**OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)**

COURSE IMPLEMENTATION DATE: May 1994
COURSE REVISED IMPLEMENTATION DATE: September 2013
COURSE TO BE REVIEWED: September 2018
*(six years after UEC approval)* *(month, year)*

## OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

| CHEM 320 | Science / Chemistry | 3 |
|---|---|---|
| COURSE NAME/NUMBER | FACULTY/DEPARTMENT | UFV CREDITS |

Intermediate Inorganic Chemistry
COURSE DESCRIPTIVE TITLE

**CALENDAR DESCRIPTION:**

This course concentrates on the coordination chemistry of the transition metals. Topics covered include nomenclature, isomerism, crystal field theory, molecular orbital theory, thermodynamic aspects, UV-visible spectroscopy and Tanabe-Sugano diagrams, and the kinetics and mechanisms of ligand substitution and redox reactions.

Note: Students planning to take CHEM 325 should do so in the same semester as either CHEM 320 or CHEM 420.

Note: Students with credit for CHEM 321 cannot take this course for further credit.

PREREQUISITES: CHEM 221
COREQUISITES:
PRE or COREQUISITES:

**SYNONYMOUS COURSE(S):**
(a) Replaces: **CHEM 321**
(b) Cross-listed with:
(c) Cannot take: for further credit.

**SERVICE COURSE TO:** *(department/program)*

**TOTAL HOURS PER TERM:** **45**

STRUCTURE OF HOURS:

| | | |
|---|---|---|
| Lectures: | **45** | Hrs |
| Seminar: | | Hrs |
| Laboratory: | | Hrs |
| Field experience: | | Hrs |
| Student directed learning: | | Hrs |
| Other (specify): | | Hrs |

TRAINING DAY-BASED INSTRUCTION:
Length of course:
Hours per day:

**OTHER:**
Maximum enrolment: **24**
Expected frequency of course offerings: Yearly
*(every semester, annually, every other year, etc.)*

| | | |
|---|---|---|
| WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only) | ☐ Yes | ☐ No |
| WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department) | ☐ Yes | ☒ No |
| TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: | ☐ Yes | ☒ No |

Course designer(s): **Nigel Dance**

| | | | |
|---|---|---|---|
| Department Head: | **David Fenske** | Date approved: | **April 27, 2012** |
| Supporting area consultation | | Date of meeting: | **June 15, 2012** |
| Curriculum Committee chair: | **David Fenske** | Date approved: | **June 22, 2012** |
| Dean/Associate VP: | **Lucila Lee** | Date approved: | **September 7, 2012** |
| Undergraduate Education Committee (UEC) approval | | Date of meeting: | **October 26, 2012** |

**LEARNING OUTCOMES:**

Upon successful completion of this course, students will be able to:

1. Critically discuss the electron configuration of transition metal ions by reference to effective nuclear charge and orbital energy level diagrams.
2. Describe the ligand-metal bonding in transition metal complexes using Crystal Field and Molecular Orbital theories.
3. Critically discuss the evidence for different mechanisms of ligand exchange and redox reactions of transition metal complexes.
4. Analyze the position of ligands in the spectrochemical series by reference to ligand to metal sigma and pi bonding, and metal to ligand pi bonding.
5. Describe the relationships between electron configuration, crystal field stabilization energy and geometry for octahedral, tetrahedral, and square planar complexes.
6. Explain the relationship between thermodynamic data enthalpy and entropy terms) and stability constants for ligand exchange reactions.
7. Synthesize microstate tables for octahedral complexes with different d-electron configurations, and relate the reducible and irreducible representations of electronic states to Tanabe-Sugano diagrams.
8. Interpret UV-visible spectra using microstate tables and Tanabe-Sugano diagrams

**METHODS:** *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Presentation of the course will be by inter-related theory classes (lectures) and discussion periods. Audio-visual aids will be used where appropriate.

**METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):**

☒ Examination(s) ☐ Portfolio assessment ☐ Interview(s) ☐ Other (specify):

**TEXTBOOKS, REFERENCES, MATERIALS:** *[Textbook selection varies by instructor. Examples for this course might be:]*

'Inorganic Chemistry," G.L. Miessler and D. A. Tarr, current edition,

**SUPPLIES / MATERIALS:**

**STUDENT EVALUATION:** *[An example of student evaluation for this course might be:]*

| | |
|---|---|
| In-term tests | 30% |
| Problem sets | 10% |
| Oral or written presentations | 20% |
| Final examination | 40% |

**COURSE CONTENT:** *[Course content varies by instructor. An example of course content might be:]*

Introduction
Some history of coordination chemistry, coordination numbers, geometry, isomerism and types of ligands, nomenclature, electron configurations of transition metals

Symmetry
Symmetry operations and group theory, applications of group theory to infrared spectroscopy

The Metal-Ligand Bond
Applications of various bonding theories to coordination chemistry with emphasis on Molecular Orbital Theory, electron configurations of coordination complexes in various geometries such as octahedral, tetrahedral and square planar, the spectrochemical series, magnetic moments, Jahn-Teller distortion

UV-Visible Spectra of Coordination Compounds
Quantum numbers of multi-electron atoms, ground and excited state terms, interpretation of UV-visible spectra using Tanabe-Sugano diagrams

Complex Stability
Stability constants, factors that influence stability

Kinetics
Inert and labile compounds, mechanisms of ligand substitution reactions and redox reactions