1. **Title of the module**

BI501 Gene Expression and its Control

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

School of Biosciences

1. **The level of the module (e.g. Level 4, Level 5, Level 6 or Level 7)**

Level 5

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**

BI302 Molecular and Cellular Biology

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.  
   On successfully completing the module students will be able to demonstrate:**
   1. An understanding of how genes are organised, expressed and controlled in both prokaryotes and eukaryotes
   2. Awareness of the contribution of modern molecular and cellular technologies in furthering our understanding of gene expression and its control
   3. An appreciation of the importance of fundamental research into gene structure and function for future developments in the fields of human genomics and disease
   4. An ability to analyse data from laboratory experiments that address issues relating to gene structure and/or expression

1. **The intended generic learning outcomes.  
   On successfully completing the module students will:**

9.1 Be able to extract and interpret information at an intermediate level

9.2 Be able to analyse and evaluate experimental data at an intermediate level

9.3 Have acquired skills in written communication and receiving critique

1. **A synopsis of the curriculum**

The module deals with the molecular mechanisms of gene expression and its regulation in organisms ranging from viruses to man. This involves descriptions of how genetic information is stored in DNA and RNA, how that information is decoded by the cell and how this flow of information is controlled in response to changes in environment or developmental stage. Throughout, the mechanisms in prokaryotes and eukaryotes will be compared and contrasted and will touch on the latest developments in how we can analyse gene expression, and what these developments have revealed.

**Lectures:**

**A. The genome** - Human genome, human chromosomes, mapping and cloning human genes, DNA testing and disease diagnosis, genome organisation, analysing genomes.

**B.** **The gene** -Gene organisation. Gene evolution. Gene transcription in prokaryotes and eukaryotes: RNA polymerases, promoters, regulatory sequences. mRNA processing in eukaryotes: intron splicing, the spliceosome, turnover pathways, catalytic RNA. mRNA translation: tRNA, the ribosome, mechanism (initiation, elongation, termination).

**C. Gene regulation** - Transcriptional regulation in prokaryotes: operons. Transcriptional regulation in eukaryotes: simple vs complex systems, promoters and enhancers. Post-transcriptional regulation: mRNA processing and turnover, translational control, non-coding RNAs. Epigenetic control.

1. **Reading List (Indicative list, current at time of publication. Reading lists will be published annually)**

Core Texts (**one** of the following):

* Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. “*Lewin's Genes XI*”, Jones and Bartlett Learning, Publishers, 2014 [ISBN-978-1-4496-5985-1] **OR/**
* Krebs, J.E., Goldstein, E.S., Kilpatrick, S.T. “*Lewin’s Essential Genes 3rd edition*” Jones and Bartlett Learning, 2013,[ISBN: 978-1-4496-4479-6] **OR/**
* **OR/** Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. & Losick, R. “*Molecular biology of the gene, 7th Edition*”, Pearson, 2014 [ISBN: 978-0-321-85149-9]

In addition, the following books are recommended for supplementary/background reading:

* Craig, N., Cohen-Fix, O., Green, R., Greider, C., Storz, G., Wolberger, C. ‘*Molecular Biology: Principles of Genome Function’*, *2nd edition* OUP Oxford; 2014, ISBN-13: 978-0198705970
* Latchman, D.S. ‘*Gene Control’*. Garland Science, 2014, ISBN-10: 0815365136
* Reece, R.J.R. ‘*Analysis of genes and genomes’* Wiley, 2004, ISBN: 978-0-470-84380-2
* McLennan, A.G., Bates, A.D., Turner P.C., White, M.R.H. *Instant notes molecular biology, 4th edition*, Oxford : Garland Sciences, 2013

1. **Learning and Teaching methods**

**Contact hours (22 hr):**

* 19 lectures (19 hr)
* 2 revision lectures (2 hr)
* 1 Supervision (1 hr)

**Directed self-learning programme (128 hr – including assessments)**

Directed reading: texts, review papers, primary research papers

Assessment 1: data analysis problems

Assessment 2: MCQ preparation

Lectures: will address learning outcomes 8.1–8.4, 9.2

Supervision/assessed problems: will address learning outcomes 8.1–8.4, 9.1-9.3

MCQ assessment: will address learning outcomes 8.1–8.3 and 9.1

Directed learning programme: will address learning outcomes 8.1–8.4, 9.1-9.2

1. **Assessment methods.**

**Assessment 1 - Problem-based assessment and supervision [20%]**

Students are provided with a set of experimental data relating to either to gene organisation or gene expression and its regulation. Following a lecture outlining the assessment and the underpinning science, students are given a number of weeks to complete the problems before handing in for marking. The solutions to the problems and other feedback are provided via small group supervisions.

**Assessment 2 - In-class multichoice quiz (MCQ) [20%]** 1 hr

**Summer exam [60%]** 2 hr

Assessment 1 will address learning outcomes 8.4, 9.1-9.3. Assessment 2 will address learning outcomes 8.1–8.3 and 9.1. Summer exam will address learning outcomes 8.1–8.3, 9.1 and 9.3

1. ***Map of Module Learning Outcomes (sections 8 & 9) to Learning and Teaching Methods (section12) and methods of Assessment (section 13)***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** |  | *8.1* | *8.2* | *8.3* | *8.4* |  |  | *9.1* | *9.2* | *9.3* |  |  |  |
| **Learning/ teaching method** | **Hours allocated** |  |  |  |  |  |  |  |  |  |  |  |  |
| Lectures | 19 | **X** | **X** | **X** | **X** |  |  |  | **X** |  |  |  |  |
| Supervision | 1 | **X** | **X** | **X** | **X** |  |  | **X** | **X** | **X** |  |  |  |
| Revision | 2 | **X** | **X** | **X** |  |  |  |  |  |  |  |  |  |
| Directed learning | 128 | **X** | **X** | **X** | **X** |  |  | **X** | **X** |  |  |  |  |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Problem based |  |  |  |  | **X** |  |  | **X** | **X** | **X** |  |  |  |
| In-class test-MCQ |  | **X** | **X** | **X** |  |  |  | **X** |  |  |  |  |  |
| Examination |  | **X** | **X** | **X** |  |  |  | **X** |  | **X** |  |  |  |
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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 student support service, and specialist support will be provided where needed.**
2. **Campus(es) or Centre(s) where module will be delivered:**

Canterbury

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**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 01/02/16 | Major | January 2016 | 10-13 | No |
|  |  |  |  |  |