3Q03 Course Outline

Term II – 2018

INSTRUCTOR:
Dr A. H. Kitai

TA’s
Isobel Bicket bicketic@mcmaster.ca

LECTURES:
Monday 4:30pm JHE210
Thursday 4:30pm JHE210
Friday 4:30pm JHE210

ASSIGNMENTS:
4

TEXTBOOK:
Principles of Solar Cells, LEDs and Diodes: The role of the p-n junction, 2011, John Wiley, by Adrian Kitai

Other supplementary material will be posted on Avenue to Learn as needed.

Fundamental properties of materials used in electronic applications, operation of devices and fabrication methods of electronic circuits and packaging. Includes description of dielectric, magnetic and optoelectronic properties.

The course provides fundamental in-depth knowledge of the physical principles and operational characteristics of semiconductor devices, dielectric materials and magnetic materials. The major emphasis is on a review of the underlying physics, and an introduction to non-equilibrium charge carriers, junction diodes, bipolar junction transistors (BJT) and related devices such as photodiodes, LEDs and solar cells. The physics and some applications of various versions of these devices will be considered. This course also presents magnetic materials and dielectric materials including fundamentals and applications.

GRADING:
This course may be taken in two modes.

Mode A is designed for students who do not expect to specialize in this field, but who wish to acquire extensive and useful working knowledge of the topics.

Mode B is designed for students who want to prepare themselves for further study in this field. Mode B is recommended for students who plan to take other optional courses on
electronic materials and devices and who may want to do postgraduate study in these areas.

Each lecture will be divided into two parts.

Part 1 covers a more formal, quantitative approach to the topic. Part 2 provides more descriptive coverage with some math but not to the same degree as in Mode 1.

Mode A students will be given homework problems involving more math. Mode B students will have some math but more qualitatively-oriented homework problems.

Both Mode A and Mode B students will work in groups to do classroom presentations. Mode A students will present more quantitative topics and Mode B students will have less mathematical topics.

All students will be responsible for quantum mechanics knowledge based on a common Quantum Mechanics Module to be posted on Avenue to Learn. The course will begin with this module which does involve quantitative work. Much of this module should be familiar to you from 2Q04.

The midterm and final exam will have some questions common to all students and some questions for either Mode A or Mode B students.

Please note that neither Mode is “harder” or “easier”. Mode B will still demand quantitative basic knowledge and a lot of other knowledge about a lot of topics!

Final grade is evaluated as follows:
Assignments 10%, Midterm test 20%, Project 15%, Class Participation 15%, Final exam 40%

Class participation will be determined as follows:

- Two student representatives will be responsible for submitting a class participation grade to the instructor.
- The class participation grade will include a component connected to attendance which will be taken at each lecture. How attendance factors into the participation grade will be determined by the student representatives.
- A further component of the class participation grade will be determined by student performance as judged by the other students during homework problem presentations. At the beginning of each lecture a student will take up one homework problem for the first 5-10 minutes of each lecture.
- The TA will be available to help students who are presenting homework solutions. The TA will be responsible for preparing complete homework solutions that will be made available to all students after questions are taken up in class.

You must declare your Mode before the 7th lecture.
A research project will be assigned that involves working in a group to present a topic. Details of the organization of this will be presented in class.

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

**POLICY REMINDERS:**
Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and 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 kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at [http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf](http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf)

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact their Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.