## New Course Proposal Form

### 1. Will this new course affect a current program?
- Yes [ ]
- No [X]

If "yes", has a Program Revision Form been submitted concurrently?
- Yes [ ]
- No [X]

### 2. Teaching Department:
- Physiology

### 3. Administering Faculty/Unit:
- Science

### 4. Campus
- (Downtown, Macdonald, Off Campus, Distance Ed, Other – specify)
- Downtown

### 5. Effective Term of Implementation
- (Ex. Sept. 2004 = 200409)
- Term: 200801

### 6. Responsible Instructor
- Alvin Shrier/ Claire Brown

### 7. Course Title (Limit 30 Characters) - required for all courses:
- Light Microscopy-Life Science

### 8. Course Number(s)
- Indicate course number & the number of terms spanned:
- (tick all that apply)
- Subject/course number: PHGY 560
- Course(s) Span:
  - [X] 1 term
  - [ ] 2 consecutive terms (D1, D2)
  - [ ] 2 non-consecutive terms (N1, N2)
  - [ ] 3 consecutive terms (J1, J2, J3)

### 10. Credit Weight
- (or CEU's for non-credit CE courses):
- 3

### 11. Rationale for new course

There is a growing need from all aspects of the life sciences to use light microscopy. Currently there is no course containing content about light microscopy offered in the Physiology curriculum. This course will fill that need by providing students with a basic understanding of optics, a technical understanding of the diverse current light microscopy applications, a critical appreciation of the information available in the images and how to use software tools to analyze the images. Students taking this course will be better prepared for projects within the department requiring the use of light microscopy or for graduate students they will be better trained for their research projects.

**COURSE WILL BE TAKEN BY UNDERGRADUATE STUDENTS AS AN UPPER-LEVEL PHYSIOLOGY COMPLEMENTARY COURSE [LIST NOT SPECIFIED IN PROGRAM] AND BY GRADUATE STUDENTS AS AN ELECTIVE COURSE.**

### 12. Course Description
- (as it will appear in the Calendar [maximum 50 words]):
- (N.B. Faculty of Medicine must append complete course outline)
- Introduction to optics, light microscopy imaging and data analysis for life scientists.

### 13. Supplementary information to appear in the Calendar in addition to the course description.
- Such as: equivalent course(s), contact hours, enrolment limitations, language of instruction etc.
- Please enter the information as it should appear in the calendar notes.

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(N.B. Faculty of Medicine must append complete course outline)
14. Schedule Type(s):
(Enter all that apply – see course guidelines for a complete list.)
(i.e. Lecture, Labs, Tutorial)

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Hours per Week</th>
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<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Seminar</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Hours per Week: 4
Total Number of Weeks: 13

15. Projected Enrollment: 18

16. Required text and/or preliminary reading list sent to library?
   X Yes   □ No  Fundamentals of Light Microscopy and Electronic Imaging, Douglas B. Murphy, Wiley-Liss

17. Prerequisite(s) (Courses or Tests)
   Specify course number(s) or name(s) of test(s):
   BIOL 301 or permission of instructors

   If the student does not have a prerequisite should web registration be blocked?
   X Yes   □ No

   If "Yes" complete A and B:
   A. Indicate minimum grade or test score(s) the student must attain in prerequisite course(s) or test(s):
      C

   B. Can the prerequisite course(s) or test(s) be taken in the same term as this course?
      X Yes   □ No

18. Corequisite(s) Course Number(s):
    Specify course number(s) and title(s):

   If the student does not register for the corequisite in the same term should web registration be blocked?
    □ Yes   □ No

19. Restriction(s):

20. Consultation Reports Attached
    X Yes   □ N/A

21. Additional Course Charges (must be approved by the Fee Policy Committee)
    Description of Fee (e.g. screening fee)      Amount

22. Requires Teaching, Physical, or Financial Resources
    Not Currently Available (attach explanation)
    □ Yes   □ No
### INFORMATION FOR ADMISSIONS, RECRUITMENT & REGISTRAR'S OFFICE

<table>
<thead>
<tr>
<th>Slot Course:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>Thesis Component:</th>
<th>Yes</th>
<th>No</th>
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#### To be completed by the Faculty

**Routing Sequence**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Meeting</th>
<th>Chair</th>
<th>Other Faculty</th>
<th>Curric/Academic Committee</th>
<th>Faculty</th>
<th>SCTP</th>
</tr>
</thead>
</table>

**Name**

John Orlowski

**Signature**

**Date**

**Departmental Contact Person**

(name/phone/email)

#### To be completed by ARR

**CIP Code**

**For Continuing Education Use**

- **CE Admin. Unit:**
- **CE Non-Grant Courses:**
- **Flat Rate: CdnFlat Rate:** Yes  N/A
Department of Physiology  
PHGY 560  
Light Microscopy-Life Science (3 cr.)

Course Description: Introduction to optics, light microscopy imaging and data analysis for life scientists.

Topics to be covered:

**Week 1**: Basics of Microscopy 1: Light absorption and emission; reflection and refraction; interference; polarization; lenses; chromatic and spherical aberrations.

**Week 2**: Basics of Microscopy 2: Abbe theory of image formation; Airy discs and resolution; infinity correction; Kohler illumination; objective lenses; condensers.

**Week 3**: Basics of microscopy 3: Brightfield Microscopy; Phase contrast; DIC, objectives.

**Week 4**: Physical basis of fluorescence: excited states, singlet/triplet states; phosphorescence; fluorescence microscopy; optical filters; organic dyes, quantum dots, fluorescent proteins.

**Week 5**: Fluorescence Microscopy 1: Wide Field versus confocal microscopy; point-spread functions; pinhole and optical sectioning laser-scanning;

**Week 6**: Fluorescence Microscopy 2: Nipkow spinning disk; multi-photon; deconvolution; apotome; swept field confocals, dual scanners.

**Week 7**: Detectors: CCD cameras; PMTs; signal-noise ratio; dark currents; quantitative microscopy.

**Week 8**: Fluorescence Microscopy Tools: Photobleaching – FRAP, FLIP; photoactivation; FRET; FLIM; TIRF.

**Week 9**: Time-dependent phenomena; the principle of correlation; fluorescence correlation spectroscopy; Image correlation spectroscopy.

**Week 10**: Image processing: pixel size, image depth, types of filters; masks; methods for computational optical sectioning; image restoration, deconvolution. Using ImageJ?


Week 13: Electron microscopy – techniques (rotary shadowing, negative staining, immunogold staining; freeze fracture; cryo-sectioning)

Student Evaluation:

Students will present one 30 minute seminar on a paper or topic chosen by the course coordinators and present a written report on the topic. Evaluation will be based on the oral and written reports. The computer labs will be based on conducting image analysis of real microscope data using various software modules and reports will be written up. There will be 8 laboratory units for evaluation. The final exam will be multiple choice and short essay questions based on the course lecture content.

Student Seminars 30%
Computer Lab Image Analysis 30%
Final Written Exam 40%

Total 100%

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/integrity for more information). The Dept. of Physiology will not tolerate any academic offences with regard to cheating and plagiarism. See A Student’s Rights and Responsibilities at www.med.mcgill.ca/secretariat/documents for details.