

## Department of Biology Course Outline

SC/BIOL 4310 3.00, Physiology of Circadian Timing  
Winter 2019/20

### Course Description

Examines the mechanism by which cells generate 24h (circadian) rhythms, how the numerous sites of these cells are coordinated by nerves and hormones and the critical roles of human circadian clocks in health and diseases.

### Prerequisites (strictly enforced)

Prerequisites: SC/BIOL 2020 4.00 or SC/BIOL 2020 3.00; SC/BIOL 2021 4.00 or SC/BIOL 2021 3.00; SC/BIOL 3060 4.00.

Students without pre-requisite must request permission from the instructor. Permission will only be granted if the student has adequate background knowledge.

### Course Instructor and Contact Information

Dr. Patricia Lakin-Thomas (Dr. Pat)

005 Farquharson, x33461

Office hours: Tues & Thurs 2:30 - 3:30 or by appointment (please email for appointment)

E-mail: [clocklab@yorku.ca](mailto:clocklab@yorku.ca) I will try to respond within one working day, or answer your question at the next class meeting if appropriate.

### Schedule

Tues & Thurs 1pm-2:20pm, PSE 321

### Evaluation

**Midterm test** (written answers) = 25%

**Final exam** (written answers, not cumulative) = 25%

**Quizzes** (written answers, best 15 out of 19) = 20%

Exams and quizzes are all open-book, open-notes. You may bring the textbook, papers and your notes to the quizzes and exams. You may not use electronics during the quizzes or exams. It is therefore essential for you to have printed copies of the papers and a print copy of the textbook. Exam questions will focus on the topics covered in lectures.

**Project** = 30%

Project proposal = 5% (due dates vary)

Project delivery = 25% (delivered after the midterm)

Students will choose among several available project options, but most students will do a Group Presentation of a set of papers on a topic of their choice.

#### Quiz Policies

There will be an in-class quiz during lectures 3-12 (10 quizzes), based on a reading assigned in advance. There will also be in-class quizzes after each of the group presentations (8 quizzes), based on a paper assigned in advance and discussed by the presenters.

The final quiz grade will be based on participating in the poster session in the last class meeting and submitting peer evaluations of the poster presenters.

Out of 19 quizzes total, the best 15 will be used for the grade.

You can miss up to 4 quizzes without penalty. This covers any illness, religious accommodation or any other absence. No documentation will be required.

## Important Dates

Jan 7

Course introduction (Lecture 1)

Jan 9 - Feb 6

Lectures 2-10 by course director, based on readings assigned from textbook and scientific papers  
Daily quizzes on the readings for lectures 3-10 (Jan 14 - Feb 6, 8 quizzes)

Jan 21

Project choices due date

Feb 11

Review session

Feb 13

Midterm test on lectures 2-10 (Jan 9 - Feb 6)

Feb 14

Project Proposals due (autorhythmometry and essays)

Feb 17-21

Reading Week

Feb 25 - Feb 27

Lectures 11-12 (2 quizzes)

March 3 - 26

Group presentations, daily quizzes on a paper assigned by the group (8 quizzes)

March 31

Review session

April 2

Poster presentations by students doing autorhythmometry projects, peer evaluations  
(worth one quiz to audience participants)

Due date for essays

TBD: Final exam on lectures 11-12 and group presentations

**Drop Deadline:** Fri. March 13, 2020 (last day to drop without course on transcript)

**Course Withdrawal Deadline:** Sun. April 5, 2020 (course still appears on transcript with 'W')

## Resources

**Website: Moodle**

### **Textbook (Required):**

Title: Circadian Rhythms: A Very Short Introduction

Authors: Foster, R.G. and Kreitzman, L.

ISBN: 978-0-19-871768-3

Publisher: Oxford University Press (2017)

Copies are available at the bookstore and Steacie Library reserves (call number QP 84.6 F667 2017).

## Learning Outcomes

Upon successful completion of this course, students should be able to:

1. Describe the basic properties, phenomenology and adaptive significance of circadian rhythms
2. Interpret and evaluate various methods of displaying and analyzing rhythmic data
3. Compare molecular mechanisms and cellular substrates of circadian rhythms between several model organisms
4. Apply circadian concepts to physiological topics such as metabolism and sleep
5. Describe the impact of light on daily and seasonal rhythmicity
6. Describe the influence of circadian rhythmicity on human health and disease
7. Depending on the project chosen:
  - a. Research and deliver an engaging lecture on a scientific subject to an audience of peers
  - b. Write clearly and logically about the history of a particular research theme in chronobiology
  - c. Assay and interpret human physiological rhythms and present a scientific poster on the results

## Course Content

See Expanded Lecture Schedule for details and assigned readings

Topics to be covered in lectures will include:

Basic circadian rhythm terminology and concepts  
Phase resetting and limit cycle models for circadian oscillators  
Molecular mechanisms of circadian oscillators in mammals and insects  
Neural basis of rhythms  
Peripheral clocks outside the brain  
The impact of light on the clock  
Clock control of metabolism  
Sleep in humans and flies  
Human circadian activity patterns, normal and disrupted  
Circadian rhythms in plants, fungi and bacteria  
Photoperiodism in mammals and plants

Additional topics will be chosen by students for presentations, and could include:

Circadian rhythms and human health such as shift work, mood disorders, neuro-degenerative diseases, cardiophysiology, athletic performance  
Rhythms in non-human mammals such as food-entrainable oscillators, non-photic entrainment, metabolic syndrome  
Rhythms in non-mammalian vertebrates such as zebrafish and birds  
Rhythms in invertebrates such as *Rhodnius*, *Drosophila* photoreception, navigating using a sun compass in bees, learning in sea slugs  
Rhythms in plants, fungi, bacteria, etc.

## Experiential Education and E-Learning

E-learning: Moodle will be used to post course material and provide links to resources such as videos.  
EE: Depending on the choice of project, students will practice in-class lecturing skills, or will learn about human rhythms by assessing their own rhythmicity and will practice skills of presenting scientific data in a poster session.

## Course Policies

### Missing the midterm

If the midterm is missed due to a well-documented excuse, a make-up midterm will be arranged during Reading Week.

### Late policy

Presentations and posters will not be accepted after the assigned date unless you have a well-documented excuse, in which case a make-up presentation will be arranged.

### Documentation for missed midterm or presentation/poster

Must be submitted online using the Biology Document Submission System:  
<https://science.apps01.yorku.ca/machform/view.php?id=84113>

### Missing a quiz

There will be 19 quizzes (including a quiz mark for participating in the poster session). The grade will be based on the best 15. If you miss a quiz for any reason, including illness or religious accommodation, it will come out of the 4 dropped quiz grades. There will be no make-up quizzes.

## University Policies

### **Academic Honesty and Integrity**

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (<http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards.

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at - <http://www.yorku.ca/academicintegrity/>

### **Access/Disability**

York University is committed to principles of respect, inclusion and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Students in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Student Accessibility Services - <https://accessibility.students.yorku.ca/>

Glendon Accessibility, Well-Being and Counselling (AWC) Centre - <https://www.glendon.yorku.ca/counselling/>

### **Religious Observance Accommodation**

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete and submit an Examination Accommodation Form at least 3 weeks before the exam period begins. The form can be obtained from Student Client Services, Student Services Centre or online at <https://secure.students.yorku.ca/pdf/religious-accommodation-agreement-final-examinations.pdf>

### **Student Conduct in Academic Situations**

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at - <http://secretariat-policies.info.yorku.ca/policies/disruptive-and-or-harassing-behaviour-in-academic-situations-senate-policy/>