exercises & discussions - 20%

Weekly exercises and discussions will constitute twenty percent of the overall grade, and provide a test of knowledge acquired and understood for each defined section within the course.

Weekly exercises may be defined as either individual or group. They are used to help develop the course project, whilst also helping to test acquired knowledge. They are scheduled, and organised, to complement course material per week.

An additional weekly component is an occasional discussion of a chosen website or web application. The class is asked to discuss different design considerations and options per week.

Project outline & mockup - 15%

The project outline and mockup is an oppprtunity to prepare an initial concept and design for the ongoing course project. This design and mockup allows each group to test and begin design of their application.

This initial design needs to be built from scratch by each project group. It is built upon the technologies discussed and outlined in the initial part of the course, including HTML5 and CSS.

Each project group may also show initial and ongoing concept designs for this application. Such designs should, at a minimum, reflect design notes and material covered in the course's extra notes.

This project work will be presented to the class in week 5 of the semester.

DEV week project - 25%

The DEV week project is scheduled for week 10 of the semester with group presentations of results. This project includes the development of an initial web application, which needs to be built from scratch by each project group. It is built upon the technologies discussed and outlined in the first nine weeks of the semester, including HTML5, CSS, JS, and JSON.

One of the many goals of this initial development is the successful demonstration of considered understanding of the above technologies, and their application for client-side design and development. Each project group is also required to outline the following in their class presentations,

- any research conducted towards this project development
- a description of data chosen for their application
- prototypes, patterns, and designs considered

Such designs should include a consideration of UI and UX material covered in the course's extra notes.

DEV week presentations also include anonymised, collated feedback from peer reviews during class. This helps each project group consider and respond to feedback and suggestions for modifications and improvements, which can then be applied, where appropriate, towards the final project assessment.

Final project - 40%

The final project assessment is a continuation of the group work developed for the DEV week assessment. The primary goal is the modification of the initial application to leverage, where appropriate, the benefits of the advanced technologies introduced in the second half of the course. These include usage of Node.js &c. plus a demonstrable understanding of a data store such as Redis or MongoDB.

Each group is also required to respond to the collated feedback received following the DEV week project presentations, and then demonstrate how and where they have incorporated suitable updates and modifications in the final application. For example,

- where and why did a project group update their application?
- what are the perceived and tested benefits of these updates?

As part of the final presentation, and final published project report, each project group is also required to carefully explain their design choices. This may include, for example, a description of design patterns for UI and interaction. They should also detail layout and data presentation patterns chosen for their given project application.

Course sections

The semester long course is divided into the following contiguous sections, which naturally complement each other in the overall development of a web application.

Section 1 - Intro to Client-side web design

This is the initial introductory section, which prefaces the introduction of specific client-side technologies. Material includes, for example

- quick introduction to client-side
- client-side vs server-side
- getting started guide
- browser technologies and web standards
- application foundations
- version control for client-side

Section 2 - HTML5 & CSS

The second section of the course starts to introduce the structure and syntax of HTML5 and CSS, and the concept of the document object model (DOM). We focus upon the following material to help us learn these initial technologies,

HTML5

- element and attribute syntax
- doctype and character encoding
- comparisons with earlier HTML iterations
- getting started with initial elements and structure
- semantic elements and structure
- page structure and design
- extra elements, including media, graphics...

DOM

- intro and getting started
- structure and manipulation

CSS

- intro and getting started
- pros and cons of CSS styles
- syntax, rulesets, and initial display
- inline and block-level elements
- CSS and HTML5
- box model and correct manipulation
- selectors, classes, pseudoclasses...
- complex selectors
- cascading rules, inheritance..
- fonts, colours...
- the *reset* option
- CSS custom grids and Flexbox

Section 3 - JavaScript & JSON

In the third section, we begin to consider JavaScript (JS), and its many options for client-side design and development. For example,

JS

- intro, basics, and core usage
- variables, operators, values, types...
- blocks, conditionals, loops...
- scope, functions, objects, arrays
- using strict mode, checking equality and inequality
- closures, usage of `this`
- extras, performance, abstraction, best practices

- selectors, DOM manipulation...
- events, asynchronous model and patterns, functions...
- JS and JSON
- working with JSONP
- deferred and promise
- prototype, classes...
- modules
- handling errors
- working with data
- various design patterns
- ...

JSON

- intro and basics
- reading, writing
- objects, arrays...
- usage with JS and jQuery
- API usage, incl. local and remote
- usage of JSONP
- working securely with JSON

Section 4 - HTML5, CSS, & JS - Demo app

In the fourth section, we start to develop a working test application from scratch using the technologies we have covered so far in the semester. This includes HTML5, CSS, JS, and some JSON. We also begin by using JSON as an additional data store for our application.

Our goal is to build a working client-side application, step-by-step, which is gradually augmented and improved as we work our way through each week. This application's development is documented at each stage of its development, and code is discussed in class. It is then posted to the course's GitHub repository for further modification.

In effect, this initial app is available as an example for usage relative to group project development.

Section 5 - Server-side & Data Storage - Node.js, Redis, MongoDB

In the fifth section of the course, we need to consider the rise of server-side JavaScript, and its impact on the way we consider and design client-side applications. In particular, we use this new technology to help us consider and develop with data stores such as Redis and MongoDB.

Again, we can use the demo application to help us implement examples of Redis and MongoDB usage. Application persistency, and additional read/write options, are provided by both of these data stores. We also consider the inherent benefits of each option for different usage scenarios.

As part of this application development, we also introduce the Node package manager (NPM), Express server, and Mongoose module. This allows us to build a fully working test application with data persistency using MongoDB, for example. JSON schema development and validation is also added, again as an integral part of this application development.

Section 6 - Data Visualisation - basics & D3.js

In the sixth section, we consider data visualisation for client-side design and development. In effect, we study how to visually communicate and analyse data within our applications.

Data visualisation covers many disparate aspects, from infographics to dashboards, and we consider many of these concepts and options using the JS library, D3.js.

For example, we look at building a sample data dashboard using this library.

n.b. Whilst the above sections are logical groupings for technologies, their structure within the course itself is more dynamic. In particular, many aspects of these technologies are introduced in the context of ongoing demo application development. Therefore, these technologies will be covered throughout the semester.

Supporting Material

The following includes samples of ongoing materials, which form a core part of each semester's course. Each student has access to these materials on the course's website and GitHub account, and these resources are updated on a weekly basis.

Sample Course Notes

Example weekly notes can be found on the course's GitHub repository, which is available at the following URL,

- https://github.com/csteach424

Sample Bibliography

A sample bibliography can be found on the course website, which is available at this following URL,

- course bibliography

Sample Links & Resources

Sample links and references used within the course can be found at the following URL,

- links & resources