



COURSE OUTLINE

SCHOOL OF COMPUTER TECHNOLOGIES

COURSE NAME: Advanced RF and Wireless Techniques

COURSE CODE: COMP 1160

CREDIT HOURS: 56

PREREQUISITES: COMP 1153

COREQUISITES: January / 11th / 2010

PLAR ELIGIBLE: YES (X) NO ()

EFFECTIVE DATE: January / 11th / 2010

PROFESSOR: Dr. Hisham Alasady **OFFICE #:**

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NOTE TO STUDENTS: Academic Departments at George Brown College will NOT retain historical copies of Course Outlines. We urge you to retain this Course Outline for your future reference.

FOR OFFICE USE ONLY		
ORIGINATOR: _____	_____	_____
	SIGNATURE	DATE
CHAIR: _____	_____	_____
	SIGNATURE	DATE
DATE OF REVISION: _____		

EQUITY STATEMENT: George Brown College values the talents and contributions of its students, staff and community partners and seeks to create a welcoming environment where equity, diversity and safety of all groups are fundamental. Language or activities which are inconsistent with this philosophy violate the College policy on the Prevention of Discrimination and Harassment and will not be tolerated. The commitment and cooperation of all students and staff are required to maintain this environment. Information and assistance are available through your Chair, Student Affairs, the Student Association or the Human Rights Advisor.

George Brown College is dedicated to providing equal access to students with disabilities. If you require academic accommodations visit the Disability Services Office or the Deaf and Hard of Hearing Services Office on your campus.

STUDENT RESPONSIBILITIES: Students should obtain a copy of the *Student Handbook* and refer to it for additional information regarding the grading system, withdrawals, exemptions, class assignments, missed tests and exams, supplemental privileges, and academic dishonesty. Students are required to apply themselves diligently to the course of study, and to prepare class and homework assignments as given. Past student performance shows a strong relationship between regular attendance and success.

COURSE DESCRIPTION:

This practical, laboratory course supports the student's need for experience with the equipment which is used in measuring and testing RF and wireless signals and equipment. The student will also be expected to learn the theory and practical aspects of Radio Spectrum, Modulation techniques and wireless telecommunications systems and networks. Starting with a short history of the evolution of the cellular industry, the student is quickly brought up to speed on the present state of the industry. The various generational changes that have occurred to the industry are outlined and explained. Course emphasis then shifts to the common cellular system components, their functions, and their relationship to system operation. With the basic cellular network architecture laid out, system operations and management functions are presented. Details of both the GSM and CDMA systems are presented in detail with the newest 3G network implementations covered. A portion of the course is devoted to further explanations of the air interface and steps taken by wireless systems to increase reliability and data transfer rates over the radio link.

ESSENTIAL EMPLOYABILITY SKILLS:

As mandated by the Ministry of Training, Colleges and Universities essential employability skills (EES) will be addressed throughout all programs of study. Students will have the opportunity to **learn (L)** specific skills, to **practice (P)** these skills, and/or **be evaluated (E)** on the EES outcomes in a variety of courses. The EES include communication, numeracy, critical thinking & problem solving, information management, interpersonal and personal skills. The faculty for this course has indicated which of the EES are either Learned (L), Practiced (P) or Evaluated (E) in this course:

Skill	L	P	E	Skill	L	P	E
1. to communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience		X	X	7. to locate, select, organize and document information using appropriate technology and information sources		X	X
2. to respond to written, spoken or visual messages in a manner that ensures effective communication		X	X	8. to show respect for the diverse opinions, values, belief systems, and contributions of others	X	X	
3. to execute mathematical operations accurately	X	X	X	9. to interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals		X	X
4. to apply a systematic approach to solve problems	X	X	X	10. to manage the use of time and other resources to complete projects	X	X	X
5. to use a variety of thinking skills to anticipate and solve problems.	X	X	X	11. to take responsibility for my actions, decisions and consequences		X	X
6. to analyze, evaluate, and apply relevant information from a variety of sources	X	X	X				

COURSE OUTCOMES:

Upon successful completion of this course the students will have reliably demonstrated the ability to:

1. Describe the functions communication system's components (A/D and D/A, course coding / decoding, channel coding / decoding, modulator / demodulator, channel)
2. Operate and configure the following pieces of test equipment:
 - a. Spectrum Analyzer
 - b. RF Signal Generator
 - c. Network Analyzer
3. Operate and configure the following pieces of test software:
 - a. Agilent Spectrum Analyzer
 - b. Agilent Vector Signal Analyzer
4. Know the general history and evolution of wireless technology from a North American viewpoint and explain the cellular radio concept.
5. Understand the behavior of different (analog and digital) modulation techniques (AM, FM, PM, ASK, FSK, PSK, QAM).
6. Understand the behavior of different channel coding techniques (block coding, convolutional coding, turbo coding).
7. Digest the evolution and deployment of wireless cellular systems on a worldwide basis.
8. Understand the difference between 1G, 2G, 2.5G, 3G and 4G cellular systems.
9. Explain the functions of each component of a wireless cellular network.
10. Design and calculate the cost of a cellular network system.
11. Understand the main architecture of 2G and 3G GSM and CDMA cellular mobile systems.
12. Understand the general features of 4G cellular mobile systems.

DELIVERY METHODS / LEARNING ACTIVITIES:

The instructional method of this course is comprised of class lectures using high quality multimedia projection system, lectures, demonstration, hands on lab exercises, quizzes and projects.

LIST OF TEXTBOOKS AND OTHER TEACHING AIDS:

Required:

1. *"Wireless Telecommunications Systems and Networks"* by Gary J Mullett
ISBN# 1-4018-8659-0 Thomson Delmar Learning
2. Notes prepared by Professor

Recommended / Optional:

TESTING POLICY:

1. A score of zero will be recorded for a missed quiz, Lab, assignment or examination unless the student presents the professor with official substantiation of the absence the first day she or he returns to class.
2. Students are responsible for reading the appropriate material before classes so that they may benefit from their practical activities and examples.

ASSIGNMENT

ASSIGNMENT POLICY:

1. Students are responsible for keeping a back-up copy of each assignment submitted.
2. All assignments submitted should adhere to the documentation standards distributed by the professor.
3. Students should check the assignment handouts for the instructions for submission.

EVALUATION SYSTEM:

Assessment Tool:	Description:	Outcome(s) demonstrated:	EES demonstrated:	Date / Week:	% of Final Grade:
Mid-term	Cover the first 7 weeks	1, 2, 3, 5, 6	L, P, E	Week 7	25
Final Exam	Cover the whole materials	1 – to – 10	L, P, E	Week 15	25
Quizzes	Will count the best 4 out of 5 quizzes	1 – to – 11	P, E	Every 2 weeks	20
Labs	Consists of reports, project and test	1, 2, 3, 4, 5, 6, 7, 8, 11	P, E	Every week	30
				TOTAL:	100%

GRADING SYSTEM

The passing grade for this course is: 50

A+	90-100	4.0	B+	77-79	3.3	C+	67-69	2.3	D+	57-59	1.3	Below 50	F	0.0
A	86-89	4.0	B	73-76	3.0	C	63-66	2.0	D	50-56	1.0			
A-	80-85	3.7	B-	70-72	2.7	C-	60-62	1.7						

Excerpt from the College Policy on Academic Dishonesty:

The *minimal* consequence for submitting a plagiarized, purchased, contracted, or in any manner inappropriately negotiated or falsified assignment, test, essay, project, or any evaluated material will be a grade of zero on that material.

To view George Brown College policies please go to www.gbrownc.on.ca/policies

TOPICAL OUTLINE:

Week	Topic / Task	Outcome(s)	Content / Activities	Chapter / Resources
1	Communication System's Components	1	Lecture	Professor's notes
2	Introduction to Wireless Telecommunication Systems and Networks	2,3,4	Lecture and Lab work on spectrum Analyzer Basics	1 &2
3	Modulation and Coding Techniques	2, 3, 5	Lecture and Lab work on Spectrum Analyzer and RF signal Generator	Professor's notes
4	Evolution and Deployment of Cellular Telephone Systems	2, 3, 7	Lecture and Lab Hands on Spectrum Analyzer and Network Analyzer	2
5	Common Cellular System Components	2, 3, 8	Lecture and Lab work on Agilent Signal Analyzer	3 & Professor's notes
6	Wireless Network Architecture and Operations	2, 3, 9, 10	Lecture and Lab work on time domain analysis	4 & Professor's notes
7	Midterm Exam			
8	<i>INTERSESSION WEEK</i>			
9	GSM and TDMA Technology – Part I	2, 3, 10, 11	Lecture and Lab work on frequency domain analysis	5
10	GSM and TDMA Technology – Part II	2, 3, 10, 11	Lecture and Lab work on AM signal	5
11	CDMA Technology – Part I	2, 3, 10, 11	Lecture and Lab work on FM signal	6
12	CDMA Technology – Part II	2, 3, 10, 11	Lecture and Lab work on GSM signal	6
13	Cellular Wireless Data Networks – 2.5G (GPRS, EDGE, HSCSD, IS95B) and 3G (WCDMA, CDMA2000, HSPA, UMTS) Systems	2, 3, 10, 11	Lecture and Lab work on WCDMA signal	7 & Professor's notes
14	4G (LTE and IEEE Standards)	2, 3, 12	Lecture and Lab work on CDMA2000 signal	9, 10, 11 & Professor's notes
15	Final Exam			

For information on withdrawing from this course without academic penalty, please refer to the College Academic Calendar: <http://www.georgebrown.ca/Admin/Registr/PSCal.aspx>