Teaching Plan

FAKULTI TEKNOLOGI MAKLUMAT DAN KOMUNIKASI
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

GEOGRAPHICAL INFORMATION SYSTEMS

BITP 3483	SEMESTER I	SESI 2023/2024

BITP 3483 GEOGRAPHIC INFORMATION SYSTEMS [3, 2, 2]
TYPE OF COURSE: P
EDITION : 1
UPDATED DATE : 06-10-2023

1.0 LEARNING OUTCOMES

Upon completion this course, students will be able to:

i. Apply the concepts, issues, techniques and various GIS applications. (C4,LL1)
ii. Solve information system problems based on the GIS language technique. (A3,CTPS3)
iii. Evaluate the issues in GIS management based on the information from various resources. (P3, CS2)

2.0 SYNOPSIS

This course will introduce students to Geographic Information Systems (GIS). GIS is a computer based data processing tool that is used to manage, analyze and visualise spatial data. It can be considered as advanced database. Students will explore some of the GIS applications in in the area of electronic government, resources management, disaster management, businesses, banking and insurance industries. Students must be familiar with traditional methods of identifying and describing locations using paper maps. The students will begin by examining the geographic basics of mapping and examine the processes in which spatial data can be recorded, captured, stored, processed using computers. Next, the students will introduce the methods used in spatial analysis.

3.0 PRE-REQUISITE

None

4.0 PRACTICAL

Practical direct data entry into GIS. ArcGIS Pro tools, and the way how customization can be implemented. The students will be exposed to how to implement GIS interoperability network analysis and other spatial analysis.

5.0 REFERENCES

[1] Chang, Kang-tsung, 2019, Introduction to Geographic Information Systems, 9th Edition, McGraw-Hill.

[2] Bruce E.Davis, 2001, GIS : A Visual Approach, 2nd Edition, OnWord Press

[3] Rudolphus Antonius By, Otto Huisman, 2009, Principles of Geographic Information Systems: An Introductory Textbook Volume 1 of ITC educational textbook series, 4th Edition, International Institute for Geo-Information Science and Earth Observation (ITC)

[4] Wilpen L. Gorr, Kristen S. Kurland, 2016, GIS Tutorial 1: Basic Workbook, 10.3.x edition, Esri Press

6.0 COURSE IMPLEMENTATION

i. Lecture
   - 2 hours per week for 13 weeks (Total = 26 hours) - OnLine

ii. Laboratory Activities
   - 2 hours per week for 13 weeks (Total = 26 hours) - OnLine

7.0 COURSE EVALUATION

Assessment Method	**LO 1**	**LO 2**	**LO 3**	**Scheme, Rubric/ guideline**
	PLO1, PLO9	**PLO9, PLO6**	**PLO2, PLO6**	
	C3, LL	**A3, CTPS**	**P3, CS**	
Lab Assessment	LA 1(5%)	LA2-5 (15%)		Rubric
Project		P1 (15%)	P2(5%)	Rubric
Lab Test			LT (15%)	AnswerScheme
Mid Term	MT2 (15%)			AnswerScheme
Final Assessment	FA (30%)			AnswerScheme
Total	50%	30%	20%	

8.0 STUDENT LEARNING TIME (SLT)

		Guided Learning Time				Independant Learning								Assessment Time				
Week	**CLO**	**L**	**T**	**P**	**O**	**L**	**T**	**P**	**O**	**F**	**T**	**A**	**O**	**F**	**T**	**A**	**O**	**SLT**
W1	1	0		0	4	0	0	0	3	0	0	0	0					7
W2	1	2		2		2	0	1	0	0	0	0	0					7
W3	1, 2	0		0	4	0	0	0	3	0	0	0	0.4				0.1	7.5
W4	1	2		2		2	0	1	0	0	0	0	0					7
W5	1, 2	2		2		2	0	1	0	0	0	0	0.4				0.1	7.5
W6	1, 2	0		0	4	0	0	0	3	0	0	0	0					7
W7	1, 2, 3	2		2		2	0	1	0	0	4	0	0		1			12
W8	1, 2, 3	2		2		2	0	1	0	0	0	0	0					7
W9	1, 2	0		0	4	0	0	0	3	0	0	0	0.4				0.1	7.5
W10	1, 3	2		2		2	0	1	0	0	0	4	0			1		12
W11	1, 2	2		2		2	0	1	0	0	0	0	0.4				0.1	7.5
W12	1, 3	0		0	4	0	0	0	3	0	4	0	0		1			12
W13	1, 2	2		2		2	0	1	0	0	0	0	0.4				0.1	7.5
W14	2, 3	2		2		2	0	1	0	0	0	4	0			1		12
>W14										0	0	0	8				2	10
Overall		**18**	0	**18**	**20**	**18**	0	**9**	**15**	0	**8**	**8**	**2**	0	**2**	**2**	**0.5**	**120.5**
SLT Credit Equivalent																		**3.0**

9.0 DETAILED SYLLABUS AND TEACHING PLAN

Week	Session	Contents	References	Delivery Method
1	Lecture 1	**INTRODUCTION TO GIS** 1.1 The nature of GIS. 1.2 Components of GIS 1.3 History of GIS 1.4 Element of GIS • Coordinate System • Vector Data Model • Raster Data Model 1.5 Example of GIS applications.	[1], [4]	Lecture & Lab
	Lab 1	**INTRODUCTION TO GIS SOFTWARE** 1.1 Getting to know GIS Software • Open source and licensed software • Installing and Configuring GIS environment	[4]	
2	Lecture 2	**GEOGRAPHIC INFORMATION AND SPATIAL DATA TYPES** 2.1 GIS data acquisition 2.2 Spatial Data Infrastructure 2.3 Geoprocessing 2.4 File Geodatabase • Digitizing • Geocoding 2.5 Geometric Transformation 2.6 Spatial Data Accuracy and Quality	[1], [3], [4]	Lecture & Lab
	Lab 2	**SETTING UP WORK ENVIRONMENT** 2.1 How GIS Work 2.2 Map Creation	[4]	
3	Lecture 3	**COMPUTER REPRESENTATIONS OF GI** 3.1 Tolopogy and spatial relationships 3.2 Attribute Data Management 3.3 Scale and Resolution 3.4 Representation of Geographic Fields 3.5 Representation of Geographic Objects	[1], [3]	Lecture & Lab
	Lab 3	**MAP PROJECTION** 3.1 How GIS Work	[4]	

4	Lecture 4	**DATA MANAGEMENT AND MAP DESIGN** 4.1 GIS Architecture & Functionality 4.2 Map Design 4.3 Map Layout 4.4 Interactive Map 4.5 Map Animation 4.6 Data Display and Cartography	[1], [3]	Lecture & Lab Project Dissemination
	Lab 4	**EXPLORING GEOSPATIAL RELATIONSHIP** 4.1 Analyzing the opioid crisis using GIS 4.2 Scale and Resolution 4.3 Adding Point Data	[4]	
5	Lecture 5	**SPATIAL DATABASE MANAGEMENT SYSTEM** 5.1 Using SDBMS 5.2 Alternative for data management 5.3 The relational data model 5.4 Querying a relational database 5.5 Other DBMSs 5.6 Using GIS and DBMS together	[1], [3]	Lecture & Lab
	Lab 5	**EXPLORING GEOSPATIAL RELATIONSHIP** 5.1 Displaying crime data using heat maps 5.2 Mapping educational level using GIS	[4]	
6	Lecture 6	**SPATIAL REFERENCING AND POSITIONING** 6.1 Spatial reference systems and frames 6.2 Spatial reference surfaces and datums 6.3 Datum transformations 6.4 Map projections	[1], [3]	Blended Learning
	Lab 6	**CREATING AND EDITING SPATIAL DATA** 6.1 The power of maps 6.2 Creating a basic story map 6.3 Creating a swipe story map 6.4 Creating a map series web app 6.5 Creating a spyglass story map	[4]	

7	Lecture 7	**SPATIAL DATA INPUT AND QUALITY** 7.1 Basic concepts and definition 7.2 Data quality 7.3 Data error 7.4 Accuracy and precision 7.5 Attribute accuracy 7.6 Temporal accuracy 7.7 Lineage 7.8 Completeness 7.9 Logical consistency	[1], [3]	Lecture & Lab Mid Term Exam
	Lab 7	**CREATING AND EDITING SPATIAL DATA** 7.1 Exploring and creating basemaps 7.2 Deriving accessibility 7.3 Helping restore a watershed 7.4 Analyzing a severe windstorm	[4]	
MIDTERM BREAK				
8	Lecture 8	**DATA ENTRY AND PREPARATION** 8.1 Data checks and repairs 8.2 Combining multiple data sources 8.3 Direct spatial data acquisition 8.4 Digitizing paper maps 8.5 Obtaining spatial data elsewhere 8.6 Generating discrete field representations from point data. 8.7 Generating continuous field representations from point data. 8.8 Advanced operation on continuous field rasters 8.9 Applications and filtering 8.10 Slope angle computation and slope aspect	[1], [3], [4]	Lecture & Lab
	Lab 8	**EXPLORING GEOSPATIAL RELATIONSHIP** • Editing • Topology **FACILITATING WORKFLOWS** 8.1 Custom pop-ups in mapping 8.2 Creating thematic maps with hexagons • ArcGIS Arcade	[4]	

9	Lecture 9	**SPATIAL DATA BASIC ANALYSIS** 9.1 Classification of analytic GIS capabilities 9.2 Retrieval, classification and measurement 9.3 Overlay functions 9.4 Neighborhood functions	[3], [4]	Lecture & Lab
	Lab 9	**COLLABORATIVE MAPPING** 9.1 Siting a new hospital using GIS 9.2 Creating thematic maps with hexagons 9.3 Understanding current events in 3D 9.4 Data Visualization	[4]	
10	Lecture 10	**SPATIAL DATA ADVANCE ANALYSIS** 10.1 Proximity Analysis 10.2 Spatial Operations 10.3 Terrain Analysis 10.4 Network Analysis	[3], [4]	Lecture & Lab
	Lab 10	**GEOENABLING YOUR PROJECT** 10.1 Responding Spatial Operations 10.2 Styling LAS point cloud layers	[4]	
11	Lecture 11	**ERROR PROPAGATION IN SPATIAL DATA PROCESSING** 11.1 Measures of location error on maps 11.2 Root mean square error 11.3 Accuracy tolerances 11.4 The epsilon band 11.5 Describing natural uncertainty in spatial data 11.6 Error propagation in spatial data processing 11.7 Error propagation analysis	[3], [4]	Lecture & Lab
	Lab 11	**ANALYZING SPATIAL AND TEMPORAL PATTERNS** 11.1 World Time Zones 11.2 Scene Viewer	[4]	
12	Lecture 12	**DATA VISUALISATION** 12.1 GIS and maps 12.2 The visualization process 12.3 Visualization strategies: Present or explore? 12.4 The cartographic toolbox 12.5 Map cosmetics 12.6 Map output	[1], [3]	Blended Learning
	Lab 12	**DETERMINING SUITABILITY** 12.1 Prepare project data 12.2 Derive new surfaces 12.3 Create weighted suitability model	[4]	

13	Lecture 13 Lab 13	**GIS & THE FUTURE** 13.1 Data sharing and related problems 13.2 Spatial data transfer and its standards 13.3 GIS infrastructure and clearinghouses 13.4 Metadata concepts and functionality 13.5 Structure of metadata 13.6 How to map? ▪ Qualitative data ▪ Quantitative data ▪ Terrain elevation 13.7 Time series **MAP PRESENTATION** 13.1 Apply detailed symbology 13.2 Label features 13.3 Page layout 13.4 Printing and exporting map	[2] [4]	Blended Learning
14	Lecture 14 Lab 14	Report Assessment **Project Presentation**		Project Presentation