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):   **Valerio Restocchi**   **Date: 06/02/2019**

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-driven business and behavioural analytics
Course Acronym *(used by the School only, e.g., for the Sortable Course List)*	DBBA
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.	__Undergraduate X Postgraduate
Normal Year Taken	__UG1 __UG2 __UG3 __UG4 __UG5 X MSc
Also available in years *[This can be changed later if need be.]*	__UG1 __UG2 __UG3 __UG4 __UG5 X MSc
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.	__7 __8 __9 __10 X 11
SCQF Credit Points	__10 X 20 __40 __60 __80 __Other:
Delivery Location	X Campus __On-line Distance Learning
Course Type	X Standard (default) __Dissertation __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 will be a core course for the MSc programmes in Advanced Financial Computing and Technology Management and Digital Future, both delivered by the School of Informatics jointly with the Business School.

This course will contribute to these programmes by providing students with an in-depth understanding of how to model people's behaviour with the appropriate mathematical and computational tools. In the past decade, the informatisation of services and the introduction of, among the others, social media, has allowed the collection of data regarding a broad range of human activities. This has legitimated modern research areas such as computational social science, complexity, and network science, and strengthened others such as behavioural economics and finance, by providing researchers with the necessary tools to understand and model complex systems such as human behaviour and human interactions. However, the techniques developed by academics are rarely acquired by practitioners, who often do not know how to efficiently analyse the data their companies collect. The aim of this course is to fill this gap by teaching methods and techniques to analyse and predict human behaviour, with particular focus on finance and business. This course will give them a unique profile which is sought out in both industry and academia alike.

Also, this course will cover a highly cross-disciplinary topic which sits in between Informatics and Business, and will provide students with an interdisciplinary skill set that will be highly spendable in a number of business and research contexts other than behavioural analytics.

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

This course will target MSc students on the MSc programmes in Advanced Financial Computing and Technology Management and Digital Future. Since one of the main goals of this course is to bring together Informatics and Business, there are two main types of students that this course is expected to be appealing to: Computer Science students who want to learn how to model human behaviour (and, more generally, model complex socio-economic systems) and Business students (e.g., Business, Management, Finance, Economics) who need to learn data analysis and data-driven methods to deal with real-world data sets. It is expected that a portion of students will have already work experience.

The demand is estimated to be of around 40-50 students initially (based on the demand for the two MSc programmes).

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.]

- Lectures: 25
- Practical Laboratories: 50 (five 2-hour mandatory lab sessions that will require a tutor every 10 students approximately, to properly support and guide the students through their tasks.)
- Demonstrating: 0
- Course Marking: 24 (including oral presentations, considering approximately 12 groups)
- Exam Preparation: 10
- Exam Marking: 40 (including oral presentations, considering approximately 40 students)
- Other Requirements: 0

Demonstrators for the practical laboratories will be recruited among AI and Data Science PhD students, who possess the essential data analysis and statistical skills to support students during the tutorials. They will require only a short training session pertaining the application of concepts they already know to behavioural data.

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.

This course will not have any quotas or special arrangements other than those of the MSc programmes.

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.

The recent exponential growth in the availability of data gathered by companies offering online services has enabled the analysis and prediction of human behaviour to reach an unprecedented level of accuracy. Behavioural analytics are now not only a subject for academics, but are the core business of some of the largest companies in the world (e.g., Google, Facebook, etc.), and are also being integrated in many other business sectors, from marketing to finance. Modern behavioural analytics must take advantage of this vast amount of data to make reliable and accurate models of how people behave. Hence, knowledge and intuitions from disciplines such as behavioural economics and sociology can no longer be considered enough to capture the full complexity of human behaviour, and need to become just a part of the more quantitative set of mathematical and computational tools. This course aims at teaching such tools from mathematical modelling and data science, enabling students to analyse and predict human behaviour in a wide range of contexts and, by doing so, learning a broad set of interdisciplinary skills required for data driven modelling in a number of different business contexts.

To achieve this, the course will be comprised of a mix of lectures on the theoretical aspects of analytics (mathematical methods, modelling techniques, etc.), and a series of tutorials during which the students can apply what they have learned on real-world data sets (or, in case no such a data set is available, e.g. for privacy reasons, an equivalent one will be created by the lecturer), which serves the purpose to give students hands-on experience on practical analytics tasks before their assessed coursework projects.

Since the main goal of this course is to prepare students to deal with such data sets, and, more in general, the main challenge of behavioural analytics is to being able to identify the appropriate description of particular behaviours (among a vast set of possible ones), students will be assessed based on coursework that replicates the structure of the tutorials. That is, students will be given two assignments: one to be done as a group project and one to be done individually. For these assignments, students will be provided with a data set containing information con human behaviour/decision making in a business-related context (e.g., finance, marketing, retail). Students will be asked to solve a specific problem a company may face (e.g., a trading firm asking to find which category of customers are more likely to lose money), typically including several sub-tasks, and will improve their analytical reasoning and problem-solving skills by deciding what pieces of data they may or may not need, what models are the most appropriate to address a problem, whether they need to retrieve additional data from the web, etc.

During the group and the individual projects students will develop different skills:

The group project aims at having students with different backgrounds to work together to improve their cross-disciplinary communication skills as well as their interdisciplinary knowledge. Also, by reflecting the interdiscinplinarity of the subject, the group assignment prepares students to work on real-world behavioural analytics projects (either in industry or academia), which usually are carried out by teams composed by people with highly heterogeneous backgrounds, while also enhancing their team-working skills and allowing students to learn aspects of disciplines in which that they do not have experience.

After the group project, the students will be ready to work individually. The individual assignment builds on the skills and knowledge students gained during the first part of the course and aims at further strengthening the students' critical and analytical skills, while also enhancing their individual learning capabilities.

An important part of the assessment will be the presentation of these assignments in front of the class, which is expected to improve the students' communication skills and simulate a work environment where results from a report or an academic paper are presented.

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) Critically analyse and explain human behaviour based on empirical observations.

2) Decide which modelling technique(s) is the most appropriate for a specific task.

3) Model and simulate realistic social systems with independent or interacting individuals.

4) Make accurate predictions of human behaviour in a broad range of scenarios (e.g., retail, finance, social systems, etc.).

5) Present (written/oral) highly interdisciplinary work in an understandable and comprehensive manner to people with different backgrounds.

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*

During this course, students will develop a number of personal attributes/generic transferrable skills, including, but not necessarily limited to:
- Problem solving
- Critical thinking
- Analytical thinking
- Information elicitation
- Information filtering
- Decision making
- Independent learning
- Teamwork
- Verbal and written communication
- Cross-disciplinary communication