

# **Development of a Web-Based Open Learning Fire Science Program**

By

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Submitted to  
the Faculty of the Information Engineering Technology Program  
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the Degree of Bachelor of Science  
in Information Engineering Technology

University of Cincinnati  
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Jen Fritz

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Date

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Faculty Project Advisor: Sam C. Geonetta

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Date

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Department Head: Lawrence G. Gilligan

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Date

## **Dedication**

To Professor Patrick Reynolds, Dr. Sam Geonetta, Dr. Shenghe Zhan, and my husband, Lee. Thank you for all your help and support.

# Table of Contents

<b>Section</b>	<b>Page</b>
Acknowledgements	i
Table of Contents	ii
List of Figures	iii
Abstract	iv
1. Statement of the Problem	1
2. Review of the Literature	2
3. Description of the Solution	
3.1 User Profile	2
3.2 Product Description	3
4. Objectives of the Project	4
5. Design and Development	
5.1 Timeline	4
5.2 Requirements	6
5.3 Budget	7
6. Design Protocols and Proof of Design	
6.1 Web Page Design and Coding	7
6.2 Database Design	16
6.3 Visual Basic Administrative Service Program	17
7. Conclusions and Recommendations	23
8. Appendix A.	
Site Map	25
9. Appendix B.	
Hardware and Software Costs	26
10. Works Cited	27

## List of Figures

Figure 1. Home Page	8
Figure 2. Registration Page	9
Figure 3. Course Description	12
Figure 4. Book Order	13
Figure 5. Course Material	14
Figure 6. Database Tables	16
Figure 7. Visual Basic Administrative Page	17
Figure 8. Visual Basic Courses Form	19

## **Abstract**

This project is designed to support the Open Learning Fire Science Program in the Department of Fire Science at the College of Applied Science. A Web page, developed using Microsoft's Visual InterDev 6, publicizes general information concerning the Fire Science Program. Students are able to use the interactive Web page to enroll in distance learning classes, order textbooks online, and download applicable class material. A Visual Basic Application, connected to a SQL database, is provided for administrative support. Administrative personnel can update course material, teacher status and student records, produce class rosters, and archive data contained in the SQL database through the forms provided by the Visual Basic Application.

# **Development of a Web-Based Open Learning Fire Science Program**

## **1. Statement of the Problem**

Firefighters and personnel working in fire services typically work 24-hour shifts. Nontraditional hours make it difficult for them to attend on-campus college classes and often limit their continuing education to a distance learning program. To accommodate fire service learners, the College of Applied Science has an Open Learning Fire Science Program that offers associate and bachelor degree programs through correspondence courses. Currently over 300 students are enrolled in the Open Learning Fire Science Program (OLFSP) at the College. Enrollment in the OLFSP has included residents of 45 states, all provinces in Canada, and twelve other foreign countries (1 and 3). Approximately 3,500 information packets are mailed to prospective students in response to inquiries each quarter (1).

Typically, registration material is mailed to the student and returned by mail, fax, or telephone to the Fire Science Office. The Fire Science Office processes registrations and forwards the completed packages to the Registrar's Office (1).

The instructors provide syllabi and class assignments through regular mail and/or through electronic mail (e-mail). Examinations are mailed individually. All student records are manually established and updated.

Current procedures depend on the U.S. and overseas mail, a slow process especially when the quarter is only ten weeks long. Also, for each student in a class (typically 20 to 25), the instructor must mail individual assignments (3). This procedure

is not only time-consuming but also labor intensive and repetitious. Add this to a teacher's normal delay in grading papers and some students (especially students in foreign countries) may have to wait weeks for replies.

## **2. Review of the Literature**

Many educators are recognizing the potential of using the Internet for instruction. With its increase in popularity and accessibility, the Internet, with a well-developed Web site, is an ideal means to develop an on-line learning program (5).

In 1997 nearly 400 accredited colleges and universities in North America used some type of on-line instruction. Almost half of these institutions of higher education offered entire bachelor's degree programs to individuals who rarely, if ever, visited the campus (4).

Studies comparing on-campus classes with distance learning programs show no significant difference between the two in meeting course objectives (2 and 5). With such positive results, distance learning programs can be an effective and desirable method for firefighters and fire service personnel to further their education.

## **3. Description of the Solution**

### **3.1 User Profile**

The Fire Science Web Page is designed for students with basic computer knowledge. Basic computer knowledge is the ability to navigate through the Web, to complete registration forms online, and to download material.

### **3.2 Product Description**

This Web Site provides around-the-clock availability to anyone with Internet access. A student may access the Web page for general information about the Fire Science Program, required courses, registration, book ordering, and course material.

This project is divided into three sections: the Web Site, the database, and the Visual Basic program for administrative support. Appendix A. shows a Site Diagram.

The Web page provides a central location for information about the Fire Science Program. The home page includes the program description and goals. Links from the home page allow the user to view course requirements for associate and bachelor degrees, course descriptions, Frequently Asked Questions (FAQ's), and e-mail addresses for additional help. Through the enrollment page, the student can register for classes, order textbooks through an on-line book distributor, and download course material.

An SQL database is populated with the information needed for the forms and reports used by the instructors and for administrative support. The information stored in the database includes tables, forms, and records required to update course material, teacher status, student records, produce class rosters, and archive data. A centralized database provides administrative control with the capabilities to manage a larger student body.

The Visual Basic Application provides a direct connection to the SQL database allowing updates to the database and the printing of required reports. Administrative personnel can perform necessary changes to the database by filling in the form and clicking a button.

#### **4. Objectives of the Project**

- The Home Page has information material posted for public access (FAQs, Course Descriptions, Degree Requirements).
- A Visual Basic Program updates the database and process reports.
- Students register for Fire Science classes through the OLFSP Web site in a secure environment.
- Students are able to order textbooks through the Web site.
- Data validation encourages complete and more accurate form completion.
- Class material can be posted and updated on web page by instructors or support personnel.
- Examinations are available to a proctor through the Web site.
- E-mail accounts for the instructors and administrators are easily available.
- Links to external sites for class research, additional information, and current events are available.
- A search engine for the internal Web site for quick reference and help has been implemented.

#### **5. Design and Development**

##### **5.1 Timeline**

###### Senior Design I

###### Weeks 1-5

- Gather information on the Open Learning Fire Science Program
- Literature review of distance learning programs
- Select software programs

###### Weeks 6-10

- Design Home Page and site map

- Preliminary design of database tables
- Procure software and manuals

#### Spring Quarter

- Study FrontPage 2000
- Prepare information packet for online publication
- Fire Prevention Organization and Management material and course online

#### Senior Design II

##### Weeks 1-5

- Convert Access to SQL
- Convert FrontPage to Visual InterDev 6
- Information packet online

##### Weeks 6-10

- Add site map information to the Web page
- Design forms and queries for reports and interactive web updates
- Functional Web page
- Begin test of the Fire Prevention Organization and Management class online

#### Fall Quarter

- Compile feedback from students and faculty participating in online class
- Adjust/modify online data and course information

#### Senior Design III

##### Weeks 1-2

- Place on-line additional classes

Week 3 - 5

- Populate database with active student rosters

Weeks 4-5

- Design forms and queries for reports and interactive web updates

Weeks 6-8

- Compile feedback from students and faculty participating in online class
- Update as required

Weeks 9-10

- Add archive tables for inactive students and graduates
- Monitor site and correct deficiencies

Throughout the project

- Continue literature review
- Build works cited

## **5.2 Hardware and Software Requirements**

A variety of software was used to development of this project:

- FrontPage 2000. The Web server on main campus is not set up to handle the Microsoft extension used by Visual InterDev6, so FrontPage2000 was used to set up a temporary Web site in order to get online.
- MS SQL 7. Microsoft's MS SQL 7 is a relational database capable of maintaining records necessary to support the Fire Science Program. SQL 7 is the database program used on the Database server on main campus and allows a seamless interface between the Registrar's database and the Fire Science Program's database.
- Visual InterDev 6. Microsoft's Visual InterDev is a professional Web development tool that interfaces with a relational database with ease. Changes made to the Web page or to the database connections are accomplished through design time controls instead of rewriting code as required when using FrontPage 2000.

- Visual Basic 6.0. Microsoft's Visual Basic 6.0 is an object-based programming language that allows easy access to Microsoft's SQL 7 relational database. The forms application for updating and changing the database is a Visual Basic application.
- Security Socket Layer (SSL) with encryption keys. The form of security currently in use by the Web server on main campus is enabling SSL with public and private encryption keys. This form of security is necessary whenever confidential information is being passed over the Internet.

Hardware requirements are:

- Web server located at main campus of the University of Cincinnati.
- SQL Database Server. For storage of information in a relational database.
- Client computer with Internet access and Internet Explorer, although Netscape 6 also displays the Fire Science Web page.

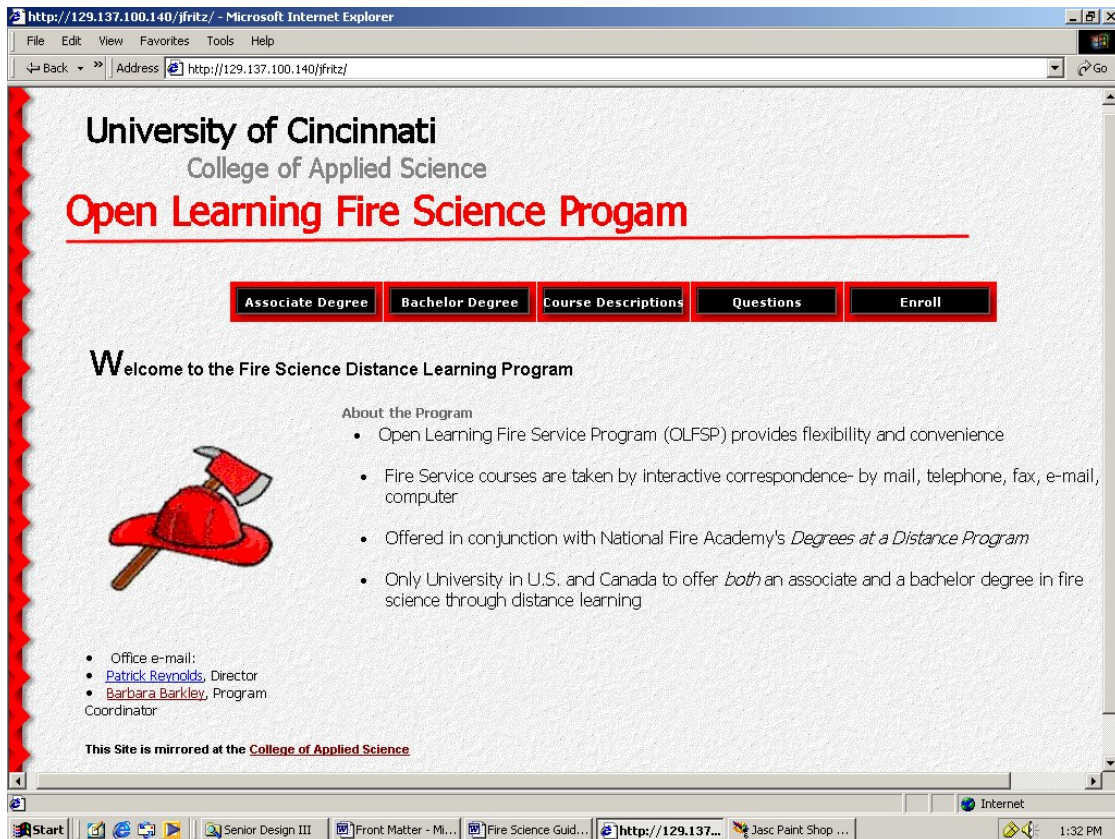
### **5.3 Budget**

The College of Applied Science, in the Information Engineering Technology Lab, made the hardware and software available. A cost table is shown in Appendix B.

## **6. Design Protocols and Proof of Design**

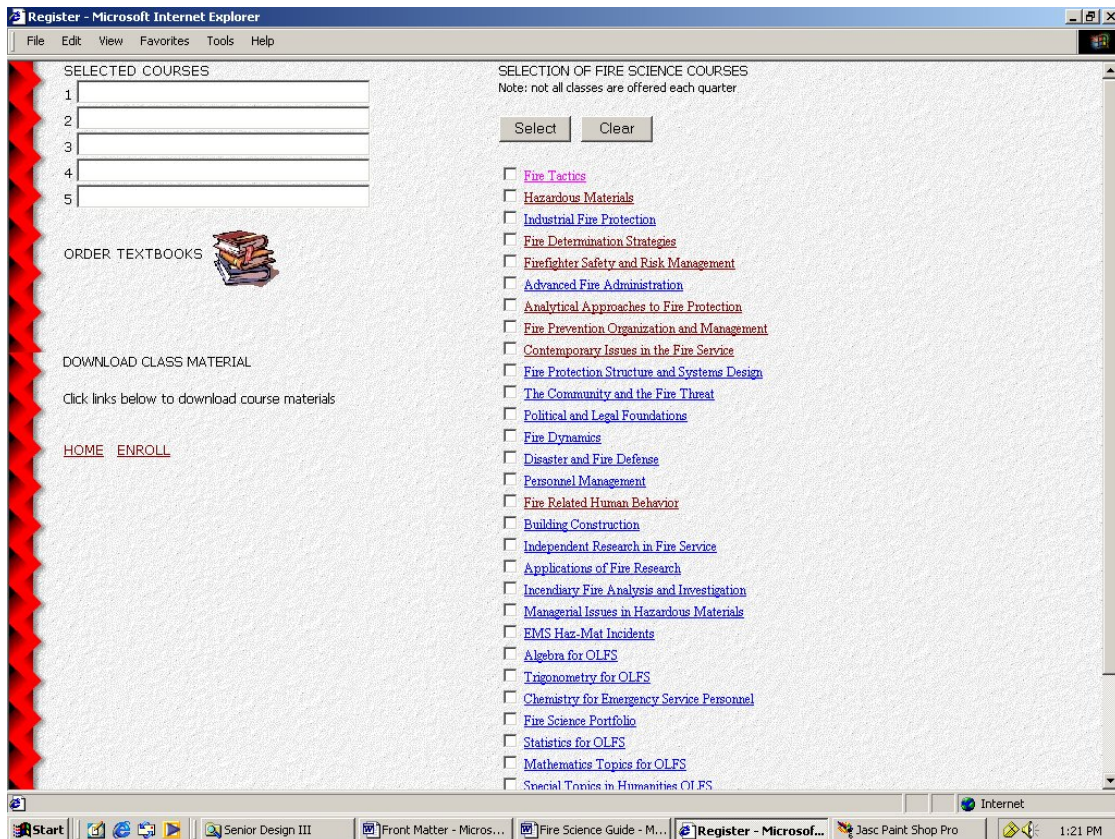
### **6.1 Web Page Design and Coding**

The *Home Page* is the Default.htm and starting point of the project. The banner, designed in Paint Shop Pro 7, introduces the Open Learning Fire Science Program (OLFSP) as part of the University of Cincinnati, located in the College of Applied Science. A red line gives focus to the Open Learning Fire Science Program and is used to separate the banner from the navigation buttons. Navigation buttons provide the links to child pages. The right side of the page describes the OLFSP. E-mail account links to the OLFSP Administrative Office are also provided. An area on the left-hand side is set aside to display pictures. The default picture is of an axe and helmet.



**Figure 1. Home Page**

Pages directly linked from the Home Page contain information on the OLFSP. The child pages include *FAQ's*, *Course Description*, *Associate Degree*, *Bachelor Degree*, and *Seminar*. *FAQ's* is an Active Server Page (ASP) linked to a database populated with questions and answers that include up-to-date information on tuition, matriculation, and course transfer and requirements. *Course Description*, also an ASP connected to the database, contains the official description of each course offered through the OLFSP. The *Associate Degree*, a Hypertext Markup Language (HTML) document, outlines the courses required for an Associate Degree in Fire Science Technology while *Bachelor Degree* provides the information needed for a Bachelor of Science Degree in Fire and Safety Engineering Technology.



**Figure 2. Registration Page**

The *Enroll* page gives instructions for selecting courses, registering through the Registrar's Web site, ordering textbooks, and downloading course material. *Enroll* directs the student to the *Register* page, an HTML page separated into three frames.

The *Register* displays information from ASP and HTML pages creating course listings, course descriptions, and displays the selected courses, and links to the course material. The ASP pages fed into the *Register* page are the *Right.asp*, *View\_Desc.asp*, and *Download\_mat.asp*. *Left.htm* is an HTML page.

The *Right.asp* first opens a database connection and populates the page with a listing of all courses in the Fire Science Program database.

```
Set Conn = Server.CreateObject("ADODB.Connection")
```

```

strConn="Driver={SQLServer};Description=UserEntre;Server=12
9.137.100.140;UID=jfritz;PWD=tigger;DATABASE=jfritz_SeniorD
esign"
Conn.Open strConn

```

The following function allows up to five courses to be selected by the user and displayed in the top left-hand frame of the *Register* page.

```

function fire(f) {
    var noc = f.elements[2].value;
    var max = 5;
    var j = 0;
    var strCourses = "";

    for (var i=3; i <= eval(noc)+2 && j < max; i++) {
        if (f.elements[i].checked) {
            top.left.document.selected.elements[j].value =
                f.elements[i].value;
            if (i == 1) {
                strCourses += f.elements[i].name;
            }
            else
            {
                strCourses += ";" + f.elements[i].name;
            }
            j++;
        }
    }
    if (j < max)
    {
        for (var k=max-1; k > j-1; k--) {
            top.left.document.selected.elements[k].value =
                "";
        }
    }
    if (j == 0) {
        alert("No selection made");
    }
    else
    {
        location = "http://www.uc.edu/registrar/";
        top.left2.document.location=http://
        129.137.100.140/jfritz_Senior_Design/download_mat.asp?
        strCourses=" + strCourses;
    }
}

```

Since the “Select” and “Clear” buttons are located at the top of the page, the number of courses (noc) had to be modified to account for these button elements. Thus the f.elements[i] value had to start at 2 in order to exclude these two buttons in the element count.

When the courses are selected (select button pushed), the right side of the screen is directed to the Registrar's Web site. If no course is selected, a message box pops up displaying “No selection made.”

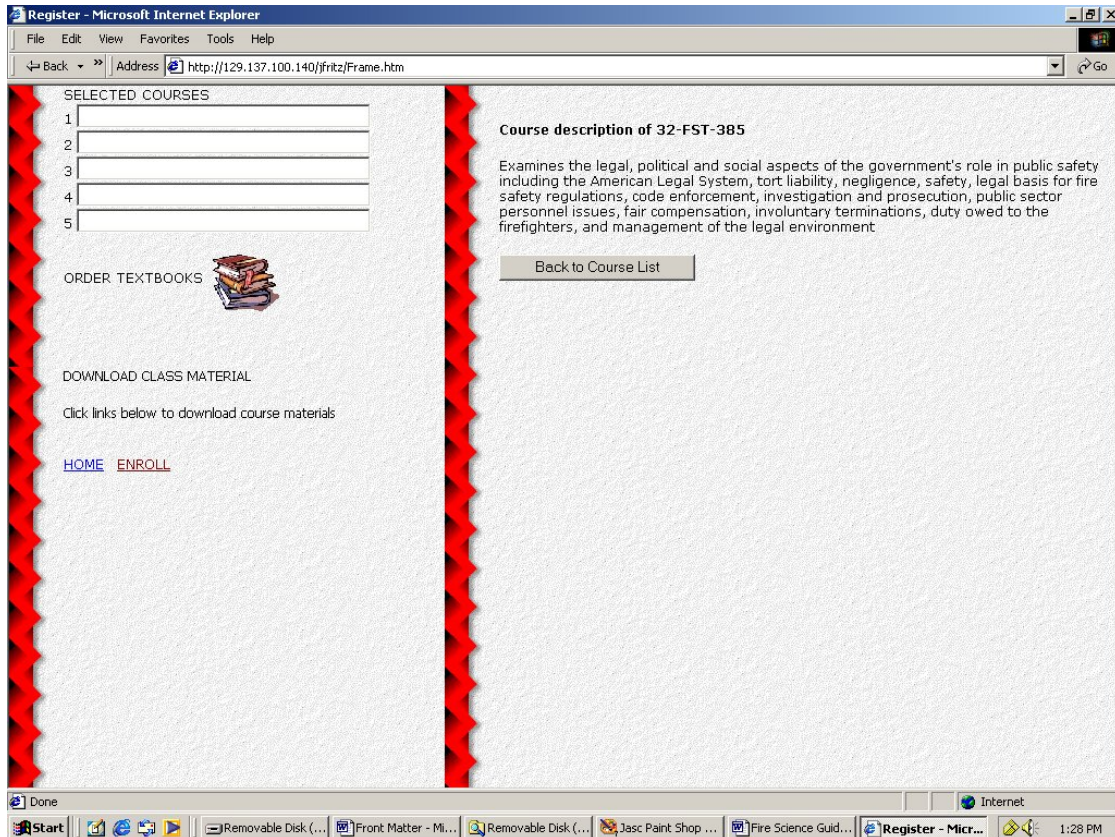
The SELECT statement provides a total count of the number of courses in the database to ensure all courses are listed. The course title is pulled from tblCourses of the database and a link is formed on the title of each course. The "View\_Desc.asp?Course Number=" displays the course description from the database.

```
nocSql="SELECT count(*) FROM tblCourse"
Set RS1 = Conn.Execute(nocSql) %>

Do While Not RS.EOF
input name="RS("CourseNumber")

"value="RS("CourseNumber")=RS("Title")
type=<a ref=View_Desc.asp?CourseNumber=
RS("CourseNumber")"=RS("Title")">/a>
Rs.MoveNext
Loop
```

For user convenience, a second set of buttons is placed at the bottom of the page to select and clear the selection boxes.



**Figure 3. Course Description**

The *View\_Desc.asp* uses a select statement to match the course description with the selected course number from the database.

```

strSql="SELECT Description FROM tblCourse where
CourseNumber='" &selCourse& "';"
Set RS = Conn.Execute(strSql)
if Not RS.EOF Then
cDesc = RS("Description")
if IsNull(sDesc) OR IsEmpty(cDesc) OR Len(cDesc) = 0 Then
cDesc = "nbsp;"
else
cDesc = replace(cDesc, vbCrLf, "<br>")
End if

```

The carriage return is replaced with an HTML break tag.

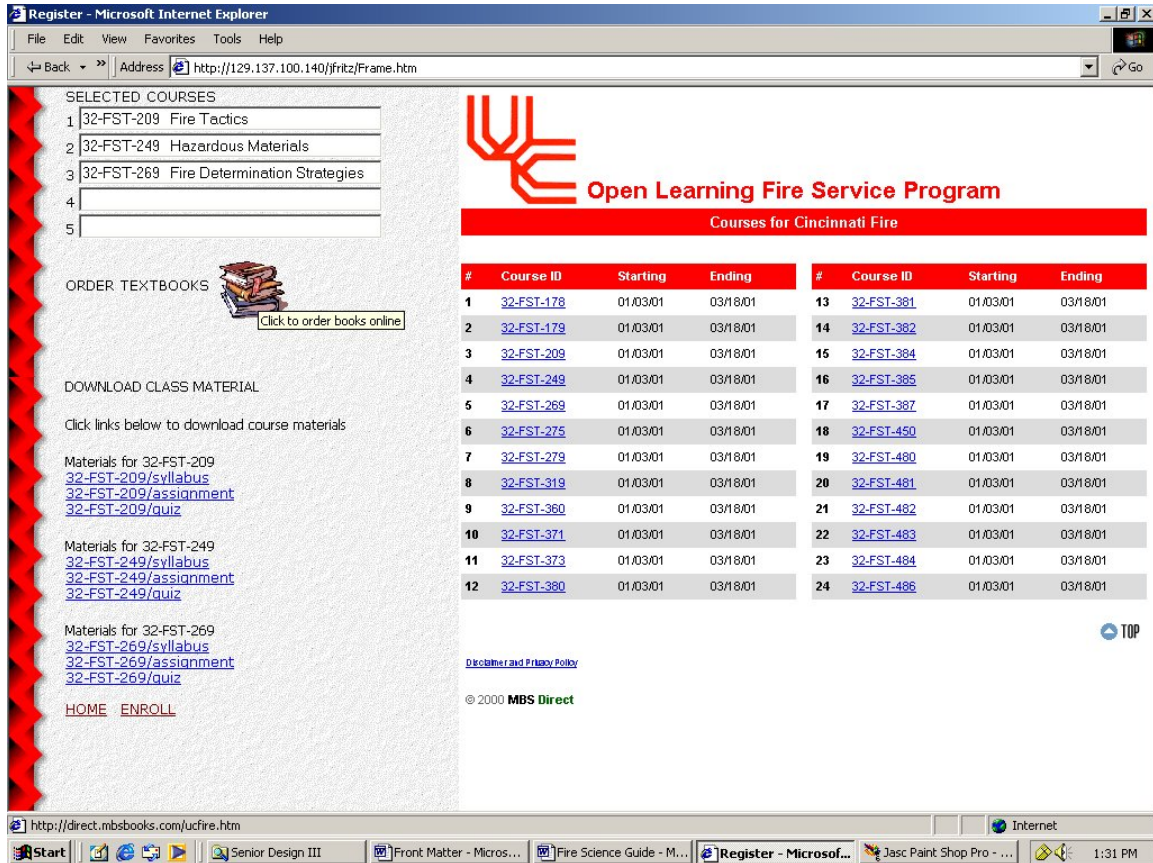
A back button is included so the user can return to the selection page using the onclick method equal to "history.go(-1)."

```

<form name="back" action="noaction.asp"
<input type="button" value="Back to Course List"
onclick="history.go(-1);">
</form>

```

*Left.htm* collects the selected courses from *Right.asp* after the Select button is pushed. Textboxes are used to display up to five courses.



**Figure 4. Book Order**

A link to the MBS Books is located underneath the selected course display allowing the student to reference the course numbers while ordering textbooks. When the mouse rolls over the picture of books, a tool tip informs the user to click on the image to order books online.

```

<form name="selected" action="noaction.asp">
1 <input name="course1"
2 <input name="course2"

```

```

3 <input name="course3"
4 <input name="course4"
5 <input name="course5"
</form>

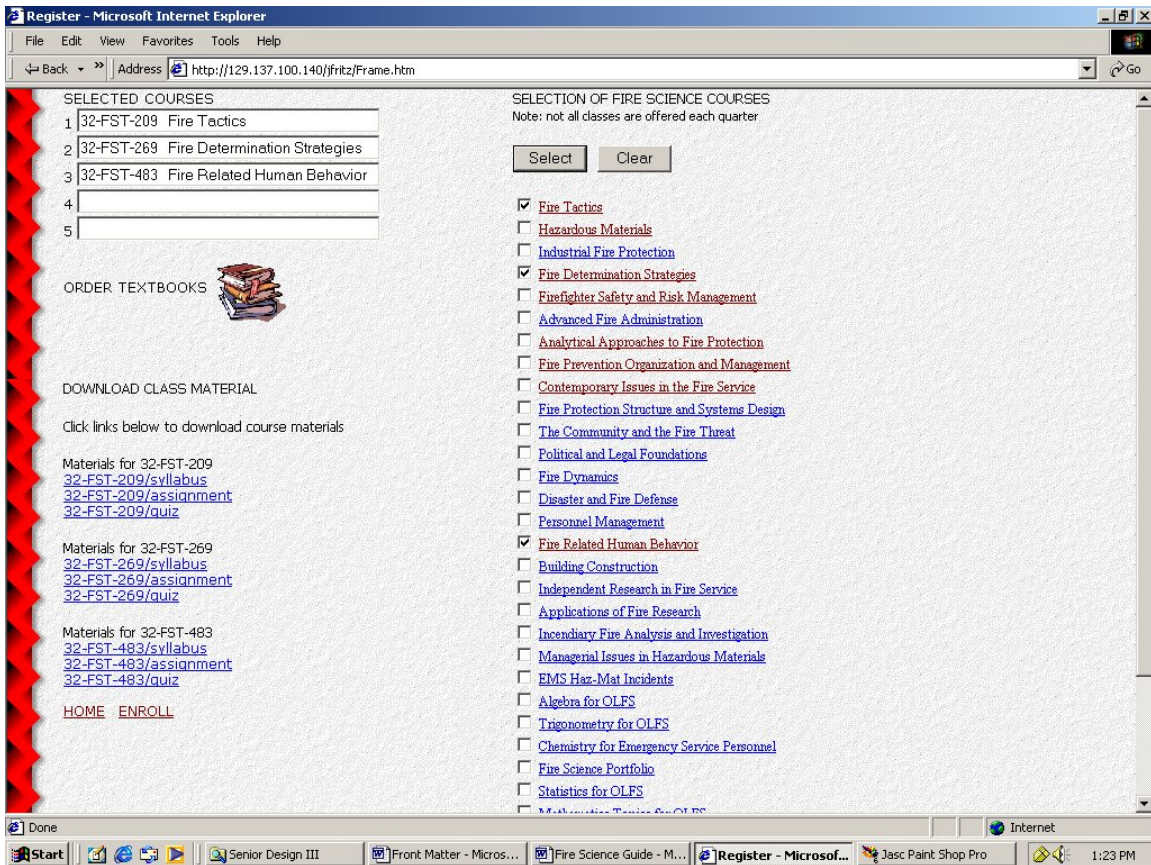
```

```

<a href=http://direct.mbsbooks.com/ucfire.htm target=
"right"> MBS Bookorder</a>

```

The *Download\_mat.asp* displays the path to the course material in the bottom left-hand side of the *Register* page.



**Figure 5. Course Material**

The course material is stored in a folder on the Web Server. The database contains a field with the location of the path where the downloadable course material is stored.

A loop is used to first count the number of links stored in the database under the specific course number. A hyperlink is established to the path of the file stores on the server.

```
strCourses= Request("strCourses")

dim selcourses
dim materials

if Len(strCourses) <> then
selcourses = split(strCourses, ";")

for intLoop=0 to uBound(selcourses)
    strSql="SELECT Material FROM tblCourse where
CourseNumber='" &selCourses(intLoop)& "'"
Set RS = Conn.Execute(strSql)

if Not RS.EOF Then
cMat = RS("Material")
materials = split(cMat, vbCrLf)

for intLoop2=0 to uBound(materials)
<a href="materials(intLoop2)"> materials(intLoop2)</a>
next
End if
RS.Close
end if
```

The user right clicks the mouse and is given the option of downloading the file to a drive on their computer or to a printer.

The *Frame.htm* structures the screen by dividing the page into three frames.

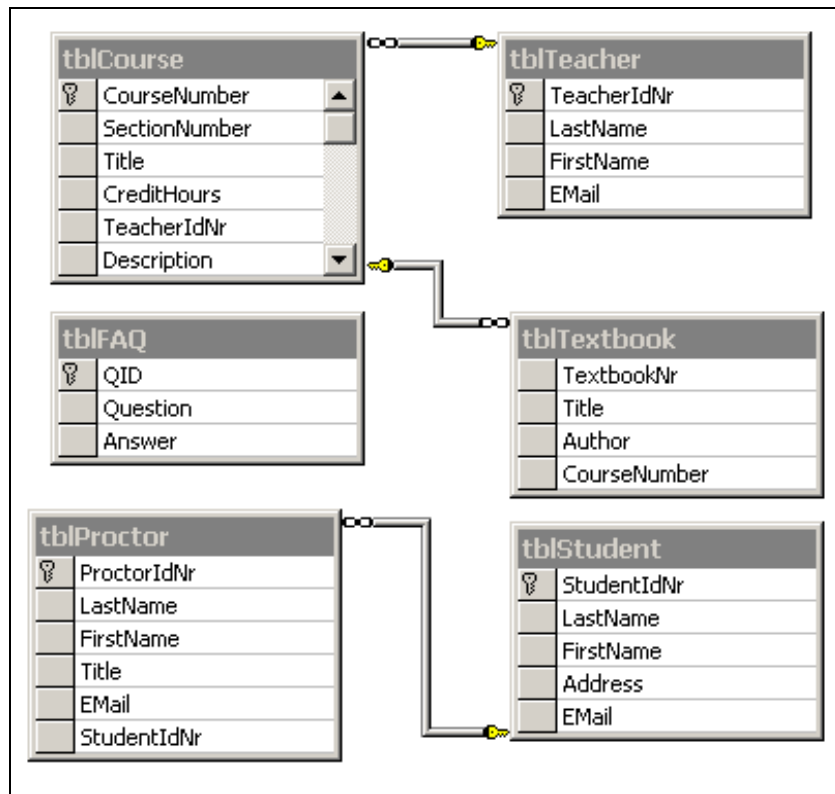
```
<frameset frameborder="0" BORDER="0" framespacing="0"
COLS="400,*">
<frame SRC="left.htm" name="left" marginwidth="1"
scrolling="no" noresize>
<frame name="left2" src="download_mat.asp" marginwidth="1"
scrolling="auto" noresize>
</frameset>

<frame src="right.asp" name="right" marginwidth ="2"
scrolling="auto"
</noframes>
```

A *Search Engine* enables the student to search the Web site for a specific item, such as a course, an instructor, or the subject of a question.

## 6.2 Database Design

The Database contains the following tables:

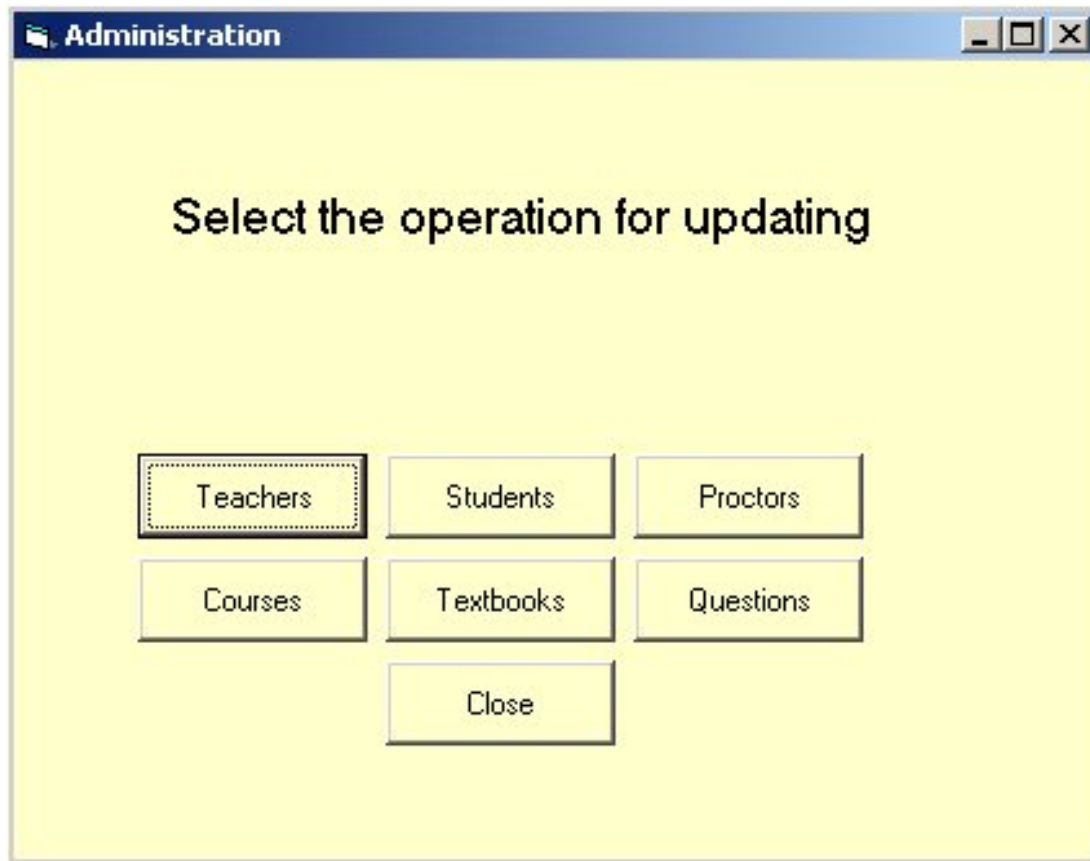


**Figure 6. Database Tables**

The *Students* table will be populated through the Registrar's office. The Registrar's office will be providing daily downloads of students that officially enroll in Fire Science courses. This information will be used compared with the student information in the OLFSP database to ensure proper registration.

### 6.3 Visual Basic Administrative Service Program

Updates to the database are accomplished through a Visual Basic program. This application allows individuals without experience with databases to make updates by filling out a form. All administrative changes to the information in the database are accomplished through this program.



**Figure 7. Visual Basic Administrative Page**

The start-up form (Administrator form) contains buttons to select which table in the database to update. As each form is selected, all remaining forms are hidden from view.

```
Private Sub cmdClose_Click()  
    frmCourses.Visible = False  
    frmFAQs.Visible = False
```

```

        frmPasswords.Visible = False
        frmProctors.Visible = False
        frmStudents.Visible = False
        frmTeachers.Visible = False
        frmTextbooks.Visible = False
        Unload Me
    End Sub

Private Sub cmdCourses_Click()
    frmCourses.Visible = True
    frmFAQs.Visible = False
    frmProctors.Visible = False
    frmStudents.Visible = False
    frmTeachers.Visible = False
    frmTextbooks.Visible = False
End Sub

Private Sub cmdFAQs_Click()
    frmCourses.Visible = False
    frmFAQs.Visible = True
    frmProctors.Visible = False
    frmStudents.Visible = False
    frmTeachers.Visible = False
    frmTextbooks.Visible = False
End Sub

Private Sub cmdProctors_Click()
    frmCourses.Visible = False
    frmFAQs.Visible = False
    frmProctors.Visible = True
    frmStudents.Visible = False
    frmTeachers.Visible = False
    frmTextbooks.Visible = False
End Sub

Private Sub cmdStudents_Click()
    frmCourses.Visible = False
    frmFAQs.Visible = False
    frmProctors.Visible = False
    frmStudents.Visible = True
    frmTeachers.Visible = False
    frmTextbooks.Visible = False
End Sub

Private Sub cmdTeachers_Click()
    frmCourses.Visible = False
    frmFAQs.Visible = False
    frmProctors.Visible = False
    frmStudents.Visible = False
    frmTeachers.Visible = True

```

```

frmTextbooks.Visible = False
End Sub

Private Sub cmdTextbooks_Click()
frmCourses.Visible = False
frmFAQs.Visible = False
frmProctors.Visible = False
frmStudents.Visible = False
frmTeachers.Visible = False
frmTextbooks.Visible = True
End Sub

```

Each of the forms contains textboxes to display the columns in the database, as shown in the database table above. Each of the forms contains options to add, update, delete, refresh and close.

The screenshot shows a window titled "Courses" with a yellow background. On the left side, there are labels for "Course Number", "Section Number", "Course Title", "Teacher Id Nr", and "Course Description". To the right of these labels are corresponding textboxes. The "Course Number" textbox contains "32-FST-209", "Section Number" is empty, "Course Title" contains "Fire Tactics", and "Teacher Id Nr" contains "3". The "Course Description" is a larger text area containing the text: "Fireground tactics and strategies using the Incident Command System are discussed. This course deals with company operations, large-scale operations, and special firefighting procedures. (You should have prior firefighting experience or be on a fire department to take this class.)". Below the textboxes are four buttons: "Add", "Delete", "Refresh", and "Update". At the bottom of the form, there are two more buttons: "Administration" and "Close".

**Figure 8. Visual Basic Courses Form**

An example is FrmCourses(Courses.frm).

```

Private Sub Form_Unload(Cancel As Integer)
    Screen.MousePointer = vbDefault
End Sub

Private Sub datPrimaryRS_Error(ByVal ErrorNumber As Long,
Description As String, ByVal Scode As Long, ByVal Source As
String, ByVal HelpFile As String, ByVal HelpContext As
Long, fCancelDisplay As Boolean)

    'Error handling code

    MsgBox "Data error event hit err:" & Description
        End Sub

    'Display the current record position for this recordset

        datPrimaryRS.Caption = "Record: " &
            CStr(datPrimaryRS.Recordset.AbsolutePosition)
End Sub

Private Sub datPrimaryRS_WillChangeRecord(ByVal adReason As
ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As
ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

    'This event gets called when the following actions occur
    Dim bCancel As Boolean

    Select Case adReason
    Case adRsnAddNew
    Case adRsnClose
    Case adRsnDelete
    Case adRsnFirstChange
    Case adRsnMove
    Case adRsnRequery
    Case adRsnResynch
    Case adRsnUndoAddNew
    Case adRsnUndoDelete
    Case adRsnUndoUpdate
    Case adRsnUpdate
    End Select

    If bCancel Then adStatus = adStatusCancel
End Sub

Private Sub cmdAdd_Click()
    On Error GoTo AddErr
    datPrimaryRS.Recordset.AddNew

    Exit Sub

```

```

AddErr:
    MsgBox Err.Description
End Sub

Private Sub cmdDelete_Click()
    On Error GoTo DeleteErr
    With datPrimaryRS.Recordset
        .Delete
        .MoveNext
        If .EOF Then .MoveLast
    End With
Exit Sub

DeleteErr:
    MsgBox Err.Description
End Sub

Private Sub cmdRefresh_Click()
    'This is only needed for multi user apps
    On Error GoTo RefreshErr
    datPrimaryRS.Refresh
Exit Sub
RefreshErr:
    MsgBox Err.Description
End Sub
Private Sub cmdUpdate_Click()
    On Error GoTo UpdateErr

    datPrimaryRS.Recordset.UpdateBatch adAffectAll
Exit Sub

UpdateErr:
    MsgBox Err.Description
End Sub

Private Sub cmdClose_Click()
    Unload Me
End Sub

frmFAQs
Private Sub Form_Unload(Cancel As Integer)
    Screen.MousePointer = vbDefault
End Sub

Private Sub datPrimaryRS_Error(ByVal ErrorNumber As Long,
Description As String, ByVal Scode As Long, ByVal Source As
String, ByVal HelpFile As String, ByVal HelpContext As
Long, fCancelDisplay As Boolean)

    'Error handler

```

```

    MsgBox "Data error event hit err:" & Description
End Sub

Private Sub datPrimaryRS_MoveComplete(ByVal adReason As
ADODB.EventReasonEnum, ByVal pError As ADODB.Error,
adStatus As ADODB.EventStatusEnum, ByVal pRecordset As
ADODB.Recordset)
    'This will display the current record position for this
recordset
    datPrimaryRS.Caption = "Record: " &
CStr(datPrimaryRS.Recordset.AbsolutePosition)
End Sub

Private Sub datPrimaryRS_WillChangeRecord(ByVal adReason As
ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As
ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

    Dim bCancel As Boolean

    Select Case adReason
    Case adRsnAddNew
    Case adRsnClose
    Case adRsnDelete
    Case adRsnFirstChange
    Case adRsnMove
    Case adRsnRequery

        MsgBox Err.Description
    End Sub

Private Sub cmdDelete_Click()
    On Error GoTo DeleteErr
    With datPrimaryRS.Recordset
        .Delete
        .MoveNext
        If .EOF Then .MoveLast
    End With
    Exit Sub
DeleteErr:
    MsgBox Err.Description
End Sub

Private Sub cmdRefresh_Click()

    'This is only needed for multi user apps
    On Error GoTo RefreshErr
    datPrimaryRS.Refresh
    Exit Sub
RefreshErr:
    MsgBox Err.Description

```

```

End Sub

Private Sub cmdUpdate_Click()
    On Error GoTo UpdateErr

    datPrimaryRS.Recordset.UpdateBatch adAffectAll
Exit Sub
UpdateErr:
    MsgBox Err.Description
End Sub

Private Sub cmdClose_Click()
    Unload Me
End Sub

```

## **7. Conclusions and Recommendations**

The explosive growth in the use of the Internet is the foundation for the next evolution in distance learning programs. The combination of practical classroom experience and implementation of the concepts learned is a natural progression in education. The Fire Science Department can and will be enhanced by this new approach to education. I recommend that the Fire Science Department encourage its students to take full advantage of this learning opportunity. This paradigm shift in education will ensure that the Fire Science Department will not only survive but will flourish.

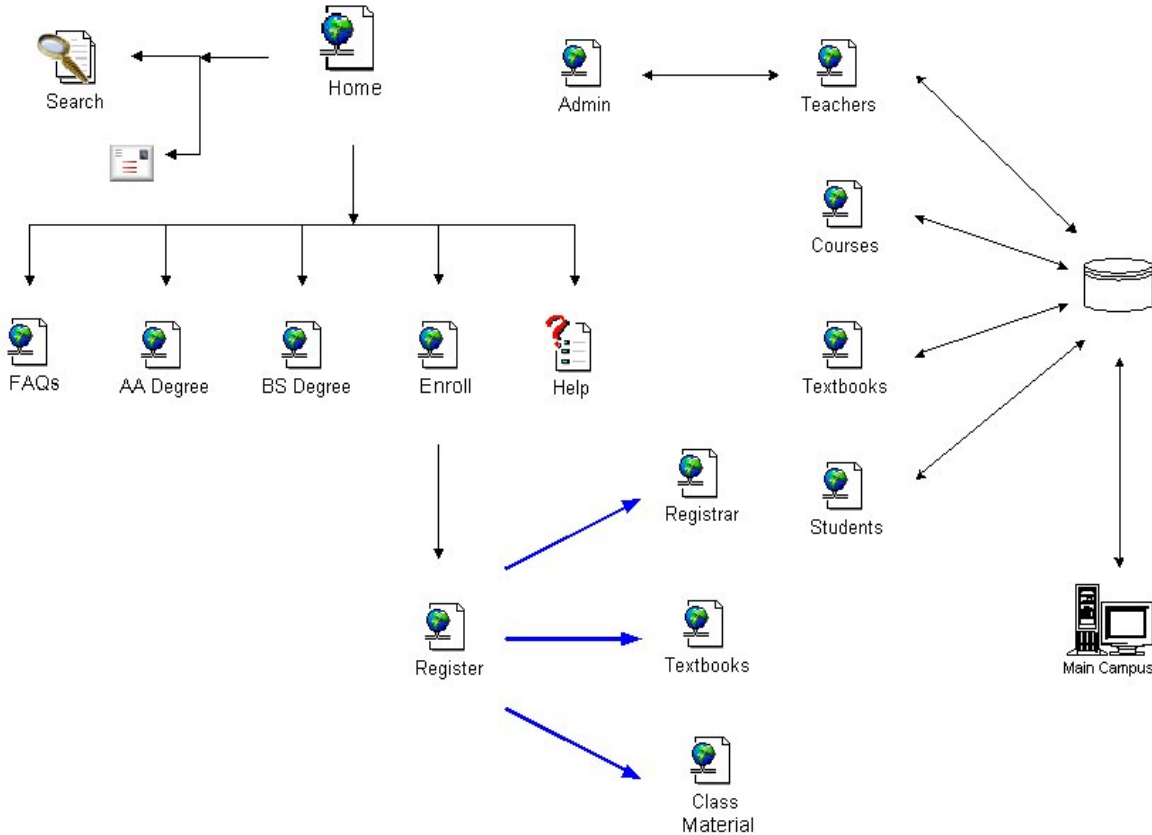
My experiences during this project taught me many valuable lessons in Web development, project planning, and interpersonal workplace skills. I learned that project definition and time management are the major factors when trying to accomplish this type of project. I underestimated the amount of time it would take to complete my work. My interactions with the Fire Science Department staff taught me that clear purpose and expectations by all parties involved must be well-defined and agreed upon.

I recommend that the Web page be maintained and enhanced to provide additional functionality. A chat room can be added so students can talk with other students or post

questions. It would also allow instructors to address specific or frequently asked question. Testing can also be administered online. The addition of streaming videos can enhance course material.

I recommend that the University of Cincinnati adopt a more flexible enrollment policy for distance learning programs. This would allow students to enroll in courses at any time and be given a completion date that need not correspond with the quarters at the university. This would provide students with an atypical work schedule even more flexibility in completing the Fire Science Distance Learning Program.

# Appendix A. Site Diagram



## **Appendix B. Hardware and Software Costs**

<b>Asset</b>	<b>Cost</b>
FrontPage 2000	\$ 149
MS SQL 7	\$ 1489
Visual InterDev 6	\$ 549
Visual Basic 6.0	\$ 549
SSL Encryption Keys	\$ 300
Web and SQL Server	\$ 1499
PC PIII 128MB RAM	\$ 1181
Total	\$ 5716

Costs are from the Microsoft Web Site located at <http://www.microsoft.com> with effective price dates of February 2001.

Hardware costs are from Dell's Web site at <http://www.dell.com/>.

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