MODULE SPECIFICATION TEMPLATE

**SECTION 1: MODULE SPECIFICATIONS**

1. Title of the module

BI604 Biological Membranes

1. School or partner institution which will be responsible for management of the module

Biosciences

1. Start date of the module

September 2003 . Latest revision July 2013

1. The number of students expected to take the module

60

1. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal

None this is a minor revision of an existing module

1. 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 credits (7.5 ECTS credits)

1. Which term(s) the module is to be taught in (or other teaching pattern)

Spring Term

1. Prerequisite and co-requisite modules

None

1. The programmes of study to which the module contributes

Biochemistry and related programmes

Biomedical Science and related programmes

Biology and related programmes

1. The intended subject specific learning outcomes
2. The students should demonstrate an understanding of membrane structure, traffic and transport, and understand the molecular basis of several common genetic diseases in this area.
3. The students should demonstrate ability to integrate data from laboratory and computer-based analyses.

12.The intended generic learning outcomes

1. The students should be enabled in a number of computer skills important to final year projects and to scientific research.

2. The students should demonstrate ability to solve honours level problems based on scientific data.

13.A synopsis of the curriculum

Cells and subcellular compartments are separated from the external milieu by lipid membranes with protein molecules inserted into the lipid layer. The aim of this module is to develop understanding of both the lipid and protein components of membranes as dynamic structures whose functions are integrated in cellular processes.

**Lectures:**

**Review of the fluid mosaic model for membrane organisation**

Experimental evidence for fluidity – lateral/rotational/flip-flop

**Membrane proteins**

Types: integral vs peripheral, and their experimental definition. Asymmetry and sidedness. Overview of types of transmembrane proteins, and lessons on prevalence and functions from genome analysis

Transmembrane protein function exemplified through transporters. Structures of channel proteins and carrier proteins, their mechanisms and disease links

Monotopic membrane proteins: exposed on one side of the membrane examples and structures

Generation of bitopic and monotopic proteins by differential exon usage in a single gene, e.g. NCAM.

Peripheral membrane proteins. Domains that allowInteraction with the lipid bilayer

**Membrane lipids**

Types: phospholipids, sphingolipids and sterols; *in vivo* distributions.

Formation of bilayers: evidence for bilayer structures.

Sidedness and asymmetry of lipids: dynamics and phases.

Pointers to membrane lipid metabolism: phospholipases and signalling; metabolic defects and disease.

**The in vivo structure of a mammalian plasma membrane**

**The red cell membrane**: observation of the requirements of such a membrane and how those requirements are not met in certain disease states (spherocytosis, elliptocytosis and pyropiokilocytosis). The putative CO2 metabolon. Structure of the red cell membrane and its associated cytoskeleton: the spectrin/ankyrin/actin system.

The membrane skeleton as a mechanism for restricting the mobility of membrane proteins in the plane of a membrane: evolutionary considerations and disease states in other cell types e.g. ankyrin-linked dysfunction of cardiac ion transport in heart diseases.

**Practical**

An exploration of the red cell membrane focusing on the anion transporter. The practical will include computer analysis of the sequence of the anion transporter to predict its structure in relation to experimental data from the practical. An additional aspect of this practical will be recapitulation of the use of some techniques widely used in final year projects (SDS gel and blotting).

**Workshop**: exam preparation

**Supervisions:**

Problem solving based on past exam papers.

14.Indicative Reading List

* Core texts: Alberts et al. "Molecular Biology of the Cell" or Lodish et al. "Molecular Cell Biology"
* AND One of the standard biochemistry texts (e.g. Lehninger/Nelson & Cox, Voet & Voet, Stryer etc.).
* In addition, students will be given references to articles in a number of key review journals (Annual Review series, Trends series, Current Opinions series), and to primary research papers in (among others) Journal of Cell Biology, Journal of Biological Chemistry and Cell.
* Supplementary (available in the Library)
* Luckey. M, “Membrane Structural Biology” Yeagle, P.L. “Membranes of cells”, 2nd edn. Jones, M.N. and Malcolm, N. “Micelles, monolayers, and biomembranes”.

15.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 module learning outcomes

**Contact Time:**

Lectures: 18h These address learning outcome 11.1 and 12.2 through class

discussion of past exam problems in relation to subjects in

lectures

Practicals: Lab 12h This addresses learning outcomes 11.1 and 11.2

Practical: Computer 3h This addresses learning outcomes 11.1, 11.2 and 12.1

Supervision 2h This addresses learning outcomes 11.1, 12.2

Workshop 2h This addresses learning outcome 11.1 and 12.2

Revision session 1h This addresses learning outcome 11.1

**Self Study:**

Practical report 20h This addresses learning outcomes 11.1, 11.2 and 12.1

Problem solving 7h This addresses learning outcomes 11.1, 12.2

Workshop preparation 10h This addresses learning outcomes 11.1, 12.2

Reading, revision 75h This addresses learning outcomes 11.1, 11.2,12.1 and 12.2

The curriculum will be delivered through the lecture series with reinforcement of key concepts through the practical classes and workshop. Data handling and problem skills will be developed through the practical report and problem solving exercises, and will be reinforced through reference to examples during the lectures and as preparation for the examination.

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

*List each applicable assessment method and their weighting and indicate which module learning outcomes (both section 11 specific and section 12 generic) are addressed by that assessment method, as above.*

*Between them, the assessment methods must cover all the module learning outcomes.*

*Note that it is not necessary to list every specific assessment item.*

Practicals 20% Learning outcomes 11.1, 11.2, 12.1

Supervision (Problem Solving) 15% Learning outcomes 11.1, 12.2

Final exam 65% Leaning outcomes 11.1, 12.2

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

None this is a minor revision of an existing module

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 disability/dyslexia support service, and specialist support will be provided where needed.
2. Campus(es) where module will be delivered:

Canterbury

**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 |

Module Specification Template  
Last updated February 2013