BS358-12 Biological Clocks

21/22

Department
Life Sciences
Level
Undergraduate Level 3
Module leader
Philip Young
Credit value
12
Module duration
10 weeks
Assessment
100% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This final year module allows the students to bring their extensive background in molecular biology to bear on a complex and wide ranging topic which crosses phylum boundaries, is largely new to them, and which is one of the department's areas of research expertise.

Module web page

Module aims

The module begins with the molecular mechanisms of the circadian system and moves on to clock-regulated processes in whole organisms, including their interactions with the environment and seasonality. Emphasis of the course is placed on understanding how research progresses. Lectures alternate with workshops in which students discuss landmark papers in the field. Students are exposed to a broad range of research approaches and experimental techniques and learn to interpret a variety of data types.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

1 Introduction. General properties of circadian clocks; adaptive significance (IC)

2 Implications of circadian rhythms for human life. (IC)

3 How circadian rhythms contribute to plant fitness. (IC)

4 The molecular mechanism of the circadian clock. Identification of clock genes. The transcriptional-translational feedback loop model (IC)

5 Workshop -Identification of Frequency as a core component of the Neurospora circadian clock (Aronson et al, 1994, Science 263: 1578-1584) -IC

6 Delay mechanisms (IC)

7 Post-translational oscillators. The cyanobacterial clock; peroxiredoxin oscillations (IC)

8-9 Anatomical location of clocks. Hierarchical organisation or circadian oscillators in animals (IC)

10 Workshop – Food-entrainable oscillator (Stokkan et al, 2001, Science291:490-3) - IC

11 The interplay between the circadian clock and metabolism (IC)

12-13 Workshop – Impact of circadian rhythms on the gut microbiome (Thaiss et al, 2014, Cell 159: 514–529)-IC

14-15 Seasonal responses in plants and animals (IC)

16 Workshop – Photoperiodism in plants (Suarez-Lopez et al, 2001, Nature 410: 1116-1120)-IC

17 Circadian rhythms and cancer (FL)

18 Chronopharmacology (RD)

19 Workshop - Chronopharmacology (RD)

20 Revision and practice exam questions. (IC)

Learning outcomes

By the end of the module, students should be able to:

- LO1 Students should develop a better appreciation of the importance of temporal organization in Biology.
- LO2 From the recent research on the molecular mechanisms of circadian rhythms, they should become familiar with the current picture of biological pacemakers in several organisms.
- LO3 Students will learn to interpret different types of research data and to formulate their own independent conclusions.

Indicative reading list

"Rhythms of life. The biological clocks that control the daily life of every living thing" by Russel Foster and Leon Kreitzman. Profile Books. 2004.

ISBN 186-197-235-0

Chronbiology: biological timekeeping. Edited by J. C. Dunlap, J. J. Loros and P. J. DeCoursey. W. H. Freeman. Sinauer associates. 2004.
ISBN 0-87893-149-X

Young, M. W. and Kay, S. A. (2001) Time zones: a comparative genetics of circadian clocks. Nature Reviews Genetics 2: 702-715

Subject specific skills

a. Demonstrate clear understanding of the scientific topic

b. Contain evidence of extended reading and lateral integration of material not covered in the lectures

c. Demonstrate independent thought and deep understanding

d. Specifically answer the set question using information from multiple lectures and sources

e. Be structured and formatted in a way that demonstrates understanding and logical flow

f. Use multiple sources to construct complex scientific arguments and integrating these to build and develop the student's own scientific conclusions.

g. Use of quantitative skills to analyse and interpret published scientific data

Transferable skills

1. Critical appraisal of source material
2. Self directed learning
3. Adult learning

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (17%)
Private study	100 hours (83%)
Total	120 hours

Private study description

100 hrs of self-study and directed reading

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group B1

	Weighting	Study time
Written Examination	100%	

Feedback on assessment

Pastoral meetings with personal tutor

Past exam papers for BS358

Availability

Courses

This module is Core for:

- Year 3 of UBSA-3 Undergraduate Biological Sciences

This module is Option list A for:

- Year 3 of UBSA-C700 Undergraduate Biochemistry
- ULFA-C1A2 Undergraduate Biochemistry (MBio)
  - Year 3 of C1A2 Biochemistry
  - Year 3 of C700 Biochemistry
- UBSA-3 Undergraduate Biological Sciences
  - Year 3 of C100 Biological Sciences
  - Year 3 of C100 Biological Sciences
  - Year 3 of C107 Biological Sciences with Virology
- Year 3 of ULFA-C1A1 Undergraduate Biological Sciences (MBio)
- UBSA-C1B9 Undergraduate Biomedical Science
  - Year 3 of C1B9 Biomedical Science
  - Year 3 of C1B9 Biomedical Science
  - Year 3 of C1B9 Biomedical Science
- ULFA-C1A3 Undergraduate Biomedical Science (MBio)
  - Year 3 of C1A3 Biomedical Science

    - Year 3 of C1B9 Biomedical Science

This module is Option list B for:

- UBSA-3 Undergraduate Biological Sciences
    - Year 3 of C102 Biological Sciences with Cell Biology
    - Year 3 of C103 Biological Sciences with Environmental Resources
    - Year 3 of C104 Biological Sciences with Microbiology