MATLS 2X03 – CRYSTALLINE STRUCTURE OF MATERIALS

Course Information 2020

Instructor: Dr. Igor Zhitomirsky, e-mail: zhitom@mcmaster.ca

Teaching Assistants
Kaelan Rorabeck e-mail: rorabeck@mcmaster.ca
Xinqian Liu e-mail: liux234@mcmaster.ca
Wenyu Liang e-mail: liangw26@mcmaster.ca
Zhen Li e-mail: liz343@mcmaster.ca

Calendar Description:
MATLS 2X03 Crystalline Structure of Materials
Crystal geometry, point groups, space groups, X-ray diffraction methods for the determination of crystalline structures and chemical compositions, electron and neutron diffraction methods, microanalysis, crystalline defects, physical properties of crystals, crystal growth, phase analysis, phase diagrams, phase transitions, protein crystallography.
Prerequisite: Completion of Science I or Engineering I

Lectures: Thursday, Friday 11:30 am-12:20 pm
Labs or Tutorials Tuesday 8.30 -11.20 am

RELEVANCE TO OTHER COURSES:
Crystallographic principles are important for:
Materials Production I (MATLS 3B03)
Mechanical Behaviour of Materials (MATLS 3M03)
Materials For Electronic Applications (MATLS 3Q03)
Phase Transformations (MATLS 3T04)
Materials Production II (MATLS 4B04)
Synthesis and Applications of Nanomaterials (MATLS 4F04)
Thin Films Science (MATLS 4H03)
Properties of Polymeric Materials (MATLS 4P03)

TEXT BOOKS
B.D.Cullity – “Elements of X-ray Diffraction”

Course objectives and learning outcomes (CEAB attributes Knowledge and Tools):

Students should be able to:
Use a special software for the analysis of different structures

Create a stereographic projection

Create a reciprocal lattice

Create electron diffraction pattern using a special software

Create X-ray diffraction patterns using a special software

Create epitaxial structures using a special software

Analyze electron diffraction patterns using a special software

Analyze X-ray diffraction patterns using a special software

Analyze elements of stereographic projections

Analyze diffraction patterns of ordered and disordered alloys

Demonstrate ability to calculate structure factors for simple, base centered, body centered and face centered unit cells

Predict systematically absent reflections in the XRD patterns for simple, base centered, body centered and face centered unit cells

Demonstrate the ability to analyze diffraction patterns

Predict special materials properties based on point group of symmetry

Demonstrate the ability to analyze particle size of nanoparticles from XRD data

Demonstrate the ability to analyze uniform and non-uniform strain in crystals from XRD data

Demonstrate the ability to model epitaxial systems and misfit optimization

**Course Operating Information.**

Special dates

Lecture Review – November 5, 11:30 am-12:20 pm, covers lectures before Midterm test

Midterm test – November 5, 7:00-7:20 pm, covers lectures before Midterm test

Tutorial review - November 3, 8.30-9.20 am covers Tutorials before Tutorial Quiz

Tutorial Quiz – November 3, 9:30-11:00 am, covers Tutorials before Quiz

Lecture Review – December 4, 11:30 am-12:20 pm, covers all lectures

Tutorial review – December 8, 8:30-11.20 am, covers all Tutorials

Evaluation Method & Grade Distribution:

Midterm Lecture Test – 20%

Tutorial Quiz – 20%

Laboratory Reports (Labs.1-4) – 20%

Final Exam – 40%

TOTAL 100%
<table>
<thead>
<tr>
<th>Date</th>
<th>Tutorial or Lab (8:30-11:20 am)</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 15</td>
<td>Tutorial 1</td>
</tr>
<tr>
<td>September 22</td>
<td>Tutorials 2,3</td>
</tr>
<tr>
<td>September 29</td>
<td>Lab 1</td>
</tr>
<tr>
<td>October 6</td>
<td>Tutorial 4A/B</td>
</tr>
<tr>
<td>October 20</td>
<td>Lab 2</td>
</tr>
<tr>
<td>October 27</td>
<td>Tutorial 5</td>
</tr>
<tr>
<td>November 3</td>
<td>Review/Quiz</td>
</tr>
<tr>
<td>November 10</td>
<td>Tutorials 6,7</td>
</tr>
<tr>
<td>November 17</td>
<td>Lab 3</td>
</tr>
<tr>
<td>November 24</td>
<td>Lab 4</td>
</tr>
<tr>
<td>December 1</td>
<td>Tutorial 8</td>
</tr>
<tr>
<td>December 8</td>
<td>Review</td>
</tr>
</tbody>
</table>
Policy Reminders:

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty:

· plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.

· improper collaboration in group work.

· copying or using unauthorized aids in tests and examinations.

AUTHENTICITY/PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING
Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the “Code”). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas.mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University’s Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar’s Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image
may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such

Completed by Igor Zhitomirsky, August 2020