Course: IT556 Service-Oriented Computing

Background

Service-oriented Computing (SOC) is the new promising cross-disciplinary area of distributed computing that represent heterogeneous distributed software applications as collection of services or software agents which can communicate freely with each other. Service-oriented computing has become an important paradigm for information technology architectures and applications. Services are platform and language independent, loosely coupled and are able to publish, discover, and orchestrate using standard protocols. SOC provides a new way to design, develop, architect and consume software applications or components. SOC aims to support interoperability and integration of enterprise applications with the help of technologies like Web Services, Service-oriented architecture, Grid and Utility computing.

Software or software components are represented as services using core Web Services standards (SOAP, WSDL, and UDDI) to achieve interoperability across highly disparate software systems. As a result, new Web services standards and specifications have been proposed for improving and supporting features like addressing, messaging, reliability, transaction, security, metadata management, orchestration and choreography of Web services. With the help of XML and Web services, service-oriented architecture (SOA) has become widely accepted in the world of Information Technology because it facilitates the composition of heterogeneous enterprise-wide or inter-enterprise services, and also supports integration and access with legacy systems, mainframes, mid-tier, PCs and mobile devices.

Course Objectives

This course discusses the basic concepts, theories, and techniques for service-oriented computing, standards related to Web services, approaches for the description, discovery, and composition of Web services. The course includes introduction of techniques for information and process semantics, specifically, conceptual modeling, ontologies, matchmaking, messaging, transactions, and processes. The course aims to formulate the foundational concepts of services, to evaluate existing approaches, and to present existing techniques from other areas that can be adopted for services. Emerging techniques for addressing challenges that are unique to services will be discussed in this course.

Course Outcome

This course will enable students to:

- Design, develop and test Web services.
- Learn standards related to Web services: Web Services Description Language (WSDL), Simple Object Access Protocol (SOAP), and Universal Description, Discovery and Integration (UDDI).
- Learn basic principles of Service-Oriented Architecture and apply these concepts to develop a sample application

- Conceptually model Web services and formulate specifications of them in the Resource Description Framework (RDF) and the Web Ontology Language (OWL).
- Learn approaches to compose services.
- Evaluate emerging and proposed standards for the main components of Web services architectures.

Course Content

Introduction: Brief history of information technology, Distributed computing, Motivations for composition, Challenges for composition, Web Services Architectures and Standards

Basic concepts: Directory services, SOAP, WSDL, UDDI

Enterprise architectures: Integration versus interoperation, J2EE, .NET, Model Driven Architecture, Legacy systems

Principles of Service-Oriented Computing: Use cases: Intra-enterprise and Inter-enterprise Interoperation, Application Configuration, Dynamic Selection, Software Fault Tolerance, Grid, and Utility Computing, Elements of Service-Oriented Architectures, RPC versus Document Orientation, Composing Services

Semantic Web and its Applications: XML primer, Conceptual modeling, Ontologies and knowledge sharing, Relevant standards: RDF, RDFS, and OWL, Inferencing and tools, Matchmaking

Service Composition: Modeling Business Processes with BPEL

Sematic Web Services: Standards: OWL-S, WSMO, WSDL-S, Service annotation, Composition of semantic Web services

Synthesis: Common threads, Open problems, Status and trends

Evaluation Scheme

Mid-term theory examination	20%
Final theory examination	40%
Research paper presentation	20%
Assignments	20%

Text Book

Service-Oriented Computing: Semantics, Processes, Agents
by Munindar P. Singh and Michael N. Huhns
John Wiley & Sons, Ltd., 2005
ISBN: 0-470-09148-7

Reference Book

Service-Oriented Architecture: Concepts, Technology, and Design
By Thomas Erl
Publisher: Prentice Hall PTR , 2005
ISBN: 0-13-185858-0