**THE UNIVERSITY OF HONG KONG**

**HKU BUSINESS SCHOOL**

**IIMT3643 Data visualization and visual analytics**

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| **General Information** |
| Instructor: DENG YipuEmail address: yipudeng@hku.hkOffice location: KKL1308Consultation times: TBATeaching Assistant: TBAPre-requisites: NoneCourse Website: Moodle |
| **Course Description** |
| Data visualization is an essential skill required in today’s data driven world. With its foundations rooted in statistics, psychology, and computer science, practitioners in almost every field use visualization to explore and present data. This course shows you how to better understand your data, present clear evidence of your findings to your intended audience, and tell engaging data stories that clearly depict the points you want to make all through data graphics. The skills learned in this course offer enormous value for creatives, educators, entrepreneurs, and business leaders in a variety of industries. Whether you are a seasoned visualization designer or just learning about it now, this course will serve as an introduction and reference to becoming visual with data.The course involves individual homework, exams, and projects. You will demonstrate your mastery of the material by applying what you learn. Some assignments will be well specified; others may be purposely less specific or less structured because an objective of these assignments is for you to not only solve the problem posed, but also to learn how to be creative in visualizing data.Class sessions will comprise 1) lectures/discussions of various data visualization concepts, 2) instructor laboratory demonstrations, and 3) student lab sessions. The purpose of this pedagogical approach is to introduce and reinforce ideas and skill sets so that students can master these on their own after class hours. You will be a critical element in class sessions, which will usually be interactive. You are strongly encouraged to ask questions to clarify and expand the covered material. Each class will provide important information. ***It is your responsibility to get this information if you are unable to attend a class*.** Class materials and discussions will often supplement the textbook and other readings. The exams will cover all these materials. |
| **Course Objectives** |
| The course aims to provide students with the foundations necessary for understanding and extending the current state of the art in data visualization. Upon successful completion of the course, you should be able to do the following:* Present data with visual representations for your target audience, task, and data;
* Experiment with and compare different visualization tools;
* Create multiple versions of digital visualizations using various software;
* Employ cutting edge tools and technologies to analyze Big Data;
* Identify appropriate data visualization techniques given particular requirements imposed by the data;
* Apply appropriate design principles in the creation of presentations and visualizations; and
* Analyze, critique, and revise data visualizations.
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| **Textbooks**  |
| **Optional Textbooks:** *Storytelling with Data: A Data Visualization Guide for Business Professionals*, by Cole Nussbaumer Knaflic, Wiley |
| **Faculty Learning Goals (FLGs)** |
| FLG1: Acquisition and internalization of knowledge of the programme disciplineFLG2: Application and integration of knowledgeFLG3: Inculcating professionalism FLG4: Developing global outlookFLG5: Mastering communication skillsFLG6: Cultivating leadership |
| **Course Learning Outcomes (CLOs)** | **Aligned FLGs** |
| CLO1 CLO2 CLO3 CLO4CLO5 | Understand the key concepts about visualization techniques and visual analytics.Identify and evaluate the key issues in the application of visualization techniques.Demonstrate effective use of visualization tools for data analysis.Learn how to obtain and present insights from data visualization.Develop problem solving skills through data visualization and visual analytics. | 1 & 3 & 62 & 3 & 612 & 52 |
| **Course Teaching and Learning Activities (T&L)** | **Expected contact hours** | **Study load (% of study)** |
| T&L1. Interactive lectures and discussions T&L2. In-class quizzesT&L3. AssignmentsT&L4. In-class practiceT&L5. Self-study and self-training | 255152515 | 29%6%18%29%18% |
| Total | 85 | 100% |
| **Assessments** | **Brief Description** | **Weights** | **Aligned CLOs** |
| A1. ParticipationA2. QuizzesA3. AssignmentsA4. Midterm examA5. Project | Interactions and discussions.In-class quizzes.Take-home assignments.One midterm examination.One Group Project. | 10%10%30%25%25% | 1 & 21 to 31 to 41 to 51 to 5 |
|  | Total | 100% |  |
| **Course Grade** | **Grade Descriptors** |
| A+, A, A- | The student is able to apply all the methods learned in the course to new, unexpected situations, independently and in a novel manner that goes beyond expectations of a good student. Student has achieved an impressive mastery of course content. |
| B+, B, B- | The student is able to apply the methods learned in the course, but only under partial guidance. Student has achieved a basic mastery of course content, and thus meets expectations. |
| C+, C, C- | The student understands conceptually most of the methods learned, but cannot apply them all, even under guidance. Performance is that of an average student and content knowledge is that of a novice, which is below expectations. |
| D+, D | The student has shown some effort but has a highly limited understanding of course content. Performance and content knowledge are poor and not to the level expected for a future data analytics professional. |
| F | The student has shown little effort or understanding toward course content. Performance and content knowledge are completely unacceptable. |
| **Course Policies** |
| ***A. Exam***One exam will be administered during the semester. If an exam will be missed because of a University-excused absence, you must notify the instructor **BEFORE** the exam. When an exam is missed due to a University-excused absence (and prior notice is provided), the exam will be rescheduled by the instructor. The format of the make-up exam may vary from the formats of regularly scheduled exams. The instructor has the sole right to make determinations concerning the potential for make-up exams. ***B. Individual Homework***There will be three individual assignments. The assignments will require you to work with data and use various technologies to create data visualizations. Each assignment must be submitted at the beginning of the class in which it is due. A late penalty of 20% per 24-hour period will be imposed for assignments turned in after the submission time. Saturday and Sunday count as one 24-hour period.***C. Group Project***You will form or be assigned to a team to work on the project. Again, this group project is a demonstration of your knowledge and fluency with data visualization techniques and tools. This project is an opportunity for you to create a series of data graphics based on data that you select. You will create at least 6 visualizations based on your defined audience, data, and tasks. You will present visualizations to the class in the form of a compelling story. Each part of the project must be submitted at the beginning of the class in which it is due. A late penalty of 20% per 24-hour period will be imposed for projects turned in after the submission time. Saturday and Sunday count as one 24-hour period.In order to assess the contributions of individual group members in different parts of the project, peer evaluation forms will be supplied near the end of the semester. You are required to provide feedback on the contributions made by the other members of your group using these forms. The filled-out forms are due by the last class. ***Failure to turn them in by this due date will result in a 25% reduction in your own peer evaluation grade.******D. General Course Policies and Expectations**** Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact the instructor personally, as soon as possible, so accommodations necessary to ensure full participation and facilitate your educational opportunities can be discussed.

***Students who are having problems with test taking (or any activities) in this class are highly encouraged to contact their instructor for help as soon as they recognize that there is a problem to obtain the necessary guidance.**** Exams, project deliverables, and individual assignments will be considered for re-grading ***only if*** **a request is made** to the instructor, along with a written explanation, ***within five business days*** since the graded items are returned.
* Students are expected to arrive in class on time and stay through the entire class. If a student must be late coming to a class or must leave a class early for unavoidable reasons, he or she ***should notify the instructor in advance.***
* Students are expected to respect the rights of their classmates by exhibiting courteous and professional behavior that is conducive (or not disruptive) to the learning environment of the classroom. ***Cell phones should be turned off or put on silent ring or vibrate.*** Phone calls should not be made or taken during the class period (this includes text messaging or instant messaging). If there is an emergency situation that prevents you from adhering to this policy, please see your instructor to discuss it as soon as possible.
* Students are strongly encouraged to collaborate with their group members while working on the project. In fact, the ***capability to work in a group and learn from one another in the group is an important objective of this cours***e. On the other hand, ***any type of collaboration during an exam is strictly prohibited***.
* The highest academic integrity is expected of all students. ***Any deviation from this will be treated harshly.*** For details concerning plagiarism, please check: http://www.hku.hk/plagiarism/page2s.htm
* As mentioned before, students are ***expected to take every exam at the scheduled time and location***. In a case where serious emergency prevents a student from doing so, the instructor must be notified immediately. All emergencies and absences must be documented by the appropriate authority (e.g., the health-care provider concerned in the case of a medical emergency).
* All students in the course are expected to have (and frequently check) an e-mail account. ***Students are responsible for updating Moodle to reflect their current e-mail address and phone contact information.***
* In the event of a major campus emergency or severe weather condition, the university may decide to delay, dismiss, or cancel classes and/or other routine operations. Such decisions will be communicated to the university community by various means, including postings on the ***university’s website***. Information regarding changes in any requirements of this course necessitated by such decisions may be obtained from the ***course website*** or by ***contacting the instructor***.
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| **Means/Processes for Student Feedback on Course** |
| x Participation in SETL around the end of the semester. |

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| **Tentative course schedule** |
| **Week** | **Topics** | **Readings** |
| 1 | Course overview and syllabusValue of data vizData viz in various fieldsExcel basic charts |  |
| 2 | Excel advanced chartsExcel practiceEthicsEffective charting |  |
| 3 | Introduction to TableauFirst data vizTableau workflow * Connect to a single sheet
* Intro to bar chart and crosstab
* Dashboard
* Twb or twbx file

Data source page* Join tables (inner, left, right, full outer join) \*
* Live vs. extract
 |  |
| 4 | Data source page* Data interpreter
* Pivot
* Manage metadata (data type, field name)
* Split and custom split\*

Edit a data source * Default properties for fields
* Edit metadata (rename)
* Tds file

Dimension and Measure* Continuous and discrete
* Date part and date value\*

Filtering* Condition filter\*
* Multiple filters (AND logic)
* Change filter options
* Date filters (date range, relative dates)

Sorting* Computed and manual sort
 |  |
| 5 | Create groups* Visual grouping

Create hierarchy* Geographic data

Custom datesDual axis chartCombined axis chart* Compare with dual axis chart\*
* Stacked marks

Scatter plot* Aggregate measures

Symbol map* Use Location hierarchy\*
 |  |
| 6 | Crosstab* Subtotals and grand totals
* Weighted average
* Local average (different from weighted ones) \*
* Highlight table
* Heatmap

Calculated fields* Numbers
* String
* Date
* Build calculations with aggregations\*

Quick table calculations* Running total and percent of total
 |  |
| 7 | Quick table calculations* Rank calculations

Tree map, word cloud, bubble chartReference linesBuild a dashboardAdvanced Tableau |  |
| 8 | Dashboard* Add highlight actions
* Add filter actions

Add URL actionsJoin tables across databases* Join calculations

Extract dataUnion dataBlend data |  |
| 9 | Blend data without a common fieldFiltering across data sourcesCreate setsContext filtersAggregate dimension* In the calculation editor

Table calculationLevel of detail expression (fixed)* With different view structures
 |  |
| 10 | Order of Filtering (table vs. LOD calculation)Parameters* Use a parameter in a calculation
* Use a parameter within a filter
* Use parameters to swap measures
 |  |
| 11 | Advanced Mapping* Edit location data
* Customize geocodes for addresses
* Add an image and plot data

HistogramBox and WhiskerBar-in-barBullet graphSlope chart |  |
| 12 | TrendlineForecast Story |  |
| 13 | Group Project Presentation |  |