

Department of Physiology  
PHGY 524 — Chronobiology (3 credits)  
Fall 2018

***Time:** Tuesday and Thursday from 10:05 a.m. – 11:25 a.m.*

***Place:** McIntyre Medical Science Building, Room 1101*

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**COURSE TIMETABLE:**

<b><u>Week</u></b>	<b><u>Date</u></b>	<b><u>Type</u></b>	<b><u>Topic</u></b>	<b><u>Instructor</u></b>
1	Sept. 4	Lecture	Basic principles of chronobiology I	N. Cermakian
	Sept. 6	Lecture	Basic principles of chronobiology II	N. Cermakian
2	Sept. 11	Lecture	Clock genes	N. Cermakian
	Sept. 13	Lecture	The suprachiasmatic nucleus	N. Cermakian
3	Sept. 18	Lecture	Peripheral clocks	N. Cermakian
	Sept. 20	Article Discussion	Article on the suprachiasmatic nucleus	N. Cermakian
4	Sept. 25	Lecture+Tutorial	Circadian photoreception	N. Cermakian
	Sept. 27	Seminar	Clock transcription factors and redundancy	N. Cermakian
5	Oct. 2	Lecture	Clock outputs and physiological rhythms I	N. Cermakian
	Oct. 4	Seminar	SCN networking and plasticity	N. Cermakian
6	Oct. 9	Lecture+Tutorial	Clock outputs and physiological rhythms II	N. Cermakian
	Oct. 11	Article Discussion	Article on circadian photoreception	N. Cermakian
7	Oct. 16	Lecture	Extra-SCN brain oscillators	F. Storch
	Oct. 18	Lecture	Circannual rhythms and photoperiodism	F. Storch
8	Oct. 23	Midterm Exam	<b><i>Special Room: 1345, McIntyre Bldg.</i></b>	N. Cermakian
	Oct. 25	Lecture	Human circadian rhythms I	N. Cermakian
9	Oct. 30	Lecture	Human circadian rhythms II	N. Cermakian
	Nov. 1	Lecture	Chronopharmacology	D. Bernard
10	Nov. 6	Seminar	Food entrainment of peripheral clocks	N. Cermakian
	Nov. 8	Article Discussion	Article on ligands for clock proteins	D. Bernard
11	Nov. 13	Seminar	Transcription-Less Clocks	N. Cermakian
	Nov. 15	Article Discussion	Article on human circadian rhythms	L. Kervezee
12	Nov. 20	Seminar	What regulates the phase of human rhythms?	N. Cermakian
	Nov. 22	Lecture	Clocks, microbes and immunity	N. Cermakian
13	Nov. 27	Lecture	Circadian and homeostatic control of sleep	N. Cermakian
	Nov. 29	Article Discussion	Article on circadian control of immunity	N. Cermakian

## **GENERAL INFORMATION:**

### Course Coordinator and Main Instructor:

Nicolas Cermakian, Ph.D.  
Douglas Mental Health University Institute, Perry building, E-2108  
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Office hours: On appointment

Other Instructors: Daniel Bernard, Ph.D.  
Department of Pharmacology and Therapeutics, McGill University  
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Kai-Florian Storch, Ph.D.  
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Laura Kervezee, Ph.D.  
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Prerequisite: Background knowledge in molecular biology and physiology: BIOL 200, PHGY 209 and 210 (or NSCI 200 and 201), and a relevant 300-level course (PHGY 311 or 314, or PSYC 318, or BIOC 311, or other, with permission of course coordinator).

Maximum enrollment: 20

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## **COURSE DESCRIPTION:**

This course is an introduction to the field of chronobiology. The aim is to provide basic knowledge on different types of biological rhythms, with particular focus on circadian (daily) rhythms.

### Learning Outcomes:

At the end of the course, students should be able to:

1. Understand the basic characteristics of rhythms ( $\tau$ ,  $A$ ,  $\Delta\Phi$ , etc.) and identify them in data sets.
2. Interpret data from standard circadian research procedures and representations (e.g. actograms, luciferase recordings, phase response curves).
3. Explain how a feedback loop can give rise to molecular rhythms, and more specifically, to 24-h rhythms.
4. Name clock synchronizers and explain how they can affect clock function.
5. Describe how the circadian clock controls physiological outputs, e.g. hormones, sleep, activity, and metabolism, immune response.
6. Explain the mechanisms through which clock dysfunction can lead to health problems (e.g. sleep & mood disorders, cancer, health problems of shiftworkers).
7. Using articles from the field of chronobiology, learn research-related skills such as to analyze and critically assess research reports, to extract the key information from articles and put it in relation to others, to come up with possible future research aims stemming from research findings, and to efficiently convey scientific information (orally or in written form).

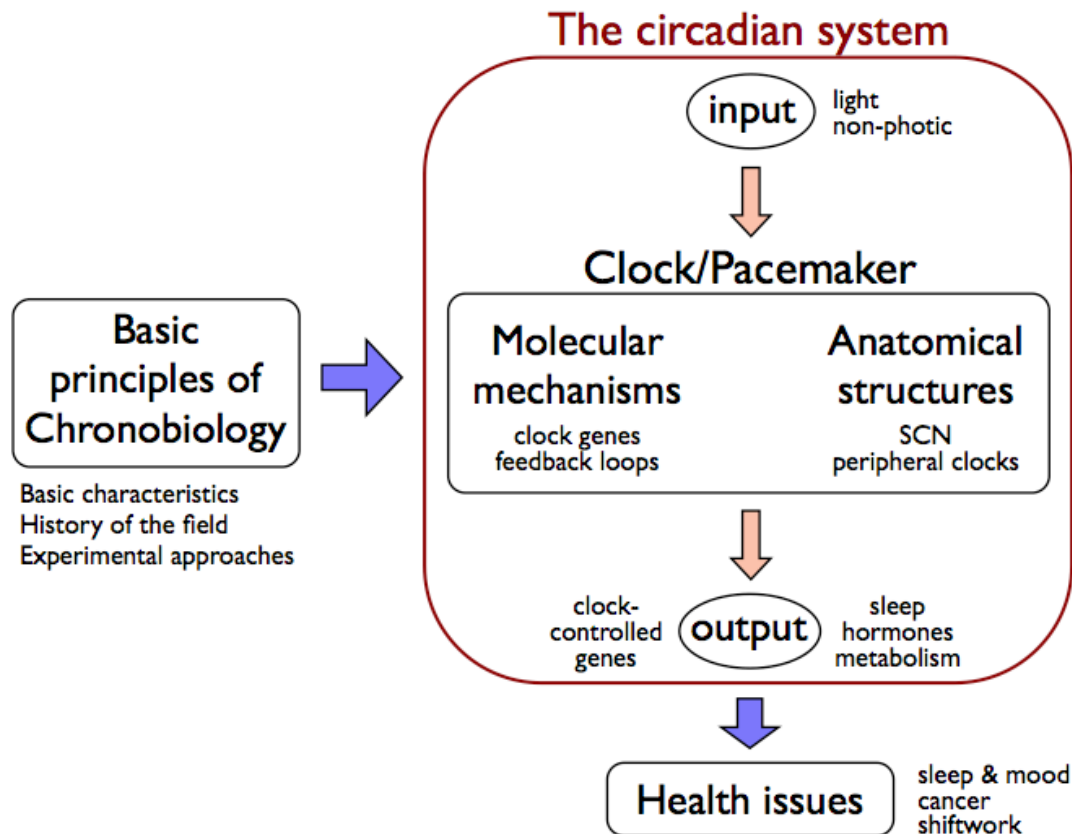
### Instructional Method:

The instructional method will consist in lectures on various topics pertaining to biological rhythms, as well as in-class discussion, seminars by students, tutorials, and text or drawing assignments.

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## COURSE CONTENT:

### CONCEPT MAP:



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## COURSE MATERIAL:

- Handouts of lecture slides will be available on myCourses before class.
  - Textbooks:
    1. Dunlap, J. C., Loros, J. J. & DeCoursey, P. J. (eds.) *Chronobiology: biological timekeeping* (Sinauer Associates, 2004). An excellent textbook covering a wide range of topics in chronobiology. Book available at the library.
    2. Refinetti, R. *Circadian physiology* (CRC Press, 2016). An excellent textbook for circadian rhythm history, fundamental concepts, techniques and other basic aspects. Electronic book (via McGill proxy) at: [http://mcgill.worldcat.org/title/circadian-physiology/oclc/946084809&referer=brief\\_results](http://mcgill.worldcat.org/title/circadian-physiology/oclc/946084809&referer=brief_results)
    3. Colwell, C.S. (ed.) *Circadian medicine* (John Wiley & Sons Inc., 2015). A recent set of contributions from specialists on various physiological systems and medical conditions and how they are affected by the circadian system. Electronic book (via McGill proxy) at: [http://mcgill.worldcat.org/title/circadian-medicine/oclc/902987041&referer=brief\\_results](http://mcgill.worldcat.org/title/circadian-medicine/oclc/902987041&referer=brief_results)
  - Additional out-of-class readings (review articles), articles for in-class discussion, for the term paper assignment, and for seminar preparation will be available on myCourses.
  - Guidelines for term paper assignment, seminars and short writing assignments are available in myCourses in the "Guidelines" folder.
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## **EVALUATION:**

### • **Midterm Exam: 20%**

The midterm exam will consist in a mix of multiple choice questions, short answer questions and essay questions, covering material of weeks 1 to 6 (lectures, seminars and article discussions).

*\*Students who for serious reasons such as illness or family affliction cannot write the midterm exam, are required to submit supporting evidence to the Physiology General Office (McIntyre Bldg, Rm. 1021) within the two weeks following the exam date. No deferred exam will be offered for missing the midterm.*

### • **Final Exam: 25%**

The final exam will consist in a mix of multiple choice questions, short answer questions and essay questions, covering all course material, with emphasis on weeks 7 to 13 (lectures, seminars and article discussions).

### • **Term Paper Assignment: 20%**

Students will be asked to write a 5-page essay (double spaced, 12 pt. font, not handwritten) to present a critical discussion on a set of related articles (see guidelines in myCourses). Articles to choose from will be available on myCourses by the end of September.

**Assignment Submission: Convert your assignment to a PDF file and deposit it in the “Assignment Drop-box” on myCourses before November 26, 4:00PM.**

**\*\*\* Late assignments will have a penalty of 1 point (out of 20) per day. \*\*\***

### • **Seminar: 20%**

Students will be grouped in teams of 4 and asked to prepare and present about several articles related to the weekly topic (reference of articles provided by the instructors a few weeks before the presentation). It is expected that each of the team members will participate in the preparation of the seminar and will present a part of the story. The students will also be assessed for their participation to the discussions, in the weeks where they do not present a topic (see below). After each seminar, all students in the course will have to submit a summary figure illustrating the main topics of the seminar and their relationships (see below).

### • **In-Class Participation and Small Assignments: 15%**

Several times during the term, students will be expected to read a research article, which will then be discussed in small groups in class. Articles will be available on myCourses. Assessment will be done by:

- i) Short writing assignment after in-class article discussions (see guidelines and questions to answer in myCourses), 5% (1% for each short assignment);
- ii) Summary figure after each of the seminars except the first one (see guidelines in myCourses), 5% (1.25% for each summary figure);
- iii) Evaluation of class participation (e.g. in discussion of research articles, discussion after students' seminars, and interactive components of lecture classes), 5%.

### **Note about Grading:**

*The Department of Physiology will **NOT** revise/upgrade marks except on sound academic grounds. Once computed, the marks in this course will **NOT** be altered/increased arbitrarily. Decimal points will be “rounded off” as follows: if the final aggregate mark is computed to be 79.5%, the mark will be reported as 80% (an A-); a final aggregate mark of 79.4% will be reported as 79% (a B+). These marks are **FINAL and NON-negotiable**.*

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McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see [www.mcgill.ca/students/srr/honest/](http://www.mcgill.ca/students/srr/honest/) for more information).

In accord with McGill University's Charter of Students' Rights, students have the right to submit in English or in French any written work that is to be graded (except in courses where knowledge of a language is one of the objectives of the course).

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

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