

Course Title	Web Applications and Services				
Course Code	ACSC404				
Course Type	BSc Computer Science: Computer Elective BSc Computer Engineering: Computer Elective				
Level	BSc (Level 1)				
Year / Semester	3rd or 4th year / 6th or 8th semester				
Teacher's Name	Dr. Achilleas Achilleos				
ECTS	6	Lectures / week	2	Laboratories/week	2
Course Purpose	<p>The aim of this module is to familiarise students to the complexity and dynamics of developing web-enabled applications as well as with the acquisition of practical skills in the construction of such software. The course will introduce to students the evolution of web technologies that made the web the universal platform of choice that supports web services and application interoperability in a fully distributed manner. It presents e-commerce applications and the various business models (e.g., B2C, B2B, C2C) that paved the way for the evolution of the web technologies and architectures. Multi-tiered architectures are introduced that address the limitations of the basic HTTP client-server model, via web server technologies (i.e., PHP) and application server technologies (i.e., Java Servlets, JSP and JavaBeans). Finally, AJAX and JSON in combination with RESTful Web Services are introduced that have fundamentally changed the HTTP request-response model from HTML-centric to Data-centric and made a huge impact on client experience.</p>				
Learning Outcomes	<p>Upon successful completion of the course students will be able to:</p> <ul style="list-style-type: none"> • Identify the elements of web enabled applications and types of e-commerce systems and recognize their impact. • Understand how multi-tier architectures can be used and utilize them for developing web enabled applications. • Outline the similarities and differences between web server languages (i.e., PHP) and application server languages (i.e., Java Servlets, JSP, ASP). • Analyse, design and develop multi-tiered web applications using technologies such as Java Servlets, JSP and JavaBeans. • Experiment with concepts such as cookies, session tracking, object persistence and collaboration with client-side objects (AJAX). • Build data-centric web applications that interact with various potentially distributed backend RESTful web services. • Discuss the challenges of data inter-exchange over the Internet and understand the role of web services in web-based applications. 				

	<ul style="list-style-type: none"> • Construct and incorporate such services into web-enabled applications and interact with them using HTTP, AJAX and XML or JSON. • Describe how web applications can be developed under the agile paradigm and discuss advantages and disadvantages. 		
Prerequisites	ACSC382, ACSC476.	Corequisites	None.
Course Content	<p>1. Introduction to web enabled applications (2 Weeks)</p> <ul style="list-style-type: none"> - Describe and summarise the technological and business forces for the emergence of web applications. Identify and outline the key types of web applications. Summarise technological and other considerations of successful web application development. Name and describe prominent and emerging models and technologies for the development of web applications. <p>2. Development of server-side components (4 Weeks)</p> <ul style="list-style-type: none"> - Illustrate how technologies such as Servlets and Java Server Pages can be used to develop server-side components. Design web applications under a multi-tiered architecture and implement such applications of a medium size. Explain and apply the variable scoping scheme in Java for web applications (request, session, page, context). Compare the taught environment with alternatives such as the PHP model. <p>3. Connectivity to data backends and JavaBeans (3 Weeks)</p> <ul style="list-style-type: none"> - Indicate how server-side components can interact with data storage systems – Java Database Connectivity (JDBC). Design web applications under a multi-tiered architecture and implement such applications of a medium size. Evaluate performance related considerations with respect to data connectivity and explain the advantages of connection pooling systems. JSP Session Tracking. JSP Standard Actions. JavaBeans Components. JavaBean Design Conventions. Develop rich internet applications using JSP, MySQL and JavaBeans. <p>4. Supporting Client Communication – JavaScript and AJAX (1 Week)</p> <ul style="list-style-type: none"> - Describe how AJAX operates and explain the importance and impact of such technologies. AJAX support in jQuery. Develop clients that can exchange information with the server. Representations: Automated data exchange over the Internet – XML and JSON. Discuss the advantages and disadvantages of XML data format and contrast to alternative approaches. AJAX – Automated JSON parsing in jQuery. <p>5. Introduction to Web Services (3 Weeks)</p> <ul style="list-style-type: none"> - Outline the core architecture (WS*-stack) and XML-based languages available for the provision of web services. Construct and incorporate web services consumers and providers in web applications. Alternative web service 		

	<p>models: The REST architectural pattern. Learn to develop web applications by consuming existing RESTful APIs. Use the REST architectural pattern to develop RESTful services.</p>
<p>Teaching Methodology</p>	<p>The methodology followed in this course is structured around lectures and laboratory exercises, so that students gain theoretical knowledge as well as practical skills. The taught part of course is delivered to the students with the help of computer presentations. Presentations are available through the e-learning system for students to use in combination with the textbooks. Furthermore, theoretical principles are explained by means of specific examples and solution of specific problems using practical examples. The code for these programming examples is also made available in the e-learning system.</p> <p>Lectures are supplemented with supervised computer laboratories, which include demonstrations of taught concepts and experimentation with related technologies to solve specific problems via exercises. Hence, during laboratory sessions, students apply their gained knowledge and identify the principles taught in the lecture sessions by means of working on different tasks and solving domain-specific problems. Students are also allocated exercises during the laboratory sessions, eight of which are submitted for evaluation. Also, a course project is assigned to the students since this is a practical-oriented programming course. Finally, the course assessment is completed by means of a three-hours final exam at the end of the semester.</p>
<p>Bibliography</p>	<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Nicholas S. Williams, "Professional Java for Web Applications", 1st Edition, Paperback: 936 pages, Publisher: Wrox; 1 edition (March 10, 2014), Language: English, ISBN-10: 1118656466, ISBN-13: 978-1118656464. Code Examples: LINK. 2. Bill Burke, "RESTful Java with JAX-RS 2.0: Designing and Developing Distributed Web Services", Paperback: 392 pages, Publisher: O'Reilly Media; Second edition (December 2, 2013), Language: English, ISBN-10: 144936134X, ISBN-13: 978-1449361341. Code examples included at the end of the book. <p>References:</p> <ol style="list-style-type: none"> 1. Murach's Java Servlets and JSP: Training & Reference (Murach: Training & Reference) 3rd Edition, by Joel Murach (Author), Michael Urban (Author), Series: Murach: Training & Reference (Book 3), Paperback: 744 pages, Publisher: Mike Murach & Associates Inc; 3 edition (June 9, 2014), Language: English, ISBN-10: 1890774782, ISBN-13: 978-1890774783. Book Code Examples: LINK. 2. RESTful Java Web Services: A pragmatic guide to designing and building RESTful APIs using Java, 3rd Edition 3rd Revised edition Edition, Paperback: 420 pages, Publisher: Packt Publishing; 3rd Revised edition edition (November 17, 2017), Language: English, ISBN-10: 1788294041, ISBN-13: 978-1788294041. Book Code Examples: LINK.

	<p>3. www.w3schools.com: A series of entry-level tutorial on various Internet Technologies.</p> <p>4. www.w3c.org: The official site of the World Wide Web Consortium. Various references, RFCs and interesting reading material on the Internet development.</p>
Assessment	<ul style="list-style-type: none"> • Eight Laboratories: 20% • Course Project: 30% • Final Exam: 50%
Language	English.