



Course description:

This course provides advanced topics in computer architecture that is necessary to understand the hardware operations of digital computers, and covers subjects associated with computer hardware. Topics of this course include: assembly language, memory hierarchy and cache mapping schemes, storage systems, RISC and CISC machines, taxonomy of computer architectures, parallel processing approaches, topics in embedded systems and performance measurement analysis.

Aims of the course:

Students are expected to:

- 1- Understand the motivations of designs used in the development of modern computing systems.
- 2- Be able to write programs in assembly language
- 3- Understand different cache mapping techniques
- 4- Understand RAID storage systems
- 5- Describe the characteristics of different computer architectures such as RISC, CISC and parallel systems
- 6- Understand the basics of embedded systems
- 7- Be able to analyze the performance of different computer systems

Intended Learning Outcomes (ILOs):

Upon successful completion of this course, students will be able to:

A. Knowledge and Understanding

A1. Concepts and Theories:

- Understand how computing systems are structured.
- Understand how different computer system components interact to perform the required tasks
- Understand how the interaction between different computer system components can affect the overall performance
- Be able to access registers and memory using assembly language

A2. Contemporary Trends, Problems and Research:

- Be able to match certain types of tasks to the appropriate computer system

A3. Professional Responsibility:

- Abide by laws and regulations of software development and hardware design

B. Subject-specific skills

B1. Problem solving skills:

- Use analytic skills to analyze problems at hand and determine the appropriate solution(s).

B2. Modeling and Design:

- Understand current models of computer systems and introduce new design ideas

B3. Application of Methods and Tools: Be able to write programs using assembly language



C. Critical-Thinking Skills

C1. Analytic skills:

- Use analytic skills to analyze problems at hand and determine the appropriate system architecture

C2. Strategic Thinking:

- Use strategic thinking to propose efficient solutions for complex problems

C3. Creative thinking and innovation:

- Use creative thinking and innovation to mix different computer architectures to improve performance

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. *Communication*: Express and communicate ideas in written and oral forms.

D2. *Teamwork and Leadership*: Be cooperative members of a team

D3. *Organizational and Developmental Skills*: Plan, prioritize, and achieve defined goals

D4. *Ethical and Social Responsibility*: Understand that they are accountable for their actions and there must be a balance between economic growth and the welfare of the society and environment.

Course Structure:

Week	Hours	ILOs	Topics	Teaching Procedure	Assessment methods
1	3	A1	Introduction	Lecturing with active participation, quizzes, team learning.	Homework, quizzes, reports
2	3	A1	Introduction to assembly language and emulator	=	=
3	3	A1, A2, B1, B2, B3	Assembly code sections, variables, printing to console	=	=
4	3	A1, B1, B2, B3, C1, C2, C3	If statement in assembly	=	=
5	3	A1, B1, B2, B3, C1, C2, C3, D1, D2, D3, D4	Looping reading from console in assembly	=	=
6,7	6	A1, B1, B2, B3, C1, C2, C3	Introduction to memory, memory hierarchy, cache mapping schemes	=	=



8,9	6	A1, B1, B2, B3, C1, C2, C3	Storage systems, Amdahl's law, Raid systems	=	=
10,11,12	9	A1, B1, B2, B3, C1, C2, C3	Alternative architectures: RISC, SISC, parallel systems		
13,14	6	A1, B1, B2, B3, C1, C2, C3	Embedded systems	=	=
15	3	A1, B1, B2, B3, C1, C2, C3	Performance measurements and analysis	=	=

References:

A. Main Textbook:

1. The Essentials of Computer Organization and Architecture by Linda Null and Julia Lobur 2nd edition 2006

B. Supplementary Textbook(s):

1. Paul A. Carter, "PC Assembly Language", 2006
2. William Stallings, "Computer Organization AND Architecture", Prentice Hall, Fifth Edition, 2000.
3. Blaauw, G., and Brooks, F. "Computer Architecture: Concepts and Evolution", Reading, MA: Addison-Wesley, 1997.

Assessment Methods:

Methods	Grade	Date
1st	15	
2 nd	15	
Project in assembly	10	
Activities & Participation	10	
Final Exam	50	

