LSC Use Only Proposal No: LSC Action-Date:	*UWUCC Use Only* Proposal No: 11-124K. UWUCC Action-Date: AP-4/3/12 Senate Action Date: App-9/9/14

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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Proposing Department/Unit Computer Science	Phone 7-4478

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

☑ New Course □ Course Prefix Change □ Course Deletion

□ Course Revision □ Course Number and/or Title Change □ Catalog Description Change

Current course prefix, number and full title:____________________

Proposed course prefix, number and full title, if changing: COSC 465 Distributed Processing and Web Services

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

□ Learning Skills □ Knowledge Area □ Global and Multicultural Awareness □ Writing Across the Curriculum (W Course)

□ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

□ Global Citizenship □ Information Literacy □ Oral Communication

□ Quantitative Reasoning □ Scientific Literacy □ Technological Literacy

3. Other Designations, as appropriate

□ Honors College Course □ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

□ Catalog Description Change □ Program Revision □ Program Title Change □ New Track

□ New Degree Program □ New Minor Program □ Liberal Studies Requirement Changes □ Other

Current program name:____________________

Proposed program name, if changing:____________________

5. Approvals	**Signature**	**Date**
Department Curriculum Committee Chair(s)		2/6/12
Department Chairperson(s)	Wm. [illegible]	2/10/2012
College Curriculum Committee Chair	Anne Kondo	3/7/12
College Dean		3/12/12
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Sechrist Revised 8/19/13	4/24/12

Part II. Description of Curriculum Change

1. Syllabus of Record

I. Catalog Description

COSC 465 Distributed Processing and Web Services 3c-0l-3sh

Prerequisites: COSC 365 or COSC 310 and permission of instructor

Provides advanced study into architecture of Internet systems and the process of developing distributed computer applications running on the Internet and/or other networks. Presents an in-depth understanding of distributed processing technologies including socket programming, RPC, RMI, EJB's, DCOM, .NET, SOAP, and Web Services. Emphasis is placed on the use of XML to support multi-party heterogeneous distributed applications and includes XML fundamentals (e.g., DTD's, XML schemas, XPath, XSLT, SAX, and DOM) and web services (e.g., SOAP, WSDL, UDDI, and ebXML). Students will complete hands-on projects utilizing mentioned technologies.

II. Course Outcomes

Upon successful completion of the course, the student will be able to:

A. Demonstrate an understanding of and ability to use distributed processing technologies such as:
1) Socket based communications
2) Remote Procedure Calls (RPC)
3) Remote Method Invocation (RMI)
4) EJB's, DCOM, CORBA, and/or .NET

B. Demonstrate an understanding of and ability to use XML technologies including:
1) DTD's and XML Schemas
2) SAX, DOM, and/or other XML parsers
3) XPath , XSLT and/or XQuery

C. Demonstrate an understanding of and ability to use Web Services technologies including:
1) SOAP
2) UDDI
3) WSDL and/or ebXML

D. Discuss problems and solutions related to the development of multi-party heterogeneous distributed systems.

III. Tentative Course Outline

1. Review of Internet and Network Programming. 3 hrs.

Review of networking, the Internet, and the World Wide Web. Brief coverage of the history and evolution of the Internet and the various technologies that emerged. Comparison of two tier (client/server), three-tier, and N-tier architectures. The request and service relationship between two processes over a network. Review of TCP/IP sockets, inter-process communication (IPC), serialization, remote procedure calls (RPC), and remote method invocation (RMI).

2. Review Dynamic Web Programming. 3 hrs.

Review the technologies related to the web container of the J2EE environment including servlets, Java Server Pages (JSP), JavaBeans, and JSP custom tag libraries. Examination of several sample applications such as an On-Line store application, E-Books, and Web-based Document Management. Hands on exercises using the Apache Tomcat Web container.

3. XML Basics. 3 ½ hrs.

Introduction to XML concepts and overview of XML usage. Methods to define XML vocabularies including Document

Type Definitions (DTD's) and XML Schemas. Use of namespaces. Introduction to XSL Transformations and XPath. Exercises in defining an XML schema, XML documents conforming to the Schema, and XSLT to transform documents into HTML for display.

4. Enterprise JavaBeans (or equivalent). 9 hrs

   In-depth study of Enterprise JavaBeans including session (stateful and stateless), entity (component vs. bean managed persistence), and message-driven beans. Configuration and deployment of EJB applications. Role of Java Naming and Directory Interface (JNDI). Interaction between web components and EJBs. Direct client use of EJBs. Hands on exercises using the reference implementation included with J2EE version of Java. Relationship of EJB to RMI and CORBA.

5. Mid-Term Exam 1 ½ hrs

6. XML Programming. 5 hrs

   Introduction to XML parsers including SAX, DOM, and JAXP. Use of DOM API to dynamically construct XML document in memory and then generate an XML document. Revisit XSLT Transformation. Hands-on exercises to parse and generate XML documents and send them between distributed processes.

7. Simple Object Access Protocol (SOAP). 7 hrs

   In-depth study of the Simple Object Access Protocol (SOAP) including the SOAP message structure (Envelope, Header, and Body), SOAP faults, data encoding, message styles, and encoding styles. Comparison of SOAP to RMI, CORBA, and other distributed technologies. Coverage of the SOAP specification version 1.2. Request/Response, notification, and one way messaging. SOAP over HTTP. Use of SOAP Intermediaries. Hands on exercises using the Apache Axis SOAP implementation.

8. Web Services. 7 ½ hrs

   Introduction to Service Oriented Architecture (SOA) concept. Use of Web Services Definition Language (WSDL) to define a web service. Implementation of web services using Java (or alternative). Exposing plain Java objects and/or EJB's as web services. Relationship to SOAP. Use of Universal Description, Discovery, and Integration (UDDI) to publish and discover web services. Hands on exercises to define, implement, and use web services.

9. Other technologies and future directions. 1 ½ hrs

   Introduction to EbXML. EbXML business process specifications. Consideration of multi-party global asynchronous applications. Non-repudiation and other legal issues. Other implications and future directions.

Total	42 hours
Final	2 hours

IV. Evaluation Methods

The final grade for the course will be determined as follows:

Exams	
Mid term	100 points
Quizzes (4)	25 points each
Final	100 points
Assignments	
Dynamic Web Application	50 points
XML Schema, Documents and XSTL	50 points
EBJ Application	50 points
XML Programming	50 points
SOAP Application	50 points
Web Services Application	50 points

Grading Scale: The following scale for the sum of the above scores will be used.

540 and above	A
480 – 539	B
420 – 479	C
360 – 419	D
359 and below	F

V. Required/Supplemental Textbooks, Software, Readings, and other materials

Required

Books:

Qian, Allen, Gan, and Brown, *Java Web Development Illuminated,* Jones and Bartlett, 2007.

Software:

J2EE reference implementation, Oracle, available at http://www.oracle.com

Eclipse, Eclipse Foundation, available at http://www.eclipse.org

Jakarta Tomcat, Apache Software Foundation, available at http://tomcat.apache.org

Jakarta Axis, Apache Software Foundation, available at http://ws.apache.org/axis

VI. Bibliography

1. Harold, Elliotte Rusty, Processing XML with Java™: A Guide to SAX, DOM, JDOM, JAXP, and TrAX, Addison-Wesley Professional, 2001

2. Jayasinghe , Deepal and Azeez, Afkham, Apache Axis2 Web Services, Packt Publishing, 2011

3. Khare, Tanuj, Apache Tomcat 7 Essentials, Packt Publishing, 2012

3. Kotok, Alan and Webber, David R. R., ebXML: The New Global Standard for Doing Business Over the Internet, Sams, 2001

4. Richardson, Leonard and Ruby, Sam, RESTful Web Services, O'Reilly Media, Inc., 2007

5. Seely, Scott, SOAP: Cross Platform Web Service Development Using XML, Prentice Hall, 2001

2. Course Analysis Questionnaire

A. Details of the Course

A1. This course an upper level elective that presents other aspects of Internet architecture and programming that cannot be covered in COSC 365 Web Architecture and Application Development. It is an upper level elective for all tracks in Computer Science. This course is not intended to be a Liberal Studies course.

A2. Course provides minimal overlap with COSC 365. Applicable content of 365 is briefly reviewed to establish context. No content is removed from 365. Topics that were briefly introduced in 365 are covered in-depth in this course.

The following tracks in Computer Science will be modified. No programs outside of Computer Science are affected:

Bachelor of Arts:
Upper Level Electives by Categories – Add COSC 465 under a new category Distributed Systems.

Bachelor of Science–Computer Science Languages and Systems track:
Select 12 cr. from the following elective courses – Add COSC 465.

Bachelor of Science–Applied Computer Science track:
Upper Level Electives by Categories – Add COSC 465 under a new category Distributed Systems.

Bachelor of Science–Information Assurance track:
Upper Level Electives– Add COSC 465.

A3. This course has not been previously offered.

A4. This course is not dual listed. However, this course is a good candidate to be dual listed in the future. It is a course in an area of high demand within industry. At the time this course is dual listed, Computer Science graduates working within commutable distance to IUP may take this course. Credits are transferrable to graduate programs of other institutions. Furthermore, when dual listed, this course could be considered as an elective by graduate students in the Eberly College of Business and Information Technology.

A5. This course is not to be taken for variable credit.

A6. Content is covered in courses are offered at the following institutions, among others:
Loyola University: Web Services Programming
UBMC Honors University in Maryland: Mastering XML for SOA & Web Services
University of California, Fullerton: Client / Server Systems with Java
University of California, Fullerton: Java Enterprise Application Development
Webster University: Web Services Protocols (graduate level in MBA)
University of Colorado: Web Services
University of Colorado: XML Technology, Tools, Standards

A7. Course content is not recommended or required by a professional society, accrediting agency, or law. However, the content is of high demand within industry. Major software vendors including Oracle, Microsoft, and IBM provide infrastructure tools in support this content. Content is a major area in international standards bodies including World Wide Web Consortium (W3C), Object Management

Group (OMG), and Organization for the Advancement of Structured Information Standards (OASIS out of the United Nations).

B. Interdisciplinary Implications

B1. This course will be taught by one instructor.

B2. Course content has minimal overlap with any courses of any college. Content has minimal overlap with the prerequisite to provide an initial context. Course may be considered for as an elective by students in the MBA program who possess programming skill and obtain permission of the instructor.

B3. This course is not cross-listed.

C. Implementation

C1. No new faculty are required to teach this course. Current faculty will initially offer this course and it will be scheduled on a rotating upper level elective basis whose frequency will be based on student demand. The content of this course is becoming more relevant to the demands of industry than the content of COSC 444 Productivity Tools and Fourth Generation Languages course (whose industry demand has declined in recent years). Therefore this course will gradually replace some of the slots currently allocated to the course rotation sequence of COSC 444. This course will be counted as one preparation and three hours of equated workload.

C2. Other resources:

a. Current space allocations are adequate to offer this course.
b. No special equipment is needed for this course.
c. Current laboratories are sufficient for this course.
d. Library holdings are adequate.
e. The required software is open source and available for download.

C3. No grant funds are necessary to provide supplementary materials.

C4. This course will be offered on a rotating basis as an upper level elective based upon student interest.

C5. When schedule, only one section will be offered in a semester.

C6. Up to 25 students can be accommodated in this class in which students do a considerable amount of programming.

C7. No professional society recommends enrollment limits or parameters for this course.

C8. This course does not involve the use of distance education.

D. Miscellaneous

No additional information is necessary