CMP3204 Distributed Information Systems

Period per Week			Contact Hour per Semester	Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

Many computer applications are confronted with ever increasing volumes of data which must be managed, accessed, and processed efficiently. Typical cases arise in the fields of e-Health, banking and insurance, e-Science, digital libraries, etc. From the data management point of view, this has led to a radical shift from centralized, monolithic database systems towards distributed information systems. For such systems, it is of utmost importance:

- To have sophisticated mechanisms and protocols for coordination and access of distributed resources
- To have appropriate infrastructure which support distributed applications

This course is designed to provide a firm understanding of the basic problems associated with distributed information systems and expose the students to the different architectural paradigms, as well as practical experimentation with selected systems.

Objectives

- To introduce the student to the concept of distributed information systems
- To expose the student to fundamentals of information integration and interoperability, federation/mediator/brokering architectures, agent-oriented systems agent-oriented systems, query formulation and processing, semi-structured and multimedia data management, metadata, and knowledge management.
- To introduce the student to the practical imperatives of the languages and protocols for developing advanced/distributed/global information systems and their applications.
- To expose the student to recent advances in technology and research in database and intelligent systems

Course Content

1. ***Introduction***
   - What are Distributed Information Systems (IS)?
   - Evolution of IS
   - IS Architectural Paradigms
2. ***Distributed Transactions***
   - Atomicity and Concurrency Control in a Distributed Setting
   - TP-lite: Application Login Inside Databases
   - Practical Exercise: Distributed Transactions & 2PC in DBMSs and in Java
3. ***Middleware***
   - Is middleware more then the "/" in client/server?
   - Practical Exercise: CORBA
4. ***Container Architectures, J2EE***
   - Enterprise Java Beans
   - Practical Exercise: JBoss
5. ***Web Services***
   - How can Web Services be invoked?
   - How can Web Services be described?
   - Practical Exercise: SOAP & WSDL
6. ***(Web) Service COMPOSITION***
   - How can (web) Services be Combined to Complex applications?
   - Demo: BPEL4WS / IBM WebSphere
   - Practical Exercise: OSIRIS
7. ***Semantic Web Services***
   - How can the Description of a Web Service (WS) be Enriched with Semantic Information?
   - Demo: OWL-S

8. ***Message-Oriented Middleware***
    - Asynchronous interactions
    - Demo: IBM WebSphere MQSeries

Learning Outcomes

On completion of this course, the student will be able to:

- Demonstrate a firm understanding of the concept of distributed information systems
- Appreciate and discuss the fundamentals of information integration and interoperability, federation/mediator/brokering architectures, agent-oriented systems agent-oriented systems, query formulation and processing, semi- structured and multimedia data management, metadata, and knowledge management.
- Implement a distributed Information System using Java EE.

Recommended and Reference Book

[1] G. Alonso, F. Casati, H. Kuno, V. Machiraju. *Web Services–Concepts, Architectures and Applications.* Springer, 2004. ISBN 3-540-44008-9.

[2] F. Berman, G. Fox, A. Hey (Eds.). *Grid Computing*. John Wiley & Sons, 2003, ISBN: 0-470-85319-0.

[3] K. Birman: *Reliable Distributed Systems – Technologies, Web Services, and Applications.* Springer, 2005. ISBN: 0-387-21509-3.

[4] J. Myerson. *The complete book of Middleware.* Auerbach, 2002. ISBN 0-8493-1272-8.

[5] T. Özsu, P. Valduriez. *Principles of Distributed Database Systems*. Prentice Hall, 2nd Edition, 1999. ISBN: 0-13-659707-6.

[6] M. Singh, M. Huhns: *Service-Oriented Computing: Semantics, Processes, Agents*. John W