AC 2010-1094: DESIGNING OF A COURSE CONTENT SERVER FOR THE DISTANCE LEARNING DELIVERY FORMAT

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Designing of a Course Content Server for the Distance Learning Delivery Format

Abstract

The paper expounds how within the department of Electrical and Computer Engineering Technology the need to deliver the courses in the distance learning format is achieved by designing the departmental Course Content Web Server. This multi prong task is under taken by the faculty with the intent to design a non-proprietary system which is open source and is affordable in its implementation. The departmental faculty members, subscribing to the Open Source Software philosophy have undertaken this task and have design the Course Content Server from ground up using all the Open source Software and Open source Operating System. The subject Course Content Server (http://ecet.calumet.purdue.edu/), is currently being used for the delivery of more than 20 undergraduate and graduate courses. The paper describes the three main components of the Course Content Server, namely: 1) the Operating System - Linux, 2) the content management system - Drupal[1], an open source platform and 3) the relational database management system (RDBMS) - MySQL**.** All of these components are open source and have no cost associated for the end user.

Since the Course Content Server's implementation the lectures are being delivered 24-7. The lectures are comprised of Spoken lecture voice along with the live interplay of screen video. This approach lends a very rich presentation medium which provides enhancements that include, color, font and size to the written characters. The instructor could design the software and demonstrate the results along with the lecture. Any software simulation or project demonstration could also be incorporated as part of the lecture. The instructor can tap into the vast reservoir of knowledge base that is available on NET and can make this an integral part of the lecture. This approach has totally changed the paradigm of Pedagogy.

The paper further illustrates how, students maintain their own portfolio of work. The students submit all the assignments and related course material electronically right from their homes. The Course Content Server from the perspective of students provides an interactive and invigorating learning platform through which, communication between the instructor and students and among students takes place very effectively. This also provides new tools for the implementation of collaborative learning model.

I. Introduction

Delivery Methods for Distance Education has been evolving over the decades. Throughout this time frame the methods of delivering the course content has been being refined and perfected to the point that it now pose a viable alternative to traditional class room delivery methods. In the not so distance past the medium of distance education delivery used to be print media delivered via the postal service. A remarkable paradigm shift has occurred with the advent of the popularity and Omni presence of personal computer with the ubiquitous connectivity of Internet. As a result today we have a number of modes of delivery methods, that are at our disposal. In

today's environment, Videoconferencing**,** Web Conferencing, Print medium , Soft or E-Print medium are all being utilized 24 -7 for the Online course delivery[2].

Online courses, which are also referred to as web courses, are usually defined as courses which are offered and available over the Internet. Basic technology deployed is a Server on one end and a client computer on the other, along with a web browser and an Internet connection. Program and course providers will identify the specific technology needs of a specific course (e.g., some courses may require the use of a certain browser version or type of computer).

The availability of 24 -7 online courses provide a host of advantages that hitherto were not available to educators of the past. The single most advantage from a socio-economic point of view is the cost of delivery. Borrowing and extending the software analogy of repeatability and reusability of code to class room instructions are the humongous untapped resources that are yet to be exploited by the educators of our era.

Another advantage of 24 -7 online course offering is that the recipients are not limited to, by time and place. The disadvantage of courses being offered that overlap in terms of time, wither away. Another advantage from the logistics points of view is that course offering is not subject to traditional semester start and end dates, hence the recipients can customized and expedite their Program of Studies to their specific needs.

Among other advantages attributed to Distance Learning Education (e-learning, web-based training (WBT) or Internet courses) is that the educators can integrate the the power of simulation to the theory and other processes. They could integrate diverse mediums of video, audio, and animation to course delivery methods.

For the benefit of educators many products called Course Management Systems (CMS) or learning management system (LMS) have emerged that facilitates and or used to design and deliver an online course. Example of such proprietary brand names products include 'Blackboard'[3] and'Desire2Learn'[4]. The disadvantage of these and similar proprietary systems is that first there is a huge cost associated with their use and second being proprietary are closed and frozen and limited to activities and enrichment of their respective corporations.

The Open Source Movement[5] provides a much superior alternative to that of proprietary systems that is both free and open and growing by the contributions of the user community. Open Source products such are Moodle[6] (course management system), Drupal and Joomla[7] (content management systems) are available to educators for free deployment and use.

II. The Course Content Server (http://ecet.calumet.purdue.edu/)

The subject Course Content Server (http://ecet.calumet.purdue.edu/), (Figure 1) is currently being used for the delivery of more than 20 undergraduate and graduate courses. The paper describes the three main components of the Course Content Server, namely: 1) the Operating System - Linux, 2) the content management system - Drupal[1] , an open source platform and 3) the relational database management system (RDBMS) - MySQL**.** All of these components are open source and have no cost associated for the end user.

The concerned faculty members chose Drupal after evaluating various alternatives .The main influences on our decision were due to the fact that Drupal is definitely one of the best documented open-source projects. The second fact was that one of our staff members had prior familiarity with Drupal.

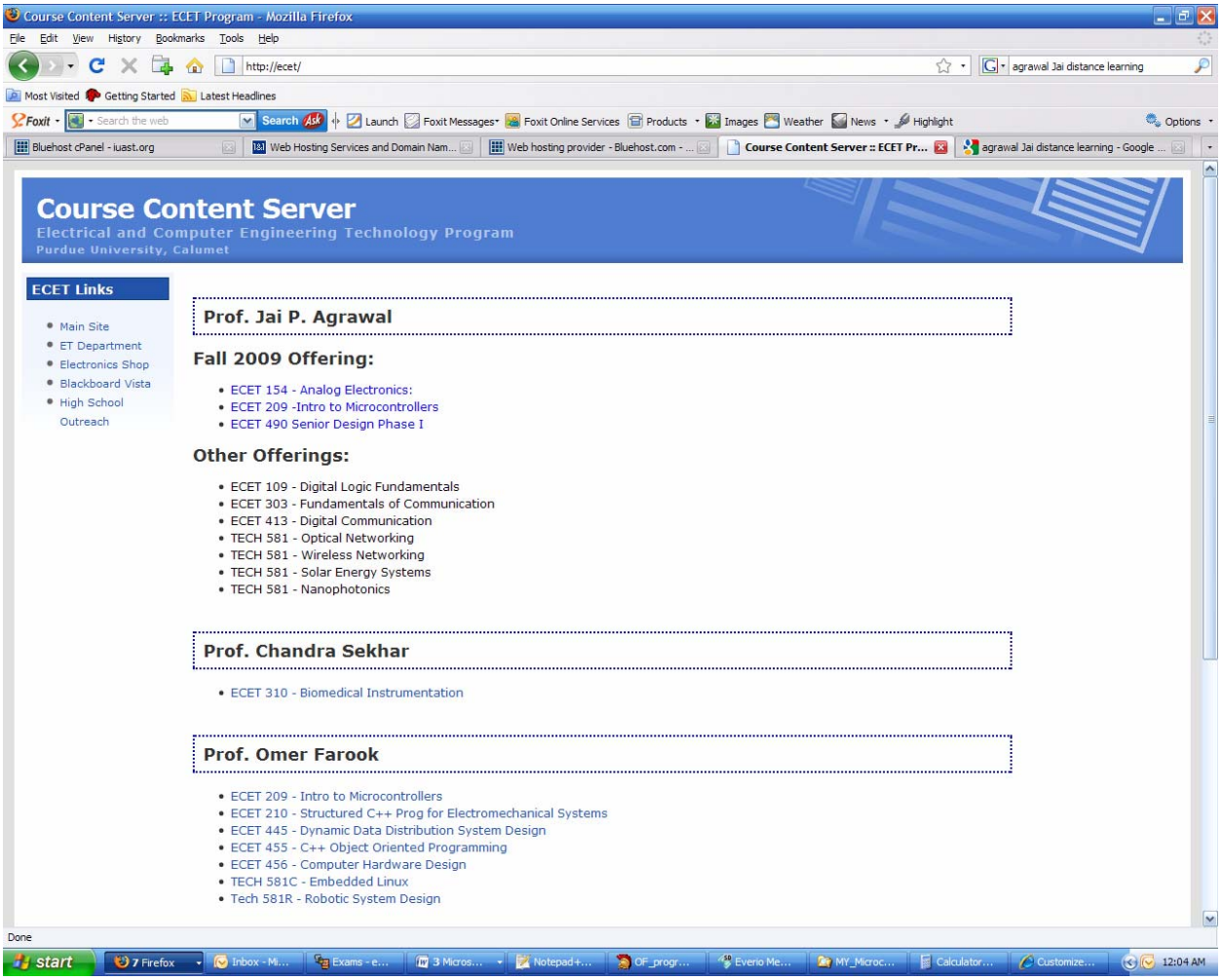

Figure 1. The Course Content Server (http://ecet.calumet.purdue.edu/)

III. Implementation Platform for the Course Content Server using Drupal

Any faculty member, department or any academic unit considering designing a course content server has got two initial choices to make. They could either 1) Hosting the site on any of the web hosting companies or 2) Designing the server on a Linux machine.

III-a Hosting the Site

This is less technically challenging choice comapared to the next alternate choice of designing and floating your own server. You could start with a commercially available hosting site for the course server. Start with a Domain name selection. After this you establish the account for a time frame. Most of the good hosting sites provide you with the tools to install all the necessary components namely latest version of Drupal, PHP and MySQL. Taking this route one could have a single course site ready and running within a matter of few days. The authors have used 1) Bluehost[8], 2) 1&1 [9] ,hosting companies that provides every available tool and services that is need.

III-b Designing the server on a Linux machine

This is technically challenging and hence rewarding (faculty with software background recommended) choice. This involves with the basic prerequisites before installing and configuring the software environment include:

- Linux (SUSE Linux, Fedora, Debian, or Ubuntu)
- Java 1.4 or higher (Java 5 is preferred)
- Internet connection, with broadband being preferred
- ~250 MB of available disk space

The next thing is the installing of the several several software packages that will require several hundred MB of free disk space. Table 1, below shows the software and installed sizes for the development environment that is needed.

Table 1. Software in the development environment

Software	**Installed size**
MySQL (latest version)	38.8 MB
Drupal (latest version)	1.7 MB
Apache HTTP Web Server 2.0 or higher	4.2 MB
phpMyAdmin (latest version)	10.9 MB
PHP (latest version)	2.4 MB

Once all of these software packages are installed, these have to be configured for development. A step by step installation instruction and tutorial is, “Using open source software to design, develop, and deploy a collaborative Web site, Part 4: Build your development environment in Linux[10].

IV. Drupal Deployment and Customization

The Drupal content management system[11] maintains its content in a database. Within the database, the content is stored as nodes and other high-level objects, such as users and comments. There are a variety of different, predefined node types including stories, blogs, and polls.

Drupal constructs pages that contain one or more pieces of information in the form of nodes, blocks, and other items. Each page is typically organized around a center column of content with left and right side-bars, and a header and footer. With the exception of the center column of content, the other areas are optional.

The center column is used to display the main site content; the optional areas are for additional content. Drupal uses blocks to fill the optional areas with small pieces of information. The optional areas typically hold navigation links (for example, most popular nodes) and other abbreviated content. Just like any content, blocks can be made dependent on the user's role, providing a customized view of the information.

The "*menu system"* controls the navigation of the Web site and is fully customizable through the user interface. By contrast, the menu hook function controls how URLs are formed, how URLs are translated,

IV-a. Nodes

An important concept in Drupal is that all content is stored as a node. They are the basic building blocks for the system, and provide a foundation from which content stored in Drupal can be extended. Creating new node modules allows developers to define and store additional fields in the database that are specific to your site's needs. Nodes are classified according to a *type*. Each type of node can be manipulated and rendered differently based on its use case. A few of the standard node types include:

Pages
Simple nodes for displaying content (By using PHP, the content can be dynamically updated. Any piece of content can be dynamic with the inclusion of PHP.)

Blog entry
A node for maintaining an online journal or weblog

Forums
Sets of nodes and their comments (These nodes are grouped by assigning a taxonomy term.)

Story
Generic pages that expire after a certain date (These are similar to normal pages but can be styled differently.)

Comment
Special type of content that lets users make comments about content defined by other nodes (Comments are not a type of node and are stored in a separate table in the database.)

IV-b. Taxonomy

The Drupal taxonomy system allows the classification of nodes, which enables the organization of node content on a displayed Web page. This categorization can also be used to modify Web site navigation.
Categories are defined by tags, or *terms*, and sets of terms can be grouped into a vocabulary. Drupal can automatically classify node content with terms, or node content can be manually classified using associated vocabularies. Drupal also allows *free tagging*, letting users define their own terms for node content.
Module developers can take advantage of nodes classified with categorization terms by using various organizational functions that the taxonomy module provides. This module also supplies functions that allow developers to add navigation to a page based on node content classification.

IV-c. Comments

The Comment system is another feature of Drupal. A node can be configured to accept the attachment of threaded comments by a user group with the appropriate permissions. This enables users to post their comments on particular content presented in a Web page. Typically, the posts might appear on a forum topic or a weblog entry.

IV-d. Blocks

Blocks are small, self-contained units of information typically displayed in navigation areas or side areas of the page, but can be placed anywhere on the page. They provide small views of information that are embedded in the presentation of other nodes. Modules provide basic blocks used to display their content. Administrators can create new blocks based on existing blocks, or write PHP code to directly query and render content inside a block.

IV-e. Modules

Modules are the main mechanism to extend Drupal. They implement a well-defined interface that allows the new modules to interact with the system and the system to interact with the module. Drupal calls the functions in this interface *hooks*. Drupal hooks are grouped into three categories; they are used in modules that:

Authentication
Provide additional user authentication mechanisms
Core
Need to respond and interact with the core Drupal code

Node
Provide a new node type to the system

V. Profile of a course on The Course Content Server (http://ecet.calumet.purdue.edu/)

A typical course "ECET 210 Structured C^{++} Programming" is presented in the Figure 2. Below.

Under the "**Navigation Block**" of the page there are the item entries which are:

- Lectures
- Assignments
- Syllabus
- Examinations
- Class Discussion
- Labs
- My account
- STUDENT ELECTRONIC PORTFOLIO
- STUDENT ELECTRONIC PORTFOLIO FALL 2009 SEC_01
- STUDENT ELECTRONIC PORTFOLIO FALL 2009 SEC_02
- STUDENT ELECTRONIC PORTFOLIO SPRING 2009 SEC_01

Under the "**Useful Information Block**" of the page there are the item entries which are:

- Program Education Objectives
- Program Outcomes
- Integrity Outcomes
- Emergency Procedures
- Borland Turbo C++ Explorer Software Down loading Procedure

Under the "**Useful Links Block**" of the page there are the item entries which are:

- C++ Programming
- C++ Tutorial
- Beginning Programming in C++ / mathbits.com

Each of these are linked to their respective pages.

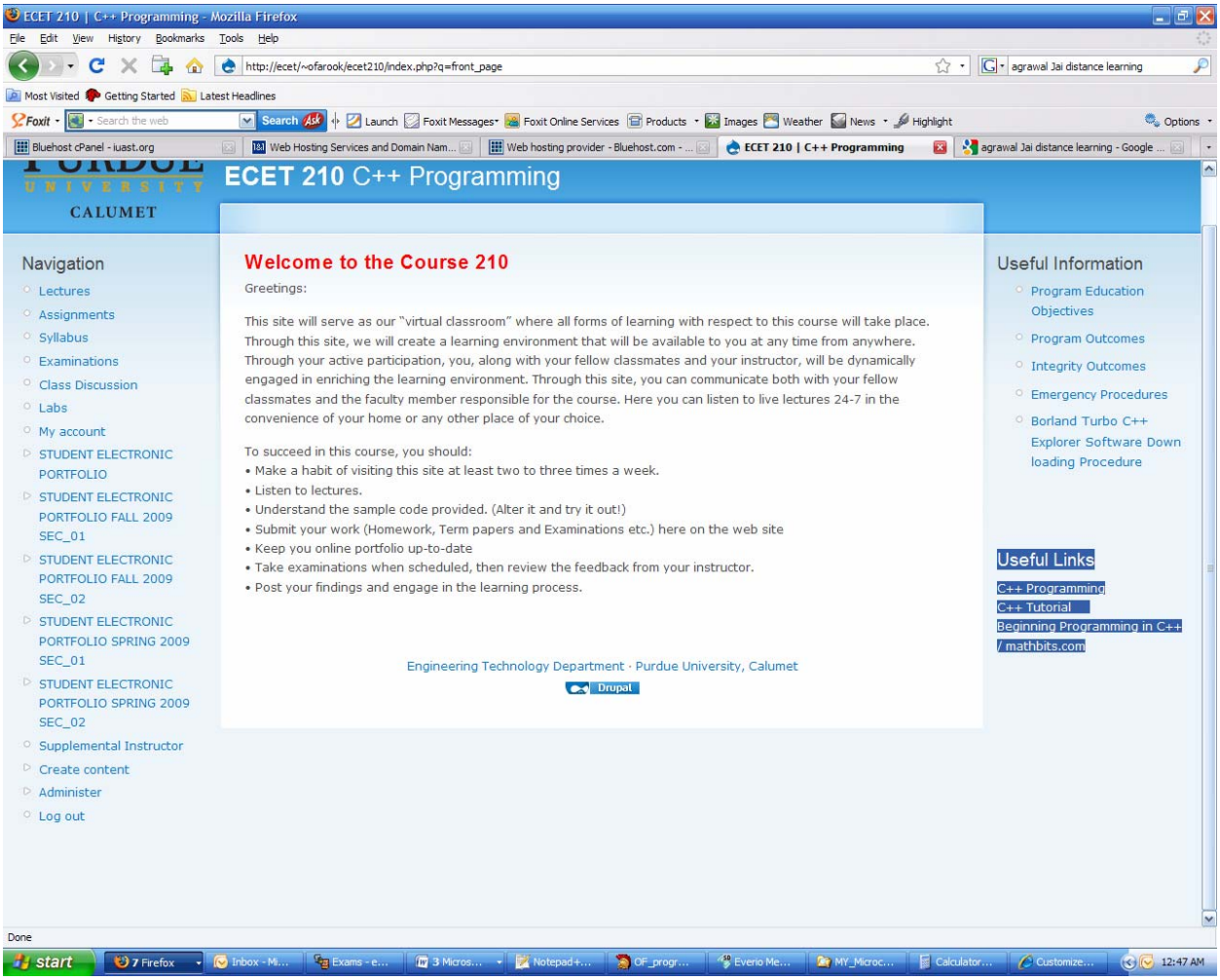

Figure 2. A typical course "ECET 210 Structured C^{++} Programming"

V. Profile of the Lectures of the course ECET 210 Structured C^{++} Programming on The Course Content Server (http://ecet.calumet.purdue.edu/)

These lectures are available to students 24 – 7. The lectures are comprised of Spoken lecture voice along with the live interplay of screen video. The lectures are recorded using Huelix Screen-Play Screen Recorder. This recorder records screen sequences directly in Windows Media format (WMV). Record screen video with audio - from a microphone, line-in, speakers, or any other port. Records streaming video - with audio. The recorder costs $49.95

This approach lends a very rich presentation medium which provides enhancements that include, color, font and size to the written characters. The instructor could design the software and demonstrate the results along with the lecture. Any software simulation or project demonstration could also be incorporated as part of the lecture. The instructor can tap into the vast reservoir of knowledge base that is available on NET and can make this an integral part of the lecture. This approach has totally changed the paradigm of Pedagogy.

Please visit the site http://ecet/~ofarook/ecet210/index.php?q=node/5 (Figure. 3)and hear the lectures using Window's build in Windows Media Player.

Figure. 3 Lectures of the course ECET 210 Structured C^{++} Programming

Conclusion

The paper here has provided all the essential elements that will be needed for the design of a Course Content server for distance delivery format. This is Course Content server is currently being used in our department for about 20 courses. Students' portfolios are being maintained. Lectures are being disseminated. Sharing of the scholarly work could be made. Students could engage in collaborative learning in ways that are, hitherto not available in traditional class room. Archival access of the past lectures in a 24-7 manner itself make it unique and worthwhile.

Bibliography

1 http://drupal.org/

2 The theme derived from: Many issues of The American Journal of Distance Education , From 1987 until 2001 *AJDE* was published at the Pennsylvania State University, following that was published by Lawrence Erlbaum Associates until 2006. *AJDE* is now published by Taylor & Francis.

3 http://www.blackboard.com/

4 http://www.desire2learn.com/

5 http://en.wikipedia.org/wiki/Open_source

6 http://moodle.org/

7 http://www.joomla.org/

8 http://www.bluehost.com

9 http://order.1and1.com/

10 https://www6.software.ibm.com/dw/education/i-osource4/section3.html

11 http://www.ibm.com/developerworks/ibm/library/i-osource5/

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