

Ministry of Higher Education and Scientific research



**Department of Computer Science**

**College of Science**

**University of Salahaddin**

**Subject: Service-Oriented Architecture**

**Course Book – *Year 4 CS***

**Lecturer's name: Hero Muhamad Sulaiman**

**Academic Year: 2023/2024**

**Course Book**

|                                      |   |
|--------------------------------------|---|
| <b>1. Course name</b>                | <b>Service-Oriented Architecture (SOA)</b>  |
| <b>2. Lecturer in charge</b>         | <b>Hero Muhamad Sulaiman</b>  |
| <b>3. Department/ College</b>        | <b>Computer Science/Science</b>   |
| <b>4. Contact</b>                    | <b>e-mail: hero.sulaiman@su.edu.krd</b>   |
| <b>5. Time (in hours) per week</b>   | <b>Theory: 3 hours</b>  |
| <b>6. Office hours</b>               |   |
| <b>7. Course code</b>                |   |
| <b>8. Teacher's academic profile</b> | <p><b>Teaching:</b><br/><b>Teaching:</b></p> <ul style="list-style-type: none"> <li>- Attended OOP labs in 2011 as a teaching assistant</li> <li>- Attended Compiler labs in 2009 as a teaching assistant</li> <li>- Attended Programming Language labs in 2009 as a teaching assistant</li> <li>- Attended Image Processing labs in 2010 as a teaching assistant</li> <li>- Attended Networking labs in 2011 as a teaching assistant</li> <li>- Attended logic Labs in 2014</li> <li>- Teaching System Analysis and Design 2015-2016</li> <li>- Attend Web Programming and Design lab 2015-2016.</li> <li>- Attended E-Business Labs in 2015.</li> <li>- Attend Web Programming lab 2015-2016</li> <li>- Teaching Web Programming lab 2017-2018</li> </ul> <p><b>Research interest:</b><br/>My research interest is in the following topics:</p> <ul style="list-style-type: none"> <li>- Semantic Web</li> <li>- SOA</li> <li>- System Analysis</li> </ul> <p><b>Supervision:</b></p> <p><b>Past Projects:</b><br/>My MSc project was on :-</p> <ul style="list-style-type: none"> <li>- “Web 2 based interface for recording Ontology within culture and heritage domain”</li> <li>- “Simulation of microprocessor”.</li> <li>- Impacts of Semantic Web on the current Web.</li> </ul> |
| <b>9. Keywords</b>                   | Service Provider, Service Requester, Discovery Agency (Registry), Use Case Diagram, Use Cases, Actors, System boundary, Sequence Diagram, Messages, Component Diagram, Components, Interfaces, Class diagram, Classes,  |

**10. Course overview:****First Semester (SOA)**

In the modern world, it is becoming more common for people to use internet, online services and web applications in different aspects of their daily life such as searching for information and solving their problems. This may be because over the past century there has been an increasing interest in using internet services in everyday life throughout the world and these applications and services need to communicate and interact with each other to complete a specific task within a software system or among various systems, there should be an approach to control and organize this communication. The approach used for this purpose is Service-Oriented Architecture (SOA).

Service-Oriented Architecture is an approach to organizing information technology in which data, logic, and infrastructure resources are accessed by routing messages between network interfaces [Microsoft].

XML technologies and UML are counted as two important subjects, which are always needed for SOA to play its role. Experiencing this course may benefit the students in the sense that they expand their knowledge in the web development and web services fields in addition to having basic knowledge about designing software systems using UML diagrams.

**Second Semester(Semantic Web):**

Furthermore, It is widely acknowledged that World Wide Web (WWW) without semantic web is only syntactic web and which is not understandable by the machine and the user is almost frustrated when searching on the internet. However, after using semantic web the information on the web is more accessible and understandable to machines.

Moreover, Ontology is the core component of Semantic Web, which is mainly the study of entities or concepts and the relationship among those concepts

**11. Course objective:**

The aim of this course is to provide students with a basic knowledge and skills in the principles and functions of Service-Oriented systems and applications, in addition to their development based on XML technologies and UML. This shall enable them to use such technologies in practice.

Throughout the course, there will be two hours of practical session every week. This will encourage the student to put their knowledge that they have gained during the theory lectures into practice. In addition, teach the students the concepts, technologies and techniques underlying and

Moreover, the aim of the Semantic Web module is to understand the rationale behind the Semantic Web and apply the principle of ontologies engineering to modelling exercise.

## **12. Student's obligation**

The students are obliged to attend the classes. Throughout the course students will be tested through quizzes, assignments, class test.

## **13. Forms of teaching**

- Using Laptop with data show
- Using PowerPoint presentation
- Delivering the PPT slides to the students before giving the lecture.
- Interaction with the students inside the classroom.

## **14. Assessment scheme:**

### **Assessments:-**

- **First Semester exam**
  - At the end of the autumn semester. % 15
  - Assignment % 5
- **Second Semester exam**
  - At the end of the spring semester. % 15
  - Assignment % 5

### **Examinations**

- Final exam % 60
- 3 hours

In June

## **15. Student learning outcome:**

By the end of the course, students should be provided with the conceptual and technological foundations of Service-Oriented Architecture, i.e.

- The motivation, basic mechanisms, and open problems of SOA.
- Service-oriented development and its relation to object-oriented and component based development.
- The realization of SOA based on Web Service technology.
- Understand the reasons behind Semantic Web.
- Student should be able to understand fundamental concepts and limitation of syntactic Web.
- Understanding how to use ontologies in the context of Semantic Web and Computer Science.
- How to use RDF (Resource Description Framework )
- Design RDF Schemas for ontologies.

- Understanding the principle of Ontology Engineering.
- Apply Semantic Web technologies to real world applications.

**16. Course Reading List and References:**

- *Learning UML 2.0*, by Kim Hamilton and Russel Miles. O'Reilly, April 2006.
- *UML 2.0 in a Nutshell*, by Dan Pilone and Neil Pitman, June 2005.
- Francisco Curbera, Frank Leymann, Tony Storey, Donald Ferguson, Sanjiva Weerawarana, *Web Services Platform Architecture: Soap, WSDL, WS-Policy, WS-Addressing, WS-Bpel, WS-Reliable Messaging and More*, Prentice Hall. 2005.
- Tom Pender, *UML Bible*, Wiley Publishing Inc, 2003.
- Martin Fowler, Kendall Scott, *UML Distilled: A Brief Guide to the Standard Object Modeling Language*, Object Technology S., 2003.
- Karin et al. *Semantic web concepts, technologies and applications*. Walter Truzkowski, MA, BA. NASA Goddard Space Flight Center USA.
- Dieter et al.(1998) :*Implementing Semantic Web services*. Springer Berlin Heidelberg.
- Heiner, Frank(1998): *Information sharing on the Semantic Web*. Springer Berlin Heidelberg New York
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**17. The Topics:**

**Lecturer's name**

Week 1: Introduction, Motivation, and Concepts of SOA

Week2: Introduction to XML

Week 3: DTD

Week 4: Introduction to UML (Use Case Diagrams)

Week 5: Sequence Diagrams

Week 6: Component Diagrams

Week 7: Class Diagrams + Object Diagrams

Week 8: Converting Class and Object diagrams to DTD and XML respectively

Week 9: XML Schema

Week 10 - 11: XPath, XSL & XSLT

Week 11: Describing and Publishing Web Services using WSDL and UDDI

Week 12 - 14: Introduction to Web Services, XML based Messaging using SOAP, Describing and Publishing Web Services

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|---|------------------------|
| <p>Week 15: <b>First Exam</b></p> <p>Week 16: Introduction to Semantic Web</p> <p>Week 17 - 18: Infrastructure of Semantic Web + Ontologies</p> <p>Week 19: Ontology Engineering</p> <p>Week 20: RDF &amp; RDF Schema (RDFS)</p> <p>Week 21: Turtle</p> <p>Week 22: SPARQL</p> <p>Week 23 - 25: Web Ontology Language : OWL</p> <p>Week 26: Linked Data</p> <p>Week 27-29: Light Weight Semantics (RDFa, Microdata/Microformat)</p> <p>Week 30: <b>Second Exam</b></p>  |                        |
| <p><b>18. Practical Topics (If there is any)</b></p>  |                        |
| <p><b>19. Examinations:</b></p> <p><b>1. Compositional:</b></p> <ol style="list-style-type: none"> <li>1. Count three properties of Web Services.</li> <li>2. What are Real Dependency and Artificial Dependency? Explain the difference between them by giving an example.</li> </ol> <p><b>2. True or false type of exams:</b></p> <p>---1. A service requester is the software entity that implements a service description.</p> <p>---2. Web Services can be dynamically discovered when required.</p> <p>---3. In SOA, an actor of Use Case diagrams can be a person, a device, a system, ...etc.</p> <p><b>3. Multiple choices:</b></p> <ol style="list-style-type: none"> <li>1. Service Requestor, Service Provider and Registry are considered as ..... in SOA.             <ol style="list-style-type: none"> <li>a. Roles</li> <li>b. Operations</li> <li>c. Discovery Agencies</li> <li>d. Components</li> </ol> </li> <li>2. The purpose of using Web Services is to connect different apps, which is known as .....             <ol style="list-style-type: none"> <li>a. Redundancy</li> <li>b. Messaging</li> <li>c. Interoperability</li> <li>d. Loose Coupling</li> </ol> </li> <li>3. .... is used to make a blue print for software systems.</li> </ol> | <p>Lecturer's name</p> |

a. SOA b. UML c. URI d. URL

**20. Extra notes:**

**21. Peer review**

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