MULTIMEDIA UNIVERSITY®

COURSE INFORMATION

1.	**Name of Course**	Game Algorithms
2.	**Course Code**	TGD 3351
3.	**Type of Course** (e.g. : Core, major, elective etc.)	Specialization Core for B. CS (GD)
4.	**Synopsis**	This course aims to provide students with the knowledge of fundamental algorithms and artificial intelligence in game programming. Students taking this course will also be exposed to hands-on game development and practical aspects of game library structuring.
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**	John See Su Yang Wong Ya Ping
7.	**Semester and Year Offered**	Trimester 1 (Delta)
8.	**Credit Value**	4 credit hours
9.	**Pre-Requisite**	TCP1201 Object-Oriented Programming & Data Structures
10.	**Objective of the course in the programme:** To equip students with the fundamental algorithms and concepts in game programming and artificial intelligence (AI) and to provide exposure to hands-on game development and application of relevant game algorithms.	
11.	**Justification for including the course in the programme:** To provide students with knowledge of fundamental algorithms in game programming and exposure to hands-on game development	

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

Course Learning Outcomes (CLO)	Domain	Level
CLO1: Describe fundamental game algorithms and artificial intelligence used in game development	Cognitive	1
CLO2: Explain game algorithms for both front-end and back-end parts of computer games	Cognitive	2
CLO3: Apply usage of artificial intelligence to accomplish complex behaviours in games	Cognitive	3
CLO4: Design specialised games that utilise relevant state-of-the-art game algorithms and artificial intelligence	Cognitive	6

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	Test
CLO2							✓						Lecture/Practical	Test/Assignment
CLO3								✓					Lecture/Practical	Assignment/Project
CLO4								✓	✓				Lecture/Practical	Project
Total							**2**	**2**	**1**				*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:**
(for Project): Time management, Delegation, (for all Coursework): Problem Solving, Concept application

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

Course Content Outline	**CLO	Guided Learning (F2F)* *L	*T	*P	*O	Guided Learning (NF2F)*	Independent Learning (NF2F)*	Total SLT
1 Introduction to Game Algorithms & AI Overview of game algorithms, Game Architecture, Data Structures in Games, AI in Games, Perspectives of AI, Perception Issues		2		0		4	2	8
2 Game AI Fundamentals AI Classifications: Weak and Strong AI, Deterministic and Non-deterministic AI; Implementations of Game AI, Complexity of Game AI, Constraints of Speed & Memory, AI Engine		2		0		4	2	8
3 Movement Basic Movement Algorithms: Chasing, Evading, Intercepting, Pattern Movements; Movement in Tile-based Environments, Movement in Continuous Environments, Steering Behaviors, Flocking Algorithm, Obstacle Avoidance, Follow-the-Leader Algorithm		4		2		4	6	16
4 Pathfinding Basic Pathfinding: Tracing Around Obstacles, Breadcrumb Pathfinding, Path Following, Wall Tracing; Review of Graphs & Graph Representations, Djikstra (Shortest Path) Algorithm, A* Algorithm, Extensions: Terrain Cost, Influence Mapping		6		6			12	24
5 Decision Making Decision Trees, Combination of Decisions, Random Decision Trees, Finite State Machines, Non-deterministic State Machines, Hierarchical State Machines, Fuzzy Logic, Fuzzy State Machines, Goal-Oriented Behavior, Rule-based Systems		6		6			12	24

No.	Topic	CLO	L	T	P	O	F2F	SLT
6	**Probabilities & Uncertainties** Using Probabilities in Games, Classical Probability, Frequency Interpretation, Subjective Interpretation, Odds, Expectation, Conditional Probability, Bayes Rule		2	2			4	8
7	**Tactical & Strategic AI** Waypoint Tactics, Tactical Locations: Primitive and Compound Tactics, Tactical Pathfinding, Influence & Visibility Maps, Coordinated Action and Behavior in Groups		4	4			8	16
8	**Advanced AI Techniques** Neural Networks, Evolutionary Algorithms, Machine Learning Techniques		2			4	2	8
							Total SLT	**112**

SUMMATIVE ASSESSMENT

1. Continuous Assessment	Percentage %	Total SLT
Test	20%	8
Assignment	20%	18
Project	60%	22
Total SLT for Continuous Assessment		**48**

2. Final Assessment	Percentage %	Total SLT F2F	ILT
Total SLT for Final Assessment (F2F + NF2F)		**0**	

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, software
17 .	**Main References:** Millington, I., & Funge, J. (2009). Artificial Intelligence for Games (2nd ed.). Morgan Kaufmann, USA
18 .	**Additional References:** Yannakakis G.N. & Togelius, J. (2017). Artificial Intelligence and Games, Springer International Publishing Bourg, D.M. & Seemann, G (2004). AI for Game Developers, O'Reilly Media Publishing, USA. Buckland, M. (2005). Programming Game AI by Example, Wordware Publishing, USA.

Note:

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