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 - 4:30 or by appointment
E-mail: 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 16 out of 20) = 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 computers during the quizzes or exams. It is therefore essential for you to have printed copies of the papers and a print copy if the textbook. Exam questions will focus on the topics covered in lectures.

Project = 30%
Project proposal = 5% (due before midterm)
Project delivery = 25% (delivered after the midterm)
Project options are described in Additional Information.

Quizzes
There will be an in-class quiz during lectures 3-11 (9 quizzes), based on a reading assigned in advance. There will also be in-class quizzes after each of the group presentations (lectures 14-23, 10 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 20 quizzes total, the best 16 will be used for the grade.
You can miss up to 4 quizzes without documentation. This covers any illness, religious accommodation or any other absence.
Important Dates

Jan 3, 8
Meetings 1,2: Course introduction

Jan 10 - Feb 7
Meetings 3-11: Lectures by course director, based on readings assigned from textbook and scientific papers, daily quizzes on the readings (9 quizzes)

Feb 12
Meeting 12: Review session

Feb 14
Meeting 13: Midterm test on lectures 3-11

Feb 18-22: Reading Week

Feb 26 - March 28
Meetings 14-23: Group presentations, daily quizzes on a paper assigned by the group (10 quizzes)

April 2
Meeting 24: Poster presentations by students doing autorhythmometry projects, peer evaluations (worth one quiz to audience participants)

TBD: Final exam on group presentations 14-23

Drop Deadline: Fri. March 8, 2019 (last day to drop without course on transcript)
Course Withdrawal: Wed. April 3, 2019 (course still appears on transcript with ‘W’)

Resources

Website: Moodle

Textbook (Required):
Title: Circadian Rhythms: A Very Short Introduction
Author: Foster, R.G. and Kreitzman, L.
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. Explain the historical development of various ideas in chronobiology
8. Depending on the project chosen:
   a. 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
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
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, life history of rhythmicity
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 other organisms such as bacteria, plants, fungus

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 20 quizzes (including a quiz mark for participating in the poster session). The grade will be based on the best 16. 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:
Counselling & Disability Services - http://cds.info.yorku.ca/
Counselling & Disability Services at Glendon - https://www.glendon.yorku.ca/counselling/
York Accessibility Hub - http://accessibilityhub.info.yorku.ca/

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 http://www.registrar.yorku.ca/pdf/exam_accommodation.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-andor-harassing-behaviour-in-academic-situations-senate-policy/