Board of Studies

Course Proposal Template

PROPOSED COURSE TITLE: Principles and Design of IoT Systems (PDIoT)

PROPOSER(S): D K Arvind

DATE: 28th February, 2017

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what motivates the course proposal, e.g. an emergent or maturing research area, a previous course having become outdated or inappropriate in other ways, novel research activity or newly acquired expertise in the School, offerings of our competitors.]

This course replaces the existing 10-credit, Level 10 System Level Integration Practical course. Two changes are proposed:

1. The original title (SLIP) was coined in 1999 and the new one (PDIoT) accurately reflects the material which has been taught on this course for more than a decade. SLIP has benefited from the platforms and the software environment developed as part of the EPSRC-funded "Speckled Computing" research project. This field has now matured into a vibrant commercial sector with a demand for personnel trained in the principles underlying the systematic design of Internet of Things and sensor data analysis.

2. The rating for this course has been increased from 10 to 20 credits at Level 11: SLIP was coursework-only – in the case of PDIoT the weighting of the coursework has been reduced to 70%; a written exam (30%) has been introduced which will test the conceptual material delivered in a series of 10 lectures in the first 5 weeks of the course. Students in PDIoT will work on their coursework in pairs as opposed to working in groups of 4-5 as in the case of SLIP. In summary, PDIoT will be a more challenging course as the students will be tested on the theoretical foundations in a written exam and will be expected to demonstrate an IoT prototype by working in pairs over a 10-week period.

[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.]

McKinsey estimates that IoT will have a potential economic impact between $3.9 to $11.1T by 2025 [1]. The course will appeal to UG4/5/MSc students interested in this emerging field of digitising the physical world with sensors and actuators connected wirelessly to the internet. It should attract students with interests in networking, embedded systems, and sensor data analytics using machine learning techniques. Others might wish to build on the Systems Design Project (SDP) course and experience in full the process of realising their idea as a working IoT prototype.

Class size of 50 students in Year 1 (the class size of the 2017-18 is expected to be around 200 students), 75 students in Year 2 and reaching a steady state of 100 students in Year 3.

[1] http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world

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/15-16/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-2015/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*.]*

Discussions have taken place to ensure that PDIoT complements the other IoT-based course being proposed in AY2017-18 entitled "IoT Systems, Security and the Cloud". A typical IoT system consists of the following sub-systems: Sensing, Computation, Communication, Sensor Data Analytics and Actuation. PDIoT course takes a principled approach to the design of IoT systems concentrating on the foundations of Sensors/Actuators and Sensor Data Analytics delivered as lectures and students apply them in a major piece of coursework of realising an IoT application idea as a working prototype. It should appeal to students on the Computer Science, Software Engineering and Artificial Intelligence degree programme and the joint degree variants (we even had a straight Mathematics Degree student taking SLIP in 2015-16!). PDIoT will be open to students on a majority of MSc specialisms.

[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.]

The PDIoT students will require access to a locker pair for their hardware kit and use of the the open labs in the Appleton Tower where they can work on their coursework. In the steady state we will require 50 development boards, each costing £54. [https://www.aliexpress.com/item/MultiBoard-NRF52832-BLE-development-board-rich-peripherals-strong-support-for-BLE-NORDIC/32726396562.html]. Each pair will also be provided with an Orient speck (ARM core, IMU sensors, BTLE, and 2.4GHz radio) for demonstration of their application idea. PDIoT would require around 9 hours/week of demonstrator/tutor time to provide F2F/on-line support [Total: 90 hours].

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 under 'DPTs and Courses', searching for courses beginning 'INFR']

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

Principles and Design of IoT Systems (PDIoT)

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 enrols 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.]

20 points

SCQF Credit Level:

[These levels correspond to different levels of skills and outcomes, see 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.]

Level 11 (makes it available to UG5 and MSc students)

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.]

Year 4

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 3rd year undergraduates only, or also open to MSc students (default); for level 10, you should specify if the course is available to 3rd year and 4th year undergraduates (default), 4th year undergraduates only, and whether it should be open to MSc students; for level 11, a course can be available to 4th and 5th year undergraduates and MSc students (default), to 5th year undergraduates and MSc students, or to MSc students only]

Year 4/5/MSc

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-2015/programme-guide/specialist-areas), distinguishing between whether the course should be considered as "core" or "optional" for the respective specialist area.]

UG subject area: Computer Science, Artificial Intelligence, Software Engineering

MSC specialism : Computer Systems, Software Engineering & High-Performance Computing; Cyber Security & Privacy; Intelligent Robotics; Machine Learning; Agents, Knowledge and Data.

Appropriate/Important for the Following Degree Programmes:

[Please check against programmes from http://www.drps.ed.ac.uk/15-16/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.]

See above.

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).]

Offered in Semester 1; Demonstration of working prototype on the Wednesday in Week 10; Report due at 4pm on the Friday in Week 1 in Semester 2; written examination in April.

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.]

PDIoT is concerned with the emerging discipline of digitising the physical world with wireless sensors, analysing the sensor data to provide actionable information, and influencing the physical world via actuators, with an optional human in the loop. The course imparts foundational concepts in IoT in a series of 10 lectures and students gain hands-on experience by realising their application idea as a demonstratable IoT system prototype. The lectures will be illustrated with a number of IoT case studies undertaken by the lecturer over the past fifteen years.

[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

The course aims to deliver a sound understanding of the design and analysis of Internet of Things through lectures and practice. The lectures provide the foundational knowledge in sensors and actuators, fusion of data from multiple sensors, sensor data calibration and topics in sensor data analytics: pre-processing and extraction of features in time-series sensor data, and classification methods. The students conduct a major piece of coursework working in pairs to develop an IoT application using the Orient speck platform. Students will experience all the stages in the design and implementation of a complex system, from its specification to the demonstration of a working prototype. They will be exposed to aspects of embedded systems programming, networking algorithms, wireless protocols, user interface design, system integration and testing. Each pair will demonstrate a working prototype of their IoT idea at the end of 10 weeks and deliver a written report at the start of Semester 2.

Each student pair will be given an Orient speck (ARM core, 2.4 GHz radio, Bluetooth Low Energy, 3-axis gyroscope, accelerometer, magnetometer) and access to dev board and programming environment . API and libraries provided for sensor data, wireless communication from the Orient. Each pair defines its idea of an application using the Orient speck and demonstrates the working prototype at the end of 10 weeks. The final report will be due at the end of Week 1 in the second semester.

Pre-Requisite Courses:

[Specify any courses that a student must have taken to be permitted to take this course. Pre-requisites 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].

Computer Communications and Networking (COMN) (INFR09027)

Introductory Applied Machine Learning (IAML) (INFR09029)

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].

N/A

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

N/A

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. 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.]

Students should be proficient in Java/Python programming.

Available to Visiting Students: Yes/No

[Provide a justification if the answer is No.]

Yes, as long as they satisfy the entry requirements.

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 have

1. An understanding of the constituent parts of a typical IoT system, a selection of sensors and actuators, and an appreciation of methods employed to address the security and privacy issues in IoT. Case studies will illustrate the application of IoT in healthcare, digital media and environmental monitoring.

2. Knowledge of a selection of sensor fusion algorithms, and data analytic methods for the pre-processing of time-series sensor data, feature extraction and their classification; the application of these methods in practice will be illustrated with case studies.

3. Experience of the practical issues involved in the specification, design and implementation of an IoT system based on his/her application idea.

4. Experience working with another team member with complimentary skill sets, and develop skills in project management, requirements capture and negotiations.

5. Experience using tools such as compilers for IoT development board using inertial sensors, system-level simulators and web-authoring tools for the final report.

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].

30% - written examination

70% - coursework:

[Technical evaluation – 60%]: Completion of the project; degree of difficulty; quality and amount of work; justification of design decisions; design for reusability.

[Presentation – 20%]: Quality of the oral presentation, website and report, and references to other sources.

[Analysis – 20%]: Critical analysis using both quantitative methods and reflection on design decisions.

Assessment Weightings:

Written Examination: 30%

Practical Examination: 0%

Coursework: 70%

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.]

Coursework – 120 hours: 10 hours/week on the coursework; 20 hours for the final report preparation.

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.]

Lecture Series: Lecture -1: Overview of IoT: industrial, wearable, environmental, healthcare, and digital media, illustrated with videos of case studies; architecture of a typical IoT systems and its components; Overview of privacy and security issues.

Lecture-2: Sensors and actuators – Introduction to commonly-used sensors/actuators, mode of operation, and data format.

Lecture 3-4: Sensor fusion algorithms: data from homogeneous and heterogeneous sensors; examples include quaternion calculations with 9-DOF IMU sensor for 3-D animation.

Lecture 5-6: Sensor data analytics: calibration of sensor data against reference sensors; use of Bland-Altman plots for sensor comparisons, illustrated with examples in healthcare and environmental monitoring.

Lecture 7-8: Sensor data analytics: Methods for pre-processing and feature extraction methods in time-series sensor data - Time warp algorithm; Principal Component Analysis; feature extraction methods illustrated with examples of IoT for Well being, musical instrument tutoring.

Lecture 9-10: Sensor data analytics: Classification methods using Machine Learning/Hidden Markov models (Naïve Bayes, k-NN, Decision Tree, Logistic Regression, Mulitlayer Perceptron, SVM) applied to features in time-series sensor data, illustrated with examples in sports, healthcare.

Coursework Schedule: Discover - Week 1   First meeting of the PDIoT pairs; explanation of the assignment; introduction to the platform and programming environment; brainstorm ideas for IoT applications.

Define - Week 2   Settle on a choice of application; capture the requirements and use cases for the application; assignment of responsibilities and tasks; tutorial on programming the platform; creation of the website

Develop - Week 3 – 5 Implementation, testing, definition of metrics for performance assessment and weekly review of progress

Week 6   First system integration and demonstration to course lecturer [Feedback to the students]

Week 7 – 8 Refinement and Testing

Week 9   Second system integration and presentation to course lecturer; performance analysis; preparation of the presentation and final demonstration [Feedback to the students]

Deliver - Week 10 10-minute presentation and demonstration by each student pair to an invited audience [Feedback to the students]

Submission: The final deliverable due on the Friday in Week1 in Semester-2 (deadline - 4pm) is a website created by each group (3 groups are shown as representative examples):

Group A - http://groups.inf.ed.ac.uk/teaching/pdiotA17-18/index.html

Group B - http://groups.inf.ed.ac.uk/teaching/pdiotB17-18/index.html

Group C - http://groups.inf.ed.ac.uk/teaching/pdiotC17-18/index.html

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.]

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].

Develop communication skills (oral/written) for capturing the requirements and specification of complex systems.

Develop inter-personal skills when working with another team member in dividing the work up and dealing with delays, setbacks and other issues.

Develop skills in project management, requirements capture and negotiations.

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]

Lecture Hours: 10 hours

Seminar/Tutorial Hours: 0

Supervise practical/Workshop/Studio hours: 10 hours

Summative assessment hours: 0.5 hours

Feedback/Feedforward hours: 0.5 hours

Directed Learning and Independent Learning hours: 179 hours

Total hours: 200 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

Keywords:

[A list of searchable keywords.]

PDIoT, Internet of Things.

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/.]

Thursday 26 April 2018

14:30 to 16:30

INSTRUCTIONS TO CANDIDATES

Answer any TWO questions. All questions carry equal weight.

Question 1:

You have been presented with a brief to develop the concept of a digital laundry in a "Smart Home" which will be implemented as an IoT system to control the washing machine/dryer, exhaust fan, and dehumidifier.

(a) Draw a block diagram which shows the main components of the IoT system for the user to start and stop the system remotely using a mobile and interrogate the stage of the wash (You may assume that the detergent has been loaded in the washing machine).

[5 marks]

(b) How would you augment such a system with a wearable device to control the operations of the washing machine/dryer, dehumidifier, and the exhaust fan. What sensors would you employ in the wearable device, and the features that you would extract in the sensor data and algorithms employed to classify the gestures.

[7 marks]

(c) Describe an enhancement to the system which will ensure that the laundry room does not suffer from problems of condensation and overheating.

[3 marks]

(d) A detergent manufacturer wishes to study the laundry habits of consumers, such as the amount of liquid detergent used for the weight of clothes and the mode of the wash (cold, warm or hot). Propose how you might instrument the washing machine and other laundry accessories with sensors to extract this information without any extra actions from the people using the washing machine, i.e., the users are oblivious to the data collection and perform their wash as they would normally (you may assume that the users have given their consent). For each sensor , describe the mode of operation, data format, features to be extracted and the algorithms employed.

[10 marks]

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 only coursework assignment, worth 70% of the marks., is a major piece of work undertaken by students working in pairs to develop an Internet of Things application based on the Orient speck platform. Students will experience all the stages in the design and implementation of a complex system, from its specification to the demonstration of a working prototype. They will be exposed to aspects of embedded systems programming, wireless protocols, user interface design, system integration and testing.

Each pair will be given a development board and software development environment. Your task is to define an application which takes into account the capabilities of the platform, and plan and implement a working prototype for demonstration to an invited audience on 29th November, 2017. Each pair will maintain a website which records the progress of their project and contain the final individual reports.

Organisation:Each pair can meet the tutor weekly on Wednesdays in the DAIP Base between 10:00 – 13:00.

Schedule:

Discover -

Week 1   First meeting of the DAIP class; Explanation of the assignment; Introduction to the platform and programming environment; Brainstorm ideas for IoT applications.

Define -

Week 2   Settle on a choice of application; Capture the requirements and use cases for the application; Assignment of responsibilities and tasks to members; Tutorial on programming the platform; Creation of the pair website

Develop -

Week 3 – 5 Implementation, Testing, Definition of metrics for performance assessment and weekly review of progress

Week 6   First system integration and demonstration to course lecturer [Feedback to the students]

Week 7 – 8 Refinement and Testing

Week 9   Second system integration and presentation to course lecturer; Performance analysis; Preparation of the presentation and final demonstration [Formative feedback to the students]

Deliver -

Week 10 (29 Nov. 2017) 5-minute presentation and demonstration by each pair to an invited audience [Formative feedback to the students]

Submission: The final deliverable due on 19th January 2018 (deadline - 4pm) is a website created by each pair (representative examples for the first 3 pairs):

Group A - http://groups.inf.ed.ac.uk/teaching/daipa17-18/index.html

Group B - http://groups.inf.ed.ac.uk/teaching/daipb17-18/index.html

Group C - http://groups.inf.ed.ac.uk/teaching/daipc17-18/index.html

Each website should have a common section which gives an overview of the project, and individual reports by group members which are clearly marked.

Assessment:

Although working in groups, students will be awarded individual marks (out of 100) based on the final report, and the breakdown of marks and criteria for assessment are as follows:

[Technical evaluation – 60%]: Completion of the project; degree of difficulty; quality and amount of work; justification of design decisions; design for reusability.

[Presentation – 20%]: Quality of the oral presentation, website and report, and references to other sources.

[Analysis – 20%]: Critical analysis using both quantitative methods and reflection on design decisions.

Final marks and feedback to the students will be delivered by 2 February, 2018.

3c. Sample tutorial/lab sheet questions

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

N/A

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.]

N/A

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 web page will be set up prior to the start of the academic year 2017-18 with the course description, coursework handout and the slides for the lectures 1 – 10.

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.

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

There will be a course feedback opportunity for the students mid-way and at the end of the course. There will be a formative feedback on the coursework provided to the students in Week 6 and Week 10.
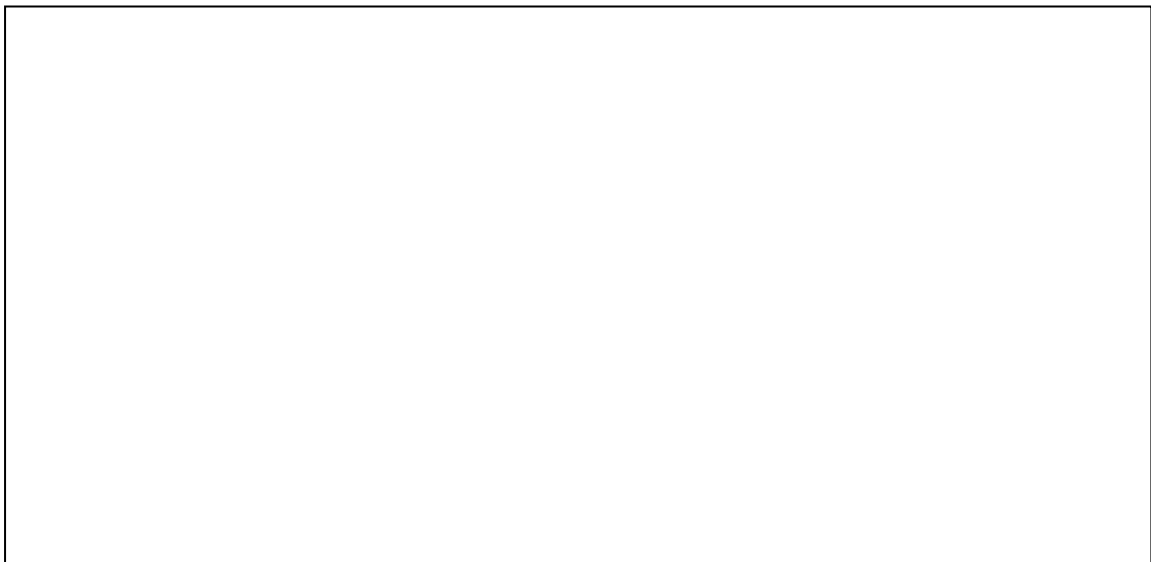
4c. Management of teaching delivery

[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 10 lectures over the first 5 weeks of Semester 1 will be delivered in a lecture theatre using slides which will be made available at the start of the course.

Each pair will be invited to attend a 1-hour slot for F2F meeting swith the course tutor as part of a group scheduled on Wednesday mornings between 10am – 1pm.
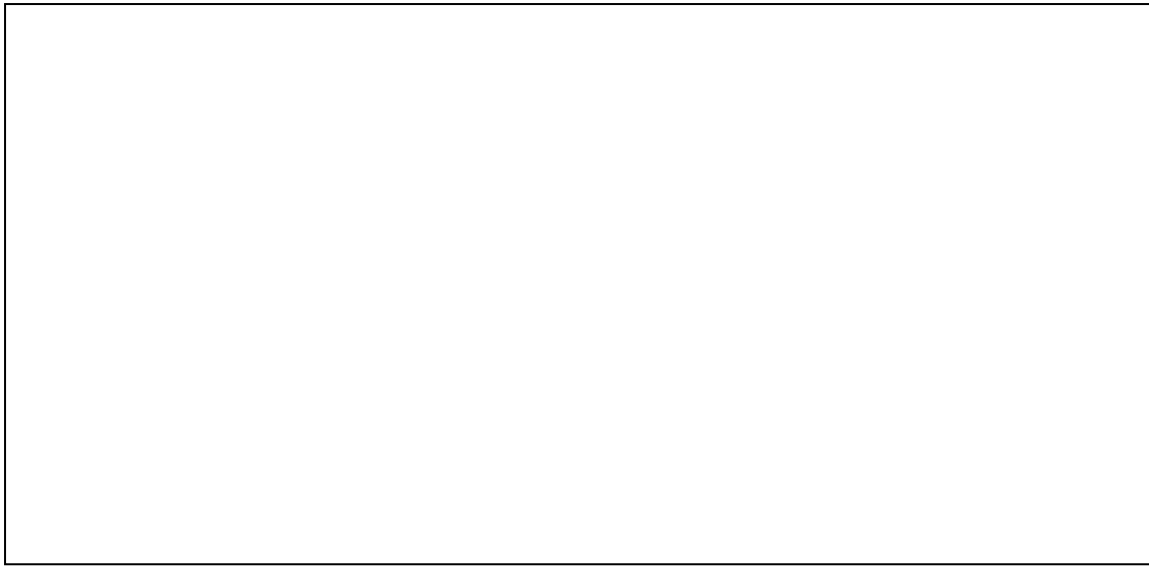
SECTION 5 - COMMENTS

[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].

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.]