Title (Units): **COMP4125 Visual Analytics (3,2,1)**

Course Aims: This course will enable students to learn the concepts, methodologies, and techniques of interactive visualization to support analytical reasoning and critical thinking with data, and to appreciate its needs and impacts in real-world contexts.

Prerequisite: Year III Standing

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Describe the fundamental concepts and methodologies of visual analytics
2	Describe the key interactive visualization techniques for data understanding and analytical reasoning
3	Identify relevant interactive visualization techniques to meet real-world needs
	Professional Skill
4	Apply relevant visual analytics techniques and tools to solving real-world problems
5	Evaluate the design and usability of visual analytics solutions
	Attitude
6	Be alert to the needs and impacts of visual problem-solving with data and ready to demonstrate them in real-world applications

Calendar Description: To provide an interdisciplinary study of visual analytics. Students will learn to understand the fundamental concepts and methodologies in interactive visualization, as well as to apply the relevant techniques and tools for the purposes of facilitating data understanding and analytical reasoning. Students will be given the opportunities to appreciate the needs and impacts of visual problem-solving with data and to develop real-world applications.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1, 2, 3	Students will learn essential concepts and algorithms of data visualization through lectures and tutorials. Besides, written assignment(s), quiz(s) and final examination will be designed to evaluate the students' level of understanding.
4, 5	Laboratory sessions will be designed so that students could apply what they have learnt in lectures. There will include laboratory classes and final examination to evaluate the students' level of understanding.
4 - 6	Students are required to conduct a project based on a selected topic individually and give a formal presentation on their proposed method. Instructor(s), teaching assistant and other students would ask questions related to their project. Lectures and laboratory classes

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Continuous Assessment-assignments and quizzes/tests	25%	1 - 5	Continuous assessments are designed to assess the students' progressive mastery of the theories and techniques as well as their applications.
2	Continuous Assessment-mini-project	25%	3 - 6	Continuous assessments are designed to assess the students' progressive mastery of the theories and techniques as well as their applications.
3	Examination	50%	1 - 6	The final examination is designed to measure the extent to which the students have reached all of the learning outcomes. Students are required to have a good comprehension of the fundamental concepts,

				methodologies, and techniques of visual analytics and their applications.

Assessment Rubrics:

Excellent (A)	• Achieves the first five CILOs, with strong evidence of having achieved the last CILO, demonstrating a good mastery of both theoretical and practical aspects of the knowledge and skills associated with visual analytics and applications • Able to develop and present sound arguments and correct solutions to problems, accompanied by in-depth analysis and insight • Demonstrates a thorough understanding and solid knowledge of visual analytics concepts, methodologies, and techniques • Able to draw on a variety of techniques and relevant knowledge and appropriately apply them to new visual analytics situations and problems
Good (B)	• Achieves the first five CILOs, with evidence of having achieved the last CILO, demonstrating a good understanding of the associated concepts and underlying methodologies • Able to develop solutions to problems, accompanied by adequate explanations • Demonstrates a competent level of knowledge of visual analytics concepts, methodologies, and techniques • Ability to make use of appropriate knowledge and techniques and apply them to familiar situations and problems
Satisfactory (C)	• Achieves most of the first five CILOs, demonstrating a basic level of understanding of the associated concepts and underlying methodologies • Able to provide acceptable solutions to problems • Demonstrates an adequate level of knowledge of visual analytics • Ability to make use of some knowledge and techniques and apply them to familiar situations
Marginal Pass (D)	• Achieves some of the first five CILOs, demonstrating a minimum level of understanding of the associated concepts and underlying methodologies • Able to provide marginally acceptable solutions to certain problems • Demonstrates a threshold level of knowledge of visual analytics • Ability to make use of limited knowledge or techniques and apply them to some simple cases
Fail (F)	• Achieves less than four of the CILOs, with little understanding of the associated concepts and underlying methodologies • Unable to provide solutions to simple problems • Knowledge of visual analytics falling below the basic minimum level • Unable to apply knowledge and techniques to situations or problems

Course Content and CILOs Mapping:

Content		**CILO No.**	**Hours**
I	Building blocks of visual analytics	1, 6	2
II	Visual representations from different perspectives	1, 6	6
III	Human visual perception and cognition	1, 6	3
IV	Data semantics, types, transformations, analysis, and representations for visual reasoning	2 - 5	9
V	Data-driven discovery and analytical reasoning	3 - 6	3
VI	Interaction design	3 - 6	3
VII	Evaluation of visual analytics solutions	3 - 6	3
VIII	Case studies in practical application areas: Business intelligence, knowledge management, and social media, etc.	3 - 6	8
IX	Existing challenges and future development in visual analytics	1, 6	2

References:

- Schwabish, J. Better *Data Visualizations: A Guide for Scholars, Researchers, and Wonks*, Columbia University Press, 2021.
- Clarke, E. *Data Analytics, Data Visualization & Communicating Data*, Kenneth Fornari Publisher, 2023.
- Munzner, T. *Visualization Analysis and Design*, CRC Press, 2014
- Meirelles, I. *Design for Information: An Introduction to the Histories, Theories, and Best Practices Behind Effective Information Visualizations*, Rockport, 2013
- Keim, D, Kohlhammer, J, Ellis, G, and Mansmann, F (Eds.). *Mastering the Information Age: Solving Problems with Visual Analytics*, Eurographics Association, 2010 (http://www.vismaster.eu/book/)

Course Content:

Topic		**Hours**
I.	Building blocks of visual analytics	2
II.	Visual representations from different perspectives	6
III.	Human visual perception and cognition	3
IV.	Data semantics, types, transformations, analysis, and representations for visual reasoning	9
V.	Data-driven discovery and analytical reasoning	3
VI.	Interaction design	3
VII.	Evaluation of visual analytics solutions	3
VIII.	Case studies in practical application areas: Business intelligence, knowledge management, and social media, etc.	8
IX.	Existing challenges and future development in visual analytics	2