Course Specification

(Postgraduate Programs)

Course Title:	**Advanced Computer Architecture**
Course Code:	CE 613 (**0913613**)
Program:	**Master of Science in Computer Science**
Department:	**Computer Science**
College:	**Computer Sciences and Information Technology**
Institution:	**King Faisal University**
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

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A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (3-0-6)					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 1 (Year 1, Semester 1)					
4. Course General Description:					
Assessing and evaluating performance of computer, Language of Computer, Operations and operands of hardware, Conversion of higher level to assembly language, Working of compiler, Addressing modes, Processor design, Data paths and control of UP, Single and multi-cycle processor design, Pipelining, Data hazard and forwarding, Branch hazards and solutions, Pentium Systems design, Superscalar processors, Speculation and software pipelining, Hardwired and Micro programmed Control section, Microprogrammed control section, Microprogramming concepts, Memory management, I/O devices, Memory management system, Memory management system of Pentium System, Parallel Processing, Multiple processor organization, Symmetric multiprocessors, Cache coherence and MESI Protocols clusters, Vector computations, VHDL, Design of sequential logic circuit.					
5. Pre-requirements for this course (if any)**:**					
Nil					
6. Pre-requirements for this course (if any)**:**					
Nil					
7. Course Main Objective(s):					
This course covers advanced topics in the architectural design of a modern computer system including understanding of performance analysis and emerging technologies in enhancing its performance.					

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	E-learning		

No	Mode of Instruction	Contact Hours	Percentage
3	Hybrid • Traditional classroom • E-learning	45	100%
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)……**	
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand fundamentals of technologies and advanced architectural features	**K1**	Lecture, Paper Review	Assignments Quizzes Paper Presentation Exams
1.2	Visualize complete computer system including processor, memory and I/O	**K2**	Lecture Paper Review	Assignments Quizzes Paper Presentation Exams
1.3	Describe difference between multiprocessor architectures	**K3**	Lecture Paper Review	Assignments Quizzes Paper Presentation Exams
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	Relate modern architectural performance and support to programming languages	**S1**	Lecture Paper Review	Assignments Quizzes Paper Presentation Exams
2.2	Enumerate various methods for enhancing cache and memory performance	**S2**	Lecture Paper Review	Assignments Quizzes Paper Presentation Exams
...	Analyze general principles affecting performance, and quantify the measurements	**S3**	Lecture Paper Review	Assignments Quizzes Paper Presentation Exams
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
...				

C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction, Performance, The Power Wall, Switch from Uniprocessors to Multiprocessors	4.5
2.	Operations and Operands of the Computer Hardware, Representing Instructions in the Computer, Instructions for Making Decisions Supporting Procedures in Computer Hardware, MIPS Addressing Modes	7.5
3	Logic Design Conventions, Building a Datapath, Simple Implementation Scheme, Overview of Pipelining, Pipelined Datapath and Control, Data Hazards, Control Hazards, Advanced Instruction-Level Parallelism	12
4	Midterm Examination, Paper Selection	3
5	Dependability, Reliability, and Availability, Disk Storage, Connecting Processors, Memory, and I/O Devices, Interfacing I/O Devices to the Processor, Memory and Operating System, I/O Performance Measures	6
6	The Difficulty of Creating Parallel Processing Programs, Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors,	6

	Hardware Multithreading, SISD, MIMD, SIMD, SPMD, and Vector, Introduction to Graphics Processing Units	
7	Thread Level Parallelism, Basic Schemes for Enforcing Cache Coherence, Snooping Coherence Protocols, Extensions to Basic Coherence Protocols	3
8	Paper Presentation	3
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Assignment #1*	*3rd*	*3.3%*
2.	*Quiz #1*	*5th*	*5%*
3.	*Assignment #2*	*10th*	*3.3%*
4	*Quiz #2*	*12th*	*5%*
5	*Assignment #3*	*3rd*	*3.3%*
6	*Mid Term Exam*	8th	*25%*
7	*Paper Review*	*15th*	*15%*
8	*Final Exam*	*16th*	*40%*

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Computer Organization and Design by David A. Patterson and John L. Hennessy, 4th Edition, Morgan Kaufmann, 2008. ISBN: 0123744938.
Supportive References	Computer Organization & Architecture by William S., 8th Edition, Prentice Hall, 2009. ISBN: 0136073735.
Electronic Materials	Access to IEEE, ACM, Springer portal
Other Learning Materials	Various Web tutorials

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A minimum of 20 seats required.
Technology equipment (Projector, smart board, software)	AV panel and data show required in the classroom.
Other equipment (Depending on the nature of the specialty)	None

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students' assessment	Faculty	Direct
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Head of department	QMS
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	