Course Title	Advanced Computer Organization & Architecture				
Course Code	ECE305				
Course Type	Elective				
Level	Bachelor (1st Cycle)				
Year / Semester	3rd Year / 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	The aim of this course is to build on the fundamental concepts of computer organization and architecture and provide students with a solid understanding of the concepts and considerations related to the design, operation and performance evaluation of high-end, modern computer systems. The course follows an embedded laboratory approach, where students are required to utilize CPU simulation tools during the implementation of lectures.				
Learning Outcomes	Upon successful completion of this course students should be able to: • Utilize effectively measures which allow the quantitative evaluation of computer systems' performance • Describe the principles and limitations of instruction level parallelism (ILP) • Describe ILP applications in high-performance processors such as superscalar execution, branch prediction and multithreading • Define multicore architectures, and critically compare alternative approaches to multicore organization • Describe basic techniques for optimizing the performance of computer memory systems				
Prerequisites	ECE210	Co-requisites	None		
Course Content	Introduction – Overview: Review of the fundamental concepts of computer organization and architecture, overview of the latest trends in computer systems design, quantitative measures for evaluating computer systems performance. Pipelining: The basic concept of pipelining, pipeline implementation, hazards in difficulties in pipeline implementation, mitigation techniques in pipeline implementation, pipeline case studies. Instruction Level Parallelism (ILP): Basic definitions and limitations of ILP, methods for exploiting ILP, superscalar execution systems, branch prediction, dynamic scheduling, hardware-based speculation, static scheduling, simultaneous multithreading.				

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<tr><td></td><td>Multicore architectures: Definition of shared-memory architectures, symmetric versus distributed shared-memory architectures, operational and performance issues, multicore processors organization, multicore multi-level caches, coherence schemes, on-chip multicore interconnect, scaling of multicore architectures, multicore case studies, review of large-scale microprocessor system considerations.

Advanced Topics in Computer Memory Design: Review of basic computer memory definitions and operational principles, the memory hierarchical organization, cache performance optimization, virtual memory optimization, computer memory design case studies.

Latest developments in the area of computer architecture and organization.</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>“Computer Architecture: A Quantitative Approach” by John L. Hennessy

“Digital Design and Computer Architecture” by David Harris and Sarah Harris

“Computer Organization and Architecture” by William Stallings

“Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture” by Jon Stokes

“The Essentials of Computer Organization and Architecture”, by Linda Null and Julia Lobur</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Examinations</td><td>70%</td></tr><tr><td>Assignments/Lab</td><td>20%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>English</td></tr>
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