

<b>Pokhara University</b> <b>Faculty of Science and Technology</b>	
Course Code.: CMP 485 (3 Credits)	Full Marks: 100
Course Title: Web Services and Applications (3-0-3)	Pass Marks: 45
Nature of the Course: Theory/Practical	Total Lectures: 48 hours
Level: Bachelor   Year: IV / Semester: VII/VIII	Program: Bachelor of Computer Engineering

### 1. Course Description:

This course introduces the fundamental principles, standards, and technologies behind Web Services and distributed applications. Students will learn how to design, develop, and deploy interoperable web-based services using protocols such as SOAP, REST, and JSON-based APIs. The course combines theoretical concepts with practical implementation using modern frameworks.

### 2. General Objectives:

The general objectives of this course are as follows:

- Understand the architecture and principles of web services.
- Explain and implement SOAP-based and RESTful web services.
- Apply XML, JSON, and WSDL in service design.
- Integrate web services with client applications.
- Use security and authentication mechanisms for web services.
- Develop and deploy interoperable web applications.

### 3. Methods of Instruction:

- Lecture and discussion
- Practical
- Demonstration
- Presentation
- Project

### 4. Course Contents:

Specific Objectives	Contents
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<b>Unit 1: Introduction to Web Technologies</b>	<b>4 hours</b>
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| <ul style="list-style-type: none"> <li>● Describe the client-server architecture and the roles of web browsers and servers.</li> <li>● Explain basic web protocols, DNS, and the differences between client-side and server-side scripting languages</li> </ul> | 1.1 Evolution of the Web<br>1.1.1 History of web<br>1.1.2 WWW<br>1.1.3 URL<br>1.1.4 Version of web<br>1.1.5 Search engine<br>1.1.6 Website and Web application<br>1.2 Client-Server Architecture |
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	1.3 Overview of Web Browsers and Web Servers 1.3.1 Web browser, cross browser compatibilities 1.3.2 Web server 1.4 Basic Protocols 1.4.1 Short overview of basic protocols 1.4.2 HTTP/HTTPS 1.4.3 HTTP request and response 1.5 DNS and its hierarchy 1.6 Client side and server side scripting language
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<b>Unit 2: Introduction to Web Services and security</b>		<b>6 hours</b>
<ul style="list-style-type: none"> <li>Setting up a web server and basic service demonstration</li> </ul>	2.1 Evolution from distributed systems to web services 2.2 Concepts: Service, Client, Message exchange patterns 2.3 Service-Oriented Architecture (SOA) 2.4 Web service standards stack (XML, SOAP, WSDL, UDDI) 2.5 Advantages and applications of web services 2.6 Web service security and countermeasures	
<b>Unit 3: XML and Data representation</b>		<b>4 hours</b>
<ul style="list-style-type: none"> <li>Creating XML and JSON schemas for a sample data model</li> </ul>	3.1 XML syntax, structure, and namespaces 3.2 XML Schema (XSD) 3.3 JSON structure and schema 3.4 Data interchange using XML and JSON	
<b>Unit 4: SOAP-based Web Services</b>		<b>8 hours</b>
<ul style="list-style-type: none"> <li>Develop a simple SOAP service using Java or PHP</li> <li>Consume SOAP service from a client application</li> </ul>	4.1 Architecture and components of SOAP 4.2 WSDL (Web Services Description Language) 4.3 Building and consuming SOAP web services 4.4 SOAP message format and processing 4.5 Tools: Apache Axis2 / JAX-WS / PHP SoapClient and SoapServer	
<b>Unit 5: RESTful Web Services</b>		<b>10 hours</b>
<ul style="list-style-type: none"> <li>Build REST APIs using Node.js / Python Flask / PHP / PHP Laravel</li> <li>Consume REST APIs using JavaScript or Postman</li> </ul>	5.1 REST architecture principles 5.2 HTTP methods (GET, POST, PUT, DELETE, PATCH) 5.3 URI design and resource modeling 5.4 Statelessness and caching 5.5 JSON-based REST APIs 5.6 Comparison: SOAP vs. REST	
<b>Unit 6: Web Service Development Frameworks</b>		<b>6 hours</b>
<ul style="list-style-type: none"> <li>Create and document an API with Swagger</li> <li>Deploy a service using Docker</li> </ul>	6.1 Overview of frameworks: Spring Boot, Flask, Laravel 6.2 API versioning and documentation (Swagger / OpenAPI) 6.3 Microservices overview	

	6.4 Integration and deployment using Docker																																											
<b>Unit 7: Security and testing integration in Web Services</b>																																												
<b>10 hours</b>																																												
<ul style="list-style-type: none"><li>Implement JWT-based authentication for a REST API</li><li>Test SOAP and REST APIs using Postman and SoapUI</li></ul>	7.1 Security challenges in web services 7.2 Authentication and Authorization (Basic Auth, OAuth 2.0, JWT) 7.3 HTTPS, SSL/TLS 7.4 API rate limiting and key management 7.5 Service testing tools: Postman, SoapUI 7.6 Continuous Integration/Delivery for APIs 7.7 Performance and load testing basics																																											
<b>5. Practical Works:</b>																																												
<b>12–15 hours of hands-on lab exercises</b>																																												
<b>Group project: Design and implement a mini application integrating REST/SOAP web services</b>																																												
<b>6. Evaluation System and Students’ Responsibilities:</b>																																												
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In addition to the formal exam(s) conducted by the Office of the Controller of Examination of Pokhara University, the internal evaluation of a student may consist of class attendance, class participation, quizzes, assignments, presentations, written exams, etc. The tabular presentation of the evaluation system is as follows.																																												
<table><tr><th>Internal Evaluation</th><th>Weight</th><th>Marks</th><th>External Evaluation</th><th>Marks</th></tr><tr><td><b>Theory</b></td><td></td><td><b>30</b></td><td rowspan="12"><b>Semester End examination</b></td><td rowspan="12"><b>50</b></td></tr><tr><td>Attendance / Class Participation</td><td>10%</td><td></td></tr><tr><td>Assignments</td><td>20%</td><td></td></tr><tr><td>Project Work/Presentations</td><td>10%</td><td></td></tr><tr><td>Term Exam</td><td>60%</td><td></td></tr><tr><td><b>Practical</b></td><td></td><td><b>20</b></td></tr><tr><td>Attendance and Lab Participation</td><td>10%</td><td></td></tr><tr><td>Lab Report</td><td>20%</td><td></td></tr><tr><td>Lab Examination</td><td>40%</td><td></td></tr><tr><td>Viva Examination</td><td>30%</td><td></td></tr><tr><td><b>Total Internal Marks</b></td><td></td><td><b>50</b></td></tr><tr><td colspan="3"><b>Full marks=50+50</b></td></tr></table>	Internal Evaluation	Weight	Marks	External Evaluation	Marks	<b>Theory</b>		<b>30</b>	<b>Semester End examination</b>	<b>50</b>	Attendance / Class Participation	10%		Assignments	20%		Project Work/Presentations	10%		Term Exam	60%		<b>Practical</b>		<b>20</b>	Attendance and Lab Participation	10%		Lab Report	20%		Lab Examination	40%		Viva Examination	30%		<b>Total Internal Marks</b>		<b>50</b>	<b>Full marks=50+50</b>			
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To be eligible for the Semester End Examinations, each student must secure at least 45% marks in the internal evaluation with 80% attendance in the class to appear in the Semester End Examination. Failing to obtain such score will be given NOT QUALIFIED (NQ) and the student will not be eligible to appear in the End-Term examinations. Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during the period. If a student fails to attend a formal exam, quiz, test, etc. there won’t be any provision for a re-exam.																																												

**7. Prescribed Books and References:**

1. Erl, Thomas. Service-Oriented Architecture: Concepts, Technology, and Design. Prentice Hall.
2. Alonso, Gustavo et al. Web Services: Concepts, Architectures and Applications. Springer.