Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

COMPUTER ORGANIZATION AND ARCHITECTURE (14032205-4)

Course Specification

Institution	**Umm Al-Qura University**
College/Department	**College of Computer & Information Systems**

A Course Identification and General Information

1. Course title and code: **Computer Organization and Architecture 14032205-4**
2. Credit hours**: 4**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course   **Dr. Turki Al-Somani**
5. Level/year at which this course is offered **Level 6**
6. Pre-requisites for this course (if any)   **Digital Logic Design**
7. Co-requisites for this course (if any)   **N/A**
8. Location if not on main campus   **Al-Abidiyah Umm Al Qura University - Makkah Al Mukarramah**

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

- An ability to evaluate and analyze computer performance
- An ability to understand computer instruction set architecture
- An understanding of basic computer arithmetic algorithms
- An ability to understand data-path and pipelining
- An ability to analyse and evaluate memory hierarchy
- An ability to understand I/O and storage devices
- An ability to understand the architecture of multiprocessors
- An ability to write assembly language programs using MIPS assembly language (labs)
- A working knowledge of modern computer architecture concepts and components via projects to increase the overall understanding of modern computer architectures.

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

The contents of course must be reviewed and changed after every semester to include current research topics in the relevant area.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1. Topics to be Covered		
List of Topics	No of Weeks	Contact Hours
Introduction to computer organization and architecture	1	3
Instruction-set architecture (ISA) for MIPS	2-3	6
Implementation of ISA (datapath and controller)	4-5	6
Pipelined datapath and controller	6-7	6
Hazards in pipelining and remedies	8-9	6
Introduction to memory hierarchy design	10-11	6
Cache and virtual memory design	12-13	6
Storage and I/O devices	14	3

2. Course components (total contact hours per semester):				
Lecture: 42	Tutorial: 12	Laboratory: 42	Practical/Field work/Internship	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week)

1. 3 x 50 mins lectures

2. 3 x 50 mins labs

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;

- A description of the teaching strategies to be used in the course to develop that knowledge or skill;

- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

1. Students will learn the fundamentals of computer organization, architecture and its relevance to classical and modern problems of computer design
2. Students will be able to identify where, when and how enhancements of computer performance can be accomplished.
3. Students will learn the sufficient background necessary to read more advance texts as well as journal articles on the field.
4. Student will see how to use concepts of computer organization in real-life settings using various PC performance improvements.
5. Students will also be introduced to more recent applications of computer organization and architecture in advanced digital systems

(ii) Teaching strategies to be used to develop that knowledge

- Case studies: - develops analytic and problem solving skills

  - allows for exploration of solutions for complex issues

- allows student to apply new knowledge and skills

■ Real-life examples: allows analysis of real-world scenarios

■ Analyse ideas and concepts bought forward in class lectures

Open-communication with students – show willingness to assist and take questions from students and clarify explanations in the class

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(iii) Methods of assessment of knowledge acquired

- Exercises & Home works , Quizzes, Midterm, Project , Final Exam
- Review outputs from the assignments in the computer lab and also from their assignments and projects.

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b. Cognitive Skills

(i) Description of cognitive skills to be developed

- **Written Examinations**
- **Assignments**
- **Quizzes**
- **Assessed class work and lab work**
- **Classroom interactions**

(ii) Teaching strategies to be used to develop these cognitive skills

- Group report and group presentation: to identify leaders, followers, hard-workers, contributors, slackers and to see whether students are comfortable in working with their peers
- Accountability
- Their ability to be in class on time and the number of times, meet deadlines and contribute in group work
- Their ability to respect class rules and college policies

(iii) Methods of assessment of students cognitive skills

- **Written Examinations**
- **Assignments**
- **Quizzes**
- **Assessed class work and lab work**

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c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

i. **Understand and communicate to others the importance and relevance of**

computer organization and architecture in the modern world.

ii. **Be an independent learner, able to acquire further knowledge with some guidance or support.**
iii. **Participate in group discussions**
iv. **Manage time and meet deadlines.**
v. **Cheating will not be tolerated**
vi. **This course requires significant effort**
vii. **Library Usage**

(ii) Teaching strategies to be used to develop these skills and abilities

■ Case studies: - develops analytic and problem solving skills

- allows for exploration of solutions for complex issues

- allows student to apply new knowledge and skills

■ Real-life examples: allows analysis of real-world scenarios

■ Analyse ideas and concepts bought forward in class lectures

■ Open-communication with students – show willingness to assist and take questions from students and clarify explanations in the class

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- **Written Examinations**
- **Assignments**
- **Quizzes**
- **Assessed class work and lab work**
- **Classroom interactions**

d. **Communication, Information Technology and Numerical Skills**

(i) Description of the skills to be developed in this domain

- Case studies: the key method of discovering students dexterity in analyzing
- Their recommendations, opinions and suggestions
- Assignments, exams, reports, presentations and quizzes will test their analytic skills and communication skills
- Class discussions should indicate a student's prowess in responding

(ii) Teaching strategies to be used to develop these skills

- **Written Examinations**
- **Assignments**
- **Quizzes**
- **Assessed class work and lab work**
- **Classroom interactions**

- **Mini projects to be developed in Lab**

(iii) Methods of assessment of students numerical and communication skills

- Case studies: the key method of discovering students dexterity in analyzing
- Their recommendations, opinions and suggestions
- Assignments, exams, reports, presentations and quizzes will test their analytic skills and communication skills
- Class discussions should indicate a student's prowess in responding

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

(ii) Teaching strategies to be used to develop these skills

- **Written Examinations**
- **Assignments**
- **Quizzes**
- **Assessed class work and lab work**
- **Classroom interactions**
- **Mini projects to be developed in Lab**

(iii) Methods of assessment of students psychomotor skills

5. Schedule of Assessment Tasks for Students During the Semester			
Assess ment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	**Quiz 1**	**2**	**5**
2	**Quiz 2**	**4**	**5**

3	**Assignment 1**	**5**	**5**
4	**Midterm**	**8**	**10**
5	**Project 1**	**10**	**5**
6	**Class Participation/Attendance**	**16**	**5**
7	**Final Exam**	**16**	**40**
8			**75**
9	**Lab Assessment**		**25**

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Faculty is available 10 hours per week for student help and consulting.

E Learning Resources

1. Required Text(s)
D. Patterson and J. Hennessy, Computer Organization and Design, The Hardware/Software Interface, 5th Edition, Morgan Kaufmann (MK), 2013

2. Essential References
D. Harris and S. Harris, Digital Design and Computer Architecture, Morgan Kaufmann (MK), 2nd Edition, 2012

3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

 Students should be motivated to search related journals and conference papers and write a monthly report over it.

4-.Electronic Materials, Web Sites etc

All related journal and conference papers

5- Other learning material such as computer-based programs/CD, professional standards/regulations

Use of Simulators in Lab

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) Maximum class size is 25. Each class room is provided with projector and electronic board. Lecture rooms and Auditorium (Occasionally)
2. Computing resources There are computer labs available for development of software skills. Students are encouraged to bring in their laptops and use them in solving problems in the class room.
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) N/A

G   Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **Survey at the end of course**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **Monthly Meeting discussing current teaching methods.**
3 Processes for Improvement of Teaching 1. **Faculty Development Program (Provide Training to the faculty)** 2. **Departmental Meeting**
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Departmental & Management Meetings.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. ## Course Improvement Plan ## Six Step Plan for Course Improvement

❑ Step 1) Review the minimum, average, and maximum score for each topic (framework objective). Mark each score which is less than 80% (highlight, circle, etc.)

❑ Step 2) For each topic marked for analysis, review the current curriculum framework. Reflect on why scores are low in that topic area.

❑ Step 3) For each topic marked for analysis, review the lesson plans used to teach the topic. Determine if the lesson plan and the topic are correlated. Reflect on how this topic was taught. What would improve student learning and retention? …a different instructional method? …devoting more time to the topic?

❑ Step 4) Decide on the action you can take to enhance teaching and learning in the course. Indicate, in note or narrative form, what action you will take. Communicate this to administrators and colleagues. Lesson plans can be updated to include the improvements/changes that you will utilize for the next school year.

❑ Step 5) Make some predictions about how much you believe these improvements and/or changes will affect the student's learning and retention.

❑ Step 6) The improvement process is an ongoing activity that should be visited each year. When it comes time for next year's Improvement Plan you can look back at your predictions and determine how well your plan worked.

⇨ Were the resources that you listed as "not available" a stumbling block in making improvement? How can these resources be obtained?

⇨ Have you made significant enough improvements that a principal would consider obtaining those resources in hopes that even more improvement will be made?

⇨ Were you realistic in your goal setting?