Fall 2019

IT 202-HM3: Internet Applications

James McHugh

IT202 Internet and Applications (3-0-3)

Base Syllabus

Fall 2019

Faculty Coordinator

James McHugh

Overview

This course presents the concepts and software technologies that underlie web-oriented, three-tier software architectures and applications. The enabling software mechanisms include the markup languages (HTML5 and CSS3) used by browsers, client-side scripting languages and libraries (Javascript and AJAX), web servers and server-side-scripting languages (Apache web server, PHP, HTTP protocol), and background databases (SQL, MySQL). The course uses a hands-on, guided development approach with several substantial assignments to illustrate the fundamental computing concepts, systems, and technologies considered and to provide direct experience in their use.

Prerequisites

- Completion of an introductory course in programming (eg Python, Java or C++).

Objectives

Course Outcomes: Upon completing this course students will:

C1. Be able to develop the *client-side* front-end interface and functionality (*HTML5 and CSS*) for a basic application in a three-tier software/hardware architecture environment.

C2. Be able to develop the *server-side* functionality (PHP, database, and SQL) for a basic three-tier application.

C3. Be able to apply *Javascript* to enhance the *client-side* interface of a basic three-tier application.

C4. Be able to research topics related to course content and *communicate* results in oral and written form.

Illustrative Schedule

Week 1: Overview full stack development, SQL, MySQL DB, phpMyAdmin, DB CLI
Week 2: PHP Intro, MobaXterm, DB connection/retrieval, embedded SQL, forms
Week 3: PHP: more syntax, functions/libraries, and applications to project assignments
Week 4: PHP: function design, application to project assignments
Week 5: JavaScript: events, event-handlers, JS debugging, user-defined JS functions
Week 6: HTML5, CSS, style sheets, project application
Week 7: PHP: sessions and cookies, project application
Week 8: Midterm exam, project assistance
Week 9: PHP: continue sessions and cookies, project application
Week 10: JavaScript: dynamic HTML, data validation, HTML5 patterns, applications
Week 11: Data input security issues, SQL injection, XSS, protection, application
Week 12: jQuery AJAX, JavaScript interaction with PHP, JSON, web services
Week 13: jQuery AJAX, JavaScript, guided project application
Week 14: Guided development on project(s)
Week 15: Student Research Presentations: oral and written reports
Final Exam

References

Extensive information related to the course topics is available on the Internet. It is expected that students will use online sites like w3schools to clarify basic concepts and examples, sites like stackoverflow.com to research issues related to programming assignments, as well as professional sites such as php.net and w3.org. Various online sources are identified on the class web site. Extensive additional course materials including more than 100 videos are available at video-list. (*A username and password are required to access these videos*. This password information is available for registered students from the instructor.) There are also weekly notes and examples posted on the IT202 web site in addition to assignment descriptions.

The following are some recommended texts. See the overview documents for further information. These are not required:

Programming the World Wide Web by Robert Sebesta, Addison-Wesley, ISBN-13: 978-0133775983 ISBN-10: 0133775984 2015, 8h Edition. This is a general text on web programming.

Fundamentals of Web Development, 2nd edition by Randy Connolly and Ricardo Hoar, 2018 Pearson; ISBN-13: 978-0134481265 ISBN-10: 0134481267. This is an *excellent* comprehensive text (the equivalent of several courses) but quite expensive.

PHP and MySQL for Dynamic Web Sites: Visual QuickPro Guide 4th Ed., Larry Ullman, Peachpit press, 2012; ISBN-13: 978-0-321-78407-0 AND ISBN-10: 0-321-78407-3. This focuses in greater depth on PHP programming, more so than our introductory course.

A course manual is available: Internet Applications Manual, J. McHugh / NJIT. See Overview-3-References for comments/information on this.

Grading

Refer to Overview-1.pdf for grading grid details and exam cutoff effects.
Grades are based on a total of 500 points distributed roughly as follows:

- In-class participation and attendance 10%
- Prototype assignments & two quizzes 20%
- Programming Assignments 30%
- Research topic presentation & report 10%
- Midterm and Final Exams 30%

Typical Programming Assignments

There are substantial programming assignments (3 or 4) that apply PHP, HTML, MySQL, CSS styles and JavaScript, as well as ungraded in-class exercises related to the programs and graded prototypes. The assignments focus on 3-tier applications (full stack development). In order to provide adequate experience with PHP and MySQL, related assignments are introduced as early as possible in the semester, then expanded on during the rest of the semester to provide repeated exposure to the ideas. HTML5 and CSS3 styles are introduced as needed during *guided development* of programs. Javascript is also introduced early and used to enhance application functionality as well as deepen expertise in programming and problem-solving skills. AJAX jQuery-related applications that *integrate* all the concepts and software technologies are covered in the latter part of the semester.

Expanded Course Description

IT 202 Internet Applications covers programming and applications in a three-tier (full stack) Internet environment. A variety of software technologies are introduced that illustrate general concepts and principles of Information Technology in this domain, from the client-server paradigm to the text-based HTTP protocol which allows clients and web servers to communicate in a distributed environment. HTML5 (Hypertext Markup Language) is introduced as the standard means for controlling information layout for web documents and for facilitating user interaction with server-side scripts. We use cascading styles for controlling the appearance of HTML pages. Client-side scripting using Javascript to allow dynamic interaction with HTML pages is explored. Javascript concepts and techniques including event-driven, dynamic HTML effects are examined to illustrate the capabilities of client-side processing. A number of software tools are used to better understand the environments. Server-side scripting (in PHP) is extensively used, primarily in the context of interacting with a backend database. Basic database concepts (MySQL environment) and SQL (Structured Query Language) are introduced to illustrate program-controlled processing in the context of backend databases. Asynchronous interaction between client browsers and web servers is illustrated with jQuery AJAX interface considered and practically applied.

Web services and JSON are also introduced. All the topics are explored using hands-on software development projects. As time permits, other topics are considered.

Concepts / Technologies Covered

1. HTML5 syntax, validation, elements, variety of input elements and attributes, Forms and Form widgets/elements (menus, sliders, etc.), tables, images, hyperlinks, directory navigation notation, div and span elements, HTML5 semantic elements like headers. Browser variations. Use of AFS environment and Secure Shell. Use of high-level HTML editors like Expression Web for implementation and self-instruction.

2. Basic SQL using MySQL, MySQL features, table definition, attributes, data types, primary keys, addressing syntax errors, insert, delete, create, select, where clauses, importing and exporting tables, operators such as *like*. Use of phpMyAdmin graphical interface to MySQL database.

3. PHP for server-side scripting and database interaction, syntax, interaction with HTML Forms, scripts as intermediaries to background databases. Design and implementation of programmer defined functions. Embedded SQL queries, use in 3-tier applications, diagnosing errors, syntax checking tools, debugging. PHP versus MySQL versus HTML errors in PHP scripts. HTML wrappers for database content. Miscellaneous other PHP features.

4. CSS style sheets, rationale for their use, style rules, CSS properties, rule priority, CSS selectors, notations for values such as variant color notations, as time permits transitions and animation in CSS3, CSS3 selectors like nth-of-type.

5. Introduction to JavaScript as API for DOM view of HTML. Additional HTML topics are introduced concurrently. Topics include binding events to elements and event handlers, control statements, arrays, scope of variables, built-in and user-defined Javascript functions, Javascript error console and Chrome developer tools for monitoring dynamic changes, basic DOM methods like document.getElementById( ), id attributes versus names for Forms, innerHTML, special effects like rollovers and dynamic visual effects. Regular expressions and related HTML5 attributes.

6. Brief introduction to HTTP, domain names, ports, TCP connections, connecting to a remote host in telnet, UNIX terminal window and commands, GET and POST commands, HTTP message headers and message bodies, understanding the usefulness of HTTP headers.

7. Basic jQuery notation and AJAX for asynchronous interaction with server-side programs and background databases. JSON notation and web services. Applications eg various JSON based web services, Google Home page's auto-extension, and others as time permits.