Attention!

This is a *representative* syllabus.

The syllabus for the course when you enroll may be *different*.

Use the syllabus provided by your instructor for the most up-to-date information. Please refer to your instructor for more information for the specific requirements for a given semester.
SYLLABUS

SPRING 2016

Neuroscience 4623: Behavioral and Molecular Biological Clocks
(3 credits)

Class meets @ 9:35-10:55 on Mondays and Wednesdays in 170 DHLRI

Instructors:
Professor Randy Nelson
Office: 4084 Graves Hall
Office Hours: Thursday 11:30-12:30 pm and by appointment
Phone: 614.688.8327
Fax: 614.688.8742
Email: rnelson@osu.edu

Professor Karl Obrietan
Office: Graves Hall, Room 4036
Office Hours: Thursday 4:30-5:30 pm and by appointment
Phone: 614 292 4432
Fax: 614.688.8742
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Professor Zachary Weil
Office: 618 Biomedical Research Tower
Office Hours: Monday 11-12:30 pm and by appointment
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Fax: 614.688.8742
Email: zachary.weil@osumc.edu

Course Assistant:
Email:

Course Summary: A consideration of the broad variety of biological rhythms of animals and humans, including ultradian, daily, lunar, tidal and annual cycles. After considering the field in historical perspective, we will spend several weeks on the formal properties of biological clocks and then go to the ways in which rhythms are generated on a molecular basis and how they are synchronized to the external environment. Emphasis is on the role of the molecular and cellular mechanisms of circadian clocks, and how these clocks affect the nervous and endocrine systems of mammals and birds in relation to behavioral rhythms of eating, drinking, sleeping, sex activity, hibernation, migration, seasonal affective disorders, menstrual and estrous cycles. Lecture notes and additional readings will be posted in Carmen.
**Prerequisite:** Psychology 4313 or a course in physiology.

**Grading:** Grades will be based on two midterm (60% of the final grade), and a final (cumulative) examination (40% of the final grade). The exam material will consist of both lecture material and material from your readings. The tests are multiple-choice, short answer, and essay examinations. Students will be responsible for attending class, reading the assigned materials in the reader, and studying the materials. Final grades will be calculated as follows: ≥90% of the highest score = A; ≥80% of the top score = B; ≥70% of the top score = C; ≥60% of the top score = D. <59% of the top score = F.

**Academic Ethics:** All students enrolled in courses at the Ohio State University should be familiar with the University's policy on academic integrity (http://www.asc.ohiostate.edu/honors/conduct_document.htm). The instructor and course assistants are committed to maintaining a fair assessment of student performance in this course. There is one major ethical consideration in this course. The three exams are closed book. No notes may be used during the examinations and you may not confer with your fellow students or look at other examinations for answers during the exam period. Prior to the examinations, all students are encouraged to study in small groups to facilitate your preparation for the tests. However, once you enter the examination room, you are expected to work alone.

**Absence from Exams:** Make-up exams and quizzes may be taken only in cases in which absence from the scheduled exam is unavoidable, such as in cases of illness or family emergency. Any such absence must be approved by the instructor in advance of the exam. Any excuse for an absence must be documented and reported to the instructor or CA as soon as possible. Undocumented absences from the scheduled exams will result in 0 points for that exam. Students are also expected to abide by the Code of Student Conduct as outlined in the University Student Handbook (http://www.asc.ohio-state.edu/honors/conduct_document.htm).

**Accommodations for Disabled Students:** The policy of The Ohio State University is to provide every reasonable, appropriate, and necessary accommodation to qualified disabled students. The University's colleges and academic centers evaluate and judge applications on an individual basis and no categories of disabled individuals are automatically barred from admission. The privacy rights of each disabled person are honored to the fullest extent possible. The University's interest in a students disabilities are only for the purpose of accommodating his/her specific disability, thereby providing an academically qualified disabled student access to programs and activities accorded all other qualified students. Whenever generally accessible facilities do not adequately accommodate a specific disability, the University makes every reasonable accommodation and program or facility adjustment to assure individual access. These policies are fully supported and practiced in this class. If you have a disability documented with The Ohio State University Office of Disability Services (http://www.ods.ohio-state.edu; 614.292.3307, or visit 150 Pomerene Hall), then please contact the instructor privately by the end of the second week of the semester so that...
any accommodations (e.g., large font exams, separate examination facilities) can be made (contact information is listed above).

**Textbook:** *Chronobiology: Biological Timekeeping*, 2004. Dunlap et al., Sinauer and Associates. Instructor-provided readings will also be used (see below).

**Important!** If you are having difficulty with any of the material, either in lecture or in the readings, then please see the instructor for help. The instructor is here to facilitate your learning, and that means not only giving lectures, but also consulting with you individually. The quarter is very short, so it is critical to seek assistance as soon as you detect a problem.

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
<th>Readings</th>
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</table>
| 1       | 11 January  
Course Organization and Overview; Strong Inference | Platt (#1)                                    |
| 2       | 13 January  
Circadian rhythms: Terminology; basic concepts and properties | Chapter 1                                     |
| 3       | 18 January  
No Class-Martin Luther King Day                                    |                                               |
| 4       | 20 January  
Circadian Rhythms: Phase response curves, entrainment, formal models | Chapter 3                                     |
| 5       | 25 January  
Mammalian circadian pacemakers: Early history and histology | Chapter 5  
Moore, Pickard and Turek, Reppert and Weaver |
| 6       | 27 January  
Hormones and circadian rhythms                                      | Zucker                                        |
| 7       | 1 February  
Midterm Exam I (25% of final grade)                                 |                                               |
| 8       | 3 February  
Molecular basis of circadian rhythms I                              | Chapter 7  
Reppert and Weaver: Vitaterna et al.         |
| 9       | 8 February  
Cell autonomous clocks and clock cell communication                 | Welsh and Kay  
Antle and Silver                            |
| 10      | 10 February  
Molecular basis of circadian rhythms II                              | Chapter 8                                     |
| 11      | 15 February  
Molecular basis of circadian rhythms III                              | Chapter 8  
de la Iglesia et al.                         |
| 12      | 17 February  
Input pathways to light entrainment                                   | Reppert and Weaver: Dziema et al.            |
| 13      | 22 February  
Entrainment of circadian rhythms by nonphotic cues                   | Mrosovsky  
Maywood et al.                                |
| 14      | 24 February  
Ontogeny of circadian rhythms                                         | Reppert et al                                 |
| 15      | 29 February  
Ultradian and infradian rhythms                                        | Daan; Klein                                   |
| 16      | 2 March     
Tidal and lunar rhythms                                                 |                                               |
| 17      | 7 March     
Estrous, menstrual cycles                                               | Fitzgerald and Zucker; Swann and Turek;       |
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<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Author(s)</th>
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<tbody>
<tr>
<td>18</td>
<td>Midterm Exam II (25% of final grade)</td>
<td>Sanduleak</td>
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<td>14</td>
<td>Spring Break (no class)</td>
<td>Wikelski and Hau</td>
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<td>16</td>
<td>Spring Break (no class)</td>
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<td>19</td>
<td>Annual Rhythms: Hibernation, torpor and migration</td>
<td>Ruby</td>
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<td>20</td>
<td>Photoperiodism I</td>
<td>Chapter 4</td>
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<tr>
<td>21</td>
<td>Photoperiodism II</td>
<td>Chapter 4</td>
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<td>22</td>
<td>Seasonal Affective Disorder</td>
<td>Wehr</td>
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<tr>
<td>23</td>
<td>4 April Circadian clocks and metabolism</td>
<td>Bass and Takahashi</td>
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<tr>
<td>24</td>
<td>6 April Circadian clocks and sleep</td>
<td>Saper</td>
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<tr>
<td>25</td>
<td>11 April Circadian clocks in clinical medicine (anesthesia and surgery)</td>
<td>Chalet</td>
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<tr>
<td>26</td>
<td>13 April Circadian disruption: Jet lag</td>
<td>Sack</td>
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<td>27</td>
<td>18 April Circadian disruption and light at night I</td>
<td>Navara and Nelson</td>
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<tr>
<td>28</td>
<td>25 April Circadian disruption and light at night II</td>
<td>Bedrosian</td>
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<tr>
<td>29</td>
<td>Final Exam (50% of final grade)</td>
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### Reading List

**Lecture 1:**

**Lecture 4:**


**Lecture 5:**

**Lecture 6:**

Lecture 7:


Lecture 9:

Lecture 10:


Lecture 11:


Lecture 12:

Lecture 13:

Lecture 14:

Lecture 15:


**Lecture 16:**

**Lecture 19:**

**Lecture 20:**

**Lecture 21:**

**Lecture 22:**

**Lecture 23:**

**Lecture 24:**
Sack, RL. “The pathophysiology of jet lag.” *Travel Medicine & Infectious Disease*, v. 7 issue 2, 2009, p. 102-10.

**Lecture 25:**

**Lecture 26:**