MULTIMEDIA UNIVERSITY®

COURSE INFORMATION

1 .	**Name of Course**	Parallel Processing
2 .	**Course Code**	TSN3151
3 .	**Type of Course** (e.g. : Core, major, elective etc.)	Elective
4 .	**Synopsis**	This course teaches the students how to write parallel computer programmes using various diffent techniques.
5 .	**Version** (State the date of theSenate's approval - previous and the current approval date)	Current: January 2018 Previous: June 2016
6 .	**Name(s) of Academic Staff**	Ian Chai, Ian Tan, Soo Wooi King
7 .	**Semester and Year Offered**	Trimester 2 (Delta Level)
8 .	**Credit Value**	3
9 .	**Pre-Requisite**	TCP1101 Programming Fundamentals
10 .	**Objective of the course in the programme:**	

The objective of the subject is to provide the knowledge of parallel processing concepts, parallel environments and architectures, parallel algorithms and parallel programming.

11 .	**Justification for including the course in the programme:**

This course will enable students to acquire the required knowledge and skills for parallel processing that enable them to provide relevant solutions which will meet the unique challenges and requirements of the current needs for high performance computing.

12 . **Course Learning Outcomes (CLO)**

	Domain	Level
CLO1: Describe different types of parallelism, their principles and structures	Cognitive	2
CLO2: Comprehend the principles, techniques, and practices relevant to the design and implementation of parallel computing systems	Cognitive	2
CLO3: Construct parallel algorithms for distributed and shared memory parallel systems	Cognitive	3

13 . **Mapping of the Course Learning Outcomes to the Programme Learning Outcomes, Teaching Methods and Assessment:**

Course Learning Outcomes (CLO) (Must tally with CLOs in item 12)	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	Teaching Methods	Assessment Method
CLO1	✓	✓											Lecture/Practical	Mid-Term Test/Final Exam
CLO2	✓	✓	✓										Lecture/Practical	Mid-Term Test/Final Exam
CLO3	✓	✓	✓										Lecture/Practical	Assignment
CLO4														
Total	**3**	**3**	**2**											

Indicate the relevancy between the CLO and PLO by ticking "✓" the appropriate relevant box (This description must be read together with standards 2.1.2, 2.2.1, and 2.2.2 in Area 2 – pages 16 & 18 of COPPA 2.0)

14 .	**Transferable Skills:**

Ability to write parallel programs, both for computation and to process data.

15 . **Distribution of Student Learning Time (SLT)**

	Course Content Outline	**CLO	Teaching and Learning Activities Guided Learning (F2F)*				Guided Learning (NF2F)*	Independent Learning (NF2F)*	Total SLT
			*L	*T	*P	*O			
1	**Introduction to Parallel Computing** Motivations for parallelism, scope of parallel computing, parallel paradigms, parallel programming environments, job- and task-level parallelism, physical organization of parallel platforms and the relevant communication methods.	1,2	4		4			8	16
2	**Analytical Modeling of Parallel Programs** Basics of message passing programming, performance metrics for parallel systems (execution time, overhead, speedup, efficiency, cost, etc), analytical evaluation of communication operations and parallel programs.	1,2	2		2			4	8
3	**Message Passing Paradigms** Message Passing Interface (MPI), introduction on Parallel Virtual Machine (PVM), sample programs.	1,2,3	2		4		4	6	16
4	**Parallel Algorithm Design** Partitioning and divide-and-conquer strategies, pipelined computations, embarrassingly parallel computations and sample applications	1,2	6		8		4	14	32
5	**Synchronization** Barriers, synchronized computations, local synchronization, data-parallelism and sample applications	1,2	2		2			4	8

#	Topic	CLO**	L	T	P	O	F2F	Total SLT
6	**Parallel Processing on Shared Memory** Shared memory multiprocessors and chip-level multiprocessor (CMP or multi-core), concurrent process creation (heavyweight process and threads), shared data access, shared memory synchronization (lock, barrier, semaphores, deadlock), cache coherence protocols.	1,2	2	2			4	8
7	**Shared Memory Programming** Creating and Maintaining shared memory parallelization with threads and OpenMP.	1,2,3	4	6	4		10	24
							Total SLT	**112**

SUMMATIVE ASSESSMENT		
1. Continuous Assessment	**Percentage %**	**Total SLT**
Mid-Term Test	30%	8
Assignment	30%	18
Total SLT for Continuous Assessment		**26**

2. Final Assessment	**Percentage %**	**Total SLT**	
		F2F	ILT
Final Exam	40%	2	20
Total SLT for Final Assessment (F2F + NF2F)		**22**	

Grand Total	**100%**	**160**

**Indicate the CLO based on the CLO's numbering in Item 12.
*L= Lecture, *T= Tutorial, *P= Practical, *O= Others, F2F*= Face to Face, NF2F*= Non Face to Face

16 .	**Identify Special Requirement to Deliver the Course (e.g., software, nursery, computer lab, simulation room):** Computer Lab
17 .	**Main References:** Robert Cook, (2011), An Introduction to Parallel Programming with OpenMP, PThreads and MPI, Cook's
18 .	**Additional References:** 1. Harry F. Jordan & Gita Alaghband, (2003), Fundamentals of Parallel Processing", Prentice Hall. 2. Peter Pacheco, (2011), Introduction to Parallel Computing (2nd Edition)", Morgan Kaufmann. 3. Books Barry Wilkinson and William Allen, (2004), Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers (2nd Edition), Prentice

Note:

Cells shaded light grey contain formulas / fixed values. Edit these formulas only if needed.