Course Proposal Form

Please see Page 2 for instructions on which parts of this form to complete, whom to consult with to avoid unnecessary effort, and where to send the completed form.

Proposer(s): Benjamin Bach   **Date: 05/12/2019**

Cover page: Basic permanent course information

Unless otherwise noted, items in this section are entered into EUCLID and **cannot** be changed without creating an entirely new course.

Course Name	Data Visualisation Upskilling
Course Acronym *(used by the School only, e.g., for the Sortable Course List)*	DataVisUp / DATAVIS-UP
Course Level If the course is **only** available to MSc students, then it must be classed as Postgraduate. All other courses, regardless of level, are Undergraduate.	**_X_ Undergraduate** (this course is for an external audience, e.g, employees who want to increase their skills) _Postgraduate
Normal Year Taken	__UG1 __UG2 __UG3 __UG4 __UG5 __MSc *(this course is not for students enrolled in a regular* *programme, it is an online course open to everybody.)*
Also available in years *[This can be changed later if need be.]*	__UG1 __UG2 __UG3 __UG4 __UG5 __MSc *(same as above)*
SCQF Credit Level Level 8 should normally be used for pre-honours courses. Level 10 should normally be used for optional UG3 courses (so UG4 students may also take them) and for courses aimed mainly at UG4 students. Level 11 should be used for courses aimed mainly at MSc students, whether or not UG4 students can also take them.	_X_ 7 __8 __9 __10 __11
SCQF Credit Points	**_X_ 10** __20 __40 __60 __80 __Other:
Delivery Location	__Campus **_X_ On-line Distance Learning**
Course Type	__Standard (default) __Dissertation **_X_ Online Distance Learning** __Other (specify: Placement, Student Led Individually Created Course, Year Abroad)
Marking Scheme By default, courses use a numerical marking scheme. If you wish to use a grade-only marking scheme, your course proposal below should justify this.	**_X_ Standard (numerical)** __Letter grade only

Guidance for remaining sections:

For an initial course proposal, please complete the **cover page and Section 1 (Case for Support)**, which asks you to describe the need for this course and to provide an overview of the course design, including the learning outcomes. **Please discuss your plans as early as possible with the head of Curriculum Review to avoid unnecessary effort.**

Send the form with these sections completed to the BoS Academic Secretary and head of Curriculum Review (listed on the BoS page) to obtain their comments before filling out the remainder of the form.

If a full proposal is invited, please complete the remaining sections and send to **iss-bos@inf.ed.ac.uk**.

2. Student-facing course description and additional feedback and assessment information.
This section provides most of the information students see in the DRPS entry for this course, as well as related details for BoS consideration.

3. Further information for BoS consideration: sample materials.

4. Additional Course Details required for DRPS. *[Administrative information such as delivery timing and prerequisites.]*

5. Placement in degree programme tables. *[Required for all level 9-11 courses; used to determine where the course will be added to existing degree programme tables.]*

6. Comments from colleagues. *[All course proposal should be sent to relevant colleagues in the area as well as to the appropriate year organizer and BoS Academic Secretary for comment in good time before the BoS meeting. Use this section to indicate what feedback has been solicited and received.]*

Colour coding and item-by-item guidance:

Guidance is provided in italics for each item. Please also refer to the guidance for new course proposals at http://www.inf.ed.ac.uk/student-services/committees/board-of-studies/course-proposal-guidelines. Examples of previous course proposal submissions are available on the past meetings page http://web.inf.ed.ac.uk/infweb/admin/committees/bos/meetings-directory but note that the proposal form was updated in Jan 2019.

Sections in gold are for **student** view and are required before a course can be entered into DRPS. You must complete these sections even if your course has already been approved based on other documentation.
Sections in orange are for **School** use but are still required for all courses (even those that have already been approved based on other documentation).
Section in gray are for consideration by the **Board of Studies**. They are normally required for all new course proposals but may be omitted in some circumstances (e.g., for invited course proposals) if you obtain permission in advance.

1. Case for support

This section is for consideration by the Board of Studies. The final two boxes (Learning Outcomes, Graduate Attributes) will also go into the student-facing course description.

Overall contribution to teaching portfolio and relation to existing curriculum
Please explain (a) what motivates the course proposal (e.g. a previous course having become outdated/inappropriate, an emergent or maturing research area or new research activity in the School, offerings of our competitors) and (b) how it relates to existing courses and degree programmes (including any prerequisite courses). Every new course should make an important contribution to the delivery of our [Degree Programmes](.).

This is an online course, meant as upskilling for people outside university, e.g., employees, freelancers or work seeking. Creating, delivering, and maintaining the course is funded by SFC with £80k for 15 months. Theoretically, it can run every semester, even in summer. Also, if possible through University bureaucracy, participants could join the and finish the course at their own pace, since it's an online course. Funding after the 15 period will depend on the success of the course. It aims to provide participants with a University certificate over 10 credits. The motivation for the course is as follows.

Data visualization is gaining increased interest as a skill, applicable to a wide range of areas and activities: business reports and business analytics, data exploration and data science, data-driven presentations and storytelling, designing infographics, communicating insights, outreach and communication activities, summarizing important facts, monitoring time-critical processes, etc. However, while many tools provide out-of-the box solutions for visualizations e.g., Tableau and PowerBI, the use of these tools and moreover the creation of bespoke visualizations for specific data, tasks, and audiences remains human labor that requires knowing about human perception, design guidelines, graphic design, data workflows, and presentation.

The course focuses on understanding, using, and designing interactive visualizations, judging their shortcomings, and creatively think of novel solutions. The course aims to focus on methodological thinking and visualization as a general scientific method, beyond informatics and graphic design. The course is mainly based on an existing course Data Visualisation (DATAVIS), organized by the same proposer at this proposal (Benjamin Bach). While DATAVIS focuses on university students, this course is an online course focussed towards employees and other workers interested in learning about data visualization (see 'Target audience' below), This course is co-proposed, designed, and organized with Gian Marco Campagnolo, from the School of Social and Political Sciences, and who is already running an online course "Understanding Visualization".

Target audience and expected demand
Describe the type of student the course would appeal to in terms of background, level of ability, and interests, and the expected class size for the course based on anticipated demand. A good justification would include some evidence, e.g. by referring to projects in an area, class sizes in similar courses, employer demand for the skills taught in the course, etc

The audience of the course is wide. It ranges from

- professionals in the area of data analysis and business analytics
- freelancers and (visualization) designers
- journalists
- school teachers

- etc

No prior knowledge or skills are required to follow the course and the course contains many relevant real-world examples to link to the different audiences. It is an introductory course which aims to provide the basics of data visualization to support exploration and explanation in different contexts.

No programming skills are required for this class. The solution design, reporting, and demonstration can be completed with various tools, which are up to the students to chose, some of which will be taught in class. Ideally participants come with their own data sets and challenges. These data can be used throughout the course as there are various opportunities to explore, visualize, and otherwise work with the data and related visualizations. Course work are designed to scale to larger numbers of participants (~100). The course offers additional and non-mandatory tutorials at the University for those students being able to make it to the city.

Anticipated Resource Requirements
Estimate how much lecturing, tutoring, exam preparation and marking effort will be needed in steady state, and any additional resources needed to set the course up initially. Provide estimates relative to class size where applicable and discuss how support staff will be recruited and supervised, if the class is likely to be very large. Please mention any scaling limits due to equipment or space. If equipment is required, say how it will be procured and maintained.]

The course will provide online videos for around 2h per week, 1h homework, plus three 1h tutorials over the semester to prepare students for the assignments and learning outcomes. Tutorials might run with a size of 10-20 students, and one tutor, paid by the funding. No specific equipment is required for the tutorials. No specific room booking will be required, since we will book Inspace for the few tutorials.

Quotas, special arrangements or unusual characteristics
Please specify if this course requires any special arrangements such as quotas or other registration arrangements; is a collaboration with another school or institution, or has other atypical characteristics that may affect finances or student registration. Further justification/information may be requested for such courses.

The course is run by Informatics but co-organized by Benjamin Bach (Informatics), Gian Marco Campagnolo (School of Social and Political Sciences) and Uta Hinrichs (Univ. of St Andrews). Students will be externals, not officially enrolled in any University program. Students are likely to be enrolled into the university for the sake of the course. The course requires a certificate from the university for every student.

Narrative description of the course aims and structure
Please describe the main goals of the course and how the course design will allow students to achieve those goals. This section should be consistent with the student-facing information provided below, but should provide additional information to help colleagues at BoS understand the vision and structure of the course. This description may refer to the learning outcomes and graduate attributes (next two boxes) and should explain how activities such as tutorials, labs, or in-lecture activities will support them, and how the proposed assessments will assess them.

For courses that are important pre-requisites for other courses, this section may also provide content/syllabus information which is too detailed for the student-facing description, such as a lecture-by-lecture syllabus.

This course teaches general knowledge about theory, application, design, and evaluation of visualizations. The goal of the course is to enable students to understand the potential of visualizations and how interactive visualization interfaces can support the workflow of data analysis.

The course will enable students to describe a visualization problem, to explore the data using visualizations, to discuss and design appropriate visualization concepts, and to implement and critically reflect on them. The course is designed for an interdisciplinary audience without requiring any pre-skills. General programming skills are not required. Besides interactive visualizations, participants can opt to create static visualizations (infographics, data comics, posters, etc).

During most of the course, participants will work with their own data that they find relevant to them. Students will go through all the stages of the exploration and visualization design process, in alignment with the above listed learning outcomes; explore data and make initial findings, critique the tools and list shortcomings and possible future features, create custom visualization designs for exploration or presentation, present the visualizations. For a final presentation, each student is expected to submit a visualization project, insights gained, and critical reflections on the visualizations used.

The course aims for 11 lectures, each targeting a set of principles in data visualizations, and organized as shown below. Topics are provided as pre-recorded lectures, with a range of topics in the areas below. Each topic will include a range of short videos. The specific topics and their weightening will be determined by continuous market research, supported through the funding.

<u>Lectures and topics (2h):</u>
1. Foundations I: Introduction to data visualization, visual perception, exploratory data analysis
2. Foundations II: Tools and programming environments for data visualization
3. Techniques I: Visualizing Statistical and Multivariate Data
4. Techniques II: Visualizing Trees and Networks
5. Techniques III: Visualizing Geographic, temporal and geo-temporal data
6. Advances I: Data-driven storytelling and Data Journalism
7. Advanced II: Interaction techniques for Data Visualization
8. Advanced III: Evaluating visualizations
9. Extra I: Deception and Communication
10. Extra II: Uncertainty Visualization
11. Extra III: Visualization Guidelines

Summary of Intended Learning Outcomes (MAXIMUM OF 5)
List the learning outcomes of the course. These must be assessable (i.e., observable), so must specify what the student should be able to do concretely, not simply what they should "understand". Use concrete verbs that indicate (a) what type of assessment would be appropriate, and (b) what level of knowledge/thinking is expected (from recall to analysis to novel creation). Example verbs: define, explain, implement, compare, justify. Assessments (described later) should be tied to the learning outcomes.

Outcomes should typically focus more on the types of thinking/skills developed than on the detailed course content, and the level of thinking should be appropriate to the level of the course: outcomes for a Level 11 course should include more

higher-level thinking skills than for a Level 8 course. Further guidance on writing learning outcomes can be found at
https://www.ncl.ac.uk/ltds/assets/documents/res-writinglearningoutcomes.pdf

On completion of this course, the student will be able to

1. **Analyze:** Describe a challenge for a visualization project and the reasons why visualization is required.
2. **Design**: Create a visualization through one of various media (website, interactive, infographic, etc.) and through a self-chosen set of tools. Visualization designs are meant to match an earlier identified challenge.
3. **Evaluation:** Critically reflect on a visualization design and suggest constructive solutions.
4. **Use:** Know and use a wide range of visualization techniques and tools and their drawbacks and features.

Graduate Attributes, Personal & Professional Skills
List the personal attributes and generic transferrable skills this course will help develop. Examples include
Cognitive skills: *problem-solving, critical/analytical thinking, handling ambiguity*
Responsibility, autonomy, effectiveness: *independent learning, self-awareness and reflection, creativity, decision-making, leadership, organization and time management, flexibility and change management, ethical/social/professional awareness and responsibility, entrepreneurship*
Communication: *interpersonal/teamwork skills, verbal and/or written communication, cross-cultural or cross-disciplinary communication*

- **Problem analysis**: analyze the problem related to exploring and communicating data in a specific context
- **Critical thinking**: thinking critically about the effectiveness of data visualization for a given challenge, in a given context.
- **Creativity**: searching for (novel) alternative visualization solutions to a specific challenge
- **Visual design:** sensitivity about how to use visual design skills to improve visual communication