

# A Three-Track Approach to Teaching Web Development

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## Abstract

This paper describes a series of Web development courses that address what our research identified as three groups of students, each with a need for a different set of Web development skills. The identifying characteristics of each set of needs are described. The course or courses that provide skills that address the corresponding set of needs are presented. This three-track approach to Web development training offers choices to students with needs for various levels of Web development skills.

**Keywords:** Web development, e-commerce, software development, World Wide Web, Internet

## 1. INTRODUCTION

In spite of so-called dot-com bust, the demand for well-trained web developers has not abated. A study by the Gartner Group indicates the demand for workers with Information Systems skills will be greater than the available supply by at least twenty-five percent (Keller, 2001). Another study conducted early in 2001 by the Information Technology Association of America (ITAA) finds a deficit of 425,000 positions going unfilled because of a lack of applicants with the requisite technical and non-technical skills (ITAA, 2001). Studies show that within these unfilled positions, the number one skill area in demand is Web development (Erickson, 2001).

In addition to the obvious need for training professional Web developers, there is another, perhaps just as large, need for training for non-professional Web developers. Hobbyists, small and part-time business owners as well as the individual or family who simply want a personal presence on the Web are all looking for training in design, development and maintenance of relatively small Web sites. This group is not interested in participating in a formal degree program. They simply want some training in rudimentary Web development techniques to help them get started.

This paper describes the identification of what turned out to be three groups with varying needs for Web development skills, and the corresponding tracks developed to meet those needs.

## 2. NEEDS ASSESSMENT

At our campus, we analyzed our customer base and took steps to address the various needs for Web development training. Our department identified three sets of needs for Web development. Each need arises from a particular group

or category of students. The first group is composed of persons who are not actively working toward a degree, but are looking for some instruction in and exposure to the World Wide Web and Web development. This group is composed mainly of non-degree seeking, casual users who are not interested in a formal career in Web development, but simply want, for example, to learn more about the Web for personal enrichment or to expand their job skills. Examples are retired persons seeking to learn about the Web, secretaries looking to expand their computer skills, and small business owners wanting to establish a presence on the Web. Students in this group might be interested in creating and publishing a personal web site. The web site would normally be composed of mostly static web pages and not have any, or perhaps very little commerce activity associated with it.

The second, and largest, group is composed of all degree-seeking Information Systems students. It was acknowledged that current IS graduates must have some exposure to World Wide Web concepts and Web development. From systems analysts to network administrators, they all must have exposure to topics such as html and basic scripting to be productive in the current IS field. However, since Web development is not their primary area of expertise, this group would not have need of advanced Web skills and techniques to do their jobs.

The third group is composed of those wishing to major in a Web-related field, such as Web development and programming or Web administration. This group requires more intense study in Web development techniques.

Recognizing these three groups and their respective needs from a Web development standpoint, we designed a three-track approach to providing Web development training. Each track addresses the needs of one of the three groups described above.

### 3. TRACK FOR DEGREE SEEKING, NON-WEB COMPUTER MAJORS

Looking at the second and largest group first, we developed a course entitled CIS 241 Web Development I. This new course is an in-depth study of the Internet and World Wide Web. Topics covered in this course are intra-, inter-, and extra-net concepts, security issues, design criteria and other Web aspects. The focus is on teaching skills necessary to develop applications for use on the Internet. Students learn how to write HTML, VBScript and JavaScript code, how to use Microsoft FrontPage and other authoring tools to create Web pages, and how to use image maps, forms, frames, animated GIF files, tables, and style sheets. Students will complete a semester project working as a member of a team.

The objectives of the course are listed below.

1. Discuss the use of the Internet and World Wide Web in business.
2. Identify the key issues and concepts in Web development as discussed in class and in the book.
3. Apply Web development methodologies to real life business problems in the lab.
4. Evaluate the effectiveness of Web sites using a list of criteria.
5. Utilize several Web development software languages for Web page creation.
6. Develop effective Web-based designs.
7. Apply the principles and languages taught in class to a real-life Web development project.
8. Analyze a user's needs and design a Web site based on those needs.
9. Create a usability test and administer that test to your users.
10. Demonstrate the ability to effectively interact with individuals possessing different opinions and abilities for the purpose of reaching a desired goal within an assigned time limit.

Students taking this course must have more advanced skills than the casual users described above in the first group. The Information Systems prerequisites are a systems analysis and design course and an introduction to C++ programming course. The systems analysis course provides system development life cycle skills the student will use to develop their laboratory assignments. The C++ programming course prerequisite serves two purposes. Some formal programming experience is necessary because some Web development tasks involve JavaScript and VBScript coding. The second purpose of the C++ programming prerequisite is to address a resource limit problem. Enrollment in our program is capped because of limited resources such as computer lab space. A problem exists with non-computer majors looking for a computer elective consuming some of the limited number of seats in the course. Many times our majors cannot get the courses they need to move along in their program because a needed course is full and contains several non-computer majors. Because the C++ programming course is a requirement for every computer major, using this as a prerequisite has the effect of limiting the number of non-

majors who might consume seats otherwise used by our majors while not impacting our majors (other than affecting the sequence of courses taken).

Initially designed for our degree program in Internet/Web technology, CIS 241 has quickly turned into a service course, with all other degree options within the Information Systems department, software development, systems analysis, and networking, making this course a requirement for their degree.

### 4. TRACK FOR NON-DEGREE SEEKING STUDENTS

Returning to the first group described above, for the casual users who may not wish to (or not have the ability to) get too technical, but want some background in the workings of the World Wide Web, and enough training to create and publish a small, simple, personal Web site, we developed the new course CIS 206 Introduction to Internet Topics. This course is an introduction to the Internet and World Wide Web. Students learn about such topics as different available browsers and their features, basic Web browsing techniques, searching for information on the Web, electronic mail, design and structure of Web sites, HTML editing, and the use of graphics and images. HTML is used to several create Web pages, introducing topics such as lists, tables, hyperlink usage, and using images. Students create a series of Web pages during dedicated laboratory time. CIS 206 is a slightly watered-down version of the CIS 241 Web Development I course.

This course resulted from requests for something more in-depth than an existing, eight session Introduction to the World Wide Web course that had been offered in the past for this group.

CIS 206 has no prerequisites. The target audience for this course is assumed to have little or no knowledge of the Web, only simple computer usage skills (mouse, keyboard, etc.). This course cannot be used to satisfy the Web development course requirement for a degree-seeking student.

The objectives of the CIS 206 course are listed below.

1. Describe how the Internet and World Wide Web work
2. Use Web browsers to access materials and information on the World Wide Web
3. Use effective search techniques to obtain information from the World Wide Web
4. Describe the mechanics of publishing a Web page on the World Wide Web
5. Identify the key issues and concepts in Web development as discussed in class
6. Use HTML to design and develop static Web pages
7. Evaluate the effectiveness of Web sites using a list of criteria.
8. Apply the principles and languages taught in class to a real-life Web development project.

## 5. TRACK FOR WEB DEVELOPMENT MAJORS

The third group of students we identified is intent on majoring in some aspect of Web development. For this group, a series of four courses provide comprehensive Web development skills and training. The first course in the series is the CIS 241 Web Development I course described above.

The second course in the series is a new course titled CIS 341 Web development II. This course is a continuation of CIS 241 Web Development I. It includes advanced features and techniques for developing sophisticated Web content, as well as new trends in Web development. Advanced Web content generation techniques are covered. Topics include using advanced scripting including asp/jsp, client/server and cgi programming, cookie use and database and application integration. The Information Systems prerequisite for this course is CIS 241 Web Development I.

The objectives of the CIS 341 course are listed below.

1. Identify and address key issues and challenges concerning client/server applications
2. Design, develop and implement client/server-based applications
3. Evaluate business needs and apply appropriate web-based solutions
4. Design, develop and implement cgi-based applications
5. Create a test plan and administer that test on the corresponding Web-based application
6. Identify advantages of both thin and thick client applications
7. Use cookies to implement persistence and dialog exchange with Web-based applications
8. Apply the principles and languages taught in class to a real-life Web development project.
9. Demonstrate the ability to effectively interact with individuals possessing different opinions and abilities for the purpose of reaching a desired goal within an assigned time limit.
10. Identify current major trends in the Web development area

The third course in the series is CIS 242 E-Commerce Architecture. This course is an introduction to client/server and web-based architecture. The topics of this lecture only course include the history and evolution of client/server systems, standards, client/server processing models, the role of the client and of the server, middleware, multi-tiered architectures, methods of data distribution, designing a client/server system, distributed RDBMS, transaction processing and E-commerce. New developments, trends and uses for E-commerce are discussed

The objectives of the CIS 242 course are listed below.

1. Discuss the use of the Internet and World Wide Web in business.
2. Define the business value chain
3. Describe the various business strategies used by businesses involved in e-commerce

4. Describe the general types of Web-based business models typically used by businesses
5. Explain how businesses use the Web to enhance value
6. Define and recognize client/server applications
7. Explain the concept of multi-tiered architecture
8. Describe the various transaction processing and payment systems used in e-commerce
9. Explain the role of encryption in e-commerce
10. Explain the issues surrounding client security and server security
11. Describe the various privacy issues concerning the collection and use of customer information

The Information Systems prerequisite for CIS 242 is CIS 241 Web Development I. This prerequisite provides students with a foundation in Web-related topics and mechanics before enrolling in CIS 242.

The fourth course in the series is CIS 342 Multimedia for Web Developers. Developments on the World Wide Web have created demand for skills in developing multimedia suitable for use in complex Web sites. This course would provide the skills necessary for students to create sophisticated graphics, animation, video and sound for use on the World Wide Web. Students would be introduced to graphic design, the creation and use of graphics, animation, video and audio on the Web. Students would design, create and deploy several instances of graphics, video and audio on a series of Web pages. Topics would include graphic design, graphic, video and audio file formats, creating multimedia content, formatting images on Web pages, animation and video, and the use of graphics for purposes such as buttons, dividers and image maps. The Information Systems prerequisites are CIS 241 Web Development I.

CIS 342 is still in the development stage. We are facing several challenges concerning this course. One is the lack of graphic design expertise on campus. The major aspect of Web-based applications is visual. We determined that some training in graphic design techniques would be necessary, but are finding it hard to locate available personnel on our campus with those skills. Our institution is a small commuter college. There are no classes in art or graphic design offered in other departments. There is a desktop publishing course offered by the English department, but very little pure graphic design is taught, and this course is already a requirement for the Information Systems Web development degree. We are considering allocating training funds for the Information Systems department faculty for graphic design training.

Another challenge is selecting and obtaining advanced graphic, video and audio hardware and software, and the personnel trained to use it. It is hoped the course will be available by January of 2002.

## 6. CONCLUSION

Web development skills are in high demand today. Our investigations identified three groups or categories of skill sets, the casual, non-professional Web user, the Information

Systems student not majoring in Web development, and the Information Systems student majoring in Web development. The five Web development courses, CIS 206 Introduction to Internet Topics, CIS 241 Web Development I, CIS 341 Web development II, CIS 242 E-Commerce Architecture and CIS 342 Multimedia for Web Developers (see Figure 1) address the non-credit, basic Web skill needs of the casual Web user, the Web development service course needs of the Information Systems student not majoring in a Web-related field, and the intense needs of the Web development Major, respectively, addressing the gap between skilled workers and the corresponding unfilled demand in the job market.

## 7. REFERENCES

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**FIGURE 1**

