EE 271.3
Materials and Heat Transport in Electrical Engineering

Department of Electrical and Computer Engineering
Winter 2017

Description: Basic concepts in materials science. Crystalline and non-crystalline materials. Crystal imperfections. Solid solutions, alloys. Kinetic molecular theory. Electrical properties of metals, alloys and semiconductors. Interconnects in microelectronics. Diffusion and oxidation. Mechanical properties of materials. Heat transport by thermal conduction. Radiation and convection. Applications of the above concepts in electrical engineering. Practicum based on these topics.

Prerequisites: CHEM 114 and PHYS 155.

Corequisites: None

Instructor:
Cyril (Kirill) Koughia
Office: Engineering Building, office 3C24
Phone: (306) 966-5400
Email: cyril.koughia@usask.ca

Lectures: Tuesday-Thursday, 11:30-12:50 pm, Room 2C44

Tutorials: Wednesday, 4:00-5:20 pm, Room ___

Website: Assignments, solutions, lab schedules, general course information, and announcements will be posted on the course website. Students are responsible for keeping up-to-date with the information on the course website.

http://kasap13.usask.ca/EE271/

Course Reference Numbers (CRNs): 29922 (lectures), 29924 (tutorials)

Textbook: Principles of Electronic Materials and Devices by S.O. Kasap (Third Edition)

Office Hours: Students are welcome and encouraged to drop by the office at any time for help with the course material. Alternatively, students can email or phone Dr. Koughia to schedule a meeting time.

Reading List: None

Assessment: The methods of assessment and their respective weightings are given below:

Assignments	15%
Midterm Exam	25%
Final Exam	60%

Final Grades: The final grades will be consistent with the "literal descriptors" specified in the university's grading system.

http://students.usask.ca/current/academics/grades/grading-system.php

For information regarding appeals of final grades or other academic matters, please consult the

University Council document on academic appeals.

http://www.usask.ca/university_secretary/honesty/StudentAcademicAppeals.pdf

Course Content: The detailed course content as well as regularly updated class schedule may be found at http://kasap13.usask.ca/EE271/index.php?view=schedule

Assignments: Assignments will be handed out every two weeks, depending on how slowly/quickly the course content is covered in the lectures. Assignments must be submitted by day and time defined in at http://kasap13.usask.ca/EE271/index.php?view=assignments in EE271 assignment box opposite to Room 2C94E. Late assignments will not be marked and will be given a mark of zero.

Tutorials: Tutorials are aimed to help students with solving problems of assignments. Tutorials are held every two weeks, preceding the weeks of assignment submission. The detailed information on tutorials is posted at http://kasap13.usask.ca/EE271/index.php?view=assignments .

Quizzes: None

Exams: The midterm exam is tentatively scheduled for the middle of February on the last week before reading week, 7:00PM-9:00PM (room to be announced). The detailed information on Midterm exam may be found at http://kasap13.usask.ca/EE271/index.php?view=midterm. The midterm exam is not forgivable. The final exam is in April. The detailed information concerning final exam may be found at http://kasap13.usask.ca/EE271/index.php?view=final. For both midterm and final exams, only the textbook and lecture slides are allowed. Hand calculator is allowed but all other electronic devices are not allowed.

Important Dates:

January, second week	EE271 class begins
January, third week	First assignment is posted
January, fourth week	First tutorial
February, second week (tentatively)	Midterm Exam Period
April	Final Exam Period

Student Conduct: Ethical behaviour is an important part of engineering practice. Each professional engineering association has a Code of Ethics, which its members are expected to follow. Since students are in the process of becoming Professional Engineers, it is expected that students will conduct themselves in an ethical manner.

The APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan) Code of Ethics states that engineers shall "conduct themselves with fairness, courtesy and good faith towards clients, colleagues, employees and others; give credit where it is due and accept, as well as give, honest and fair professional criticism" (Section 20(e), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

The first part of this statement discusses an engineer's relationships with his or her colleagues. One of the ways in which engineering students can demonstrate courtesy to their colleagues is by helping to maintain an atmosphere that is conducive to learning, and minimizing disruptions in class. This includes arriving on time for lectures, turning cell phones and other electronic devices off during lectures, not leaving or entering the class at inopportune times, and refraining from talking to others while the instructor is talking. However, if you have questions at any time during lectures, please feel free to ask (chances are very good that someone else may have the same question as you do).

For more information, please consult the University Council Guidelines for Academic Conduct.

http://www.usask.ca/university_secretary/council/reports_forms/reports/guide_conduct.php

Academic Honesty: The latter part of the above statement from the APEGS Code of Ethics discusses giving credit where it is due. At the University, this is addressed by university policies on academic integrity and academic misconduct. In this class, students are expected to submit their own individual work for academic credit, properly cite the work of others, and to follow the rules for examinations. Academic misconduct, plagiarism, and cheating will not be tolerated. Copying of assignments and lab reports is considered academic misconduct. Students are responsible for understanding the university's policies on academic integrity and academic misconduct. For more information, please consult the University Council Regulations on Student Academic Misconduct and the university's examination regulations.

http://www.usask.ca/university_secretary/honesty/StudentAcademicMisconduct.pdf
http://www.usask.ca/university_secretary/council/academiccourses.php

Safety: The APEGS Code of Ethics also states that Professional Engineers shall "hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace" (Section 20(a), The Engineering and Geoscience Professions Regulatory Bylaws, 1997).

Safety is taken very seriously by the Department of Electrical and Computer Engineering. Students are expected to work in a safe manner, follow all safety instructions, and use any personal protective equipment provided. Students failing to observe the safety rules in any laboratory will be asked to leave.

Course Learning Outcomes:

1. Students will know basic concepts in materials science; crystalline and non-crystalline materials; kinetic molecular theory; electrical properties of metals, alloys and semiconductors; role and specific of interconnects in microelectronics; importance of diffusion and oxidation; mechanical properties of materials; heat transport and heat dissipation.
2. Students will know applications of these concepts in electrical engineering.
3. Students will be able to analyze and solve practical problems related to the above topics.

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