The University of Jordan

King Abdullah II School for Information Technology (KASIT)			
Computer Science Department			
Semester:	Spring	**Year:**	2014 / 2015

Course Information	
Course Title & Number	Parallel & Distributed Computing (CS 1901752)
Course Level	Graduate (Master Program)
Prerequisite	------
Course Website	**http://elearning.ju.edu.jo**
Instructor	Dr. Basel Mahafzah
Office Location	KASIT, First Floor – Across CS Department
Office Phone	06-5355000 Ext. 22579
Office Hours	Monday & Wednesday 2:00 – 3:00 Or by Appointment
E-mail	**b.mahafzah@ju.edu.jo or BASEL8@hotmail.com**

Text Book & References	
Text Book	• **Introduction to Parallel Computing**, by Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, Addison-Wesley an imprint of Pearson Education, Second Edition, 2003. (**http://www-users.cs.umn.edu/~karypis/parbook/**)
References	• **Introduction to Parallel Computing Design and Analysis of Algorithms**, by Vipin Kumar, Ananth Grama, Anshul Gupta, and George Karypis, The Benjamin/Cummings Publishing Company, Inc. 1994. • **Parallel Programming in C with MPI and OpenMP,** by Michael J. Quinn, Mc Graw Hill, 2003. • **Fundamentals of Parallel Processing**, by Harry F. Jordan and Gita Alaghband, Prentice Hall and Pearson Education, 2003. • **Introduction to Algorithms**, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, The MIT Press, Third Edition, 2009. • **Advanced Computer Architecture: Parallelism, Scalability, Programmability**, by Kai Hwang, McGraw-Hill Higher Education, First Edition, 1992.

Assessment Policy		
Assessment Type	**Exam Dates**	**Weight**
Midterm Exam	Wednesday March 25, 2015 at KASIT 202 Lab from 1:00 – 2:00 PM	30%
Final Exam	Monday May 11, 2015 at KASIT 202 Lab from 12:00 – 2:00 PM	40%
Research Project Report	Monday April 27, 2015	20%
Research Project Presentation	Monday April 27, 2015	10%

Intended Grading Scale		
Weight	**Points**	**Grade**
85 – 100	4	A
80 – 84	3.75	A-
75 – 79	3.5	B+
70 – 74	3	B
60 – 69	2.75	B-
50 – 59	2.5	C+
0 – 49	2	C

Course Description

The course is centered in three concepts: Architectures, Algorithms and Programming. Parallel and Distributed Architectures: Parallel and Distributed computer taxonomy, example of Parallel and Distributed computers, fundamental communication operations, and performance metrics. Parallel algorithms: design and analysis of parallel algorithms with emphasis on sorting, matrix problems, and graph problems. Parallel programming: types of parallelism, parallel programming paradigms, message passing programming, data and parallel programming.

Course Main Goals

The main goals of this course are to be able to know the types of various parallel and distributed architectures and to be able to evaluate various parallel and distributed systems including various interconnection networks and parallel algorithms.

Course Objectives

- To provide a thorough treatment of the concepts, design principles, and performance issues of contemporary Parallel and Distributed Computing.
- To illustrate the structure of Parallel and Distributed Systems.
- To illustrate the design of parallel algorithms for various problems such as sorting, matrix multiplication and graphs.

Teaching/Learning & Assessment Methods

Teaching (T) Methods:

- Class contact is 3 hours per week. The Course will be delivered using different means like lectures, presentations, and discussion.
- Lecture notes, exams (midterm and final) and research project are designed to achieve the course goals and objectives.

Learning (L) Methods:

- You should read the assigned topics before class, and participate in class and do whatever it takes for you to grasp this material. Also, ask any question related to Parallel and Distributed Computing.
- You are responsible for all material covered in the class.
- Please communicate with me regarding any concerns or issues related to Parallel and Distributed Computing by either in class or email.
- The web page (elearning.ju.edu.jo) is a primary communication vehicle. Lecture notes, presentations, project material, and syllabus are available on the web.

Assessment (A) Methods:

- There will be several assessment methods of evaluation the performance of the students such as attending and class participation, project, conducting the midterm and the final exams.

Intended Learning Outcomes (ILOs)

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

A- Knowledge and Understanding:

A1) know and understand basic terms associated with Parallel and Distributed architectures, such as Message Passing, Multiprocessors, SIMD, MIMD, etc.
A2) know and understand basic terms associated with Performance Evaluation, such as Parallel Run Time, Speedup, Efficiency, Cost, Diameter, Connectivity, etc.
A3) know the structure of various Parallel and Distributed architecture.
A4) know the advantages and disadvantages of various Parallel and Distributed Architectures.
A5) understand the concept of various communication operations; such as broadcast communication, personalized communication, etc.
A6) understand the structure of various parallel algorithms; such as parallel sorting, parallel searching, parallel matrix problems, etc.

B- Cognitive and Intellectual skills:

B1) analyze and evaluate various interconnection networks.
B2) analyze and evaluate various communication operations on various architectures.
B3) analyze and evaluate various matrix problems.

C- Subject specific skills:

C1) design various parallel algorithms, such as sorting, searching, graph problems, matrix problems, etc.

D- Transferable skills:

D1) Discuss and evaluate in class the design of various parallel algorithms.

Course Contents, Teaching/Learning & Assessments Methods with ILOs			
Chapter & Number of Lectures	**Topic Details**	**Teaching/Learning & Assessments Methods**	**ILOs**
Chapter 1 (3 Hours, One Week)	Introduction Cost versus Performance; What is Parallel Computing? The Scope of Parallel Computing; Issues in Parallel Computing.	**T:** Lecture & Discussion **L:** Reading lecture notes and Chapter 1 **A:** In class questions	A1
Chapter 2 (12 Hours, Four Weeks)	Models of Parallel Computers A Taxonomy of Parallel Architectures; An Idealized Parallel Computer; Dynamic Interconnection Networks; Static Interconnection Networks; Routing Mechanisms for Static Networks; and Communication Costs in Static Interconnection Networks.	**T:** Lecture & Presentation **L:** Reading Chapter 2 **A:** In class questions	A1, A2, A3, A4, B1
Chapter 3 (15 Hours, Five Weeks)	Basic Communication Operations Assumptions in Store-and-Forward and Cut-Through Routing Schemes; Simple Message Transfer between Two Processors; One-to-All Broadcast; All-to-All Broadcast; One-to-All Personalized Communication; All-to-All Personalized Communication; and Circular Shift.	**T:** Lecture & Presentation **L:** Reading Chapter 3 **A:** Midterm Exam in Chapters 1, 2, and 3	A5, B2
Chapter 4 (9 Hours, Three Weeks)	Performance and Scalability of Parallel Systems Performance Metrics for Parallel Systems (run time, speedup, efficiency and cost); The Effect of Granularity and Data Mapping on Performance; and The Scalability of Parallel Systems.	**T:** Lecture & Presentation **L:** Reading Chapter 4 **A:** In class questions	A2, D1
Chapter 5 (6 Hours, Two Weeks)	Dense Matrix Algorithms Mapping Matrices onto Processors (Dense versus Sparse Matrices, Striped Partitioning, Checkerboard Partitioning); Matrix Transposition; and Matrix Multiplication.	**T:** Lecture & Presentation **L:** Reading Chapter 5 **A:** In class questions	A6, B3, C1, D1
Chapter 7 (3 Hours, One Week)	Project Presentation Presenting and discussing your project as groups.	**T:** Presentation **L:** Design/Implementing your project **A:** In class discussion	A2, A3, A5, A6, B1, B3, C1, D1

Course Regulations & Ethics	
Project Assignments	• .Research project will be assigned for each group (check project guidelines).
Exams	• The format for the exams is generally (but NOT always) as follows: General Definitions, Multiple-Choice, True/False, Analyze a Problem, Short Essay Questions, Solving Problems etc.
Makeup Exams	• Makeup exam should not be given unless there is a valid excuse.
Cheating	• Cheating or copying on exam or research project is an illegal and unethical activity. • Standard JU policy will be applied. • All graded assignments must be your own work (your own words).
Attendance	• Excellent attendance is expected. • The University of Jordan policy requires the faculty member to assign ZERO grade (F) if a student misses 10% of the classes that are not excused. • If you miss class, it is your responsibility to find out about any announcements or assignments you may have missed.
Workload	• Average work-load student should expect to spend 8 hours per week.
Participation	• Participation in and contribution to class discussions will affect your final grade positively. Raise your hand if you have any question. • Making any kind of disruption and (side talks) in the class will affect you negatively.
Concerns or Complaints	• Concerns or complaints should be expressed in the first instance to the module lecturer; if no resolution is forthcoming, then the issue should be brought to the attention of the module coordinator (for multiple sections) who will take the concerns to the module representative meeting. Thereafter, problems are dealt with by the Department Chair and if still unresolved the Dean and then ultimately the Vice President. For final complaints, there will be a committee to review grading the final exam
University Regulations	• For more details on University regulations please visit: http://www.ju.edu.jo/rules/index.htm