MATLS 2X03 – CRYSTALLINE STRUCTURE OF MATERIALS

Course Information 2019
Instructor: Dr. Igor Zhitomirsky, zhitom@mcmaster.ca, JHE A418, ext. 23914

Teaching Assistants
Qinfu Zhao – zhaoq36@mcmaster.ca, JHE A203 B/B
Wenyu Liang – liangw26@mcmaster.ca, JHE A203 B/B
Ryan Poon -poonry@mcmaster.ca, JHE A203 B/B
Amanda Clifford – cliffoa@mcmaster.ca, JHE A203C

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: Monday, Wednesday 1:30-2:20 pm, ABB165
Labs Wednesday 8.30 -11.20 am, JHE-233A and 234 or tutorials Wednesday 8:30-11:20 am, BSB B103

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 test 1 – October 2, 1:30-2:20 pm, ABB165, covers lectures before test 1
Lecture test 2 – November 11, 1:30-2:20 pm, ABB165, covers lectures after test 1
Tutorial Quiz 1 – October 9, 10:30-11:20 am, BSB B103, covers Tutorials before Quiz 1
Tutorial Quiz 2 – November 13, 1:30-2:20 pm, ABB165, covers Tutorials after Quiz 1
Evaluation Method & Grade Distribution:
Lecture Test 1 – 10%
Lecture Test 2 – 10%
Tutorial Quiz 1 – 10%
Tutorial Quiz 2 – 10%
Laboratory Reports (Labs.1-4) – 20%
Final Exam – 40%
TOTAL 100%

Laboratory and Tutorial Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Group A</th>
<th>Group B</th>
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<tbody>
<tr>
<td>September 11</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>September 18</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>September 25</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>September 25</td>
<td>JHE233/234, 8:30-11:20 am Computer lab 1</td>
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<td>October 2</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<tr>
<td>October 2</td>
<td>JHE 233/234, 8:30-11:20 am Computer lab 1</td>
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<td>October 9</td>
<td>Tutorial, 8:30-10:20 am, Quiz 1 10.30-11.20 am BSB B103</td>
<td>Tutorial, 8:30-10:20 am,</td>
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<table>
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<tr>
<th>Date</th>
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<tr>
<td>October 23</td>
<td>Quiz 1 10.30-11.20 am BSB B103</td>
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<td>October 23</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>October 23</td>
<td>JHE233/234, 8:30-11:20 am, Computer lab 2</td>
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<td>October 30</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>JHE233/234, 8:30-11:20 am, Computer lab 2</td>
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<td>November 6</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>November 6</td>
<td>JHE233/234, 8:30-11:20 am, Computer lab 3</td>
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<td>November 13</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<tr>
<td>November 13</td>
<td>JHE233/234, 8:30-11:20 am, Computer lab 3</td>
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<td>November 20</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<tr>
<td>November 20</td>
<td>JHE233/234, 8:30-11:20 am,</td>
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### Computer lab 4

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<tbody>
<tr>
<td>November 27</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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<td>November 27</td>
<td>JHE233/234, 8:30-11:20 am</td>
<td>Computer lab 4</td>
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<tr>
<td>December 4</td>
<td>Tutorial, 8:30-11:20 am, BSB B103</td>
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### 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. 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. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at.

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.

**Academic Accommodation:**

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University’s Academic Accommodation of Students with Disabilities policy.

**Missed Work:**

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:**
Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation 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.

**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 as McMaster Daily News, A2L and/or McMaster email.

Completed by Igor Zhitomirsky, August 2019