ECE 7430 – Experimental Methods for Microwave Engineering

COURSE OUTLINE – FALL 2014

COURSE DESCRIPTION:
Modern measurement methods for microwave and millimeter wave circuits. Techniques for characterizing linear and non-linear passive and active circuits, materials and antennas.

COURSE OBJECTIVE:
The objective is to familiarize students with conventional test techniques and equipment used for characterization of microwave devices, circuits and systems. Both fixtured and on-wafer level test methods will be covered. The course involves experimental labs employing state-of-the-art microwave test equipment.

PRE-REQUISITES:
A firm grasp of undergraduate level electromagnetic theory and introductory undergraduate level microwave circuit theory.

CONTACT HOURS:
3 hours/week

COURSE CONTENT:
1. Introduction to RF systems and microwave network parameters
2. Microwave network analysis - vector network analyzer, calibration, passive device measurement
3. Distributed and resonant devices
4. Noise in microwave systems and its measurement – amplifier measurement
5. Non-linearity and its characterization – amplifier measurement
6. Characterization of frequency conversion devices – mixer measurement
7. Microwave sources and their characterization - oscillators and frequency synthesizers
8. Microwave systems test and measurement
9. Microwave circuit test issues - fixturing and packaging, on-wafer probing
10. Time-Domain-Reflectometry
11. Antenna measurement basics

The course requires completion of 10 experimental labs.

HOMEWORK:
Assignments covering background material related to the particular test or lab experiment covered for that week.

TEXTBOOK:
References:
2. Agilent Application Notes
3. CMC/ARFSL RF test tutorial notes.

Website: ece.eng.umanitoba.ca/graduate/ECE7430/MIC/
EVALUATION:
Your final course grade is determined by your performance in assignments, term test, and a final examination. The weighting of each of these components is as follows:

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<thead>
<tr>
<th>COMPONENT</th>
<th>NO</th>
<th>VALUE</th>
<th>TOTAL VALUE</th>
<th>DETAILS / ADDITIONAL INFO</th>
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<tbody>
<tr>
<td>Labs/Assignments</td>
<td>10</td>
<td>5%</td>
<td>50</td>
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<tr>
<td>Project / Presentation</td>
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<td>Midterm Exam</td>
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<td>Final Examination</td>
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INSTRUCTOR INFO:
Name: Greg Bridges, Ph.D., P.Eng., Professor, Department of Electrical and Computer Engineering
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Email: Gregory.Bridges@umanitoba.ca
Office Hours: by appointment

VOLUNTARY WITHDRAW:
Wednesday, Nov. 12, 2014

REQUIREMENTS/REGULATIONS
• Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, and attendance and withdrawal.
  o Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY:
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media
  o examinations
  o assignments
  o laboratory reports
  o term exams
A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

*Plagiarism: to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source