COURSE OUTLINE 1999/2000
Engineering Physics 3W04 - Term II
"Acquisition and Analysis of Experimental Information"

****NOTE: This information applies to term II only and supercedes previous information.****

PREREQUISITE: Registration in Level III or above of any Engineering or Science Program

LECTURER: Dr. Wm. J. Garland, Nuclear Reactor Bldg., room 117, ext. 24925
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TEACHING ASSISTANTS:
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LECTURES: 2 hours per week, Thursday at 12:30 p.m. - 2:30 p.m.

TEXT: J. F. James, A Student's Guide to Fourier Transforms, Cambridge University Press, 1995, ISBN 0 521 46829 9. A supplemental reading list is given in the course pack.

COURSE PACK: A course pack containing lecture notes and supplemental information for the term is available in the bookstore. The information is also available on the web.

WEB SITE: A web site at http://epic.mcmaster.ca/~garlandw/ep3w4 contains administrative information, lecture notes, related links, assignments, etc. Solutions to completed assignments will be posted there.

COURSE OBJECTIVES (TERM II):

The overall objective of this course is to provide a background in the acquisition and analysis of experimental information. The first term covered error analysis, estimation, probability and statistics. This second term covers Fourier Transforms, signal processing, sampling, filtering and windowing.

COURSE DESCRIPTION (TERM II):

The second part of this course is about Fourier Transforms, what they are, why they are useful and how to use them. We set the scene for FTs by first looking at linear systems to show why FTs are useful. To provide a better understanding of this tool, the FT is developed from the Fourier Series which the reader may be more familiar with. Complex number notation will be necessary so we will have to make a side trip there to ensure full understanding. We can then proceed to the FT and study it in some detail, exploring its properties and physical interpretation. This will occupy us for the bulk of the term. Our end goal is the application of FTs to practical signal analysis situations. We will be able to study only a

few applications within this term but the hope is that a firm understanding of FTs that should be acquired in the study of the material herein will enable the reader to apply FTs to the various situations that will undoubtedly arise in future work.

OUTLINE:

1. Introduction
2. Linear Systems
3. Fourier Series
4. Complex Numbers
5. Fourier Transforms
6. Useful Properties and Theorems
7. Application: Fraunhofer Diffraction
8. Application: Signal Analysis and Filters
9. Windows and the Discrete Fourier Transform

PROBLEM ASSIGNMENTS:

(a) Normally problem assignments will be handed out at intervals of two weeks. They will be assigned as the appropriate material is covered in the lectures.

(b) Problem sets are due by 5:00 P.M. one week after being assigned, unless otherwise specified. **If the problem set is not turned in by the dead-line, a penalty of 10% per day will be levied for up to 2 days, after which, the mark given will be zero.**. If you expect to miss an assignment for any reason or if you miss for reasons of ill health, you must inform the lecturer as soon as possible to avoid penalty.

(c) Marked sets will normally be returned within one week of submission. Assignments will be reviewed in class if necessary.

(d) Format: If your solutions are not legible they will not be marked; please use one side of a page only. Draw a solid line at the end of each problem solution. Order the problems in the same way they are assigned. Remember if the marker has to spend five to ten minutes deciphering what you have submitted, he has that much less time to assist you by indicating your errors.

(e) Adjustments: We are not infallible. If an error has been made in marking, consult the marker or lecturer for an adjustment.

(f) Solutions: Solutions to problem sets will be posted on the web soon after the assignment is due. For obvious reasons, no late assignments will be accepted once the solutions are posted.

ASSISTANCE WITH COURSE WORK AND PROBLEMS:

The instructor and a teaching assistant will be available to assist you with the lecture material or problems. Times will be arranged in class.

TERM TESTS AND QUIZZES:

During the term there will be one midterm test (50 minutes). There will also be two short quizzes (~15 minutes). These will be conducted in regular lecture periods. Solutions will be posted on the web after the test/quiz lecture period.

FINAL EXAM:

There will be a 2 hour final examination for the term II portion of the course during the April examination session. It will be based on material covered by the lectures, assignments, test and quizzes. The final exam will be closed book with up to 3 double sided 8 ½ " x 11" crib sheets permitted. There is no restriction on the use of a calculator. Check the web site for sample questions.

FINAL TERM AND COURSE MARK:

(a) The final mark for the course will be split 50-50 between terms I and II. The final mark for the term will be based on three components:

(i) problem assignments during the term;
(ii) term tests and quizzes;
(iii) final test or examination.

(b) The three components are weighted so as to maximize the student's mark based on his or her performance. The following table lists all possible weighting combinations (in percent):

Assignments	Test & Quizzes	Examination
30	10	60
20	10	70
30	30	40
20	30	50

(c) The weighting scheme was developed with the following criteria in mind:

(i) The final mark will consist of no less than 40% examination mark.
(ii) It is possible to pass the course based on the term work alone. Up to 60% of the final mark can be from the term work.
(iii) The assignment component is obtained by simply averaging the number of assignments involved. If an assignment is not received, a zero is included when calculating the average. The weight ratio of one test to one quiz is 3:1.

FORECAST OF THE FINAL MARK:

Soon after the mid-term, a projection of final marks will be made based on performance to that time and assuming an exam mark identical to the mid-term. This will be updated periodically as more marks become available. If a student has a forecast final mark of less than 50%, it is suggested that he/she seek advice as quickly as possible from the lecturer.

COLLUSION:

In the past, groups of students have tended to collaborate and discuss assignments. This is acceptable in moderation. However, the final submitted assignments must be a student's individual work, not a copy of someone else's solution. The course marker is instructed to watch carefully for any evidence of copying. If the marker suspects copying, he/she will mark the relevant papers normally, but will make a special notation on the paper and the marking sheet. **The marks of these students will not be entered until they have discussed the assignments with the lecturer**. If copying has taken place, all students involved will receive zero for that assignment and will be subject to the university regulations governing academic dishonesty.

POLICY REMINDERS:

Attention is drawn to the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office. Any student who infringes one of these resolutions will be treated according to the published policy.

The following material is adapted from the Senate Statement on Academic Ethics: Appendix A

> Work submitted for credit in a course, and which is not referenced, footnoted, or acknowledged, is assumed to be the independent work of the student submitting the work. The submission of work without references, footnotes, or acknowledgements and which is not the independent work of the student submitting the work is plagiarism and is one form of academic dishonesty.
>
> Work that is copied directly must be enclosed in quotation marks and the source documented by giving the author, title, page, and date of the source.
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> Materials that have had a strong influence on the work but that have not been copied directly must be referenced with a footnote or endnote that documents the source of the material. It is also expected that the material be introduced with sentences of the form 'Kreyszig, on page 865, shows how to solve a similar problem. I have adapted his work to ...' to identify clearly the source and influence.
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> The form of acknowledgement described above is to be used for conversations.
> Students who allow their work to be copied are as guilty of academic dishonesty as those who copy.

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as the problem occurs.