MODULE SPECIFICATION TEMPLATE

**SECTION 1: MODULE SPECIFICATIONS**

1. Title of the module - **Bioinformatics and Genomics**
2. School or partner institution which will be responsible for management of the module

**Biosciences**

1. Start date of the module **September 2013**
2. The number of students expected to take the module **40**
3. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal **None**
4. The level of the module (e.g. Certificate [C], Intermediate [I], Honours [H] or Postgraduate [M])

**H**

1. The number of credits and the ECTS value which the module represents **15**
2. Which term(s) the module is to be taught in (or other teaching pattern) **Autumn**
3. Prerequisite and co-requisite modules **BI300, BI532**
4. The programmes of study to which the module contributes

**Will be optional for:**

**Biochemistry**

**Biology**

1. The intended subject specific learning outcomes
   1. **An understanding of DNA/protein databases, sequence searching methods, multiple sequence alignments, residue conservation and phylogenetic trees. (Biochemistry and related programmes A4, B2, C4, D1)**

**(Biology A2,A6,B1)**

* 1. **An understanding of bioinformatics methods for the analysis and prediction of protein structure, function and interactions with small ligands and with other proteins. (Biochemistry and related programmes A4, A5)**

**(Biology – A2,A6,B1)**

* 1. **An understanding of genomics approaches including – genome sequencing, comparative and functional genomics, metagenomics and transcriptomics. (Biochemistry and related programmes A4)**

**(Biology – A3,A4,A6, B1)**

* 1. **The ability to use online resources taught in 11.1 and 11.2 to analyse protein and gene features (including structure, function and interactions). (Biochemistry and related programmes A10, B2,B3, B4, C4,D4)**

**(Biology – A2,A3,A4,A6,B1,B2, C1,C2,C6,C7,C8)**

1. The intended generic learning outcomes
   1. **Bioinformatics computer skills for use in biology and data retrieval/analysis. These are generic bioinformatics skills, which can be used across biological sciences. Data retrieval/analysis are generic to all numerate subjects.**

**(Biochemistry and related programmes C4, C5, C6, D1, D4.)**

**(Biology – D1,D4,D5,D6,D8,D9,D10,D11)**

* 1. **Transferable skills including written communication (technical reports and a coursework project. Analytical skills including analysis and presentation of data, writing of reports and a mini project(coursework) ) (Biochemistry and related programmes C3, C4,D1).**

**(Biology – D7,D8,D9,D10,D11)**

1. A synopsis of the curriculum
2. **Bioinformatics Data sources & Sequence analysis:**

**Databases and data availability. Using sequence data for analysis – sequence searching methods, multiple sequence alignments, residue conservation, Phylogenetics, Protein domains and families (e.g. Pfam, Interpro).**

1. **Protein Bioinformatics Methods**

**Protein structure and function prediction. Prediction of binding sites/interfaces with small ligands and with other proteins. Bioinformatics analyses using protein data.**

1. **Genomics**

**An introduction to DNA analysis methods moving onto omics approaches, primarily focussing on the data available from DNA sequencing – how it can be used to compare genomes (comparative and functional genomics). Metagenomics and transcriptomics will also be covered.**

1. Indicative Reading List

**There will be 2 core texts for the course:**

**Lesk A, Introduction to Bioinformatics, 3rd Edition, Oxford University Press, 2008 Templeman Library Classmark QH 323.5 3 x Core Text Collection [1 week loan], 5 x Core Text Collection [Ordinary loan]. Note Edition 2 also held in the library [8 in CTC ordinary loan].**

**Lesk A, Introduction to Genomics, 1st Edition, OUP, 2011, Not currently available in Templeman Library.**

**Additionally selected research and review papers will be recommended.**

1. Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended learning outcomes

**The course material will be delivered in lectures supported by reference to the core texts and the scientific literature. This will address outcomes 11.1,11.2, 11.3.**

**Experience of web-based bioinformatics programs to investigate proteins, genes and genomes will be studied in the computational workshops. Four of the workshops will be formative and they will provide a background for the students to complete the assessed workshops. This will address outcomes 11.1-11.4, 12.1, 12.2.**

**The assessed coursework will develop analytical and problem solving skills using the online programs that were introduced in workshops. This task will be more open in style and expect the students to utilise all the knowledge they have gained throughout the course. This will address outcomes 11.4, 12.1, 12.2.**

**Contact Hours**

**Lectures 20 hours**

**Computing Workshops 12 hours (6 x 2hours)**

**Total 32 hours**

**Self-Study**

**Coursework project report 45 hours**

**Workshop Assessments 20 hours**

**Personal Study 53 hours**

1. Assessment methods and how these relate to testing achievement of the intended learning outcomes

**Assessed workshops (30%) – Students will complete 2 assessed workshops. These will be computer based and will require the students to use the methods taught in the lecture course. Outcomes: 11.1-4, 12.1-12.2.**

**Gene Analysis Project (70%) – Each student will perform an extended analysis for a gene to analyse using the tools introduced in the lectures and practical sessions. This will combine the protein and genomics elements of the course. This will also include a short literature review.**

**The project will be given to the students mid way through the term (Week 6/7). They will have a practical to introduce the project. The literature review and a plan outlining the work they are going to do in the project will be handed in 3 weeks later. A second practical session towards the end of term (after the literature review and plan have been returned) will give the students the opportunity to get feedback on their work and get guidance on what they are doing.**

**The marks for the project will be allocated the in the following way:**

**Literature review – 20%**

**Plan – 10%**

**Methods section– 20%**

**Results section– 30%**

**Discussion/Conclusion – 20%**

**Outcomes: 11.1-4, 12.1-12.2.**

1. Implications for learning resources, including staff, library, IT and space

**IT: Will need a computer room for practical sessions that will accommodate all students on course. Software will need to be installed - Pymol (pymol.org), Jalview (jalview.org), R, Matlab, Java runtime, flash.**

**Library: already has 8 copies of the main Bioinformatics text book. The library does not stock Introduction to Genomics so copies will need to be purchased.**

***Space:* Lecture theatre, computer room (no laboratory teaching space required).**

**Staff: Module will be taught by Mark Wass and Anthony Baines.**

1. The School/ recognises and has embedded the expectations of current disability equality legislation, and supports students with a declared disability or special educational need in its teaching. Within this module we will make reasonable adjustments wherever necessary, including additional or substitute materials, teaching modes or assessment methods for students who have declared and discussed their learning support needs. Arrangements for students with declared disabilities will be made on an individual basis, in consultation with the University’s/Collaborative Partner’s (delete as applicable) disability/dyslexia support service, and specialist support will be provided where needed.

***If the module is part of a programme in a Partner College or Validated Institution, please complete the following:***

1. Campus(es) where module will be delivered: Canterbury
2. Partner College/Validated Institution:
3. University School responsible for the programme: Biosciences

**SECTION 2: MODULE IS PART OF A PROGRAMME OF STUDY IN A UNIVERSITY SCHOOL**

**Statement by the School Director of Learning and Teaching/School Director of Graduate Studies (as appropriate):** "I confirm I have been consulted on the above module proposal and have given advice on the correct procedures and required content of module proposals"

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| ................................................................  Director of Learning and Teaching/Director of Graduate Studies (delete as applicable)  …………………………………………………  Print Name | ..............................................  Date |

**Statement by the Head of School:** "I confirm that the School has approved the introduction of the module and, where the module is proposed by School staff, will be responsible for its resourcing"

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| .................................................................  Head of School  …………………………………………………….  Print Name | ..............................................  Date |

**SECTION 3: MODULE IS PART OF A PROGRAMME IN A PARTNER COLLEGE OR VALIDATED INSTITUTION**

(Where the module is proposed by a Partner College/Validated Institution)

**Statement by the Nominated Officer of the College/Validated Institution** *(delete as applicable)***:** "I confirm that the College/Validated Institution*(delete as applicable)* has approved the introduction of the module and will be responsible for its resourcing"

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| .................................................................  Nominated Responsible Officer of Partner College/Validated Institution  ………………………………………………….  Print Name  …………………………………………………..  Post | ..............................................  Date |

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Partner College/Validated Institution

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Last updated October 2012