Module Specification

1. Factual information			
Module title	**MT372: Parallel Computing**	**Level**	**3**
Module tutor	TBA	**Credit value**	**10**
Module type	Taught	**Notional learning hours**	**3**

2. Rationale for the module and its links with other modules
The module is a comprehensive study of parallel computing techniques, parallel programming and performance tuning. Topics covered include: fundamentals of parallel, concurrent and distributed computing systems, performance and limitations of these systems, and parallelism paradigms. In addition to these topics the software needs and support for parallel processor systems are covered in details. This includes programming languages, simulation and tracing tools. Students will examine a range of topics involved in using parallel operations to improve computational performance, parallel architectures, parallel algorithms and parallel programming languages; Architectures covered include vector computers, multiprocessors, network computers, and data flow machines.

3. Aims of the module
The module aims to give solid understanding about the following: 1. The fundamentals of parallel computing. 2. Parallel operation. 3. The different core concepts behind the hardware layer of a computer system. 4. Performance and limitations of parallel systems 5. The processor's architecture of parallel systems and its interconnection networks. 6. The parallel algorithms.

4. Pre-requisite modules or specified entry requirements
Students are expected to have completed study of M269 & M251

5. Intended learning outcomes	
A. Knowledge and understanding	**Learning and teaching strategy**
Upon completing this module, students will be able to: A1. Understand of the fundamental concept and issues of parallel computing A2. Recognize parallel programming experience solving computationally intensive problems in a variety of disciplines A3. Understand the related implementations and measurements of performance and constraints of parallel computing	• 25% face-to-face tutorial sessions • TMA • Module learning text book and support material

B. Cognitive skills	Learning and teaching strategy
Upon completing this module, students will be able to: B1. Practice Parallel programming platforms B2. Apply Principles of parallel algorithm design B3. Illustrate Basic communication operations B4. Perform Analytical modelling of parallel programs B5. Develop Programming using the message-passing paradigm (MPI)	• 25% face-to-face tutorial sessions • TMA • Module learning booklets and support material

C. Practical and professional skills	Learning and teaching strategy
Upon completing this module, students will be able to: C1. Apply the techniques and theorems in real applications. C2. Analyze specific data and information to build the parallel models C3. Apply the tools studied concerning parallel computing to solve a real problem.	• 25% face-to-face tutorial sessions • TMA • Module learning booklets and support material

D Key transferable skills	Learning and teaching strategy
Upon completing this module, students will be able to:	

D Key transferable skills	Learning and teaching strategy
D1. Gather data from various sources, including the electronic media, such as internet. D2. Choose a case study from the real world and apply the techniques studied. D3. Show responsibility for the preparation of the case study and manage the presentation schedule of his/her work. D4. Exercise research skills, such as data collection, tabulation, analysis, report presentation and class discussions.	• 25% face-to-face tutorial sessions • TMA • Module learning booklets and support material

6. Indicative content.
- Introduction to parallel computing - Fundamentals of Inter -processor Communication - PRAM model and basic algorithms - Overview of parallel algorithms - Parallel algorithms Complexity and models - Shared-memory algorithms and implementations. - Classification of Parallel Machines SISD , MISD , SIMD , MIMD , SPMD - Interconnection Networks Basics - Shared Memory and Message Passing EREW , CREW , ERCW , CRCW - Interconnection Networks (• All-to-All • Mesh • Rings • Hypercube) - Shuffle Exchange - Cube Connected Cycles - Metrics for Interconnection Networks - Parallel Algorithm Construction - Algorithmic Parallelism - Geometric Parallelism - Asynchronous / Relaxed Parallelism - Defining Speedup and Efficiency - Factors That Limit Speedup

7. Assessment strategy, assessment methods and their relative weightings
TMA: 20% MTA: 30% Exam: 50%

8. Mapping of assessment tasks to learning outcomes															
Assessment tasks	**Learning Outcomes**														
	A1	**A2**	**A3**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**
TMA	✓				✓			✓			✓	✓	✓	✓	✓
MTA	✓	✓	✓	✓				✓		✓					
Exam	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			

9. Teaching staff associated with the module	
Tutor's name and contact details	Contact hours
TBA	

10. Key reading list				
Author	Year	Title	Publisher	Location
Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar	2003 2nd Edition	Introduction to Parallel Computing	Addison Wesley	ISBN: 0-201064865-2

11. Other indicative text (e.g. websites)
https://lms.arabou.edu.kw