ATTACHMENT 5.

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

T6. Course Specifications (CS)

Course Specifications

Institution Umm Al Qura University	Date 16/4/2016
College/Department College of Computers and Information Systems	

A. Course Identification and General Information

1. Course title and code: 14013204-3 Parallel Computing
2. Credit hours 3
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Computer Science
4. Name of faculty member responsible for the course Mohammad Ansari
5. Level/year at which this course is offered 3th year / level 8
6. Pre-requisites for this course (if any) : 14012203-4 Operating Systems, 14012401-3 Data Structures
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	yes	What percentage?	100
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course?
This course examines the theory and practice of parallel computing. Topics covered: Introduction to Parallel computing, parallel architectures, Designing parallel program algorithms, managing different kind of parallel programming overheads, e.g. synchronization, communication, etc. Measuring and tuning the parallel performance, and programming for shared and distributed parallel architectures. 1. Ability to use the primitives needed to construct parallel programs. 2. Appreciate how parallel algorithms are designed and developed. 3. Appreciate the issues in distributing work and load balancing. 4. Ability to understand different performance bottlenecks and ability to tune the parallel performance to best exploit the underlying parallel hardware resources.
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) Parallel computing is emerging as an important topic due to the rise of multi/many-cores. Specifically, Parallel architectures are increasingly hierarchal with increasing layers of heterogeneous cores e.g. the use of GPUs . As a result, there is not only a lot of new research, but also many new parallel languages, libraries, technologies, and books, and these are under review for improving the course.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Introduction + Multi-core and its implications on software engineers	1	2
Parallel architectures	2	4

Designing parallel program covering: Patterns, dependences, granularity, Data locality, Load balancing, Communication, Synchronization	2 - 3	6
Parallel Performance (Speedup, Scalability, Amdahl's Law)	1	2
Accessing shared data safely	1	2
Shared memory programming openMP	2	4
distributed memory programming openMP	2	4
some new technologies	1-2	2-4

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	30	0	30			60
Credit						

3. Additional private study/learning hours expected for students per week. 6-9 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		

1.1	Awareness of basic multiprocessor hardware taxonomy.	Course lectures, tutorials, assignments, labs	Quizzes Assignments Midterm Exam Final Exam Lab works
1.2	Ability to measure the performance, and knowledge of the major sources of performance loss in parallel programs.		
1.3	Ability to design and develop parallel program on shared and distributed memory machines.		
2.0	**Cognitive Skills**		
2.1	Ability to use basic software and hardware strategies for managing access to shared data (from locks, and barriers, to cache coherency)	Course lectures, tutorials, assignments, labs	Quizzes Assignments Midterm Exam Final Exam Lab works
2.2	Ability to apply general solutions to reducing performance loss		
2.3	Ability to use standard parallel programming APIs such as Pthreads, OpenMP, and MPI		
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1			
4.2			
5.0	**Psychomotor**		
5.1			
5.2			

5. Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course Los #	**Program Learning Outcomes (Use Program LO Code #s provided in the Program Specifications)**														
	1.1	**1.2**	**2.1**	**2.2**	**2.3**	**2.4**	**2.5**	**3.1**	**3.2**	**3.3**	**4.1**	**4.2**	**4.3**	**5.1**	**5.2**
1.1		**A**	**A**												
1.2		**A**					**P**								
1.3		**A**		**A**				**P**				**A**	**A**	**A**	
2.1		**A**										**A**	**A**		
2.2		**A**										**A**	**A**		
2.3		**A**			**A**									**A**	

6. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination,	Week Due	Proportion of Total

	speech, oral presentation, etc.)		Assessment
1	HW 1	3	5
2	HW 2	5	5
3	HW 3	7	5
4	Midterm	8	20
5	HW 4	9	5
6	project	12	20
7	Final	Exam week	40
8			

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)
Office hours between 2-4 hours per week.

E Learning Resources

1. List Required Textbooks Introduction to Parallel Programming, Peter Pacheco, 2011
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) • The Art of Multiprocessor Programming by Maurice Herlihy and Nir Shavit • Parallel Programming: for Multicore and Cluster Systems by Thomas Rauber and Gudula Rünger • Patterns for parallel programming by Timothy G. Mattson • Parallel Programming in C with MPI and OpenMP by Michael J. Quinn

• Parallel Programming in OpenMP by Rohit Chandra • Parallel Programming with MPI Peter S. Pacheco
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Lecture room (max 40 students) Computer lab (max 20 students)
2. Computing resources (AV, data show, Smart Board, software, etc.) Computer & Data Show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Parallel computer

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Indirect feedback through end-of-semester per-course and general surveys
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Direct measurement of attainment via assessments (quizzes, exams, etc.).
3 Processes for Improvement of Teaching Teaching faculty member suggests improvements in areas where attainment is low, either in student feedback or in direct measurement results. Committee-based process for approving suggestions, implementing them in the next major offering of the course (annual) or as otherwise practical, and re-evaluating attainment.
4 Processes for Verifying Standards of Student Achievement (e.g. 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) N/A.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Attainment results and improvement suggestions, if any, checked and approved by committee.

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____