**Name of the module:** X-ray diffraction

**Number of module:** 365-1-4441

BGU Credits: 3.5

ECTS credits: 5.25

Academic year: 2012-2013

Semester: Fall

Hours of instruction: 3 lecture hours: Monday 8-11 + exercise Monday 16-17 or Monday 17-18

Location of instruction: lecture: building 28 room 205; exercise building 28 room 102

Language of instruction: hebrew

Cycle: First, undergraduate (students towards BSc)

Position: basic and obligatory for 2-nd year students towards BSc in materials engineering

Field of Education: Materials Engineering

Responsible department: department of materials engineering

General prerequisites: students should complete module Materials Science-1, course number 365-1-1021

Grading scale:the grading scale would be determined on a scale of 0 – 100 (0 would indicate failure and 100 success), passing grade is 56*.*

Course Description:

Aims and objectives of the module: the module intends to provide basic knowledge on crystallography and X-ray diffraction method. During the module the students will understand the mechanisms of generation and properties of X-rays and become familiar with practical use of X-ray diffraction.

Learning outcomes of the module: On successful completion of the course, the student should be able to:

1. define mechanisms of generation of X-rays as well as their properties;
2. formulate elements of crystallography (symmetry elements; point and space groups; miller indices; 14 Bravais lattices etc`);
3. construct stereographic projection and apply it for illustration of symmetry elements;
4. define scattering of X-rays by crystals;
5. calculate structure factors and intensity of powder X-ray diffraction peaks;
6. evaluate powder X-ray diffractogramm;
7. examine database in order to identify the phases constituting the alloy;
8. list advantages, disadvantages and limitation of powder X-ray diffraction;
9. apply and choose the most appropriate X-ray diffraction technique in order to solve basic problems in materials science.

Attendance regulation: students are expected to attend 100% of lectures and practical lessons, however neither lecturer nor teaching assistance will check formally the attendance. Inaddition one 1 hour lecture will be given at the X-ray diffraction laboratory – attendance compulsory.

Teaching arrangement and method of instruction: the module consists of 3 hours frontal lectures weekly given by the lecturer and 1 hour practical lesson weekly given by teaching assistant.

Lecturer: Dr. Louisa Meshi

Contact details: room 111, building 59

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Office hours: Monday 12-14

Module evaluation: at the end of the module the students will evaluate it through "teaching quality survey".

Confirmation: the syllabus was confirmed by the faculty academic advisory committee to be valid on 2012-2013

Last update: 10/2012

Assessment:

1. final test 100%

 100%

Work and assignments: each week after the practical lesson additional questions will be given to students as homework. The homework will not be graded – however it's completion is crucial for success at final exam. In addition one assignement will be given for two weeks for each two students. The submission of the assignment is obligatory and is a prerequisite for attendance the final test.

Time required for individual work: in addition to attendance in class, the students are expected to do their homework and the assignement, read additional literature and prepare themselves for final test. Lecturer expects from the students to invest 1 hour weekly, 2 hours for the preparation of the assignement and at least 1 full day in order to prepare for final test.

Module Content\ schedule and outlines:

1. generation and properties of X-rays – 2 weeks;
2. X-ray diffraction experiment – 1 week;
3. Fundamentals of crystallography – 1 week;
4. Stereographic projection – 1 week;
5. Symmetry – 2 weeks;
6. Scattering of X-rays by crystals – 2 weeks;
7. Applications of X-ray diffraction to problems in materials science – 1 week;
8. Advantages and limitations of X-ray powder diffraction – 1 week;
9. Summary of the course and preparation to the final exam – 1 week

Total: 12 weeks\*.

\*) Semesters which includes 13 weeks allow in depth study of topic number 7 which is given for 2 and not for 1 week.

Required reading: none

Additional (recommended) literature:

1) B.D. Cullity," [Elements of x-ray diffraction](http://wserv.bgu.ac.il/java_script%3Aopen_window%28%22http%3A/dahab.bgu.ac.il%3A80/F/UXAL37NNPA2K2YALQEU4498LY5VKDTEFFVDP8PST76RJ84RE68-02723?func=service&doc_number=000066902&line_number=0007&service_type=TAG%22);) "  Reading, Mass. : Addison-Wesley,  1978 (Library QC 482.D5C84)

2) Relva C. Buchanan and Taeun Park,"Materials Crystal Chemistry",Marcel. Dekker Inc, New York**.**(Library QD 478.B83 1997).

3) C. S. Barrett, T.B. Massalsky, “Structure of Metals” (Library TN690, B3 1966 or TN690.B3 1980)

4) B.K. Vainshtein, “Modern Crystallography”, Berlin, Springer-Verlag, 1981 (Library QD905.2.M6213)

**\* All learning material will be available to the students on the module's website (high-learn)/ library/ electronic documents available to BGU students.**