



# **Board of Studies**

# **Course Proposal Template**

**PROPOSED COURSE TITLE: Biomedical AI MSc Project**

**PROPOSER(S): Prof Guido Sanguinetti**

**DATE: 30/10/2018**

## SUMMARY

*This template contains the following sections, which should be prepared roughly in the order in which they appear (to avoid spending too much time on preparation of proposals that are unlikely to be approved):*

### **1. Case for Support**

*– To be supplied by the proposer and shown to the BoS Academic Secretary prior to preparation of an in-depth course description*

#### **1a. Overall contribution to teaching portfolio**

#### **1b. Target audience and expected demand**

#### **1c. Relation to existing curriculum**

#### **1d. Resources**

### **2. Course descriptor**

*- This is the official course documentation that will be published if the course is approved, ITO and the BoS Academic Secretary can assist in its preparation*

### **3. Course materials**

*- These should be prepared once the Board meeting at which the proposal will be discussed has been specified*

#### **3a. Sample exam question**

#### **3b. Sample coursework specification**

#### **3c. Sample tutorial/lab sheet question**

#### **3d. Any other relevant materials**

### **4. Course management**

*- This information can be compiled in parallel to the elicitation of comments for section 5.*

#### **4a. Course information and publicity**

#### **4b. Feedback**

#### **4c. Management of teaching delivery**

### **5. Comments**

*- To be collected by the proposer in good time before the actual BoS meeting and included as received*

#### **5a. Year Organiser Comments**

#### **5b. Degree Programme Co-Ordinators**

#### **5c. BoS Academic Secretary**

*[Guidance in square brackets below 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>.]*

## **SECTION 1 – CASE FOR SUPPORT**

*[This section should summarise why the new course is needed, how it fits with the existing course portfolio, the curricula of our Degree Programmes, and delivery of teaching for the different years it would affect.]*

### **1a. Overall contribution to teaching portfolio**

*[Explain what motivates the course proposal, e.g. an emergent or maturing research area, a previous course having become outdated or inappropriate in other ways, novel research activity or newly acquired expertise in the School, offerings of our competitors.]*

The course is proposed in the context of the proposed MSc(Res) in Biomedical Artificial Intelligence, currently being evaluated as part of the UKRI CDT call in Applications and Implications of Artificial Intelligence. The course constitutes the main individual research project for the first year of the CDT programme, and will provide CDT students with an opportunity to perform in-depth research on an interdisciplinary topic of relevance to the remit of the CDT.

### **1b. 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 course will only be available to (and mandatory for) students recruited onto the UKRI CDT in Biomedical Artificial Intelligence programme (expected to recruit 12 students per year)

### 1c. Relation to existing curriculum

*[This section should describe how the proposed course relates to existing courses, programmes, years of study, and specialisms. Every new course should make an important contribution to the delivery of our Degree Programmes, which are described at [http://www.drps.ed.ac.uk/17-18/dpt/drps\\_inf.htm](http://www.drps.ed.ac.uk/17-18/dpt/drps_inf.htm).*

*Please name the Programmes the course will contribute to, and justify its contribution in relation to courses already available within those programmes. For courses available to MSc students, describe which specialism(s) the course should be listed under (see <http://web.inf.ed.ac.uk/infweb/student-services/ito/students/taught-msc-2017/programme-guide/specialist-areas>), and what its significance for the specialism would be. Comment on the fit of the proposed course with the structure of academic years for which it should be offered. This is described in the Year Guides linked from <http://web.inf.ed.ac.uk/infweb/student-services/ito/students>.]*

The course contributes, and is restricted, to the proposed MSc by Research in Biomedical Artificial Intelligence.

### 1d. Resources

*[While course approvals do not anticipate the School's decision that a course will actually be taught in any given year, it is important to describe what resources would be required if it were run. Please describe how much lecturing, tutoring, exam preparation and marking effort will be required in steady state, and any additional resources that will be required to set the course up for the first time. Please make sure that you provide estimates relative to class size if there are natural limits to its scalability (e.g. due to equipment or space requirements). Describe the profile of the course team, including lecturer, tutors, markers, and their required background. Where possible, identify a set of specific lecturers who have confirmed that they would either like to teach this course apart from the proposer, or who could teach the course in principle. It is useful to include ideas and suggestions for potential teaching duty re-allocation (e.g. through course sharing, discontinuation of an existing course, voluntary teaching over and above normal teaching duties) to be taken into account when resourcing decisions are made.]*

Students will meet as a group twice early in semester two, together with the course organiser (likely to be the CDT director Guido Sanguinetti). The course organiser will also handle the project assignment (given the small numbers this will not be too onerous and it is anticipated that most students/ supervisors will have pre-arranged agreements). The course will require a TA, likely to be a PhD student from one of the groups involved in the bid (or from the CDT itself after the first year); resources for both staff and TA time are included in the CDT bid.

The course will require the standard resources for MSc projects, entailing weekly supervisory meetings with the supervisor, and double marking of the project dissertation.

## **SECTION 2 – COURSE DESCRIPTOR**

*[This is the official course descriptor that will be published by the University and serves as the authoritative source of information about the course for student via DRPS and PATH. Current course descriptions in the EUCLID Course Catalogue are available at [www.euclid.ed.ac.uk](http://www.euclid.ed.ac.uk) under 'DPTs and Courses', searching for courses beginning 'INFR']*

### **2a. Course Title [Name of the course.]:**

MSc project in Biomedical Artificial Intelligence

### **2b. SCQF Credit Points:**

*[The Scottish Credit and Qualifications Framework specifies where each training component provided by educational institutions fits into the national education system. Credit points per course are normally 10 or 20, and a student normally enrolls for 60 credits per semester. For those familiar with the ECTS system, one ECTS credit is equivalent to 2 SCQF credits. See also <http://www.scqf.org.uk/The%20Framework/Credit%20Points>.]*

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### **SCQF Credit Level:**

*[These levels correspond to different levels of skills and outcomes, see [http://www.sqa.org.uk/files\\_ccc/SCQF-LevelDescriptors.pdf](http://www.sqa.org.uk/files_ccc/SCQF-LevelDescriptors.pdf) At University level, Year 1/2 courses are normally level 8, Year 3 can be level 9 or 10, Year 4 10 or 11, and Year 5/MSc have to be level 11. MSc programmes may permit a small number (up to 30 credits overall) of level 9 or 10 courses.]*

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### **Normal Year Taken: 1/2/3/4/5/MSc**

*[While a course may be available for more than one year, this should specify when it is normally taken by a student. "5" here indicates the fifth year of undergraduate Masters programmes such as MInf.]*

MSc

### **Also available in years: 1/2/3/4/5/MSc**

*Different options are possible depending on the choice of SCQF Credit Level above: for level 9, you should specify if the course is for 3<sup>rd</sup> year undergraduates only, or also open to MSc students (default); for level 10, you should specify if the course is available to 3<sup>rd</sup> year and 4<sup>th</sup> year undergraduates (default), 4<sup>th</sup> year undergraduates only, and whether it should be open to MSc students; for level 11, a course can be available to 4<sup>th</sup> and 5<sup>th</sup> year undergraduates and MSc students (default), to 5<sup>th</sup> year undergraduates and MSc students, or to MSc students only]*

NA

## Undergraduate or Postgraduate?

*[If the course is only available to MSc students, then it must be classified as a Postgraduate course. All other courses, regardless of level, will be classified as Undergraduate]*

Postgraduate

## 2c. Subject Area and Specialism Classification:

*[Any combination of Computer Science, Artificial Intelligence, Software Engineering and/or Cognitive Science as appropriate. For courses available to MSc students, please also specify the relevant MSc specialist area (to be found in the online MSc Year Guide at <http://web.inf.ed.ac.uk/infweb/student-services/ito/students/taught-msc-2017/programme-guide/specialist-areas>), distinguishing between whether the course should be considered as “core” or “optional” for the respective specialist area.]*

NA

## Appropriate/Important for the Following Degree Programmes:

*[Please check against programmes from [http://www.drps.ed.ac.uk/17-18/dpt/drps\\_inf.htm](http://www.drps.ed.ac.uk/17-18/dpt/drps_inf.htm) to determine any specific programmes for which the course would be relevant (in many cases, information about the Subject Area classification above will be sufficient and specific programmes do not have to be specified). Some courses may be specifically designed for non-Informatics students or with students with a specific profile as a potential audience, please describe this here if appropriate.]*

Proposed UKRI CDT in Biomedical Artificial Intelligence, MSc (Res)

## Timetabling Information:

*[Provide details on the semester the course should be offered in, specifying any timetabling constraints to be considered (e.g. overlap of popular combinations, other specialism courses, external courses etc).]*

Second semester and summer

## 2d. Summary Course Description:

*[Provide a brief official description of the course, **around 100 words**. This should be worded in a student-friendly way, it is the part of the descriptor a student is most likely to read.]*

The course is the main MSc project for the proposed MSc (Res) in Biomedical Artificial Intelligence. It will offer students the opportunity to gain in-depth experience of research in an interdisciplinary environment, with joint supervision from an AI and a biomedical specialist.

## Course Description:

*[Provide an academic description, an outline of the content covered by the course and a description of the learning experience students can expect to get. See guidance notes at: [http://www.studentsystems.is.ed.ac.uk/staff/Support/User\\_Guides/CCAM/CCAM\\_Information\\_Captured.html](http://www.studentsystems.is.ed.ac.uk/staff/Support/User_Guides/CCAM/CCAM_Information_Captured.html)]*

The course is an individual research project where the students will work independently on an application of Artificial Intelligence to a biomedical problem. All projects will have joint supervision from an AI and a biomedical expert, enabling the student to work in an interdisciplinary environment and be embedded within the application. A particular feature of this course will be its attention to the societal and ethical aspects of the proposed research, which will form part of the assessment for the responsible innovation course (see below)

## Pre-Requisite Courses:

*[Specify any courses that a student must have taken to be permitted to take this course. Prerequisites listed in this section can only be waived by special permission from the School's Curriculum Approval Officer, so they should be treated as "must-have". By default, you may assume that any student who will register for the course has taken those courses compulsory for the degree for which the course is listed in previous years.]*

*Please include the FULL course name and course code].*

Course Title: Proposed course in Issues in Clinical Data Modelling; Proposed group project in Biomedical AI; Proposed course on Responsible Research and Innovation in Biomedical Artificial Intelligence (SSPS)

## Co-Requisite Courses:

*[Specify any courses that should be taken in parallel with the existing course. Note that this leads to a timetabling constraint that should be mentioned elsewhere in the proposal. Please include the FULL course name and course code].*

Course Title: NA

Course Code:

*[Specify any courses that should not be taken in combination with the proposed course. Please include the FULL course name and course code].*

Course Title:

Course Code:

**Other Requirements:**

*[Please list any further background students should have, including, for example, mathematical skills, programming ability, experimentation/lab experience, etc. It is important to consider that unless there are formal prerequisites for participation in a course, other Schools can register their students onto our courses, so it is important to be clear in this section. Also be aware that MSc students are unlikely to have the pre-requisite courses, so alternative knowledge should be recommended. If you want to only permit this by special permission, a statement like "Successful completion of Year X of an Informatics Single or Combined Honours Degree, or equivalent by permission of the School." can be included.]*

**Available to Visiting Students: Yes/No**

*[Provide a justification if the answer is No.]*

No, the course is only available to CDT first year students



## 2e. Summary of Intended Learning Outcomes (MAXIMUM OF 5):

*[List the learning outcomes of the course, emphasising what the impact of the course will be on an individual who successfully completes it, rather than the activity that will lead to this outcome. Further guidance is available from*

*<https://canvas.instructure.com/courses/801386/files/24062695>*

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

1. Be able to independently identify and apply appropriate AI algorithms to specific biomedical problems
2. Communicate effectively, both in writing and orally, technical AI concepts to an interdisciplinary audience of biomedical scientists
3. Understand the broader societal and ethical implications of AI research in the biomedical field
- 4.
- 5.

## Assessment Information

*[Provide a description of all types of assessment that will be used in the course (e.g. written exam, oral presentation, essay, programming practical, etc) and how each of them will assess the intended learning outcomes listed above. Where coursework involves group work, it is important to remember that every student has to be assessed individually for their contribution to any jointly produced piece of work. Please include any minimum requirements for assessment components e.g. student must pass all individual pieces of assessment as well as course overall].*

The course assessment will consist of a written dissertation to be independently marked by two examiners, in line with standard MSc requirements. The dissertation will address the following:

- motivation: why is the problem tackled important?
- background: what are the necessary AI and biomedical knowledge?
- originality: what is different in what is proposed?
- implications: what is the impact of the research, both scientifically and more broadly in terms of its societal implications?

**Assessment Weightings:**

Written Examination: \_\_\_%

Practical Examination: \_\_\_%

Coursework: \_\_100\_%

**Time spend on assignments:**

*[Weightings up to a 70/30 split between exam and coursework are considered standard, any higher coursework percentage requires a specific justification. The general expectation is that a 10-point course will have an 80/20 split and include the equivalent of one 20-hour coursework assignment (although this can be split into several smaller pieces of coursework. The Practical Examination category should be used for courses with programming exams. You should not expect that during term time a student will have more than 2-4 hours to spend on a single assignment for a course per week. Please note that it is possible, and in many cases desirable, to include formative assignments which are not formally assessed but submitted for feedback, often in combination with peer assessment.]*

400 hours, including supervision and group meetings

**Academic description:**

*[A more technical summary of the course aims and contents. May include terminology and technical content that might be more relevant to colleagues and administrators than to students.]*

The course is an individual research project where the students will work independently on an application of Artificial Intelligence to a biomedical problem. All projects will have joint supervision from an AI and a biomedical expert, enabling the student to work in an interdisciplinary environment and be embedded within the application. A particular feature of this course will be its attention to the societal and ethical aspects of the proposed research, which will form part of the assessment for the responsible innovation course

## Syllabus:

*[Provide a more detailed description of the contents of the course, e.g. a list of bullet points roughly corresponding to the topics covered in each individual lecture/tutorial/coursework. The description should **not exceed 500 words** but should be detailed enough to allow a student to have a good idea of what material will be covered in the course. Please keep in mind that this needs to be flexible enough to allow for minor changes from year to year without requiring new course approval each time.]*

- Developing a hypothesis
- Proposing methods to test a hypothesis
- Reporting results
- Writing a scientific paper

## Relevant QAA Computing Curriculum Sections:

*[Please see <http://www.qaa.ac.uk/en/Publications/Documents/SBS-Computing-consultation-15.pdf> to check which section the course fits into.]*

Generic (transferable) skills, section 5.5: those required for the creation of the lifelong learner, who can set goals and identify resources for the purpose of learning; an ability to critically review the literature, which includes identifying all of the key developments in a particular area of study, critically analysing them and identifying limitations and avenues for further development or explanation; an ability to recognise and respond to opportunities for innovation

## Graduate Attributes, Personal and Professional skills:

*[This field should be used to describe the contribution made to the development of a student's personal and professional attributes and skills as a result of studying this course – i.e. the generic and transferable skills beyond the subject of study itself. Reference in particular should be made to SCQF learning characteristics at the correct level [http://www.sqa.org.uk/files\\_ccc/SCQF-LevelDescriptors.pdf](http://www.sqa.org.uk/files_ccc/SCQF-LevelDescriptors.pdf).]*

The course will provide the students with in-depth technical skills in one area of biomedical AI, as well as developing their problem solving and programming skills. As the course entails independent (but supervised) research, the students will gain considerably in terms of self-management skills (timetabling, independence in finding resources, etc). Through the course, the student will gain considerable experience of research in an interdisciplinary environment. Therefore, the students will improve their interdisciplinary communication skills.

## Breakdown of Learning and Teaching Activities:

*[Total number of lecture hours and tutorial hours, with hours for coursework assignments.]*

*[The breakdown of learning and teaching activities should only include contact hours with the students; everything else should be accounted for in the Directed Learning and Independent Learning hours.*

*The total being 10 x course credits. Assume 10 weeks of lectures slots and 10 weeks of tutorials, though not all of these need to be filled with actual contact hours. As a guideline, if a 10-pt course has 20 lecture slots in principle, around 15 of these should be filled with examinable material; the rest should be used for guest lectures, revision sessions, introductions to assignments, etc. Additional categories of learning and teaching activities are available, a full list can be found at:*

[http://www.euclid.ed.ac.uk/Staff/Support/User\\_Guides/CCAM/Teaching\\_Learning.htm](http://www.euclid.ed.ac.uk/Staff/Support/User_Guides/CCAM/Teaching_Learning.htm)

Lecture Hours: \_\_\_1\_ hours

Seminar/Tutorial Hours: \_\_\_2\_\_ hours

Supervise practical/Workshop/Studio hours: \_\_\_0\_\_ hours

Summative assessment hours: \_\_\_\_ hours

Feedback/Feedforward hours: \_\_\_2\_\_ hours

Directed Learning and Independent Learning hours: \_\_\_395\_ hours

Total hours: 400\_ hours

You may also find the guidance on 'Total Contact Teaching Hours' and 'Examination & Assessment Information' at:

[http://www.studentsystems.ed.ac.uk/Staff/Support/User\\_Guides/CCAM/CCAM\\_Information\\_Captured.html](http://www.studentsystems.ed.ac.uk/Staff/Support/User_Guides/CCAM/CCAM_Information_Captured.html)

## Keywords:

*[A list of searchable keywords.]*

Biomedical applications, Artificial intelligence

## SECTION 3 - COURSE MATERIALS

### 3a. Sample exam question(s)

*[Sample exam questions with model answers to the individual questions are required for new courses. A justification of the exam format should be provided where the suggested format non-standard. The online list of past exam papers gives an idea of what exam formats are most commonly used and which alternative formats have been [http://www.inf.ed.ac.uk/teaching/exam\\_papers/](http://www.inf.ed.ac.uk/teaching/exam_papers/).]*

NA

### 3b. Sample coursework specification

*[Provide a description of a possible assignment with an estimate of effort against each sub-task and a description of marking criteria.]*

The coursework component is similar in design (though not necessarily in scale) to that of the informatics honours project or taught MSc thesis.

### 3c. Sample tutorial/lab sheet questions

*[Provide a list of tutorial questions and answers and/or samples of lab sheets.]*

NA

**3d. 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.]*

NA

## SECTION 4 - COURSE MANAGEMENT

### 4a. Course information and publicity

*[Describe what information will be provided at the start of the academic year in which format, how and where the course will be advertised, what materials will be made available online and when they will be finalised. Please note that University and School policies require that all course information is available at the start of the academic year including all teaching materials and lecture slides.]*

The course will be advertised in the CDT handbook and a course web page will be created for the start of AY 2019-20.

### 4b. Feedback

*[Provide details on feedback arrangements for the course. This includes when and how course feedback is solicited from the class and responded to, what feedback will be provided on assessment (coursework and exams) within what timeframe, and what opportunities students will be given to respond to feedback.*

*The University is committed to a baseline of principles regarding feedback that we have to implement at every level, these are described at*

*[http://www.docs.sasg.ed.ac.uk/AcademicServices/Policies/Feedback\\_Standards\\_Guiding\\_Principles.pdf](http://www.docs.sasg.ed.ac.uk/AcademicServices/Policies/Feedback_Standards_Guiding_Principles.pdf).*

*Further guidance is available from <http://www.enhancingfeedback.ed.ac.uk/staff.html>.]*

Feedback on assessed coursework will be provided within two weeks, and will include formative comments on work in relation to concepts studied in the course.

Report drafts will be reviewed by peers, the course instructor, the TA, and individual supervisors under a provided rubric.

#### **4c. Management of teaching delivery**

*[Provide details on responsibilities of each course staff member, how the lecturer will recruit, train, and supervise other course staff, what forms of communication with the class will be used, how required equipment will be procured and maintained. Include information about what support will be required for this from other parties, e.g. colleagues or the Informatics Teaching Organisation.]*

The course organizer will recruit a student with suitable background from the PhD programme (relevant groups include Armstrong, Gutmann, Hennig, Onken, Sanguinetti, Simpson) or the CDT programme who has experience on writing, speaking, and reviewing. Communication will be through email and learn as appropriate.



## SECTION 5 - COMMENTS

*[This section summarises comments received from relevant individuals prior to proposing the course. If you have not discussed this proposal with others please note this].*

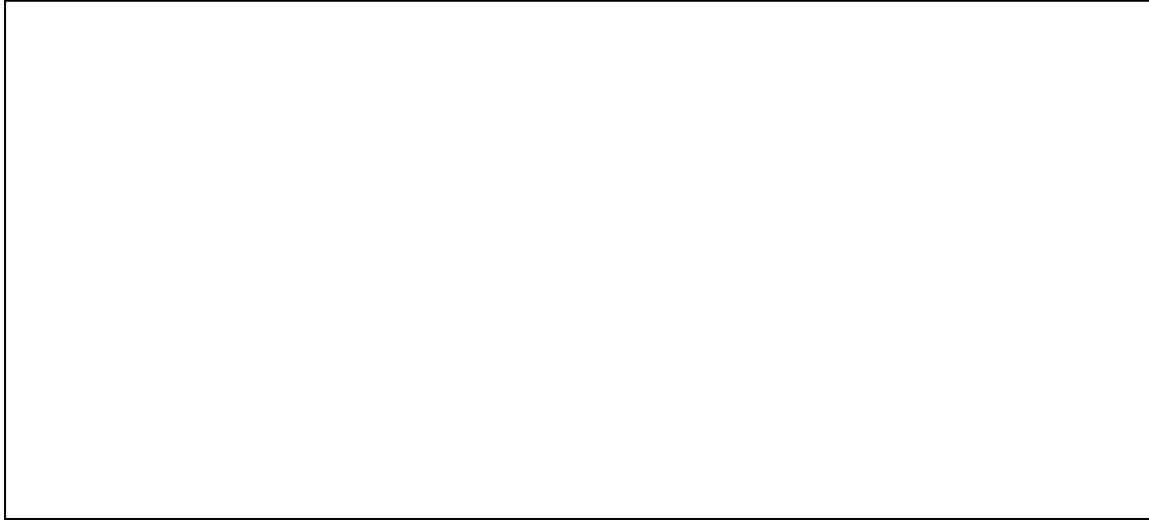
The proposal originates from discussion amongst the stakeholders on the CDT in Biomedical AI, including several members of staff in ANC and across participating Schools/ Institutes in the University (SBS, SSPS, MVM). It elaborates on ideas described in the UKRI proposal written by Guido Sanguinetti, Michael Gutmann, Chris Ponting, Meriem El Karoui, Kathrin Cresswell, Cathie Sudlow and Robin Williams.

### 5a. Year Organiser Comments

*[Year Organisers are responsible for maintaining the official Year Guides for every year of study, which, among other things, provide guidance on available course choices and specialist areas. The Year Organisers of all years for which the course will be offered should be consulted on the appropriateness and relevance on the course. Issues to consider here include balance of course offerings across semesters, subject areas, and credit levels, timetabling implications, fit into the administrative structures used in delivering that year.]*

**5b. BoS Academic Secretary**

*[Any proposal has to be checked by the Secretary of the Board of Studies prior to discussion at the actual Board meeting. This is a placeholder for their comments, mainly on the formal quality of the content provided above.]*

A large, empty rectangular box with a thin black border, occupying the lower half of the page. It is intended for the Academic Secretary to provide comments on the proposal's formal quality.