Subject Description Form

Subject Code	AMA2233
Subject Title	Data Analytics and Visualization
Credit Value	3
Level	2
Pre-requisite	Principles of Programming (AMA2222) or equivalent
Objectives	This subject aims to provide students with knowledge and techniques in data analytics and visualization, which refers to the process of analyzing data and encoding data or information into visual form including statistical charts or other graphical objects. It aims to enrich students' knowledge in various disciplines such as visual communication, computer programming, logical reasoning, data science and statistics. These knowledges are essential for data analytics and reporting.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) understand the principles of data analytics and visualization; b) acquire information from data using statistical methods and computer programming techniques c) familiarize with various types of diagrams suitable for representing datasets or statistical information under different situations; d) apply computer programming techniques to create computer graphics for data visualization; e) Get familiar with some important models in data analytics; f) present data in visual form for effective communication and analytics; g) develop innovative ideas using big-data analytics and information technologies
Subject Synopsis/ Indicative Syllabus	**1. Visual communication** Principles of visual design, colour theory, perception. **2. Data analytics** Basic regression analysis, basic time series analysis, basic graph theory and social network analysis, data dimension reduction. **3. Foundations of data visualization with applications in understanding probability theory** Basic charts and plots, statistical charts, scatter plots. **4. Visualization of time-oriented data** Time-oriented data, time series, real-time data, simulations. **5. Visualization of discrete structures** Networks, graphs, trees. **6. Visualization of scientific data** Spatial data, geospatial data, scalar and vector field. **7. Interactive data visualization** 3D-plots, animations, annotations, transformation, interactive controls.

Teaching/Learning Methodology	This subject emphasizes both the conceptual elements in visual communication and data analytics, and also practical techniques in using computer programming. The lectures will be taught in a workshop mode with hands-on exercises reinforcing taught concepts. Students are required to attend the laboratory sessions, which allows them to consolidate their concepts through laboratory tasks. These tasks involve practical work that help students to reinforce the programming skills learned for applications.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						
		a	b	c	d	e	f	g
1. Continuous Assessment – Two assignments (20%) and Mid-term (20%)	40%		✓	✓	✓	✓	✓	
2. Examination	40%	✓	✓	✓	✓	✓		
3. Project	20%	✓	✓	✓	✓	✓	✓	✓
Total	100 %							

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The Mid-term and final examination will be designed to assess students' conceptual knowledge about the subject.

The assignments and laboratory exercises will be designed to assess students' practical techniques in using the data visualization tools.

The project will be designed to assess students' ability to apply their knowledge to analyze, visualize and report data in real-life situation.

Student Study Effort Required

Class contact:	
▪ Lecture	26 Hrs.
▪ Lab	13 Hrs.
Other student study effort:	
Assignments, quizzes, projects, exams	81 Hrs.
Total student study effort	120 Hrs.

Reading List and References

Matthew Ward, Georges Grinstein, Daniel Keim	Interactive Data Visualization, 2nd Edition	CRC Press, 2015
Tamara Munzner	Visualization Analysis and Design	CRC Press, 2014
Calus O. Wilke	Fundamentals of Data Visualization	O'Reilly, 2019
Ashwin Pajankar	Practical Python Data Visualization	Apress, 2021

	Kirthi Raman	Mastering Python Data Visualization	Packt Publishing, 2015
	Abha Belorkar, Sharath Chandra Guntuku, Shubhangi Hora, Anshu Kumar	Interactive Data Visualization with Python, 2nd Edition	Packt Publishing, 2020