

# Chemistry 3371F - Transition Metal Chemistry (Fall 2024 Course Outline)

## 1. Course Information

Description: The study of the effects of the electronic structure of transition metals on their properties, including coordination chemistry, electronic spectra, magnetic properties, and reactions. Introduction to organometallic chemistry. The laboratory experiments aim to illustrate and amplify concepts discussed in the lectures.

Course prerequisites: Chemistry 2271 and 2281.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites. Please see

\_\_\_\_\_ [REDACTED]  
[REDACTED]  
[REDACTED]  
(e-mail messages *must* be from your @uwo.ca account)

Office hours: By appointment

Course Web Page: OWL Brightspace

Course Schedule: Lectures

[REDACTED]

Laboratory (one of)

[REDACTED] | [REDACTED]

[REDACTED]  
[REDACTED]

### 3. Course Syllabus, Schedule, Delivery Mode

#### Course-Based Learning Outcomes:

*Upon completion of Chem 3371F, students will be able to....*

- (i) apply their understanding of inorganic nomenclature to describe a range of transition metal complexes.
- (ii) use their knowledge of common structural properties of coordination compounds (such as coordination numbers, stereochemistry, isomerism) to rationalize factors influencing the stability and reactivity of transition metal complexes.
- (iii) interpret and predict the physical and chemical properties of transition metal complexes in terms of their electronic structure and the bonding theories typically used to describe them.
- (iv) use their knowledge of structure and bonding properties of transition metal organometallic complexes to predict and rationalize their properties and reactivity.
- (v) conduct laboratory experiments safely and evaluate the potential impact transition metal chemistry may have on society, health, and the environment.
- (vi) prepare logical, organized, and concise written reports describing their experimental results in the areas of the synthesis and characterization of transition metal complexes.

#### Chemistry 3371F Syllabus Fall 2024:

The topics likely to be covered are outlined in the section below. The order of presentation and the number of lectures devoted to each are approximate.

##### i. Tentative Course Outline

- (a) Periodic Table, electronic configurations, d-block elements: the open d-shell (1-2 lectures)
- (b) Coordination Chemistry: nomenclature, terms, and examples (2-3 lectures)
- (c) Coordination numbers, stereochemistry, and isomerism (3-4 lectures)
- (d) Formation equilibria for complexes (1-2 lectures)
- (e) Crystal field theory: spectral properties (4-5 lectures)
- (f) Ligand field theory and Molecular Orbital theory of complexes (5-6 lectures)
- (g) More of spectroscopic properties (1-2 lectures)
- (h) Mechanisms of substitution (2-3 lectures)
- (i) Organometallic chemistry (6-7 lectures)

A lab report must be submitted for each experiment (details are provided in the 3371F lab manual). This will either be in the form of a formal, written report or data sheet format. You will be given your individual schedule during the first week

Topic choices include but are not limited to:

Metal-metal quintuple bonds, photonic ink, ferredoxins, redox active ligands, coordination polymers, side chain cobaltocenium polymers, complexes with  $CN > 6$ , non 18-electron complexes (*e.g.*, 14, 16, 17, 19 electrons), IR of nitrile vs. isonitrile complexes, agostic interactions,  $^1H$  NMR le vs.



(INC grade) by the Dean's Office will be required to complete the missed work the next time the course is offered.

Problem Sets:

Lab Reports: If a lab report is missed for valid reasons, the weighting of the lab report will be transferred to the corresponding portion of the course (*i.e.*, the total for the lab).

Presentation: If the presentation is missed for valid reasons, the weighting will be transferred to the final examination.

Midterm Tests: If a midterm test is missed for valid reasons, the weighting of the test will be transferred to the final examination. For those students who cannot write the midterm test on the date indicated because of religious or class conflicts, please contact Dr. Gilroy immediately.

Final Exam: If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam). You may also be eligible to write

