SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE OUTLINE: NETWORK ANALYSIS

CODE NO.: ELR 309 - 8

PROGRAM: ELECTRICAL/ELECTRONIC TECHNOLOGY

SEMESTER: FIVE

DATE: SEPTEMBER 1993

PREVIOUS OUTLINE DATED: SEPTEMBER 1982

AUTHOR: DOUG FAGGETTER

NEW: ____ **REV.:** 2

APPROVED: W. Filipowich Sep 2/93

COORDINATOR **DATE**

D. McCord 93 09 02

DEAN **DATE**

NETWORK ANALYSIS | **ELR 309 - 8**
COURSE NAME | **CODE NUMBER**

TOTAL CREDIT HOURS: 105

PREREQUISITE(S): MTH 577

PHILOSOPHY/GOALS:

THE STUDENT WILL STUDY AC & DC CIRCUITS IN-DEPTH USING NETWORK THEOREMS, DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORMS, FOURIER ANALYSIS USING TRADITIONAL SOLUTION TECHNIQUES AS WELL AS THE APPLICATION OF COMPUTER SOLUTION TECHNIQUES .

STUDENT PERFORMANCE OBJECTIVES:

UPON SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENT WILL BE ABLE TO:

1) DEFINE AND DISCUSS BASIC CIRCUIT LAWS AND ANALYSIS METHODS.
2) SOLVE INITIAL, FINAL AND FIRST-ORDER CAPACITIVE AND INDUCTIVE CIRCUITS.
3) ANALYZE CIRCUITS WITH LAPLACE TRANSFORMS.
4) PERFORM WAVEFORM ANALYSIS USING MATHCAD.
5) PERFORM CIRCUIT ANALYSIS USING SPICE.

NETWORK ANALYSIS	ELR 309 - 8
COURSE NAME	CODE NUMBER

TOPICS TO BE COVERED:

1) OVERVIEW OF BASIC CIRCUIT LAWS.

2) INTRODUCTION TO CIRCUIT ANALYSIS METHODS.

3) APPLICATION OF CIRCUIT ANALYSIS TO CAPACITIVE AND INDUCTIVE CIRCUITS.

4) SOLVING FIRST ORDER DIFFERENTIAL CIRCUITS.

5) CIRCUIT ANALYSIS WITH LAPLACE TRANSFORMS.

6) INTRODUCTION TO TRANSFER FUNCTIONS.

7) INTRODUCTION TO SINUSOIDAL STEADY-STATE ANALYSIS.

8) INTRODUCTION TO FREQUENCY RESPONSE ANALYSIS

9) INTRODUCTION TO WAVEFORM ANALYSIS.

REQUIRED STUDENT RESOURCES
(INCLUDING TEXTBOOKS & WORKBOOKS)

1) L.P. HUELSOMAN, BASIC CIRCUIT THEORY
TORONTO, PRENTICE-HALL, 1991 (THIRD EDITION)

ADDITIONAL RESOURCES

1) R.B. ANDERSON, THE STUDENT EDITION OF MATHCAD, VER.2.0
TORONTO, ADDISON WESLEY, 1989

2) P.W.TUINENGA, SPICE A GUIDE TO CIRCUIT SIMULATION
AND ANALYSIS USING PSPICE, TORONTO, PRENTICE HALL, 1988

NETWORK ANALYSIS | **ELR 309 - 8**
COURSE NAME | **CODE NUMBER**

METHOD(S) OF EVALUATION

THE FINAL GRADE FOR THE COURSE WILL BE DERIVED FROM THE RESULTS OF FOUR TEACHER ASSIGNED TESTS, AND ASSIGNMENTS:

FOUR TESTS	90%	(22.5% PER TEST)
ASSIGNMENTS	10%	
TOTAL	100%	

THE GRADING SYSTEM USED WILL BE AS FOLLOWS:

A+	>= 90%	CONSISTENTLY OUTSTANDING ACHIEVEMENT
A	80-89%	EXCELLENT ACHIEVEMENT
B	70-79%	ABOVE AVERAGE ACHIEVEMENT
C	55-69%	SATISFACTORY ACHIEVEMENT
R		REPEAT

NETWORK ANALYSIS	**ELR 309 - 8**
COURSE NAME	**CODE NUMBER**

LEARNING ACTIVITIES	**REQUIRED RESOURCES**
1.0 BASIC CIRCUIT LAWS 1.1) DEFINE THE BASIC CIRCUIT QUANTITIES AND STATE THE SYMBOLS & UNITS USED TO REPRESENT THEM. 1.2) DEFINE THE BASIC ACTIVE AND PASSIVE MODELS AND SKETCH THEIR SCHEMATIC FORMS. 1.3) EXPLAIN CLASSIFICATIONS OF NETWORK ELEMENTS. 1.4) STATE AND APPLY NETWORK TOPOLOGY LAW: 1) OHM'S LAW 2) KIRCHHOFF'S CURRENT LAW 3) KIRCHHOFF'S VOLTAGE LAW 1.5) DEFINE NETWORK ELEMENTS: 1) RESISTOR 2) SOURCE 3) NON-IDEAL SOURCE 1.6) DETERMINE THE EQUIVALENT RESISTANCE OF RESISTIVE NETWORKS IN SERIES AND PARALLEL CONNECTIONS. 1.7) STATE AND APPLY THE VOLTAGE AND CURRENT DIVIDER RULES TO COMPLEX RESISTIVE NETWORKS. 1.8) DEFINE THE FORM TYPES OF CONTROLLED (OR DEPENDANT) SOURCES AND DISCUSS THEIR SIGNIFICANCE IN CIRCUIT MODELLING.	TEXT: CHAPTER #2
2.0) CIRCUIT ANALYSIS METHODS 2.1) DETERMINE THE CURRENT, VOLTAGE AND POWER IN A CIRCUIT USING MESH ANALYSIS. 2.2) DETERMINE THE CURRENT, VOLTAGE AND POWER IN A CIRCUIT USING NODAL ANALYSIS. 2.3) APPLY SOURCE TRANSFORMATIONS TO SIMPLIFY INDEPENDENT SOURCE MODELS. 2.4) APPLY SOURCE TRANSFORMATIONS TO SIMPLIFY DEPENDENT SOURCE MODELS. 2.5) DETERMINE THE THEVENIN AND NORTON EQUIVALENT CIRCUITS FOR A GIVEN CIRCUIT.	TEXT: CHAPTER #3

NETWORK ANALYSIS
COURSE NAME

ELR 309 - 8
CODE NUMBER

LEARNING ACTIVITIES	REQUIRED RESOURCES
3.0 CAPACITIVE AND INDUCTIVE TRANSIENTS AND EQUIVALENT CIRCUITS	TEXT: CHAPTER #4
3.1) DEFINE THE BASIC CAPACITIVE INTEGRO -DIFFERENTIAL EQUATIONS & WAVEFORMS	
3.2) DEFINE THE COMMONLY USED TIME FUNCTIONS USED IN NETWORK ANALYSIS.	
3.3) DEFINE THE BASIC INDUCTIVE INTEGRO-DIFFERENTIAL EQUATIONS & WAVEFORMS.	
3.4) DETERMINE SERIES AND PARALLEL COMBINATIONS OF CAPACITORS AND INDUCTORS.	
3.5) STATE AND APPLY THE VOLTAGE-CURRENT RELATIONSHIPS FOR MUTUAL INDUCTANCE	
4.0) FIRST ORDER DIFFERENTIAL CIRCUITS	TEXT: CHAPTER #5
4.1) SOLVING FIRST ORDER DIFFERENTIAL CIRCUITS EXCITED BY INITIAL CONDITIONS.	
4.2) SOLVING FIRST ORDER DIFFERENTIAL CIRCUITS EXCITED BY SOURCES.	
4.3) SOLVING FIRST ORDER DIFFERENTIAL CIRCUITS EXCITED BY INITIAL CONDITIONS AND SOURCES.	
4.4) SOLVING FIRST ORDER DIFFERENTIAL CIRCUITS EXCITED BY CERTAIN RESPONSES AND INITIAL CONDITIONS.	
5.0) SECOND ORDER DIFFERENTIAL CIRCUITS	TEXT: CHAPTER #6
5.1) SOLVING SECOND ORDER DIFFERENTIAL CIRCUITS EXITED BY INITIAL CONDITIONS - CASE 1 & 11.	
5.2) SOLVING SECOND ORDER DIFFERENTIAL CIRCUITS EXITED BY INITIAL CONDITIONS - CASE 111	
5.3) SOLVING SECOND ORDER DIFFERENTIAL CIRCUITS EXITED BY INITIAL CONDITIONS AND SOURCES.	
5.4) SOLVING HIGHER ORDER DIFFERENTIAL CIRCUITS EXITED BY CERTAIN RESPONSES AND INITIAL CONDITIONS.	

NETWORK ANALYSIS | **ELR 309 - 8**
COURSE NAME | **CODE NUMBER**

LEARNING ACTIVITIES	**REQUIRED RESOURCES**
6.0 CIRCUIT ANALYSIS WITH LAPLACE TRANSFORMS	TEXT: CHAPTER #9
6.1) DEFINE AND EXPALIN THE PURPOSE OF THE LAPLACE TRANSFORMS AS APPLIED TO CIRCUIT ANALYSIS.	
6.2) STATE THE LAPLACE TRANSFORMS FOR THE MOST COMMON FUNCTIONS ENCOUNTERED IN CIRCUIT ANALYSIS.	
6.3) STATE THE FORMS OF THE MOST COMMON LAPLACE TRANSFORM OPERATIONS.	
6.4) DETERMINE THE LAPLACE TRANSFORM OF A GIVEN TIME FUNCTION.	
6.5) DETERMINE THE INVERSE TRANSFORM OF OF A GIVEN S-DOMAIN FUNCTION.	
7.0 ADDITIONAL TOPICS TO BE COVERED IF TIME PERMITS	TEXT: CHAPTER #7,8,10
TRANSFORMED NETWORKS TRANSFER FUNCTIONS POLES & ZEROS COMPLEX S-PLANE BODE PLOT FILTER THEORY	