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Integration of Student Academic Record and Major Requirements through XML.

Zhujun Hou
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Integration Of Student Academic Record And Major Requirements Through XML

A Thesis
Presented to
the Faculty of the Department of Computer and Information Sciences
East Tennessee State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Sciences

by
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May 2001

and

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Keywords: Student Record, Major Requirements, Petri Net, XML, DTD, XSL
ABSTRACT

Integration of Student Academic Record and Major Requirements through XML

by

Zhujun Hou

The purpose of this thesis is to develop a software application based on previous studies by 1997 Oak Ridge Design Studio Team that matches students' progress with major requirements in their college career. This study addresses the problems of previous studies and suggests a solution. A powerful new technique, XML, is used to model, store, and process the data of major requirements and student records. This application produces an HTML file that provides detailed information of a student's academic progress towards graduation.
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Chapter 1

INTRODUCTION

College education has become more complex today. Many new majors have been created. Some majors contain several different concentrations to make the study more specific. In addition, the requirements for a major might keep changing. Therefore, it has become more complicated and difficult for students, advisors, and graduation counselors to track a student's academic progress.

In a personal interview on April 20th 1999, Susan Burkey, a graduation counselor at East Tennessee State University, explained that there are about seven hundred undergraduate students who graduate from ETSU every semester. All these students' records have to be checked. Besides these seven hundred records, she also has to check the records of students who are going to graduate in one or two semesters. Therefore, a total of two thousand student records are reviewed each semester. As Mrs. Burkey said, the worst part is that she has to go through all the procedures by hand. There is currently no software that can be used to help this process. Although she can remember most of the requirements for many majors due to years of experience, she still has to look up the updated published requirements in the undergraduate catalog because they change from time to time. Mrs. Burkey would be pleased if a simple checklist
can be generated to help her to look through a student's progress towards graduation when she specifies a student ID.

Several systems are implemented to record student information and registration at ETSU, such as SROL (Student Records On-line), SIS (Student Information System), and SISPLUS (Kristen Cornett, 1997). 'On Course' is a component of SIS, used to determine if a student completed the required courses for the major that he or she is pursuing. 'On Course' asks for student name and major as input, and then outputs a checklist on the screen. However, the checklist contains twelve pages and its format lacks clarity.

**Statement of the Problem**

The Department of Computer and Information Sciences has put some effort into the development of systems that would produce an advising checklist at ETSU. The STAR (Systematic Tracking Academic Records) and METEOR (matching student progress with major requirements) systems are two major products. The STAR system evaluates a student's transcript and major requirements and creates the output to the screen or printer in the form of an advising checklist (Oak Ridge Design Studio Team, 1997).

METEOR is a software application that produces a definition language for academic majors (APPENDIX A) (Kristen Cornett, 1997). The output produced by METEOR should allow a department secretary or undergraduate student
advisor to create a file of requirements for any major. The file should contain
information like required courses, required credit hours, required GPA, or any
other requirement information. However, METEOR fails to achieve this goal. In
addition, METEOR was developed for only four majors, Computer and
Information Science, Mathematics, Engineer Design Graphics, and Interior
Design.

The primary problem of the METEOR language is that it fails to capture
course constraints and alternate information. Course constraints include course
prerequisites, minimum course grades, minimum GPA, and others. Course
alternates are a set of courses that a student can choose from to satisfy some
requirements. There are many kinds of alternates. Students could select
courses from a list of given courses. Students could choose courses offered by a
certain department. Students could choose courses at a certain level. Students
could choose a block of courses from several given blocks. Students could
choose a pair of courses from several given pairs. Students could choose
courses from a certain area. Some of these alternates are represented in the
METEOR language, but some of them are not. In addition, intensive
requirements and residency requirements must also be evaluated before
granting a bachelors degree to a student. Intensive requirements include writing
intensive requirements, oral intensive requirements and using information
technology requirements. ETSU requires a student to complete a minimum
number of intensive courses for each type. A transfer student must completed
enough work in residence at ETSU in both the major and minor (East Tennessee State University Undergraduate Catalog, 1999-2000). METEOR failed to provide all the intensive and residency information as well. Therefore, designing the language to capture all the requirement information for all majors becomes the first task.

A graduation counselor may need to review a student's minor performance in order to determine if a student is able to graduate, because most of the majors require a student to complete a minor. However, METEOR did not produce a definition language for any minor. Therefore, the language for minors needed to be built as well.

STAR has two incoming data streams: DLAM (Descriptive Language for Academic Majors) and SIS (Oak Ridge Design Studio Team, 1997). STAR accesses a student's transcript from SIS and retrieves the major requirements from a DLAM file. DLAM files contain data describing academic programs for each major and concentration in any catalog year (APPENDIX B). DLAM files are manually generated text rather than produced by METEOR. However, DLAM files follow the logic and language established by METEOR. STAR creates a tree structure to demonstrate a student's academic progress by comparing the student's record with the corresponding major requirement. The tree view has the same format as the major requirement file but includes a student's grade on the completed courses (APPENDIX C). Since DLAM files fail to illustrate course
prerequisite information, alternate information, intensive information and residency information, STAR is not able to provide sufficient academic progress information to students and to their advisors.

In order to produce a software to analyze a student's graduation progress, the language created by METEOR needed to be redefined to capture the major information in much more detail. For STAR, a simple tree structure is not able to provide sufficient information to an advisor, graduation counselor or student. A much more complex user-friendly interface needed to be developed to represent all the constraints and other information. The interface should give students or their advisors a view of academic progress, and it could also be used to help students make a better plan for their rest of college education career.

**Research Objectives**

In this study, the two research objectives are to, (1) formally define major requirements and, (2) to integrate major requirements and student transcripts. A major requirement could be extremely complicated due to course constraints and alternates. The complexity of major requirements increases the difficulties of data modeling and event modeling. In this study, a new technique, XML, was used to organize and format the data of major requirements and the data of student transcripts.
This chapter describes two theoretical approaches to specify major requirements, event modeling and data modeling.

**Event Modeling**

The process of pursuing a degree can be decomposed into a set of course taking events. For a given major requirement, some of those events can occur concurrently, but some events must occur sequentially depending on the prerequisite requirement. A Petri net is an appropriate technique to model this process. A Petri net is a widely used abstract model for describing and analyzing a process that contains asynchronous and concurrent activities (Peterson, 1977).

A process usually involves a state change of an object. A course-taking event involves a state change of a course. A course usually falls into one of the following three primary states: waiting state, ready state, and completed state. In a waiting state, a course can't be taken until its prerequisite has been satisfied. A student may take a course at any time if the course is in a ready state. A course is in a completed state when the student completes the course and meets the grade requirement. A course is in a ready state when all his prerequisite courses are in completed states; otherwise, it is in a waiting state. The initial state of a
course could be a waiting state or a ready state, depending on whether the course has prerequisites or not.

Figure 1 and Figure 2 show two simple Petri nets for triggering course state changes. The diagrams contain circles (called places) and bars (called transitions). If an arc is directed from a circle A to a bar B (or a bar A to a circle B), then A is an input to B, and B is an output of A. The markers inside circle are called tokens. The position and movement of tokens control the execution of a Petri net (Peterson, 1977). The firing of a transition causes the movement of token. A transition is enabled to fire when all its input places have a token in them. In Figure 1, the transition is enabled. The transition fires by removing the tokens from its input places and placing a token in the output place. Figure 2 displays the movement of token after the transition fires.

According to the language defined in METEOR, a major is split into several advising units. An advising unit is composed of groups, and a group is made up of courses. For an advising unit or a group, there are two states, uncompleted and completed. The uncompleted state is the initial state. A student completes a group when he or she completes all the courses inside the group. If a group contains alternative courses, a student has to obtain the required credit hours and meet the GPA requirement to complete the group. In other words, a group can not be in completed state unless all or some of its courses are in completed state. The same logic can apply to an advising unit.
A course is in transcript   Earned grade $\geq$ required grade

Course completed

Figure 1: Petri net for triggering course to completed state.

Prerequisite 1 completed   Prerequisite2 completed   ....

Course is ready to take

Figure 2: Petri net for triggering course is ready to take

An advising unit is not able to move to completed state until all its groups move to completed state. Finally, a major requirement is satisfied when all advising units are in completed state. Figure 3 shows the overall Petri net.
A goal of the program developed for this thesis is to determine the state of each course, group and advising unit and then show those states through an interface to let students and their advisors understand where the students stand.
Data Modeling

"Data modeling is the first step in designing an object-oriented program. Data modeling is the analysis of data objects and the identification of the relationships among these data objects" (Sally Schlaer and Stephen J. Mellor, 1988). In order to determine the state of each course, group, advising unit and major, the data of those objects were first collected, modeled and analyzed. There are primary two major sets of data, major requirements and student records shown on his/her transcript. The major must be the one claimed by the student. Minor requirement is optional, because some majors do not require a student to claim a minor.

There are several traditional database approaches that are usually used to organize and format data, such as relational data model, hierarchical data model, and object-oriented data model. In this study, a new technique, XML, will be applied for data handling.


XML was initially "developed by a W3C Generic SGML Editorial Review Board formed under the auspices of the W3 (World Wide Web) Consortium in
XML is not the first generation of markup language. Instead, both XML and HTML (HyperText Markup Language) are the children of SGML (Standard Generalized Markup Language).

SGML is defined in ISO (International Organization for Standardization Standard) 8879:1986 with the full name "ISO 8879 Information processing -- text and office systems -- Standard Generalized Markup Language". Its first edition was published in 1986 (Martin Bryan, 1992). SGML provides an internationally recognized, non-proprietary language for designing an user's own markup schemes. Generally speaking, "markup" is character text or binary codes added to data content in order to pass particular information about that data. In a document produced by a typical word processor file, "markup" is represented by the proprietary codes that the software inserts into the files to indicate which words should be printed in a certain font, which paragraphs should be centered, where page breaks occur, and so on. In the case of a database system, "markup" is represented by proprietary codes in the data file which indicate where one field or record ends and another begins, what is the attribute of the records and so on (International SGML Users' Group, 1997).

As a simple subset of SGML, XML is primarily designed for representing data, and is usually considered as a relatively new document and data description language (Richard Lander, 2000). An XML file looks very similar to an HTML file. Like HTML, XML uses tags (words bracketed by '<' and '>') and
attributes (of the form name = "value") to describe a class of data objects. HTML specifies the meaning of each tag and attribute. XML uses the tags only to delimit pieces of data, and leaves the interpretation of the data completely to the application that reads it (Bert Bos, 1999). For example, <P> in HTML means "paragraph", but <P> in XML means nothing to a browser, and "P" is only the name of a data element given by a XML document developer. Each XML document works as a database, and elements are the primary logical components of a XML document. An element is bound by a start tag and an end tag. An element can have one or more than one attributes, which define the property of the element. Element content is not limited to text. Elements can contain other elements.

An XML document is constructed as a tree of elements. There is no limit to the depth of the tree, and the elements can repeat. An element that encloses another element is called a parent. The element that is enclosed in a parent is called a child (Ann Navarro, Chuck White, and Linda Burman, 2000).

Table 1 gives a simple example of an XML document. There are nine elements in Table 1, employee, name, address, street, city, state, zipcode, country, and tel. It is important to distinguish the tag sets that delimit elements and the element itself. For example, <name> is not an element, but a tag set that describes the element. The entire chunk, "<name>John Simth</name>", is the actual element, which is called a document component (Ann Navarro, Chuck
Table 1: An example of an XML document for "employee"

```xml
<?xml version="1.0"?>
<!DOCTYPE employee SYSTEM "employee.dtd">
< employee >
  <entry>
    <name>Kate Smith</name>
    <SSN>0116667878</SSN>
    <address>
      <street>1429 Maple Road</street>
      <city>Johnson City</city>
      <state>Tennessee</state>
      <zip-code>37601</zip-code>
      <country>US</country>
    </address>
    <tel preferred="true">423-967-9879</tel>
    <tel>423-282-4343</tel>
  </entry>
  <entry>
    <name>Jone Levy</name>
    <SSN>0116665656</SSN>
    <address>
      <street>2001 Walnet Street</street>
      <city>Johnson City</city>
      <state>Tennessee</state>
      <zip-code>37604</zip-code>
      <country>US</country>
    </address>
    <tel preferred="true">423-969-9800</tel>
    <tel>423-282-4343</tel>
  </entry>
</ employee >
```

White, and Linda Burman, 2000). There is only one attribute in Table 1, **preferred**, which is the attribute of element **tel**. Attributes usually attach to an element to provide additional information about the element. An attribute has a name and a value, like **preferred** is the name of the attribute and **true** is the value.
A tree structure can be simply constructed according to the XML document in Table 1 (Figure 4). **Employee** is the root element in the tree. Any XML document must contain one and only one root element. All other elements must be the children or grandchildren of the root element (Benoit Marchat, 1999). Different database approaches, like the relational data model, network data model, object-oriented data model and hierarchical data model, have their own data definition language (Rames Elmasri and Shamkant B. Navathe, 1994). XML has its own data definition language as well. A data definition language is used by database designer to describe a database. The description of a database is called the database schema. A data definition language defines the structure and instances of a database in a human-readable and machine-readable form (DDL Reference Manual, 1991). In other words, a data definition language is used to describe the structure of the whole database, the relationship between data item, the data type of each data items, and the constraints of each data item for a group of users.

Broadly speaking, the Document Type Definition (DTD) is the data definition language or schema for XML. An XML document can adopt many kinds of structure. Developing a DTD to formally specify the structure of an XML document allows an XML processor to check if the documents are syntactically correct and also ensures that they follow the structures described in the DTD. The main purpose of using a DTD is to let the XML processor enforce the structure as defined in the DTD. Based on a DTD, an application, like an XML editor, can access the document structure to perform a task such as
Figure 4: Tree of "employee"

populating an element list. A DTD also gives hints to the XML processor to separate indenting from content (Benoit Marchat, 1999).

Based on the same set of data shown in Table 1, a simple DTD is developed (Table 2). In Table 2, each element associates with tag <!ELEMENT>. Some elements contain a list of other elements, like address, which contains street, city, state, zip-code, and country. Some elements only contain text, like street, city, and state. If an element has attributes, the list of attributes is specified by <! ATTLIST, the element name, the attribute name, the attribute type, a default value>. For example, preferred is an attribute of element tel. Its type is Boolean ("true" or "false"), and its default value is "false". There are several special key words using in a DTD, such as "#PCDATA", "?", "*", and "+". "#PCDATA" stands for parsed character data and means the element can
Table 2: The DTD for the "employee"

```xml
<!ELEMENT employee (entry+)>  
<!ELEMENT entry (name,address*,tel*)>  
<!ELEMENT name(#PCDATA | fname | lnamt)>  
<!ELEMENT fname (#PCDATA)>  
<!ELEMENT lname (#PCDATA)>  
<!ELEMENT address (street, city, state, zip-code, country?)>  
<!ELEMENT street (#PCDATA)>  
<!ELEMENT city (#PCDATA)>  
<!ELEMENT state (#PCDATA)>  
<!ELEMENT zip-code (#PCDATA)>  
<!ELEMENT country (#PCDATA)>  
<!ELEMENT tel (#PCDATA)>  
<!ATTLIST tel preferred (true | false) "false")
```

contain text (Benoit Marchal, 1999). Key word "?" means the element is optional and it can have one or zero occurrence. Key word "*" means the element is optional and it can occur zero or more than one times. Key word "+" means the element is required and it must occur one or more than one times. For example "entry+" means an employee element must enclose one or more than one entry elements.

Although a DTD is usually treated as an XML data schema, and it may provide most of the information that an XML data schema provides, a DTD is not equal to an XML data schema. DTDs place minimal constraints on data, but XML data schemas place more specific constraints on data, like content constraints and datatype constraints. Content constraints determine where and when elements may be used, and datatype constraints govern what types of data may appear in an element (Ann Navarro, Chuck White, and Linda Burman, 1997).
The difference between a DTD and a standard data definition language (data schema) can be easily addressed by comparing the DTD shown in Table 2 and the HDDL show in Table 3. Table 3 displays a simple example of a hierarchical data definition language (HDDL). It defines the data fields of each record type, the data type of each field, any key constraints on the data fields and finally the parent and child relationship among records. The data types specified in the HDDL include string, integer, and so on. However, there is only one data type specified in the DTD, which is #PCDATA.

Compared to the HDDL and DTD examples, the language built by METEOR is not a data definition language. It works more like a database. It defines each major requirement in detail (Appendix A). Figure 5 displays the data structure that is abstracted from the language of METEOR. METEOR constructs a hierarchical structure for all courses required by a major. From top to bottom, a major is split into several advising units, each advising unit containing several groups, and each group including courses. Although METEOR does not define data objects or classes specifically, several components can be treated as data objects, such as major, advising unit, group, and course, because they have attributes and play an important role in the data structure.
Table 3: An example of HDDL. Child number specifies the left-to-right order of a child record type under its parent record type.

RECORD
NAME = DEPARTMENT
TYPE = ROOT
DATA ITEMS =
    DNAME CHARACTER20
    DNUMBER INTEGER
    KEY = DNAME
    KEY = DNUMBER
    ORDER BY DNAME

RECORD
NAME = DLOCATION
PARENT = DEPARTMENT
CHILD NUMBER = 1
DATA ITEMS
    LOCATION CHARACTER 15

RECORD
NAME = PROJECT
PARENT = DEPARTMENT
CHILD NUMBER = 2
DATA ITEMS
    PNAME CHARACTER 20
    PNUMBER INTERGER
    PDESCRIPTION CHARACTER 20
    KEY = PNAME
    KEY = PNUMBER
    ORDER BY PNAME
In METEOR, the attributes assigned to each data item are not sufficient to provide the information of major requirements (Table 4). That may be the main reason that METEOR fails to capture all the major requirements. A major only has six attributes, which are name, abbreviation, type, concentration, catalog, and required credit hours. An advising unit and a group contain two attributes each, name and required credit hours. A course has two attributes as well, course identification number and credit hours. However, there should be other requirements besides the minimum required credit hours for a major. These requirements could be minimum overall GPA, minimum credit hours earned at ETSU, minimum intensive courses, and so on. In order to
Table 4: The attributes of each data objects in METEOR

- **Major**
  - name, abbreviation, type, concentration, catalog, credit hours
- **Advising Unit**
  - name, credit hours
- **Group**
  - name, credit hours
- **Course**
  - course ID, credit hours

represent major requirements accurately, a high-level definition language has to be developed to represent the data structure. The definition language will be written in the form of DTD. In the language, more attributes have to be added to the course object, such as required grade, prerequisite information and intensive information. Required grade reflects that a student has to make certain grade to obtain the credits. Some courses require a higher grade, like "C", but other courses only require student to pass. For some types of major, students have to take certain courses in strict order. For those courses, prerequisites have to be specified. Intensive courses are categorized into writing intensive, communicating orally intensive, and using information technology intensive. Students must complete a minimum number of these intensive courses before graduating. For some types of advising unit, there are other requirements
besides required credit hours. For example, students with computer sciences major have to earn 2.5 GPA in the **Common Core Course unit**. Therefore, an attribute **Required GPA** must added to **advising unit**.

After the construction of a **major** DTD, a **major** XML document is developed by following the data structure specified in the DTD. Meanwhile, a **student transcript** DTD and **student transcript** XML document are created as well. If the major requires a minor, a **minor** DTD and a **minor** XML document must be developed as well. The next step is to integrate those two (or three) XML documents and demonstrate the student's academic progress through a user-friendly interface. In order to accomplish this, a series of extensible style sheets (XSL) had to be developed.

The extensible style sheet language is a powerful tool to transform, format and style XML documents. XSL can render XML documents on screen, on paper, or in an editor. Also, XSL can transform an XML document into another XML document, or to an HTML file. Finally, XSL can manipulate, compute, or retrieve data (XML content) from a XML document.

An XSL document is examined and executed by an XSL processor. The XSL processor takes an XML document and an XSL document as input, then outputs a new XML document or an HTML document based upon the transformation and formatting instruction in the XSL document.
There are many advantages of using XML to handle data. First, the data in an XML document can be posted on the Internet through XSL. Second, all the data can be loaded into only one XML document. There is no need for multiple tables, multiple classes, and foreign keys across tables. The main disadvantage of XML is slow execution of XSL.
Chapter 3

METHODOLOGY

The project is divided into two components. The first component is to develop a software (METEOR) that allows an advisor to specify the corresponding major requirements in the form of an XML file. The second component is to generate a new version of STAR. The new version of STAR is called STARX (STAR eXtensible version). STARX compares a student's record with the corresponding major requirements and creates an interface to display a student's academic progress. STARX also produces output in the form of checklists for graduation counselor to decide whether a student can graduate or else what classes a student needs to take towards graduation. This study focuses on the second section, developing STARX.

Before the software is developed, a data definition language for major requirements, minor requirements and student transcripts will be generated. Table 5 displays the major DTD, Table 6 shows the minor DTD and Table 7 shows the student DTD. Based on these three DTDs, a tree named major (Figure 6), a tree named minor (Figure 7) and a tree named student (Figure 8) are constructed to allow better view of those three sets of data.

The data structure major basically follows the hierarchical structure constructed in METEOR. A major contains several advising units, an advising
Table 5: DTD of "major"

<!ELEMENT major (majorName, majorAbbreviation, concentration, synthesis?, catalog, totalCreditHours, minorRequirement, ETSUCreditHours, ETSUMajorFieldCreditHours, residencyRequirement, overallGPA, majorGPA, majorCreditHours, totalWritingIntensive, majorFieldWritingIntensive, level3000WritingIntensive, totalOralIntensive, majorFieldOralIntensive, totalTechnologyIntensive, majorFieldTechnologyIntensive, advisingUnit+)>  
<!ELEMENT majorName (#PCDATA)>  
<!ELEMENT majorAbbreviation (#PCDATA)>  
<!ELEMENT concentration (#PCDATA)>  
<!ELEMENT synthesis (#PCDATA)>  
<!ELEMENT catalog (#PCDATA)>  
<!ELEMENT totalCreditHours (#PCDATA)>  
<!ELEMENT minorRequirement (#PCDATA)>  
<!ELEMENT ETSUCreditHours (#PCDATA)>  
<!ELEMENT ETSUMajorFieldCreditHours (#PCDATA)>  
<!ELEMENT residencyRequirement (#PCDATA)>  
<!ELEMENT overallGPA (#PCDATA)>  
<!ELEMENT majorGPA (#PCDATA)>  
<!ELEMENT majorCreditHours (#PCDATA)>  
<!ELEMENT totalWritingIntensive(#PCDATA)>  
<!ELEMENT majorFieldWritingIntensive (#PCDATA)>  
<!ELEMENT lever3000WritingIntensive (#PCDATA)>  
<!ELEMENT totalOralIntensive (#PCDATA)>  
<!ELEMENT majorFieldOralIntensive (#PCDATA)>  
<!ELEMENT totalTechnologyIntensive (#PCDATA)>  
<!ELEMENT majorFieldTechnologyIntensive (#PCDATA)>  
<!ELEMENT advisingUnit (unitName, unitCreditHours, unitGPA, group+)>  
<!ELEMENT unitName (#PCDATA)>  
<!ELEMENT unitCreditHours (#PCDATA)>  
<!ELEMENT unitGPA (#PCDATA)>  
<!ELEMENT group (groupName, groupCreditHours, groupGPA, sequence?, otherGroup?, otherRequirement?, level?, field?, course+)>  
<!ELEMENT groupName (#PCDATA)>  
<!ELEMENT groupCreditHours (#PCDATA)>  
<!ELEMENT groupGPA (#PCDATA)>  
<!ELEMENT sequence (#PCDATA)>  
<!ELEMENT otherGroup (#PCDATA)>  
<!ELEMENT otherRequirement (#PCDATA)>  
<!ELEMENT level (#PCDATA)>  
<!ELEMENT field (#PCDATA)>
Table 5: DTD of "major" (cont'd)

<!ELEMENT course (courseId, courseName, courseCreditHours, courseQpt, courseGrade, intensive, prerequisite+, selectPrerequisite?, pairNumber?, sequenceNumber?)>
<!ELEMENT courseId (#PCDATA)>
<!ELEMENT courseName (#PCDATA)>
<!ELEMENT courseCreditHours (#PCDATA)>
<!ELEMENT courseQpt (#PCDATA)>
<!ELEMENT courseGrade (#PCDATA)>
<!ELEMENT intensive (#PCDATA)>
<!ELEMENT prerequisite(preId, preQpts?, preGrade?)>
<!ELEMENT preId (#PCDATA)>
<!ELEMENT preQpts (#PCDATA)>
<!ELEMENT preGrade (#PCDATA)>
<!ELEMENT selectPrerequisite (number, prerequisite+)>
<!ELEMENT number (#PCDATA)>
<!ELEMENTN prerequisite (preId, preQpts, preGrade)>
<!ELEMENT preId (#PCDATA)>
<!ELEMENT preQpts (#PCDATA)>
<!ELEMENT preGrade (#PCDATA)>
<!ELEMENT pairNumber (#PCDATA)>
<!ELEMENT sequenceNumber (#PCDATA)>
Table 6: DTD of "minor"

<!ELEMENT minor (minorName, minorCreditHours, minorGPA, group+)>  
<!ELEMENT minorName (#PCDATA)>  
<!ELEMENT minorCreditHours (#PCDATA)>  
<!ELEMENT minorGPA (#PCDATA)>  
<!ELEMENT group (groupName, groupCreditHours, groupGPA, sequence?, otherGroup?, otherRequirement?, level?, field?, course+)>  
<!ELEMENT groupName (#PCDATA)>  
<!ELEMENT groupCreditHours (#PCDATA)>  
<!ELEMENT groupGPA (#PCDATA)>  
<!ELEMENT sequence (#PCDATA)>  
<!ELEMENT otherGroup (#PCDATA)>  
<!ELEMENT otherRequirement (#PCDATA)>  
<!ELEMENT level (#PCDATA)>  
<!ELEMENT field (#PCDATA)>  
<!ELEMENT course (courseId, courseName, courseCreditHours, courseQpt, courseGrade, intensive, prerequisite+, selectPrerequisite?, pairNumber?, sequenceNumber?)>  
<!ELEMENT courseId (#PCDATA)>  
<!ELEMENT courseName (#PCDATA)>  
<!ELEMENT courseCreditHours (#PCDATA)>  
<!ELEMENT courseQpt (#PCDATA)>  
<!ELEMENT courseGrade (#PCDATA)>  
<!ELEMENT intensive (#PCDATA)>  
<!ELEMENT prerequisite(preId, preQpts?, preGrade?)>  
<!ELEMENT preId (#PCDATA)>  
<!ELEMENT preQpts (#PCDATA)>  
<!ELEMENT preGrade (#PCDATA)>  
<!ELEMENT selectPrerequisite (number, prerequisite+)>  
<!ELEMENT number (#PCDATA)>  
<!ELEMENT prerequisite(preId, preQpts, preGrade)>  
<!ELEMENT preId (#PCDATA)>  
<!ELEMENT preQpts (#PCDATA)>  
<!ELEMENT preGrade (#PCDATA)>  
<!ELEMENT pairNumber (#PCDATA)>  
<!ELEMENT sequenceNumber (#PCDATA)>
Table 7: DTD of "student"

```xml
<!ELEMENT student(name, Id, major, concentration?, emphasis?, totalCreditHours, overallGPA, type, transfer?, nontransfer)>
<!ELEMENT name(#PCDATA)>
<!ELEMENT Id(#PCDATA)>
<!ELEMENT major(#PCDATA)>
<!ELEMENT concentration(#PCDATA)>
<!ELEMENT synthesis(#PCDATA)>
<!ELEMENT totalCreditHours (#PCDATA)>
<!ELEMENT overallGPA (#PCDATA)>
<!ELEMENT type (#PCDATA)>
<!ELEMENT nontransfer(semester+)>
<!ELEMENT semester(semesterName, course)>
<!ELEMENT semesterName(#PCDATA)>
<!ELEMENT course(courseld, courseName, grade, qpts, creditHours)>
<!ELEMENT courseld(#PCDATA)>
<!ELEMENT courseName(#PCDATA)>
<!ELEMENT grade(#PCDATA)>
<!ELEMENT qpts(#PCDATA)>
<!ELEMENT creditHours(#PCDATA)>
<!ELEMENT transfer(course+)>
<!ELEMENT course(courseld, courseName, grade, qpts, creditHours)>
<!ELEMENT courseld(#PCDATA)>
<!ELEMENT courseName(#PCDATA)>
<!ELEMENT grade(#PCDATA)>
<!ELEMENT qpts(#PCDATA)>
<!ELEMENT creditHours(#PCDATA)>
```
Figure 6: Tree of "major"
Figure 6: Tree of "major" (cont'd)
Figure 6: Tree of "major" (cont'd)
Figure 7: Tree of "minor"
Figure 7: Tree of "minor" (cont'd)
Figure 8: Tree of "student"
unit includes groups, and a group contains courses. However, the structure of a minor is somewhat different. A minor contains groups but not advising units, and a group includes courses. All courses within a student transcript fall into two categories, "transfer" and "nontransfer". Element transfer groups all courses that are not taken at ETSU. Element nontransfer includes all courses that are taken at ETSU. The courses within nontransfer are grouped again into semester, based on the term of course taking.

By the name of each child element of major, minor, advising unit, group, or course, the contents of those child elements are easily known. For example, majorName must mean the name of major. However, some of the names may not be very obvious, like minorRequirement, ETSUCreditHours, ETSUMajorFieldCreditHours, 3000LevelWritingIntensive, otherGroup, level, field, sequence, pairNumber, sequenceNumber, and selectPrerequisite. Element minorRequirement tells if the major requires a minor or not. ETSUCreditHours means the required credit hours taken at ETSU. ETSUMajorFieldCreditHours means the required credit hours taken in the major department at ETSU. 3000LevelWritingIntensive means the required number of writing intensive courses at 3000 and 4000 level. Because a group may contain other groups, element otherGroup provides the name of a sub group. For an elective group, courses can be elected by level, by field or by both, such as CSCI electives, 3000-4000 electives or CSCI 3000-4000 electives. Element level and element field is used to provide these kinds of information.
The content of **field** is usually a major's abbreviation, like CSCI. The possible value of **level** can be SX, EX, LX. X can be any integer from 1 to 4. S means "smaller", E means "equal to" and L means "larger". So, "E4" means that the elective level must be 4000. Because a **group** of natural science courses have to be taken in sequence or in pairs, element **sequence** is the child element of **group** to give the sequence requirement. Element **sequenceNumber** and element **pairNumber** are attached to natural science courses to illustrate which courses should be paired and which courses are in the same sequence. If a student does not have to finish taking all the prerequisite courses, but only several of them, those **prerequisites** must become the children of element **selectPrerequisite**. The child element **number** means the number of prerequisite course a student has to take from the list of prerequisite courses. Under element **prerequisite**, there are three child elements, **preID**, **preGrade**, **preQpts**. **PreID** stands for prerequisite course ID. **PreGrade** means required grade for the prerequisite course. **PreQpts** means required grade points.

An application written in Visual Basic will combine a **student** XML document and a corresponding **major** XML document into a final **evaluation** XML document (Appendix D). If the student claims a minor, the corresponding **minor** XML document will be added to **evaluation** XML file as well. Figure 9 displays the tree of **evaluation**. First, the VB application accepts the **major** XML file created by METEOR. Then, it retrieves a student's transcript from the SQL server and organizes the data into a **student** XML file by following the rules
After the *evaluation* XML document is generated, seven extensible style sheets are developed to transform the original XML document to a final XML file by integrating the two (or three) sets of data. XT is used as the XSL processor to execute those style sheets. Besides the elements in the original XML document, there are many new elements listed in the final XML document. Most of these new elements provide information about how well a student performed with
regards to each major requirement. For example, if there is an old element "required overall GPA ", the final XML file must include a new element "earned overall GPA".

Two of the new elements are total credit hours earned for a major and GPA earned for a major. Credit hours earned for the major are the sum of obtained credit hours, but exclude the credit hours earned for General Education advising unit and Free Elective advising unit. The new elements for ETSU residency include credit hours earned at ETSU, credit hours earned at ETSU in major field, and the number of semesters being full time student at ETSU. The new elements for writing intensive information include the number of writing intensive courses taken by a student, the number of writing intensive courses in major field taken by a student, and the number of 3000-4000 level writing intensive courses taken by a student. The new elements for oral intensive information include the number of oral intensive courses taken by a student, and the number of oral intensive courses in major field taken by a student. The elements for technology intensive information include the number of technology intensive courses taken by a student and the number of technology intensive courses in major field taken by a student. The final XML also lists the credit hours earned for each advising unit, credit hours earned for each group, earned GPA of each advising unit and earned GPA of each group. Finally, each advising unit, group and course are assigned a child element state. The possible state content for an advising unit and a group could be "finished", "not
finished" or "GPA not satisfied". The possible value of state for a course could be "done", "ready to take" "grade not satisfied", "prerequisite has not been taken", "prerequisite's grade not satisfied" or "determined by your advisor". The state of each object is determined by Petri net implementation in the style sheets.

After the final XML file has been created, one more style sheet is developed to transform the final XML file to an HTML file. The HTML file provides an interface to display a student's academic progress through a web browser (Appendix F). The interface contains two major parts. The first part is a series of checklists, and the second part is a series of detailed tables. The checklists only provide completed or uncompleted information for each requirement. For example, if a student completes a course, a check mark will be placed in front of the course Id. However, if a student wants to know the detailed information about that course, like grade, intensive, and others, he/she must click the course Id to go to the detailed table to read the information.

For the purpose of application testing, XML files of several major requirements are manually generated as the input to STARX. According to Mrs. Susan Burkey's suggestion, we will start with three majors: Nursing, Computer Sciences, and Early Education Development. Nursing has the simplest and most straightforward requirements. Early Education Development contains the most complicated requirements. Computer Sciences requirements are ordinary.
Chapter 4

SUMMARY

This study addressed problems identified in the previous studies and provides more detail information about students' academic progress in their college career. However, several limitations still exist. One of the problems is that STARX only allows a user to specify one major and one minor. If a student has multiple majors, then the user has to run the application for each major. The second problem is that the maximum number of advising units in a major has to be set before running the application, as well as the maximum number of groups in a advising unit and the maximum number of groups in a minor. However, the maximum number can be set as high as the user requires. This problem is caused by a limitation of HTML syntax for linking pages. The third problem is that STARX is not able to calculate the optimal GPA for a group with alternative courses. For example, if a student is only required to complete two courses within a group, but he/she complete three, STARX is unable to filter out the course with the worst grade and calculate GPA for the other two courses. Instead, STARX calculates the GPA of all three courses. Finally, the application can't move the excess credit hours from a group to Free Elective advising unit. It is up to the user to complete the task and determine if Free Elective is completed or not.

The accurateness and robustness of STARX could not be fully tested until the use of STARX for all majors of any catalog year. However, we can conclude
that XML is a feasible technique to achieve the goal for matching a student academic progress to their major requirement.
REFERENCES


East Tennessee State University Undergraduate Catalog, East Tennessee State University, Johnson City, Vol. LXXXII, No.3, April 1999.

International SGML User’s Group, 1997


APPENDIX A

DEFINITION LANGUAGE IN METEOR FOR COMPUTER SCIENCE MAJOR

Computer Science

MAJOR Computer Science
ABBREVIATION CSCI
TYPE BS
CONCENTRATION CSCI
CATALOG 1995
CREDIT HOURS 128

ADVISING UNIT
  Free Electives (14)
  General education (46)
  CS Concentration (6)
  Common Core (44)
  Additional Requirements (18)

END

GROUP Free Electives
CREDIT HOURS (14)
  COURSE ????? ???? (?)

END

GROUP General Education
CREDIT HOURS (46)
  GROUP Arts and the Artistic Vision (3)
  GROUP Heritage (9)
  GROUP Humanities (3)
  GROUP Identity Ethics and Social Responsibility (3)
  GROUP Institutions and Society (6)
  GROUP Science (8)
  GROUP Using Information Tech (2)
  GROUP Using Math (4)
  GROUP Writing (6)
  GROUP Physical (3)

END

GROUP Arts and the Artistic Vision
CREDIT HOURS (3)
  COURSE ARTA 2040 (3)
COURSE ARTA 3040 (3)
COURSE HUMT 2310 (3)
COURSE HUMT 2320 (3)
COURSE MUSC 2100 (3)
COURSE MUST 2110 (3)
COURSE PEXS 3500 (3)
COURSE THEA 1500 (3)
END

GROUP Heritage
CREDIT HOURS (9)
COURSE *HIST 2010 (3)
COURSE *HIST 2020 (3)
COURSE ENGL 2220 (3)
COURSE ENGL 2240 (3)
COURSE ENGL 2260 (3)
COURSE ENGL 2262 (3)
END

GROUP Humanities
CREDIT HOURS (9)
COURSE ENGL 2250 (3)
COURSE ENGL 3280 (3)
COURSE ENTC 3020 (3)
COURSE HIST 1010 (3)
COURSE HIST 1020 (3)
COURSE PHIL 2640 (3)
GROUP Heritage (3)
GROUP Arts and the Artistic Vision (3)
GROUP Identity Ethics and Social Responsibility (3)
END

GROUP Identity Ethics and Social Responsibility
CREDIT HOURS (9)
COURSE ENGL 3150 (3)
COURSE PHIL 2020 (3)
COURSE PHIL 2025 (3)
COURSE PHIL 2210 (3)
COURSE PSCI 1110 (3)
COURSE SOAA 2020 (3)
COURSE WMST 2010 (3)
END

GROUP Institutions and Society
CREDIT HOURS (6)
GROUP Economics
COURSE GEOG 1012 (3)
COURSE PSCI 1120 (3)
COURSE PSYC 1310 (3)
COURSE SOAA 1020 (3)
COURSE SOAA 1240 (3)
END

GROUP Economics
CREDIT HOURS (3)
COURSE ECON 1050 (3)
COURSE ECON 2210 (3)
END

GROUP Science
CREDIT HOURS (8)
GROUP Gen Chemistry (8)
GROUP Gen Biology (8)
GROUP Gen Physics (8)
END

GROUP Gen Chemistry
CREDIT HOURS (8)
COURSE CHEM 1110/1111 (4)
COURSE CHEM 1120/1121 (4)
END

GROUP Gen Biology
CREDIT HOURS (8)
COURSE BISC 1100/1101 (4)
COURSE BISC 1200/1201 (4)
COURSE BISC 1300/1301 (4)
END

GROUP Gen Physics
CREDIT HOURS (8)
COURSE PHYS 2110/2111 (4)
COURSE PHYS 2120/2121 (4)
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GROUP Intro. Chemistry
CREDIT HOURS (4)
COURSE CHEM 1320/1321 (4)
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GROUP Additional Requirements
CREDIT HOURS (18)
  GROUP   Additional Mathematics (10)
  GROUP   Additional Science (8)
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GROUP Additional Mathematics
CREDIT HOURS (10)
  COURSE   MATH 1120 (4)
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CREDIT HOURS (8)
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  COURSE   BISC 1200/1201 (4)
  COURSE   BISC 1300/1301 (4)
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APPENDIX B

A SAMPLE OF DLAM FILE

cscicsci94.dlm

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**CSCI-Core (44)**

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**CSCI-CS Concentration (6)**

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# APPENDIX C

A SAMPLE OF CHECKLIST PRODUCED BY STAR

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Student ID:  
Major: CSCI  
Concentration: CSCI

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Writing (6)  
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THEA 1500 3  C

Identity (3)
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PHIL 2020 3
PHIL 2025 3
PHIL 2210 3  B
PSCI 1110 3
SOAA 2020 3
WMST 2010 3

Humanities (3)
ENGL 2250 3
ENGL 3280 3
ENTC 3020 3
HIST 1010 3  B-
HIST 1020 3
PHIL 2640 3

Institutions (6)
ECON 1050 3
ECON 2210 3  B
GEOG 1012 3
PSCI 1120 3
PSYC 1310 3  C+
SOAA 1020 3  B-
SOAA 1240 3

CSCI-Core (44)

Requirements (44)
CSCI 1510 3  B+
CSCI 1250 4  C+
CSCI 1260 4
CSCI 2150 3
CSCI 2160 4
CSCI 2210 4
CSCI 2230 4
CSCI 3220 3
CSCI 3250 3
CSCI 3350 4
CSCI 4417 3
CSCI 4717 3
CSCI 4727 3

CSCI-CS Concentration (6)

Course (6)
*MATH 2250 3
CSCI 4257 3
CSCI 4267 3
APPENDIX D

A SAMPLE OF "EVALUATION" XML FILE

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Course with (*) only open to nonscience majors.

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- **Qpt**: 4
- **Grade**: D
- **Intensive**: Not Defined
- **Prerequisite**: None

Course:
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- **Course Name**: Astronomy II
- **Credit Hours**: 4
- **Qpt**: 4
- **Grade**: D
- **Intensive**: Not Defined
- **Prerequisite**: None

Course:
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- **Course Name**: Biology for Non-majors I
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APPENDIX E

STARX USER'S MANUAL

Hardware and Software Specification

STARX can be run via Windows. The system is designed to be used with a mouse. However, if the user does not have a mouse, tab key can be used.

User Manual

Student ID Screen

To evaluate a student's academic progress, you have to specify a student's id or last name first in Figure 10. Then click "Find" button. The student id contains nine digits. If the student id or the last name is valid, the student data will be displayed in the DATAGRIB table underneath and pointed by an arrow. Otherwise, a message box will pop up to tell that the student is not in the list (Figure 11). Under the DATAGRIB table, a message shows the student's major and catalog year. There are four buttons at the bottom. The user must hit the "Open a major file" button first, otherwise a message box will pop up to tell you to do so (Figure 12). After the "Open a major file" button is clicked, the "Open" dialog box pops up (Figure 13). The user selects a corresponding file from an appropriate directory. For example, if the student is in computer science
Figure 10: Student ID Screen

Figure 11: Invalid Student ID Message Box
Figure 12: Invalid Button Message Box

Figure 13: "Open" Dialog Box
concentration, the file "csci_cs.xml" should be opened. If the user accidentally selects a *minor* XML file, a message box will pop up to tell that the selected file is not a *major* XML files (Figure 14). After the *major* file is open, the "Open" dialog box will disappear. Then, the user follows the same procedure to open a *minor* file if the student claims a minor. The user hits the "Process" button, a "Progress Evaluation" screen shows up.

![Invalid File Message Box](image)

**Figure 14: Invalid File Message Box**

*Progress Evaluation Screen*

The "Progress Evaluation" screen (Figure 15) tells the user that the *Evaluation* XML file for the student is created and asks the user to click "OK" button to view the progress or click "Cancel" to go back to "Student ID Screen". If the user clicks "OK", a WebBrowser screen pops up.
The WebBrowser screen displays the final HTML file, which provides the student progress information (APPENDIX F). The screen contains two major parts. The first part is a series of checklists, and the second part is a series of detailed tables. The checklists only provide completed or uncompleted information for each requirement. For example, if a student completes a course, a check mark will be placed in front of the course Id. A user can also add a check mark to the WebBrowser screen or delete a check mark from the WebBrowser screen. If a student wants to know the detailed information about
that course, like grade, intensive, and others, he/she must click the course Id to go to the detailed table to read the information.
APPENDIX F

WEBBROWSER SCREEN OF THE FINAL HTML FILE
ETSU Student Academic Progress Evaluation

Index

- Student Information (DINA WISE)
- Residency Check List
- Intensive Check List
- Major Course Check List
- Minor Course Check List

Residency Check List

- Credits Earned at ETSU
- Credits Earned at ETSU Major Field
- Residency Requirement

Intensive Check List

- Writing Intensive
  - Total Writing Intensive
  - Major Field Writing Intensive
  - Level 3000-4000 Writing Intensive
- Oral Intensive
  - Total Oral Intensive
  - Major Field Oral Intensive
- Using Information Technology Intensive
  - Total Using Information Technology Intensive
  - Major Field Using Information Technology Intensive
Major Course Check List

- **General Education: 46 credits**
  - **Using Mathematics: 3 credits**
    - MATH1032 Calculus for Business
    - MATH1060 Analytic Geometry and Differential Calculus
    - MATH1080 Probability and Statistics
    - MATH1110 Calculus
  - **Science: 8 credits**
    - ASTR1015 Astronomy I
    - ASTR1025 Astronomy II
    - BISC1040 Biology for Non-majors I
    - BISC1041 Biology for Non-majors I Lab
    - BISC1050 Biology for Non-majors II
    - BISC1051 Biology for Non-majors II Lab
    - BISC2100 Principles of Biology I
    - BISC2101 Principles of Biology I Lab
    - BISC2200 Principles of Biology II
    - BISC2201 Principles of Biology II Lab
    - BISC2300 Principles of Biology III
    - BISC2301 Principles of Biology III Lab
    - CHEM1110 General Chemistry
    - CHEM1111 General Chemistry Lab
    - CHEM1120 General Chemistry
    - CHEM1121 General Chemistry Lab
    - CHEM1320 Introductory Chemistry
    - CHEM1321 Introductory Chemistry Lab
    - PHYS2110 General Physics I
    - PHYS2111 General Physics I Lab
    - PHYS2120 General Physics II
    - PHYS2121 General Physics II Lab
    - GEOL1001 Physical Geology
    - GEOL1002 Historical Geology
    - GEOL1010 Earth Science: Weather and Climate
    - GEOL1011 Earth Science: Landforms and Processes
    - HSCI1210 Anatomy and Physiology I
    - HSCI1211 Anatomy and Physiology I Lab
    - HSCI1220 Anatomy and Physiology II
    - HSCI1221 Anatomy and Physiology II Lab
    - CHEM1000* Science and Society I
    - PHYS1010* Science and Society II
Student: DINA WISE

- **BISC1020** Science and Society III

- **Arts and the Artistic Vision:** 3 credits
  - ARTA2040 Art History Survey I
  - ARTA3040 Art History Survey II
  - HUMT2310 Introduction to the Humanities I
  - HUMT2320 Introduction to the Humanities II
  - MUSC2100 Music Appreciation
  - MUST2110 History of Jazz
  - PEXS3500 Dance as Human Experience
  - THEA1500 Introduction to the Theatre

- **Heritage:** 6 credits
  - HIST2010 The United State to 1877
  - HIST2020 The United State Since 1877

- **Heritage Elective:** 3 credits
  - ENGL2220 American Major Authors
  - ENGL2240 British Major Authors
  - ENGL2260 Literature of Western Civilization
  - ENGL2262 World Literature

- **Humanities Elective:** 3 credits
  - HIST1010 World History and Civilization to 1500
  - HIST1020 World History and Civilization Since 1500
  - PHIL2640 Science and the Modern World
  - ENGL2250 Great Books
  - ENGL3280 Mythology

  Group: Arts and the Artistic Vision, 0 credits are available

  Group: Heritage, 0 credits are available

  Group: Heritage Elective, 0 credits are available

  Group: Identity Ethics and Social Responsibility, 0 credits are available

- **Identity Ethics and Social Responsibility:** 3 credits
  - ENGL3150 Literature, Ethics, and Values
  - PHIL2020 Values and Society
  - PHIL2025 Self and World
  - PHIL2040 Philosophy as Conversation
  - PHIL2210 Intro. to the Study of Religion
  - PSCI1110 Political Life
  - SOAA2020 Social Problems and Human Values
  - WMST2010 Introduction to Women's Studies
Institutions and Society: 6 credits
- ECON1050 Economics and Society
- ECON2210 Principles of Economics Part I
- GEOG1012 Introduction to Cultural Geography
- PSCI1120 Introduction to American Government
- PSYC1310 Introduction to Psychology
- SOAA1020 Introduction to Sociology
- SOAA1240 Introduction to Cultural Anthropology

Using Information Technology: 2 credits
- CSCI1100 Using Information Technology

Writing: 6 credits
- ENGL1110 Critical Reading and Expository Writing
- ENGL1120 Critical Thinking and Argumentation

PEXS1XXX: 1 credits

CSCI Common Core: 50 credits
- CSCI1150 Intro. to Computer Science I
- CSCI1250 Intro. to Computer Science II
- CSCI1510 Student in University
- CSCI2150 Computer Organization
- CSCI2160 Assembly Language
- CSCI2210 Data Structure
- CSCI2230 File Processing
- CSCI3220 Data Base Management
- CSCI3250 Software Engineering I
- CSCI3350 Software Engineering II
- CSCI4417 Data Communications
- CSCI4717 Computer Architecture
- CSCI4727 Operating Systems

CSCI Elective: 6 credits
- CSCI1010 COMPUTER CONCEPT
- CSCI1941 PROGRAMMING II
- CSCI1901 DATA PROC MGMT
- CSCI1962 EQUIPMENT SURVEY
- CSCI1270 BUS ORIENT PRGRM
- CSCI1200 INTRO TO "C"
- CSCI3710 OS JOB CNTRL LNG
- CSCI4957 SP TOP COMP SCI
**CS Concentration: 36 credits**

**Math: 17 credits**
- MATH1110 Calculus
- MATH1120 Calculus II
- MATH2180 Foundation of Prob. and Stat.
- MATH2250 Linear Algebra
- MATH2710 Discrete Structures

**CSCI: 3 credits**
- CSCI4257 Numerical Analysis
- CSCI4267 Numerical Linear Algebra

**Science I: 8 credits**
- CHEM1110 General Chemistry I
- CHEM1111 General Chemistry I Lab
- CHEM1120 General Chemistry II
- CHEM1121 General Chemistry II Lab
- BISC2100 Principles of Biology I
- BISC2101 Principles of Biology I Lab
- BISC2200 Principles of Biology II
- BISC2201 Principles of Biology II Lab
- GEOL1001 Physical Geology
- GEOL1002 Historical Geology
- PHYS2110 General Physics I
- PHYS2111 General Physics I Lab
- PHYS2120 General Physics II
- PHYS2121 General Physics II Lab

**Science II: 8 credits**
- CHEM1110 General Chemistry I
- CHEM1111 General Chemistry I Lab
- CHEM1120 General Chemistry II
- CHEM1121 General Chemistry II Lab
- CHEM1320 Organic and Biochem
- CHEM1321 Organic and Biochem Lab
- BISC2100 Principles of Biology I
- BISC2101 Principles of Biology I Lab
- BISC2200 Principles of Biology II
- BISC2201 Principles of Biology II Lab
- BISC2300 Principles of Biology III
- BISC2301 Principles of Biology III Lab
- GEOL1001 Physical Geology
- GEOL1002 Historical Geology
PHYS2110 General Physics I
PHYS2111 General Physics I Lab
PHYS2120 General Physics II
PHYS2121 General Physics II Lab
PHYS2610 Technical Physics I
PHYS2620 Technical Physics II

**Free Elective: 9 credits**

**Free Elective Group: 9 credits**
- MATH1040 PRE-CALCULUS
- MATH9084 SYMB LOG and SET THEORY
- MGMT9043 ADMN THEORY
- PHYS1010 SCIENCE AND SOCIETY II
- PHYS9016 PHYSICAL SCIENCE II
- ECON2220 PRIN OF ECONOMICS II
- ENGL9089 COMMUNICATION SKILLS
- MGMT9012 INTRO TO MGMT
- OFMG9002 BUS MATH
- PEXS9005 PHYS ED ACTIVITIES
- SPAN1013 BEGINNING SPANISH I
- MATH1070 INTEGRL CAL TECH
- ACCT2010 PRINCIPLES OF ACCT I
- MATH1010 COLLEGE ALGEBRA
- ENTC2010 TECH WRITING
- MGMT3220 MGMT INFORMATION SYS

**Minor Course Check List**
- No Minor Claimed

**Student**

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<td>DINA WISE</td>
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<td>Required Credits Earned at ETSU</td>
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<td>Earned Credits at ETSU in Major Field</td>
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Residency Requirement:
- Finish 12 credit hours in each of two semester during the junior and senior years, including the last semester
- Full semester at ETSU: 0 Full Semester

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### Major Information
### Advising Unit -- General Education

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*Courses in Group: Using Mathematics*

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### Science

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*Courses in Group: Science*

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[Back to Major Check List]
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### Arts and the Artistic Vision

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State: Finished

*Courses in Group: Arts and the Artistic Vision*

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### Heritage

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### Heritage Elective

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**State** | Finished

### Courses in Group: Heritage Elective

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### Humanities Elective

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---|---|---|---|---|---|---|
**Required GPA** | N/A | **Earned GPA** | 0, (this group contains subgroups, GPA may not be accurate.)
**State** | Not Finished

### Courses in Group: Humanities Elective

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#### Identity Ethics and Social Responsibility

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Back to major Check List

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<tr>
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<td>CSCI2210</td>
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<td>No</td>
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</tr>
<tr>
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<td>CSCI2210</td>
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**CSCI Elective**

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*Courses in Group: CSCI Elective*

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<th>Course ID</th>
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<td>CSCI1270</td>
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<td>CSCI4957</td>
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### Advising Unit—CS Concentration

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### Math

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*Courses in Group: Math*

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<th>Prerequisite</th>
<th>Grade</th>
<th>Transfered?</th>
<th>State</th>
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<tr>
<td>MATH1110</td>
<td>4</td>
<td>Not Defined</td>
<td>Two years of high school algebra</td>
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<td>No</td>
<td>Prerequisite (MATH1110) has not been taken!</td>
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<td>MATH1120</td>
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<td>MATH1110</td>
<td>------</td>
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<tr>
<td>MATH2180</td>
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<td>MATH1110 MATH1120</td>
<td>------</td>
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<tr>
<td>MATH2250</td>
<td>3</td>
<td>Not Defined</td>
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<td>------</td>
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<td>Ready To Take</td>
</tr>
<tr>
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<td>MATH1060 MATH1110 Note*: must complete 1 course(s) from (MATH1060/MATH1110/)</td>
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### CSCI

Back to major Check List
<table>
<thead>
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*Courses in Group: CSCI*

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*Back to major Check List*

**Science I**

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<td>Notes*</td>
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*Courses in Group: Science I*

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<th>Grade</th>
<th>Transferred?</th>
<th>Pair number</th>
<th>Sequence number</th>
<th>State</th>
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<tbody>
<tr>
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<tr>
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<td>Not Defined</td>
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<td>Course ID</td>
<td>Credit Hours</td>
<td>Intensive</td>
<td>Prerequisite</td>
<td>Grade</td>
<td>Transferred?</td>
<td>Pair number</td>
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<td>State</td>
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<td>No</td>
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<td>Ready To Take</td>
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<tr>
<td>CHEM1111</td>
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<td>Not Defined</td>
<td>None</td>
<td>-----</td>
<td>No</td>
<td>1</td>
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<tr>
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<tr>
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**Required Credit Hours**: 8

**Earned Credit Hours**: 0

**Required GPA**: N/A

**Earned GPA**: 0

**Notes**: Courses with the same pair number must be both completed to obtain the credits

**State**: Not Finished

---

**Back to major Check List**

---

### Science II

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**Notes**: Courses with the same pair number must be both completed to obtain the credits

**State**: Not Finished

---

### *Courses in Group: Science II*

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</thead>
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<tr>
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<tr>
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<td>-----</td>
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### Back to major Check List

#### Advising Unit: Free Elective

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State: Finished

[Back to Major Check List](#)
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</table>
VITA

Zhujun Hou

Personal Data: Date of Birth: September 1, 1968
Place of Birth: Guangzhou, P. R. China
Marital Status: Married

Education: Jinan University, Guangzhou, P. R. China; Biological Engineering, B.S., 1990
East Tennessee State University, Johnson City, Tennessee; Biology, M.S., 1995
East Tennessee State University, Johnson City, Tennessee; Computer and Information Science, M.S., 2001

Professional Experience: Research Assistant, Department of Biological Science, East Tennessee State University, Tennessee, 1993-1995
Teaching Assistant, Zoology Department, Duke University, Durham, 1995-1996
Teaching Assistant, Department of Computer and Information Science, East Tennessee State University, Tennessee, 1999-2000

Honor: Upsilon Epsilon, 1999