

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE MARIE, ON



COURSE OUTLINE

Course Title: MICROWAVE COMMUNICATION

Code No.: ELN316

Semester: 5

Program: ELECTRICAL/ELECTRONICS ENG. TECHNOLOGY

Author: Doug Faggetter

Date: Sept. 1999

Previous Outline Date: Sept. 1998

Approved: _____
Dean Date

Total Credits: 6

Prerequisite(s): ELN245

Length of Course: 16

Total Credit Hours: 96

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I. COURSE DESCRIPTION:

The theory and hardware of the active and passive components employed in microwave systems are considered. Topics include electromagnetic theory, transmission lines, waveguide components, antennas, microwave semiconductor devices and microwave tubes.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course the student will demonstrate the ability to:

- 1) Analyze a transmission line.

Potential Elements of the Performance:

- Use Circuit theory and Electromagnetic Theory to analyze a transmission line.
- Use the Smith chart to analyze a transmission line.

- 2) Analyze a rectangular and circular waveguides.

Potential Elements of the Performance:

- Identify the transverse electric and transverse magnetic modes of operation of a rectangular and circular waveguide.
- Calculate various parameters such as cutoff frequency, guide wavelength, phase constant, group velocity and phase velocity and guide impedance.
- Calculate the resonant frequency of waveguide resonators.
- Perform measurements in the lab on microwave waveguide equipment.

- 3) Analyze various waveguide components using scattering parameters.

Potential Elements of the Performance:

- Use scattering parameters to calculate the reflection coefficient and attenuation or isolation for various waveguide components such as: terminators, attenuators, waveguide tees, magic tee, directional coupler, isolator and circulator.

- 4) Analyze microwave antenna properties.

Potential Elements of the Performance:

- Use antenna formulas to analyze the properties of various microwave antennas the: Dipole Antenna, Small Loop Antenna, Horn Antenna, Parabolic Reflector Antenna, Lens Antenna, Slot Antenna Polyrod Antenna, Frequency-Antenna and Antenna arrays.

including

Independent

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued)**

- 5) Describe the operation of microwave tubes.

Potential Elements of the Performance:

- Describe the operation of Linear Beam Devices such as the Klystron Amplifier, Reflex Klystron Oscillator, Traveling Wave Tube Amplifier, Backward Wave Amplifier and - Backward Wave Oscillator.
- Describe the operation of Crossed-Field devices such as the Magnetron.

- 6) Design and build a microwave amplifier.

Potential elements of the performance:

- Use the Smith Chart to design a microwave amplifier using microstrip technology.
- Build and test the amplifier in the lab.

III. TOPICS:

- 1) Introduction to Microwaves
- 2) Circuits and Electromagnetic Fields
- 3) Transmission Lines
- 4) Waveguides and Resonators
- 5) Smith Chart
- 6) Microwave Network Parameters
- 7) Microwave Components
- 8) Antennas
- 9) Microwave Tubes
- 10) Solid-State Microwave Devices

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Microwave Theory, Components, and Devices
by John A. Seeger

V. EVALUATION PROCESS/GRADING SYSTEM

The grading weight will be:

Theory 75%

Lab 25%

The grading system will be as follows:

A+	90% - 100%	Outstanding Achievement
A	80% - 89%	Above Average Achievement
B	70% - 79%	Average Achievement
C	60% - 69%	Satisfactory Achievement
R	below 60%	Repeat

VI. SPECIAL NOTES:

- Special Needs

If you are a student with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities), you are encouraged to discuss required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Ext. 493, 717, 491 so that support services can be arranged for you.

- Retention of Course Outlines

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other post-secondary institutions.

- Substitute Course Information is available at the Registrar's Office.

VII. PRIOR LEARNING ASSESSMENT

Students who wish to apply for advanced credit in the course should consult the instructor.