

PoND CREATE Module
Manufacturing and Characterizing Polymer Nanoparticles for Drug Delivery

This course is open to students in the PoND program and graduate students at UVic. This module will cover theoretical and practical aspects of various methods for manufacturing and characterizing polymer nanoparticles for drug delivery. Methods for characterizing the mean sizes, size distributions, morphologies, and drug encapsulation efficiency of polymer nanoparticles will be covered, including dynamic light scattering (DLS), transmission electron microscopy (TEM), and high performance liquid chromatography (HPLC). The lectures and laboratory demonstrations will be available on video and students are expected to view these before tutorials on associated topics. The purpose of the tutorials is for students to ask questions and discuss the lecture and video materials. Quizzes will be completed online in between tutorial sessions. As a capstone assignment, students will write a critical analysis of two papers chosen from the literature.

Instructor: Matt Moffitt

Next offering: October – December 2021

Tutorials: 11:00 am – noon Pacific Time every Friday (6 tutorials).

Start date: Friday, October 8, 2021

Module Topics:

Topic 1: Manufacturing Polymer Nanoparticles for Drug Delivery (Lecture #1 and Video #1)

Topic 2: HPLC Analysis of Polymer Nanoparticles for Drug Delivery: Determination of Drug Loading and Release (Lecture #2 and Video #2)

Topic 3: DLS Analysis of Polymer Nanoparticles for Drug Delivery: Determination of Hydrodynamic Sizes and Size Distributions (Lecture #3 and Video #3)

Topic 4: TEM Analysis of Polymer Nanoparticles for Drug Delivery: Determination of Core Sizes and Morphologies (Lecture #4 and Video #4)

Evaluation:

10%: Tutorial attendance and participation (*you must ask at least 1 question for participation marks*)

30%: Quizzes

60%: Critical analysis of two papers from the literature selected by the student

Schedule for Tutorials:

October 8: Introduction

October 15: Topic 1 discussion

October 22: Topic 2 discussion

October 29: Topic 3 discussion

November 5: Topic 4 discussion

November 12: no session (University Of Victoria Reading Break)

November 19: Literature assignment discussion

Schedule for Literature Critical Analysis Assignment (all deadlines 11:59 PM on indicated date):

Friday, November 5: Two paper selections (.pdf files) must be sent by email to Matt for approval.

Friday, November 12: Second deadline if the choice of papers has to be changed.

Friday, November 26: Submission of draft of the paper for feedback (optional but highly recommended).

Monday, November 29: Matt's deadline to send feedback back to students on their drafts.

Monday, December 6: Deadline for submission of paper. (Submit to Matt by email as .pdf file only.)

Instructions for Literature Critical Analysis Assignment:

Objective: The objective of the assignment is to provide a critical analysis of two papers from the literature.

Format: 8-10 pages (12-point font), double-spaced, including figures (**maximum 2000 words**) + 1 page of references. Papers chosen for critical analysis must be pre-approved by the posted deadlines. Papers should not be from your current group, former groups, or the groups of collaborators. Papers should focus on methodologies for preparing polymer nanoparticles for drug delivery and their **physicochemical** characterization (size, structure, drug loading and in vitro release). Papers should be no more than 10 years old (2010 or later).

Your analysis should address the following questions:

1. Describe and compare the main experimental objectives of the papers.
2. Describe and compare the methodologies used to prepare the polymer nanoparticles. Do you think you could reproduce the manufacturing experiments given the experimental details provided? Explain the key aspects of the experiments that were described and those, if any, that are missing.
3. Describe and compare the methodologies used to characterize the **physicochemical** properties of the polymer nanoparticles. Do you think you could reproduce the characterization experiments given the experimental details provided? For each **physicochemical** characterization technique, explain the key aspects that were described and those, if any, that are missing.
4. In each paper, did the described results achieve the experimental objectives? Provide support for your opinion.
5. Finally, compare the two papers in terms of the quality and importance of the data. Your analysis should include at least 10 references from the literature (not including your selected papers) to place the results of both papers within the broader context of the field.