Special Problems in Physics (PHY 659) – Spring 2016 (credit hours: 6)

Instructor: Prof. Bogdan Dabrowski, Physics Department, NIU. You can find me in my office (La Tourette Hall 216; phone: 753-6474) or in my labs La Tourette Hall 215 and FR 110 (phone: 753-6472). You can also reach me at NIU and Argonne National Laboratory at emails bdabrowski@niu.edu and dabrowski@anl.gov.

Course meeting time and place: weekly in Faraday Hall 110 and via Internet and Skype.

Office hours: weekly at La Tourette Hall 216 and via Internet and Skype.
Textbook: "The Science and Engineering of Materials" by Donald R. Askeland, Pradeep P. Fulay, and Wandelin J. Wright – Sixth ed., Cengage Learning (ISBN-13 978 0-495-29602-7).

Chapters and topics we will study:
1) Introduction to Materials
2) Atomic Structure
3) Atomic and ionic Arrangement
4) Imperfections in the Atomic Arrangement
5) Atomic and Ionic Movements in Materials
10) Solid Solutions and Phase Equilibrium
12) and 13) Structures, Properties and Processing of Ceramics
15) Ceramic Materials
19) Electronic Materials
20) Magnetic Behavior of Materials
22) Thermal and Thermoelectric Properties of Materials

Research papers:
[1] S. Remsen and B. Dabrowski "*Synthesis and Oxygen Storage Capacities of Hexagonal $Dy_{1-x}Y_xMnO_{3+\delta}$*" Chem. of Mater. 2011, *23*, 3818-3827
[2] C. Abughayada, B. Dabrowski, M. Avdeev, S. Kolesnik, S. Remsen, O. Chmaissem, *"Structural, magnetic, and oxygen storage properties of hexagonal $Dy_{1-x}Y_xMnO_{3+\delta}$"*, Journal of Solid State Chemistry, 217, 127 (2014)
[3] C. Abughayada, "*AIR SEPARATION AND OXYGEN STORAGE PROPERTIES OF HEXAGONAL RARE-EARTH MANGANITES*", Ph.D. Dissertation, NIU 2015.

The course is designed for graduate physics majors (Wadiah Allahyani, Z1692542@STUDENTS.NIU.EDU) individual study of selected problems in physics under faculty supervision. The course involves theoretical work: elements of statistical physics and thermodynamics, crystallography, thermoelectric effects, principles of synthesis and processing of oxide materials. Experimental work consists of synthesis of thermoelectric oxides, x-ray diffraction, resistivity, dilatometry, and electron microscopy. Development of other skills involves preparation of reports, research proposals and manuscripts.

The grades will be based on the total amount of points you would accumulate during the course (homework 50%, laboratory work 50%)

A (4.00)	90 – 100%
A- (3.67)	80 – 89 %
B+ (3.33)	72 – 79%
B (3.00)	64 – 71%
B- (2.67)	56 - 63%
C+ (2.33)	48 – 55%
C (2.00)	40 – 47%
D (1.00)	32 – 39%
F (0.00)	31% or less

NIU abides by Section 504 of the Rehabilitation Act of 1973 regarding provision of reasonable accommodations for students with documented disabilities. Moreover, your academic success is of importance to me. If you have a disability that may have a negative impact on your performance in this course and you may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing accommodations you may need. If you have not already done so, you will need to register with the Center for Access Ability Resources (CAAR), the designated office on campus to provide services and administer exams with accommodations for students with disabilities. CAAR is located on the 4th floor of the University Health Services building (753-1303). ***I look forward to talking with you to learn how I may be helpful in enhancing your academic success in this course.***