The Hong Kong University of Science and Technology

UG Course Syllabus (Spring 25-26)

[Course Title] **Data Visualization**

[Course Code] **COMP 4462**

[No. of Credits] **3**

[Any pre-/co-requisites] **COMP 2011 OR COMP 2012 OR COMP 2012H**

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Course Description

In today's data-driven world, the ability to effectively analyze and make decisions using large, complex datasets is crucial across various disciplines, including political reporting and forecasting, news reporting, social science and economics, social networking and web traffic, business intelligence, text analysis, criminal investigation, and bioinformatics, etc. Data visualization (or information visualization) is a rich research area that focuses on the design, development, and utilization of visual representations and interaction techniques to help people understand, analyze, and make decisions using data. This course aims to equip students with the principles and skills necessary to design, implement, and critique information visualizations effectively. Topics include human visual system and perception, visual design principles, commercial as well as open-source visualization tools and systems, visualization techniques (for graphs and networks, trees and hierarchies, text and documents, time-series, and geospatial data), visualizations across cultures, and visualization in the era of multimodal language models. In addition to lectures, there will be labs and a capstone project which will give students hands-on experience to turn data into effective (functional and aesthetic) visualizations.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Understand human perceptual and cognitive capabilities as they relate to the design of data visualizations.
2. State and describe the fundamental principles of effective data visualization.
3. Learn to apply the wide range of data visualization techniques depending on the data types and user goals.
4. Analyze social impact and responsibilities as well as possible ethical, legal, security and privacy considerations associated with data visualizations.
5. Create and evaluate an interactive visualization system.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date*^
In-class Exercises	10%	09/05/2026
Individual Mini Project	15%	09/05/2026
Lab Exercises	20%	09/05/2026
Midterm Exams	25%	09/05/2026
Group Project	30%	09/05/2026

* All deliverables will be complete on/before last day of classes. For individual dates, check Canvas.
^ Assessment marks for assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
In-class Exercises	ILO2, ILO3, ILO4, ILO5	This task assesses students' ability to explain and apply different visualization principles and techniques (ILO2) based on the available data and user goals (ILO3) and analyze associated social, legal, and ethical impact and implications (ILO4), and design effective visualizations (ILO5).
Individual Mini Project	ILO1, ILO2, ILO3, ILO5	This task assesses students' ability to work individually and design and develop one or more visualizations.
Lab Exercises	ILO3, ILO5	This task assesses students' ability to apply visualization principles and techniques (ILO3), as well as design, develop, and evaluate visualizations (ILO5).
Mid-term Exams	ILO1, ILO2, ILO3, ILO4	This task assesses students' ability to explain human perceptual and cognitive abilities related to visualization (ILO1), explain and apply different visualization principles and techniques (ILO2) based on the available data and user goals (ILO3) and analyze associated impact and implications (ILO4).
Group Project	ILO1, ILO2, ILO3, ILO4, ILO5	This task assesses students' ability to work in a group setting and apply everything they learnt about visualizations to design, develop, and evaluate a working prototype of an effective visualization system.

Grading Rubrics

Detailed rubrics for each assignment will be provided. These rubrics will clearly outline the criteria used for evaluation. Students can refer to these rubrics to understand how their work will be assessed.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

The course is open to the use of generative artificial intelligence tools to complete assessment tasks with proper acknowledgement and sharing of corresponding prompts and outputs. Exams will be 'close book'.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include justifications and areas for improvement. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

N/A

Required Texts and Materials

N/A

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

[Optional] Additional Resources

Entire course content will be available within the Canvas Learning Management System (LMS).

Reference books

- **Visualization Analysis and Design by Tamara Munzner**
- **Interactive Data Visualization: Foundations, Techniques, and Applications by Matthew Ward, Georges Grinstein, and Daniel Keim**
- **Interactive Data Visualization for the Web by Scott Murray**