DESCRIPTION

This research project course is designed to introduce to 4th year BSc Pharmaceutical Chemistry specialist students the philosophy, methodology and performance of research in scientific fields offered by faculty members who hold graduate appointments in the Dept of Pharmaceutical Sciences, Leslie Dan Faculty of Pharmacy. A list of these could be found in http://www.pharmacy.utoronto.ca/gradprograms/graduate-faculty. The research will involve the review of pertinent scientific literature and the generation of new scientific information. Depending upon the project and the supervisor, the research may be conducted in a number of settings, e.g., laboratory at the Faculty, in a hospital, community pharmacy, pharmaceutical company, or in an office. Fields of study are wide ranging, e.g., drug delivery, drug metabolism, medicinal chemistry, pharmaceutics, pharmacokinetics/dynamics, pharmacoepidemiology, pharmacy administration and pharmacoconomics, radiopharmacy, receptor biology, therapeutics, and toxicology. Students are expected to spend a minimum of 156 hours on the course. Fields of study available are shown on the Pharmacy website, where one finds a list of graduate faculty professors and description of research areas. Often times, the research may result in joint publication with supervisor. The course includes working in the laboratory/office, reading, searching for literature, performance of research and writing of the research report. Students are required to obtain prior written consent of the supervisor and course coordinator.

APPLICATION AND ENROLMENT PROCEDURES

This course is offered in the fall term (K.S. Pang, coordinator) and in the summer (D. Dubins, coordinator) to Pharmaceutical Chemistry students who have successfully passed their 3rd year or who are commencing their 4th year. The proposed work for PHC489Y1 must be novel and distinct from those generated in other programs (summer student research or any paid activity), and completed within the stipulated time.

Prior to enrolment, PHC students may interview with potential supervisors (pharmaceutical sciences graduate faculty) who will provide the time and resources for completion of the research project. The successful enrolment of the course requires the written consent of the professor who will supervise the student’s research. Students are responsible for completing and returning the signed Research Project/Supervisor Form to Linda Chung, room PB 424, Leslie Dan Faculty of Pharmacy by the appropriate deadline (please refer the PHC489Y1 timetable – end of document) to complete registration of the course. Students may also consult with the PHC489Y1 Course Coordinator for advice on the choice of supervisor. Students may investigate the nature of research topics of the potential supervisors through the internet. It must be noted that the number of available research positions in each laboratory is limited. Students should complete arrangements before the end of the Faculty registration deadline.

Deadline dates for enrolment and drop dates must be strictly adhered to. For late submission of thesis, a penalty of 5 marks of the total grade will be deducted for each late day, including Saturday and Sunday.

Course Co-ordinators:  Professor K. Sandy Pang (fall/winter)
E-Mail: ks.pang@utoronto.ca
Phone: 416-978-6164
Room: PB 1205

Professor David Dubins (summer)
E-mail: d.dubins@utoronto.ca
Telephone: 416-946-5303
Room: PB 802
RESPONSIBILITIES OF STUDENT

Selection of a Supervisor

Students may select a supervisor from among members of the Graduate Department of Pharmaceutical Sciences (science stream or social administration stream). Students may investigate the nature of research of potential supervisors through the Internet (e.g. Pubmed or Google Scholar). Students are encouraged to meet with several professors to discuss the project before making their final selection. Under the guidance of the supervisor, the student should

- develop a clear and comprehensive understanding of the research problem through a thorough review of the literature,
- acquire the necessary skills to obtain and interpret data, and summarize the findings, and
- critically comment on study findings, limitations and how results fit within the context of existing literature.

The student is expected to devote no less than 156 hours to the project. This will involve working in the laboratory (or other relevant setting), reading, or searching literature in the library, performing surveys or analyzing data, and writing up the project. The actual time distribution will be flexible and determined by the nature of the research conditions and any timetable conflicts. Students taking PHC489Y1 as their elective requirement should initiate their research during the spring session in their 3rd year if taking the course in the summer and work during the summer months to complete the project by the end of the fall term. If student takes PHC489Y1 during the fall/winter academic session, the student should initiate their research in the fall session leading into their 4th year and must complete the project by the end of the spring term. A review of the literature only or a review cannot be used as a substitute for the proposed research in this course.

The student will:

i) Submit a preliminary report/protocol that outlines the background/rationale, the type of question(s) or hypotheses asked, methods and the significance of the project (see Blackboard). The aim of this report is to aid the student in understanding the scope, nature and feasibility of the research project. The report should not exceed THREE double-spaced, typed (Times New Roman, 12 point font) pages, exclusive of references, tables and figures (tables and figures may be appended to support the protocol report). References are imperative. Submit the report to Linda Chung or coordinator directly. Student will then have an interview with the Course Coordinator (lasting about 30 minutes) to discuss the suggested research topic (arrangement made about 30 days after start of semester; time will be set individually). The aim of this meeting is for the coordinator to ensure that the student is familiar with what has been done via background search, understands the project, stays focused, and proposes a project that is both feasible and manageable within the time frame.

The write-up and interview will comprise 10% of the final course grade.

*The interview date for the above will be set individually for each student with the Coordinator.

ii) For the mid-term assessment, the student and the supervisor will meet to discuss progress, and the discussion will be summarized using the “PHC489H1 Mid-term Evaluation Form”. The forms are then submitted to Linda Chung who submits these to the Course Coordinators. The purpose is to identify any deficiencies or problems at this mid-point and determine if the project is progressing normally.

The assessment is not graded, just for information only.

iii) Final Thesis. Prepare a final, double-spaced, type-written (Times New Roman, 12 point font) report of 15 pages or less, excluding references, tables and figures [maximum of 5 tables and 10 figures]. A penalty will be given for excess pages and lack of conformity to specifications of the report. The report must follow the format of a scientific journal that includes an Abstract, not exceeding 250 words, and Sections on Introduction, Materials and Methods, Results, and Discussion, with sometimes a Conclusion. The sections (excluding abstract) must not exceed 15 pages. Acknowledgement, Citations or References, Tables and Figures (less than 10), and Figure Legends. If collaborators (e.g. immediate supervisor or other students) are included, the roles of each must be defined. The student must submit an electronic copy of the report to Linda Chung, and two paper copies of the report – one to the supervisor, and one to Linda Chung no later than 5:00 p.m. on the specified day (see deadline on page 8) for grading by a second reviewer. The reader will remain anonymous, but comments should be available.

The final report comprises 80% of the final grade (marks from the supervisor and reader).
iv) Present his/her research in a 15-minute PowerPoint presentation (10 minute presentation + 5 minute Q&A) to faculty and students. This will be scheduled at the end of the fall/winter term. The presentation will be graded by attending faculty members & comprises of 10% of the final grade.

**Evaluation of student performance will be as follows: All of the marks will be provided on Blackboard**

1. Preliminary report (write-up and interview), 10%
2. Presentation, 10%
3. Thesis/Research paper, 80%: Supervisor, 54%; Secondary reviewer, 26%

**Final Grade:** The student’s final grade will be taken as sum of the grades

**Supervisor responsibilities include:**

a) to define the research problem; topic should be new and different from previously defined theses for this course, so student would have fresh approach and new project
b) to ensure, through guidance and encouragement, progress of the student and provide resources for conduct of the project
c) to stimulate and evaluate the student in the laboratory on his/her aptitude to think and learn
d) to oversee the progress of student and ensure a successful write-up of the project for submission of a grade
e) to evaluate at mid-term the progress of the student and final report

**Course Coordinators responsibilities include:**

a) to oversee all project students; in case of conflict of interest by both course coordinators, the Chair of the Graduate Department will serve as the Course Coordinator
b) to interview each student in defining the title and scope, and strengths and weaknesses of the project at the time of submission of the first report and assign a grade for the interview
c) to act as a back-up resource for consultation
d) to identify a secondary reviewer that will evaluate the report and assign the final grade

**Research Paper – recommended assessment for marks**

<table>
<thead>
<tr>
<th>Components</th>
<th>Supervisor, 54% of final</th>
<th>Second Reviewer, 26% of final</th>
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<tbody>
<tr>
<td><strong>SUPERVISOR ONLY</strong></td>
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<tr>
<td>Assess student initiatives, industriousness,</td>
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<td>0</td>
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<td>problem-solving skills, responsiveness to</td>
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<tr>
<td>suggestions, attention to details, comprehension, originality and creativity</td>
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<td><strong>Background/Rationale</strong></td>
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<td>(identification of problem)</td>
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<td>10</td>
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<tr>
<td>Assess thoroughness of literature search and</td>
<td></td>
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<tr>
<td>rationale</td>
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<td><strong>Methods</strong></td>
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<tr>
<td>(quality and depth of work)</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Assess whether student has adopted the most</td>
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<td>appropriate and relevant methodologies</td>
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<tr>
<td><strong>Results / data analysis</strong></td>
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<tr>
<td>Assess whether there are sufficient numbers/</td>
<td>10</td>
<td>10</td>
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<tr>
<td>subjects or observations (n&gt; 3); Statistical</td>
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<tr>
<td>analyses</td>
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<td></td>
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<tr>
<td><strong>Discussion</strong></td>
<td>10</td>
<td>10</td>
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<tr>
<td>Critical evaluation, interpretation</td>
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<tr>
<td><strong>Write-up</strong></td>
<td>10</td>
<td>10</td>
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<tr>
<td>flow, style, grammar</td>
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<tr>
<td><strong>Total</strong></td>
<td>70</td>
<td>50</td>
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Students who fail to submit the final report by the specified due date will receive a deduction of 5% of the total marks for the thesis, for each day beyond the due date (including weekends/holidays).
PHC489Y1 RESEARCH PROJECT/SUPERVISOR FORM
(submit to Linda Chung, Room 424)

NOTES TO STUDENT:

This course requires the prior written consent of a member of the Graduate Department of Pharmaceutical Sciences.

It is the student’s responsibility to contact and search for a suitable supervisor for the research project, and return the signed and completed form to Linda Chung, PB 424 by May 10, 2019 (summer) or September 20, 2019 (fall).

Faculty approval and permission to enroll will not be granted unless this form contains the assigned title and the signature of the prospective supervisor. All parties agree to adhere to the guidelines for this course.

TO BE COMPLETED BY THE STUDENT:

Surname Given Name(s) (as on ROSI)

Student Number Telephone Number

E-mail Address

Desired Research Topic

Date Name Student’s Signature

TO BE COMPLETED BY THE SUPERVISOR:

I consider this student acceptable to engage in a research project under my supervision.

Date Supervisor’s Signature Supervisor’s Name (Please print)

TO BE COMPLETED BY THE COURSE COORDINATOR:

I approve this student’s enrolment in PHC489Y1.

Date Name Course Coordinator’s Signature
SOME SUGGESTIONS FOR PREPARATION OF PRELIMINARY REPORT (and interview) FOR PHC489Y1 RESEARCH PROJECT (to be submitted to Linda Chung, room 424, by deadline)

Name of Student: ________________________________

Name of Supervisor: ________________________________

Title of Project: ________________________________

Items to be covered:

(1) Background/Rationale
   Through reading of materials supplied by the supervisor and completing a literature search, the gaps in present knowledge should be apparent. How will the proposed study contribute to new knowledge and understanding of the problem?

(2) Objectives /Hypothesis
   Clearly outline and identify hypotheses to be tested (should be supported by literature review/background)
   What are the aims and objectives?

(3) Proposed Methods
   What are the models used and their rationale? What procedures are to be used in collection of data, and are they state-of-the-art? What are the controls of the experiment, if any? Is the scope reasonable so that data can be generated within an appropriate time frame?
   a) Measurement: What measurements are to be made, and would these pertain to the question?
   b) Data Analysis: Is statistical analysis required? What is the number of experiments needed?
   c) Timeline: Are the goals realistic?

(4) Ethics
   Is animal experimentation under approval by University protocols? Is consent for working with human subjects/collaborators obtained according to University protocols? Has approval from the Faculty’s Undergraduate Ethics Committee (or hospital site) been obtained, if necessary?
   NB: projects that require ethics approval prior to data collection MUST have ethical approval PRIOR to course enrolment

(5) What are the difficulties you foresee in the project?
   Are there difficulties in mastering techniques or in data interpretation? Is there a problem with time-commitment in the laboratory? What support will the student have, e.g., graduate students have experience in techniques to be employed and will be available
PHC489Y1 MIDTERM EVALUATION FORM

Please submit this form to Linda Chung in Room 424 by June 21, 2019 (summer)/January 10, 2020 (fall/winter)

To be completed by Student:

Name of Student: ________________________________

Name of Supervisor: ________________________________

Describe your accomplishments during the first half of the course. Are there any problems or difficulties you foresee any difficulties in completing the project?

Date

Student Signature

Updated August 29, 2019
PHC489Y1 MIDTERM EVALUATION FORM

Please submit this form to Linda Chung in Room 424 by June 21, 2019 (summer)/January 10, 2020 (fall/winter)

To be completed by Supervisor:

Name of Student: ________________________________________________________________

Name of Supervisor: _____________________________________________________________

Comment on the general performance of student and work completed thus far. Comment on any existing or potential problems for the student in the second half of the course.

__________________________________________________________
Date

__________________________________________________________
Supervisor Signature

Updated August 29, 2019

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### PHC489Y1 Deadline Dates 2019-2020

<table>
<thead>
<tr>
<th>Summer Registration</th>
<th>Fall Registration</th>
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<tbody>
<tr>
<td>Safety Course</td>
<td>Safety Course</td>
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<tr>
<td>early May, prior to start of classes</td>
<td>early September, prior to start of classes</td>
</tr>
<tr>
<td>Submit Research Project – Supervisor Form*</td>
<td>Submit Research Project – Supervisor Form*</td>
</tr>
<tr>
<td>May 10, 2019</td>
<td>September 20, 2019</td>
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<tr>
<td>Last day to add Y section course</td>
<td>Last day to add Y section course</td>
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<td>May 13, 2019</td>
<td>September 18, 2019</td>
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<tr>
<td>Last day to drop Y section course</td>
<td>Last day to drop Y section course</td>
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<tr>
<td>July 16, 2019</td>
<td>February 17, 2020</td>
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<tr>
<td>Short write-up of proposed project to Coordinator*</td>
<td>Short write-up of proposed project to Coordinator*</td>
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<tr>
<td>May 24, 2019</td>
<td>September 27, 2019</td>
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<tr>
<td>Complete interview with Coordinator#</td>
<td>Complete interview with Coordinator#</td>
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<tr>
<td>Last week in May/first week in June</td>
<td>end of October/beginning of November</td>
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<tr>
<td>Mid-term evaluation, co-signed by student and supervisor*</td>
<td>Mid-term evaluation, co-signed by student and supervisor*</td>
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<tr>
<td>June 21, 2019</td>
<td>January 10, 2020</td>
</tr>
<tr>
<td>Thesis deadline, 2 copies, one to supervisor, one to Coordinator**</td>
<td>Thesis deadline, 2 copies, one to supervisor, one to Coordinator**</td>
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<tr>
<td>August 2, 2019</td>
<td>March 20, 2020</td>
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<tr>
<td>PowerPoint presentation of project</td>
<td>PowerPoint presentation of project</td>
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<tr>
<td>Week of August 5 or 12, 2019</td>
<td>Week of March 23 or 30, 2020</td>
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* Submit an hard copy of the supervisory document to Linda Chung in Room 424.
** Submit a hard copy and an electronic copy of the final report to Linda Chung l.chung@utoronto.ca in room 424; two paper copies, one to supervisor and one to course coordinator.
# Student will be contacted by e-mail for an interview with the Course Coordinators.