**ECE 4290 – Microwave Engineering**  

**Course Objectives**  
Microwave Engineering introduces the student to RF/microwave analysis and design techniques. Scattering parameters are defined and used to characterize device and system behaviour. The passive and active devices commonly used as components in a microwave subsystem are studied. Device design procedures and methods to evaluate performance are developed. A computer-aided-design (CAD) platform is used in the laboratory to carry out by simulation the design and performance evaluation of devices. Laboratory assignments, quizzes and project work serve to develop student engineering design and report writing skills.

**Course Content**  
The following topics will be covered:  
- An introduction to microwave engineering  
- Lines for signal transmission or as circuit elements  
- The impedance of line circuits calculated using analytic and Smith chart methods  
- The impedance transforming and matching circuits  
- Line and waveguide physical structures and associated interconnect components  
- Power waves and the network scattering matrix  
- Passive device design  
- Two-port network transmission properties  
- Active device design

**Projects**  
A design project is normally assigned which requires the preparation and submission of a formal report. _Late project submission may be penalized at the rate 10% of project value per day._

**Textbook**  
*Microwave Engineering: Notes for Course ECE 4290*, Ernest Bridges. This textbook is available in PDF format from the course webpage.

**Other Resources**  
A list of reference books relevant to the course topics appears in the first chapter of the course notes.

**Requirements and Regulations**  
- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.
Learning Outcomes

1. Demonstrate knowledge and understanding of microwave analysis methods by solving microwave engineering problems in laboratory assignments and in timed examinations.
2. Analyze passive and active microwave devices to determine their circuit properties.
3. Model a microwave circuit or system and obtain its performance characteristics using computer-aided design methods.
4. Identify standard types of transmission line structures, waveguide structures, and associated interconnect components.
5. Design passive and active microwave devices and transmission line structures to meet specified performance requirements.

Expected Competency Levels

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Evaluation

The final course grade is determined by the student’s performance on quizzes, laboratory assignments, a project, term test, and final examination. Students must complete all project and laboratory assignments in order to be eligible to receive a passing grade.

In the event that a student misses the Term Test for medical or compassionate reasons, a deferred test will not be given and the value of the Final Examination will be increased to 75%.

CEAB Graduate Attributes Assessed

DE.3 – Develops/implements possible solutions to an open-ended design problem, leading to an appropriate recommendation.

CS.2 – Designs and produces appropriate engineering documents (i.e., research reports, engineering reports, design documents, graphics).

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 on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g., suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.
Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University’s Intellectual Property Policy and the protection of privacy provisions of The Freedom of Information and Protection of Privacy Act (Manitoba). Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.