



COURSE OUTLINE

1. **Course:** CHEM 402.01, Introduction to Research in Chemistry I - Winter 2021

Coordinator(s)

Name	Email	Phone	Office	Hours
Dr Gregory Welch	gregory.welch@ucalgary.ca	403 210-7603	EEEL 546	TBA

Section(s)

Lab 01:

Instructor	Email	Phone	Office	Hours
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Chemistry 402 is a free form course. The faculty supervisor will create a detailed research project outline that includes a breakdown of all grading. This document is to be signed by both the faculty supervisor and student and sent to the course coordinator by **Friday January 29, 2021**.

The course can be delivered in lab, remotely, or via a hybrid approach.

An example follows:

Chemistry 402, "Semester"

Student Name and UCID:

Title: Side-chain engineering of perylene diimide non-fullerene acceptors for improved solar cell performance

Overview: Organic solar cells are a viable clean energy technology. To facilitate commercialization high performance must be coupled with green device fabrication methods and low-cost, stable active layer materials. This project will build on recent advances in developing perylene diimide non-fullerene acceptors which are relatively easy to make, can be processed from greener solvents, and enable good performing polymer based organic solar cells. The overall goal is to improve the solar cell performance by creating a better active layer morphology.

Objectives: Synthesis of a new N-annulated perylene diimide (PDI) with cyclic side chains and test as a non-fullerene acceptor in organic solar cells. Materials with linear alkyl or benzyl side chains have lead to polymer solar cells with power conversion efficiencies from 5-7%. Limiting is the miscibility of PDI with the polymer donor and the ability for the PDI to form small highly crystalline domains. The hypothesis is that cyclic side chains will result in a different self-assembly of the PDI potentially giving high solar cell performance.

Research:

(1) Synthesize the PDI compound in >200 mg. Fully characterize using ¹H, ¹³C NMR spec (fully assigned), high resolution MS, and elemental analysis

(2) Determine materials properties using UV/vis, PL, DSC, and TGA.

(3) Grow a single crystal of the compound and determine crystal structure

(4) Investigate self-assembly by making films using the processing additives DIO and DPE

(5) Work with a device HQP to obtain solar cell performance

(6) Compare to the n-hexyl derivative

Literature:

Small Methods, 2018, 2, 1800081, Solar RRL 2018, 2, 1800009, Advanced Functional Materials, 2011, 21, 1616-1623, Chemistry of Materials, 2005, 17, 3366-3374.

Course Evaluation:

- Create a detailed PowerPoint presentation that outlines the, project, literature, research goals, and work plan (25%)*
- Research work (25%) - this is determined by faculty supervisor and graduate student mentor*
- Interpretation of results (25%) - as determined by formal research updates using PowerPoint*

- Final presentation to the research group (25%)

Approval

Faculty Supervisor Name and Signature: _____

Student Name and Signature: _____

In Person Delivery Details:

Chemistry laboratory research allowed. Student must have approval from Vice President Research office, Faculty of Science office, and Chemistry Head to work in the research laboratory.

Re-Entry Protocol for Labs and Classrooms:

To limit the spread of COVID-19 on campus, the University of Calgary has implemented an Instructional Space Re-Entry Protocol that must be followed. Details are found in the [Covid-19 Protocol for Class and Lab re-entry.pdf](#) document. **Online Delivery Details:**

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

Delivery details are to be determined by the research supervisor.

Course Site:

Note: Students must use their U of C account for all course correspondence.

2. Requisites:

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Chemistry 201 or 211, and 203 or 213, and consent of the Department.

Approval of faculty supervisor and course coordinator.

3. Grading:

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

All faculty supervisors are required to complete a 2-page maximum project outline that details the project scope, objectives, reporting and grading. This is to be signed by both the faculty supervisor and student and submitted to the course coordinator no later than **Friday January 29, 2021** and prior to any research activities starting.

Grades are due to the course coordinator no later than the last day of the exam period, April 29th, 2021.

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	87 %	82 %	77%	72%	66 %	62 %	58%	54%	50 %	45 %

4. Missed Components Of Term Work:

The university has suspended the requirement for students to provide evidence for absences. Please do not

attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

REGULARLY SCHEDULED LAB WORK HAS PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with an out-of-class-time-activity, please send an e-mail to your supervisor so that alternative arrangements may be made for you.

6. **Course Materials:**

There is no required textbook.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

7. **Examination Policy:**

There are no tests or examinations.

Students should also read the Calendar, [Section G](#), on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

10. **Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar

- b. **Final Exam:**The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email ([svsa@ucalgary.ca](mailto:svs@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>)
- d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)
Student Academic Misconduct [Policy](#) and [Procedure](#)
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

- e. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Chemistry, Dr. Yuen-Ying Carpenter by email ahugchem@ucalgary.ca or phone 403-220-6908. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.

- f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- g. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.
- h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes,

assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

Electronically Approved - Jan 08 2021 17:03

Department Approval

Electronically Approved - Jan 10 2021 09:20

Associate Dean's Approval