School of Informatics Course Proposal Form (version: May 2021)

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): **Jeff Pan** **Date: 05 Jan, 2021**

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	Knowledge Graphs
Is this an EPCC course?	_X_ No (default) *(If you don't know what EPCC is, this is the right choice.)* __ Yes *(If so, leave Course Acronym blank, to be filled in by ITO as EPCC/<number> for Theon and our Sortable List.)*
Course Acronym *(used only School-internally)*	KG
SCQF Credit Level and Normal Year Taken	**Standard options for Informatics courses:** __ Level 8/Year 1 __ Level 8/Year 2 __ Level 10/Year 3 (also available in Year 4). *[In practice, most level 10 courses have many students in both UG3 and UG4. MSc students may take up to 20 credits at Level 10.]* _X_ Level 11/Year 4 (also available in Year 5 and MSc). *[These courses are listed as options in both UG and MSc DPTs.]* __ Level 11/PG (also available in Year 5). *[These courses are normally for MSc and UG5 students. They are not explicitly listed in UG4 DPTs, but UG4 students can take limited credits of them.]* __ Level 11/PG (only). *[These courses are not available to UG4 or UG5 students. Examples: CDT courses; CPD courses.]* **Other options. Please provide justification if using:** __ Level 9/Year 3 *[Deprecated except for compulsory UG3 courses. The course will not be available to other years.]* __ Level 10/Year 4 __ Other:
SCQF Credit Points	_X_ 10 __20 __40 __60 __80 __Other:
Delivery Location	_X_ Campus __On-line Distance Learning
Course Type	_X_ Standard (default) __Dissertation __Online Distance Learning __Placement __Student Led Individually Created Course __Year Abroad
Marking Scheme	_X_ Standard (numerical) __Letter grade only __Pass/Fail *[Normally only for externally delivered courses]*

Guidance for remaining sections:

Before starting your proposal: please contact the DDoLT (Curriculum) informally before starting to complete this form, with at least the following information:

- Tentative course title, level, year, and number of credits
- Who the target audience is, and why the course is needed.

The DDoLT (Curriculum) or delegate will schedule a meeting with you to discuss your plans and whether a full course proposal makes sense. If so, you will be provided with further instructions.

Deadlines: New courses must be approved by the December BoS meeting to ensure allocation of teaching staff for the following academic year. Since it may require considerable discussion and iteration to prepare the proposal, you should **contact the DDoLT (Curriculum) as early as possible, ideally in spring or summer**, and you should **plan on submitting your full proposal by November.**

Submitting your proposal: When your proposal is complete, please submit to **iss-bos@inf.ed.ac.uk**.

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 Apr 2021.

Sections in gold are for student view and are required before a course can be entered into DRPS.
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 cases, with permission (e.g., for invited proposals).

Glossary of terms:
(D)DoLT: (Deputy) Director of Learning and Teaching.
DRPS (The Degree Regulations and Programmes of Study): Provides the University's official listing and descriptions of courses, degree programmes, and the regulations that govern them; updated annually in April. Course information in DRPS is considered a contract with students.
DPT (Degree Programme Table): Lays out the course requirements for each year of a degree. All UoE degrees have a DPT in the DRPS.
Path: A system that students use to help choose courses and view options in their DPT. The information feeds through from DRPS but has a more student-friendly interface (e.g., by highlighting courses that are not running or where the student hasn't satisfied prerequisites).
SCQF (The Scottish Credit Qualifications Framework): Lays out the requirements for courses at different levels and with different numbers of credits.

1. Course overview and case for support

Except as noted, all fields are required and will go into the DRPS (course catalogue) entry for students. Important: Text in DRPS is effectively a contract with students, so should not include details that are likely to change from year to year.

Summary Description (for DRPS)

Provide a brief official description of the course, around 100 words. This should be student-friendly, as it is the part of the descriptor a student is most likely to read. If this course replaces another course, please say so in this summary.

Recent advances in AI have changed the perception of what AI systems can do, from decision support to answering questions. An underlying feature of many AI systems concerns how knowledge is acquired, represented, and reasoned with. Today, knowledge graphs are used extensively by most of the world's leading IT companies, from search engines (e.g., the content of the Google knowledge panel is a tiny fragment of Google's knowledge graph) and chatbots to product recommenders and many applications of AI and data science. This course provides the theory and practice of knowledge graph construction, reasoning, and question answering technologies. The students will analyse case studies to construct knowledge graphs and apply reasoning services on them.

Contribution to curriculum; target audience and expected demand; consultation (for BoS only)

Why is this course needed and how does it relate to existing courses and degree programmes (including any prerequisite courses)?	The term 'knowledge graph' was coined by Google in 2012 to refer to its general-purpose knowledge base, though similar approaches have been around since the beginning of modern AI in areas such as knowledge representation, knowledge acquisition, natural language processing, ontology engineering and the semantic web. According to Google, knowledge graphs are used extensively by the world's leading IT companies, from search engines and chatbots to product recommenders and intelligent systems. It is a maturing research area, and the Alan Turing Institute recently sets up a group on this very topic (https://www.turing.ac.uk/research/interest-groups/knowledge-graphs) in November 2020. Knowledge graphs are related to both AI and Data Science degrees. In AI, knowledge graphs complement machine learning techniques to: • reduce the need of large, labelled datasets; • facilitate transfer learning and explainability; • encode domain, task and application knowledge that would be costly to learn from data alone. In Data Science, common use cases are around adding identifiers and descriptions to data of various modalities to enable sense-making, integration, and explainable analysis.
What is the target audience, in terms of background and interests,	I would expect to see 50-80 students interested in this course; since students will not require meeting any pre-requisites. As mentioned above, the course is highly

and what is the expected demand (class size) for the course? *State what your estimate is based on: e.g. by referring to projects in an area, sizes of similar courses, employer demand, etc. A survey of students may be requested once the main descriptor information is ready.*	relevant to our MSc degrees on AI and Data Science. This may even become a compulsory course in some programmes.
Has this proposal been discussed with the DDoLT (Curriculum) or DoLT prior to BoS submission?	_X_ Yes ___ No
Who else has been consulted? *Proposals should typically be discussed with relevant colleagues, including the programme director (for MSc courses). Summarize their comments if needed.*	Sharon Goldwater

Course Description (for DRPS)

*This student-facing description should normally include **(a)** a more in-depth description of the learning aims, nature and context of the course, **(b)** a rough outline of the content, and **(c)** a description of how the course will be taught, and how students are expected to engage with it and to demonstrate their achievement of the learning outcomes.*
***Note:** Please keep this section general enough to avoid the need for yearly updates, and keep in mind that you should have only around 15 lecture hours of examinable material per 10pts of a course. (10pt courses may have 18-20 lecture hours, but the rest should be used for guest lectures, revision sessions, assignment feedforward/feedback, etc.)*

In this course, we will cover topics such as:

- Knowledge graph foundation and standards
  - RDF (Resource Description Framework)
  - OWL (Web Ontology Language)
  - SPARQL (Query Language for RDF and OWL)
- Knowledge graph construction, embeddings, and completion
- Knowledge graph reasoning and querying
  - Tableaux algorithm
  - Tractable schema reasoning in EL
  - Tractable query answering in DL-Lite
  - Semantic parsing

The students will be expected to prepare for the lectures by reading related textbook chapters and papers. In addition to lectures, there will be some tutorials, helping students to better understand some concepts and theories.

Assessment Weightings (for DRPS)

These should correspond approximately to the proportion of learning outcomes (below) that each component assesses. Note that assessed coursework is typically more time-consuming than exams for both students and staff. A typical course is based no more than 30% on coursework and doing so requires justification.

Written Exam __80__%
Practical Exam _____% (*for courses with programming exams)*
Coursework _20__%

Additional Information, Assessment (for DRPS)

State briefly for students what type of coursework to expect, including whether implementation is required. E.g., "Coursework will involve implementing some of the methods discussed" or "The coursework will assess students' analysis and proof skills. No implementation is required." More specific information can be useful, but please keep it high level and do not include details that are likely to change from year to year.

There will be one piece of individual coursework. It will involve the student working on a specific case study where the student will be expected to construct and query a knowledge graph to solve the case study in hand. It will take around 10 hours. The length limit will be around 1000-1200 words.

There are 2 lectures per week or 1 lecture plus 1 tutorial per week, and 3 supervised lab sessions in the semester. The student will need to spend about 30 minutes-2 hours preparing for lectures and tutorials each week. The student will read and work on some materials prior to lectures and tutorials.

Learning Outcomes (MAXIMUM OF 5; for DRPS)

List the learning outcomes (LOs) 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 LOs.*

LOs should focus more on the types of thinking/skills developed than on the detailed course content, and should be appropriate to the level of the course: e.g., LOs at Level 11 should include more higher-level thinking skills than at Level 8. See how to write good learning outcomes and the descriptors of the SCQF Levels. Also, please consider including LOs related to ***social or ethical implications*** *or* ***meta-skills*** *as well as technically-focussed LOs.*

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

1) construct and query over knowledge graphs by applying relevant knowledge graph standards such as RDF, OWL and SPARQL;

2) complete knowledge graphs by applying and evaluating pros and cons of knowledge graph embeddings-based techniques;

3) reason with knowledge graphs by applying and evaluating pros and cons of description logic reasoning algorithms;

4) query over knowledge graphs by applying semantic parsing and query answering techniques.

Graduate Attributes, Personal & Professional Skills (for DRPS)

Please list the generic transferrable skills that this course will develop, as aligned with the UoE's Graduate Attributes framework. Examples from the four skills categories in the framework include:

Research and enquiry: *problem-solving, critical/analytical thinking, handling ambiguity, knowledge integration*

Personal effectiveness: *leadership, planning and organizing, flexibility and change management, entrepreneurship*

Personal responsibility and autonomy: *ethics and social responsibility, independent learning, self-awareness and reflection, creativity, decision-making*

Communication: *interpersonal/teamwork skills; verbal, written, cross-cultural, or cross-disciplinary communication*

Cognitive skills: problem-solving (via tutorials, coursework), critical thinking (via lectures/tutorials/coursework), handling ambiguity (via in-class discussions)
Responsibility, autonomy, effectiveness: independent learning (via readings), self-awareness and reflection (via tutorials, coursework, lectures), time management (via coursework, discussions during classes)
Communication: written communication (via coursework), verbal communication (via in class-discussions)

2. Additional information on course design and resourcing (for BoS only, except where noted)

Breakdown of Learning and Teaching Activities (for DRPS)

Please fill in the number of timetabled hours per student for each type of activity. Do not include non-timetabled hours.

***A typical 10pt Informatics course** has:*

- *18-20 lecture slots (2/wk), but only ~15h should be examinable lectures, with the rest used for guest lectures, revision sessions, assignment feedforward/ feedback, etc. If unsure of plans, count these under 'lecture hours' but please explain tentative plans in the free text below.*
- *No more than 4-5 lab or tutorial hours. Please consider whether fewer can be used, e.g. by using some lecture hours for whole-class discussion/feedforward.*

***A typical 20pt course** has 30 lecture slots (3/wk) and no more than 8 lab/tutorial hours.*

Timetabled Hours	Type
14	Lecture Hours
4	Seminar/Tutorial Hours
	Dissertation Project Supervision Hours
3	Supervised Lab/Workshop/Studio Hours
	Feedback/Feedforward hours
2	Summative assessment hours *[Normally 2h if using an exam; otherwise 0]*
	Revision Session Hours

(Note for ISS: Remaining hours should be allocated to Directed and Undirected Learning Activities.)

Use of timetabled activities (not to be included in DRPS)

If labs or tutorials are planned, please describe their role in the course (e.g., as support for assessed coursework, review of exercises, discussion of ethical questions, etc). If a non-standard pattern or style of lectures is planned, please explain.

4 tutorials and 3 labs are planned. Tutorials are for helping students to better understand the concepts and algorithms, while the labs are used as support for assessed coursework.

Summative assessment and time spent on assignments (not to be included in DRPS)

*Please describe your plans for summative assessment, in more detail than in the student-facing description: How many and what types of assessment are planned (oral presentation, report, programming, etc)? For each piece of assessment, please indicate **(a)** which learning outcome(s) it assesses; and **(b)** how many hours students are expected to spend on it.*

*Please minimize the time spent on summative assessments (for both students and markers) while robustly assessing the learning outcomes. See the School policy on Workload and Assessment, which places limits on the number of summative courseworks and time expectations: to ensure a 35-40h working week, we must limit time asked of students to **6-7h/wk in total per 10 credits, including contact hours, self-study, and coursework.***

There will be one piece of individual coursework for learning outcome 1). It will be about problem solving where the students will analyse a case study in depth, and they will prepare a design solution for knowledge graph construction in the chosen case study. I anticipate that it will take around 10 hours. The length limit will be around 1000-1200 words.

Tentative plans for feedback/formative assessment (not to be included in DRPS)

Please describe your current plans for providing feedback to students: e.g. oral feedback during labs/tutorials, automarked solutions to in-lecture or online quizzes, peer feedback, etc. We also encourage submission of at least one piece of (individual or group) written work, with formative feedback emphasizing how students can improve.

Some useful guides for planning effective and efficient feedback:

- *Two short IAD web pages: Five basic principles for feedback and Tips for improving feedback*
- *EngagED in... assessment and feedback. This flyer from IAD discusses assessment **of**, **for**, and **as** learning, and includes examples of innovative approaches that could help both with scaling to large courses and with causing students to reflect on and become engaged with their own assessment.*
- *Considerable further reading is available at the University pages on Enhancing Feedback.*

During the tutorials, the students will receive formative feedback from the tutors.

The individual coursework will be about problem solving where the students will analyse a case study in depth, and they will prepare a design solution for knowledge graph construction in the chosen case study. Feedbacks will be provided after the student submissions are marked.

The exam will be pen and paper, and raw marks will be given.

Decolonisation and Inclusivity (not to be included in DRPS)

*What actions are you taking towards making your course inclusive for all students, in terms of both **content** and **delivery**? Please be as specific as possible. If you are not taking any action, please justify. See suggestions and guidance here.*

Content: I will check and avoid the use of offensive or exclusionary terminology in the lecture presentations, as well as other course materials, such as black / white box (and use opaque/clear box instead). Furthermore, the course might mention how knowledge graphs can be useful for addressing issues on data safety and privacy, as well as how to avoid biases in knowledge graphs.

Delivery: Make my slides available one slide per page, just in case some students prefer to see large fonts. Present to the class and clarify the purpose, task and criterial of the course work. A challenge for the course is that the logical background (description logics) of knowledge graphs can be a bit abstract. To help with the student, four tutorials are introduced to help students to go through such abstract concepts. The coursework would involve some practical tools for constructing and exploring knowledge graphs, three lab practicals are introduced to help with using such related tools.

Anticipated Resource Requirements

If tutorials are needed, how many students per tutors? (*Please provide your desired number, and the maximum feasible number.)*	15-20
If labs are needed, how many students per demonstrator? (*Please provide your desired number, and the maximum feasible number.)*	15-20
Please estimate the number of hours required for marking, per student.	1.5
If any other teaching support resource will be requested in order to **develop** or **maintain** the course, please provide an estimate of that here.	TA support (32 hours) to help me in developing course materials (e.g., tutorials) and preparing the practicals and the course work
Do you anticipate any difficulty recruiting enough teaching support? *(For example if the course is very large or very specialized.)*	No
Does the course have any scaling limits due to available space or equipment?	No

If equipment is required, please state how it will be procured and maintained.	PCs are needed for the lab sessions.
Does the course have any external funding? *(Typically only for CPD courses)*	No
Does the course need any special arrangements such as quotas, agreements with other schools, or registration arrangements? Does it have any atypical characteristics that may affect finance or student registration? Please specify if so.	N/A

3. Further information for BoS consideration

A full proposal for a new course must include examples of exercises and assessment. Please provide these below, along with publicity information.

Course information and publicity

The course web page (typically the Learn landing page) will be linked from the Sortable Course List, and information such as timetables and assignment deadlines must be made available prior to the start of the academic year. Please specify here if any additional info/publicity is needed for your course, especially if it is aimed largely at non-SoI students.

Sample tutorial/lab sheet questions

Provide a list of tutorial questions and answers and/or samples of lab sheets. These need not be fully fleshed out but should indicate what sort of exercises will be provided to help students learn the material.

Sample question:

Formulate ALC concepts: for each of the following concepts, build a suitable ALC concept description, using only the concept names: Person, Happy, Animal, Cat, Old, Fish, and the role name owns.

1. happy person
2. happy pet owner
3. person who owns only cats
4. unhappy pet owners who own an old cat
5. per owners who only own cats and fish

Solution:

1.Happy ⊓ Person
2. Happy ⊓ Person ⊓ ∃owns.Animal
3.Person ⊓ ∀owns.Cat
4.¬Happy ⊓ Person ⊓ ∃own.(Cat ⊓ old)
5.Person ⊓ ∃owns.Animal⊓ ∀own.(Cat ⊔ fish)

Sample assessment materials

*If the course is primarily assessed by **exam**, provide a sample exam question with model answers. The online list of past exam papers gives an idea of typical and alternative exam formats.*
*If the course is largely or primarily assessed by **coursework**, provide a sketch of a possible assignment with an estimate of effort against each sub-task and a description of marking criteria.*

Sample question:

Consider the ontology O consisting of the following axioms [16 marks]:

- Class(Cow partial Herbivore)
- Class(MadCow partial (intersectionOf(Cow restriction(eat someValuesFrom(AnimalComponent)))))
- Class(Herbivore partial restriction(eat allValuesFrom(Vegetable)))
- DisjointClasses(AnimalComponent Vegetable)

Here are your tasks:

i) Write down the above ontology in DL syntax.
ii) Use the tableaux algorithm to check if MadCow is satisfiable.
If it is not satisfiable, which axiom(s) need to be changed to make it satisfiable.

Solution:

(1) The axioms can be written DL syntax [4]:

1. Cow ⊑ Herbivore
2. MadCow ⊑ Cow ⊓ ∃eat.AnimalComponent
3. Herbivore ⊑ ∀eat.Vegetable
4. AnimalComponent ⊑ ¬Vegetable

(2) Tableau algorithm [10]

1) Initialisation: Construct a root x0 and set L(x0) = {MadCow}
2) Normalisation: all descriptions in L(x0) are normalised.
3) L(x0)={MadCow, Cow ⊓ ∃eat.AnimalComponent}//expansion on simple axiom 2
4) L(x0)={MadCow, Cow ⊓ ∃eat.AnimalComponent, Cow, ∃eat.AnimalComponent }//⊓ -expansion
5) L(x0)={MadCow, Cow ⊓ ∃eat.AnimalComponent, Cow, ∃eat.AnimalComponent, Herbivore} //expansion on simple axiom 1
6) L(x0)={MadCow, Cow ⊓ ∃eat.AnimalComponent, Cow, ∃eat.AnimalComponent, Herbivore, ∀eat.Vegetable } //expansion on simple axiom 3
7) Add a new node x1, such that L(x0,x1)={eat} and L(x1)={AnimalComponent}//∃-expansion on L(x0)
8) L(x1)={AnimalComponent,Vegetable}//}//∀-expansion on L(x0)
9) L(x1)={AnimalComponent,Vegetable, ¬Vegetable}//}//expansion on simple axiom 4
10) L(x1) contains a contradiction; hence, the MadCow classs is unsatisfiable.

(3) Removing any of the axioms in the ontology would resolve the problem. To minimise the change, one could revise axiom 2 as MadCow ⊑ ∃eat.AnimalComponent. [2]

Any other relevant materials
Include anything else that is relevant, possibly in the form of links. If you do not want to specify a set of concrete readings for the official course descriptor, please list examples here.

4. Additional Course Details for DRPS

Except where otherwise noted, these fields are required for entry into EUCLID and will be visible to students in the DRPS entry.

Planned Academic Year of Delivery *(The first year you anticipate the course running, e.g. AY 2019-20)*	AY 2022-23
Keywords *Give a list of searchable keywords for the course.*	Knowledge Graph, Knowledge Graph Construction, Ontology Reasoning, Query Answering
Course Organiser *(By default, the course proposer)*	Jeff Pan
Intended Delivery Period	_X_Semester1 ___Semester 2 ___Full Year ___Summer ___Other (please specify):
Timetable considerations/conflicts *For School use. Please specify any constraints to be considered (e.g. overlap of popular combinations, other specialism courses, external courses etc). Include whether the semester delivery is constrained or could be flexible.*	
Reading List/Learning Resources (for DRPS) *You are encouraged to create resource lists using LEGANTO*	Required: F. Baader, I. Horrocks, C. Lutz, and U. Sattler: An Introduction to Description Logic. Cambridge University Press 2017. R. Brachman and H. Levesque: Knowledge Representation and Reasoning. Morgan Kaufmann 2014. Recommended: J. Z. Pan, G. Vetere, J. M. Gómez-Pérez, H. Wu (Eds.): Exploiting Linked Data and Knowledge Graphs in Large Organisations. Springer 2017. J. Z. Pan, S. Staab, U. Aßmann, J. Ebert, Y. Zhao (Eds.): Ontology-Driven Software Development. Springer 2013. Horricks. Practical KRR http://www.cs.ox.ac.uk/ian.horrocks/Publications/download/2010/HoPa10a.pdf

Feedback Information *Provide a high-level description of how and what type of feedback will be provided to students, for inclusion in DRPS.*	During the tutorials, the students will receive formative feedback from the tutors. The individual coursework will be about problem solving where the students will analyse a case study in depth, and they will prepare a design solution for knowledge graph construction in the chosen case study. Feedbacks will be provided after the student submissions are marked. The exam will be pen and paper, and raw marks will be given. Students are expected to attend the lab session, although the lab exercises will be designed to be doable on any DICE machine at any time. The students will get model solutions the week after the lab takes place, so as to compare their work to the model answers. Similarly, model answers to the tutorial exercises will be released the week after the tutorial takes place.
Is this course available to visiting students?	_X_ Yes (default) ___ No **If no, please provide a justification here:**
Required pre-requisite courses *Use sparingly: these are enforced in PATH and can only be waived by approval from the School's Curriculum Approval Officer. Note that cross-year required pre-requisites may prevent MSc students from registering; consider using recommended pre-requisites or "other requirements" instead.*	_X_ No ___ Yes (please specify full course name(s) and code(s)):
Recommended pre-requisite courses	_X_ No ___ Yes (please specify full course name(s) and code(s)):
Required co-requisite courses *Specify any courses that must be taken in parallel with the existing course. Note that this leads to a timetabling constraint that should be mentioned elsewhere in the proposal.*	_X_ No ___ Yes (please specify full course name(s) and code(s)):

Prohibited Combinations *Specify any courses that may not be taken in combination with the proposed course].*	X No ___Yes (please specify full course name(s) and code(s)):
Other Requirements/Additional Information *This information is often used by MSc students and students from other Schools to see if they have appropriate background without having done our School's courses. So please avoid course titles, instead list specific knowledge and skills (such as mathematical concepts, programming ability or specific languages, etc).* *Also list any other constraints on registration, for example: "Only available to 4th Year Informatics students including those on joint degrees." or "This course is open to all Informatics students including those on joint degrees, and to students in the School of Mathematics. Other external students whose DPT does not list this course should seek permission from the course organiser."*	___No X Yes (please specify): Students are expected to have basic understanding of set theory and propositional / predicate logic. This is a programming light course, although one of the lab sections will use Python for knowledge graph embeddings.
Visiting Student Pre-requisites	X Same as "other requirements" ___Different than "other requirements" (please specify):

5. Placement in degree programme tables: for level 9-11 courses only (except EPCC)

This section is for consideration by the Board of Studies and will be used later by ITO to determine where the course will be added to existing degree programme tables.

Is this course restricted to students on a specific degree? *E.g., some courses are only available to students on a specific CDT or MSc.*	_X_ No ___ Yes (please specify and provide justification):
Is this course compulsory for students on any degree(s)?	_X_ No ___ Yes (please specify and provide justification):
Any issues for part-time students? *Normally, part-time students have access to the same courses as full-time students on the equivalent degree. If you anticipate any problems with this, please specify here.*	

For optional courses:
If this course is available but non-compulsory for students on various degrees (most courses), please fill in this section. The choices here determine where the course appears in degree programme tables (DPTs) and the 2-3 character tags are displayed in the Informatics sortable course list.

Should this course be tagged as 'ML' (machine learning foundations and methods)? *Courses with the ML tag are typically very high-demand and most degrees limit the number of ML credits. If your course might appeal to a similar audience but draw off students from these large courses, please select 'no' and choose one of the tags below.*	X No __ Yes
If you chose 'no', please choose at least one of the following tags… *Ideally, select exactly one, unless there is a good argument for more than one. These three are used in various combinations for many of our degrees.*	__**FSS** (CS foundations, systems, and software) X **AIA** (artificial intelligence applications and paradigms) __**COG** (cognitive science: including HCI and NLP courses, but not most other AI courses. Please restrict to courses most relevant to natural cognition.)
…and also tick if any of the following tags or categories apply. *Do not tick any of these if you selected 'ML' already.*	__**SE** (software engineering: including courses that are highly relevant to SE degrees. All SE courses should also be FSS. This tag is mainly relevant for UG SE degrees.) _X_ Databases and data management systems (used for Data Science MSc and MSc(R)) __Unstructured data and applications (used for Data Science MSc and MSc(R)) __Level 11 Security courses (used for Security MSc) __ATFC Optional courses (used for ATFC MSc)

If you are not sure which tags are most appropriate or have other questions about this section, please note any comments/issues here.	