GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT NAME: Service Oriented Computing
SUBJECT CODE: 2170713
B.E. 7th SEMESTER

Type of course: Bachelor of Engineering

Prerequisite: Nil

Rationale: This course describes the foundation of Service Oriented Architecture with its characteristics and advantages. It strongly describes distinction between client-server, two-tier, three-tier and Enterprise architectures. Course continuous with Basic of web services and Introduction to SOAP, REST, WSDL and UDDI. It also highlight the SOAP and REST architecture along with its importance and standards. At the end, WS-BPEL specifies the framework for Web services.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**SOC Introduction** Distributed computing in the large, Motivations for composition, Challenges for composition, Web Services Architectures and Standards, Computing with Services , W3C	**03**	05
2	**Roots of SOA** Fundamental of SOA, Characteristics of SOA, Comparing SOA to client-server and distributed internet architectures, Anatomy of SOA, How components in an SOA interrelate,	**03**	10
3	**Enterprise Architectures and SOC Principles** Introduction, Integration versus interoperation , Model Driven Architecture , Concepts of Distributed Computing, XML, Use cases: Intra-enterprise and Inter-enterprise Interoperation, Application, Configuration, Dynamic Selection, Software Fault Tolerance,	**05**	15
4	**Service Oriented Analysis** Business-centric SOA – Deriving business, Services, Service modeling, Service Oriented Design; WSDL Basics, SOAP Basics, UDDI Basics, REST Basics, Difference between SOAP v/s REST	**05**	15

5	**Web Service Basics** Service Description, Messaging with SOAP, Message Exchange pattern, Coordination, Transaction, Business Activities, Orchestration, Choreography. Service layer Abstraction - Application Service Layer, Business Service Layer, Orchestration Service Layer	**06**	15
6	**Service Composition** Service composition guidelines – Entity-centric business service design, Application service design, Task centric business, service design	**02**	05
7	**SOA Platform basics** SOA support in J2EE: Java API for XML based web services (JAX-WS), Java architecture for XML binding (JAXB), Java API for XML Registries (JAXR), Java API for XML based RPC (JAX-RPC), Web Services Interoperability Technologies (WSIT). SOA support in .NET: Common Language Runtime, ASP.NET web forms, ASP.NET web services, Web Services Enhancements (WSE).	**08**	20
8	**WS-* Specifications and WS-BPEL** WS-Addressing, WS-ReliableMessaging, WS-Policy (including WS-Policy Attachments and WS-PolicyAssertions), WS-Metadata Exchange, WS-BPEL basics, WS-Coordination overview, WS-Choreography, WS-Security (including XML-Encryption, XML-Signature, and SAML)	**07**	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	**U Level**	**A Level**	**N Level**	**E Level**
10	18	18	18	06

Legends: R : Remembrance ; U = Understanding; A = Application; N = Analyze; E = Evaluation and above Levels (Revised Bloom's Taxonomy)

Reference Books:

- Munindar Singh & Michael Huhns, "Service Oriented Computing: Semantics, Processes, Agents", Wiley Publication, 2004
- Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005
- Thomas Erl, "SOA Principles of Service Design" (The Prentice Hall Service-Oriented Computing Series from Thomas Erl), 2005
- Mark D Hansen, "SOA using Java™ Web Services", Prentice Hall Publication, 2007
- Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILLY.
- Shankar Kambhampaty, "Service-oriented Architecture for Enterprise Applications", John Wiley & Sons, 2008

Course Outcome:

After learning the course, the student will be able:

1. To understand the principles of service oriented architecture.
2. To understand and describe the standards & technologies of modern web services implementations.
3. To properly use market-leading development tools to create and consume web services.
4. To analyze and select the appropriate framework components in the creation of web service solutions.
5. To apply object-oriented programming principles to the creation of web service solutions.
6. To identify the requirements of a medium-difficulty programming task, and create software that meets the requirements.

List of Experiments:

1. Develop DTD and XSD for University Information System having Exam Enrollment from beginning of Semester, along with Exam Registration and Marks submission by Teachers to University from Various Colleges and Results Sheets Generation by University on Online Report
2. Develop Mark sheet XML Document and display Mark sheet based on CSS and XSL presentation Format.
3. Develop Java Based Program using JAXP or XML API in reading XML file for Students Information and Display HTML Table.
4. Develop Java Based web Service using REST and SOAP Based web service in Netbeans for University Course List and Search Course based Course Title and Course ID.
5. Create DTD file for student information and create a valid well-formed XML document to store student information against this DTD file.
6. Create XMS schema file for student information and create a valid well-formed XML document to store student information against this DTD file.
7. Create web calculator service in .NET Beans and create Java client to consume this web service.
8. Develop same web service using JX-WS.
9. Create web calculator service in .NET and Experiment. 9 Create java client to consume web service developed using Apache AXIS.
10. Using WS –GEN and WS-Import develop the java web service & call it by Java Client.

Design based Problems (DP)/Open Ended Problem:

1. Think, analyze and implement SOAP based web service to create to-do list application in your preferred language.
2. Consider library management system for your college and create REST based web service for it to manage all the functionalities of your college library.

Major Equipment:

Computer system with latest hardware, Java Environment with IDE (Eclipse or NetBeans), .NET Environment with Microsoft framework.

List of Open Source Software/learning website:

- http://www.bogotobogo.com/WebTechnologies/OpenAPI_RESTful.php
- http://www.bogotobogo.com/python/python_http_web_services.php
- http://www.xmlmaster.org/en/article/d01/c03/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate

chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.