HUMBER

Faculty:

Program Coordinator(s): George Livanos/Savdulla Kazazi

Associate Dean: Shaun Ghafari, PhD, P. Eng.

Course Outline

Academic Year: 2020/2021

Course Name: TECH 101 (Electric Circuits)

Land Acknowledgement

Humber College is located in Adobigok, known as "Place of the Black Alders" in the Ojibwe Anishinaabe language. It is uniquely situated along GabeKanang Ziibi, the Humber River providing an integral connection for Indigenous peoples between the northern shore of Lake Ontario and the Lake Simcoe Georgian Bay region. In Honouring the Land, we are walking in the moccasin tracks of our ancestors and leaving our footprints for the future generations to come.

Faculty	Faculty of Applied Sciences and Technology
Program	Electronics Engineering Technology, Electrical Engineering Technology, Computer Engineering Technology, Computer Systems Technician – ITS Infrastructure and Services.
Course Name:	TECH 101 (Electric Circuits)
Pre-Requisite(s)	None
Co-Requisite(s)	None
Pre-Requisite(s) for	TECH 150, TECH 156

Equates	None
Restrictions	None
Credit Value	6
Total Course Hours	84

Developed By:

Approved by: 

Course Description

This is an introductory course on basic concepts of D.C. voltage, current flow and resistance. The students learn to do analysis of series, parallel, and series-parallel circuits using the classic circuit theorems. They learn to calculate the current or voltage at any point in a resistive network. Power and efficiency are studied. The students also learn sinusoidal and square waves and their characteristics. They also learn the behavior of capacitors in DC conditions. Complementary laboratory work includes the use of multimeters, oscilloscopes, power supplies, and signal generators.

Course Rationale

A basic understanding of voltage, current, resistance and power in DC electronic circuits forms an essential background of study and a foundation for further courses.

Program Learning Outcomes Emphasized in this Course:

Electronics Engineering Technician/Technology

1. Analyze, interpret, modify, design and produce electrical and electronics drawings, layouts and reports.
2. Analyze and solve technical problems related to electronics engineering by applying principles of advanced mathematics and science.
3. Apply appropriate troubleshooting techniques to electronic circuits or systems and generate and perform test procedures.
4. Design, analyze and troubleshoot circuits consisting of passive components by applying appropriate measurement techniques.

Electrical Engineering-Control Technician/Technology

1. Analyze, interpret, and produce electrical and electronics drawings, technical reports including other related documents and graphics.
2. Analyze and solve complex technical problems related to electrical systems by applying mathematics and science principles.
3. Design, use, verify, and maintain instrumentation equipment and systems.
4. Design, assemble, test, modify, maintain and commission electrical equipment and systems to fulfill requirements and specifications under the supervision of a qualified person.
5. Design, assemble, analyze, and troubleshoot electrical and electronic circuits, components, equipment and systems under the supervision of a qualified person.
6. Design, install, analyze, assemble and troubleshoot control systems under the supervision of a qualified person.
7. Use computer skills and tools to solve a range of electrical related problems.
8. Prepare reports and maintain records and documentation systems.
9. Apply and monitor health and safety standards and best practices to workplaces.
10. Perform and monitor tasks in accordance with relevant legislation, policies, procedures, standards, regulations, and ethical principles.
11. Configure installation and apply electrical cabling requirements and system grounding and bonding requirements for a variety of applications under the supervision of a qualified person.
12. Design, commission, test and troubleshoot electrical power systems under the supervision of a qualified person.
13. Select and recommend electrical equipment, systems and components to fulfill the requirements and specifications under the supervision of a qualified person.

Essential Employability Skills Emphasized in this Course:

Essential Employability Skills are transferable skills that provide the foundation for a student's academic, vocational, and personal success.

Communication Skills	x
Critical Thinking and Problem Solving	x
Interpersonal	x

Numeracy	x
Information Management	x
Personal	x

Course Format(s)

The instructional format of the class will include Interactive lecture and discussion, class discussions, audio-visual presentations, small group discussions, formal lectures, tutorial sessions and labs.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Describe the concepts of voltage, current, resistance, and power in D. C. electric circuits including symbols and units for each.
2. Analyze series resistive and parallel resistive electric circuits to determine all D.C. voltages, currents, power and equivalent circuit resistance using Ohm's Law, Kirchhoff's Voltage Law and apply resistor color codes to determine the values of the individual resistors.
3. Perform calculations using the Voltage Divider and Current Divider principles to determine D.C. voltages and currents in electric circuits.
4. Describe the concepts and characteristics of ideal and real voltage and current sources.
5. Use the Superposition, Thevenin, and Norton Theorems to simplify and perform calculations on complex D.C. electric circuits.
6. Define and perform calculations for the amplitude and time domain parameters (RMS, Peak, Peak-Peak, Period, Frequency etc.) for sinusoidal and square wave AC waveforms.
7. Describe the construction of, types of and identify values of and the behavior of capacitors in D.C. electric circuits.
8. Explain the operation of and perform calculations using capacitors in charge/discharge circuits, bypass and coupling applications.
9. Demonstrate competency in building electric circuits and use standard electronic test equipment (DVMs, Oscilloscopes, D.C. Power Supplies and Function Generators) to measure voltage, current, and resistance in these circuits.

Assessment Weighting

Given the circumstances due to COVID-19, Humber reserves the right to alter the mode of delivery and examinations/assessments in this course.

Assessment	**Weight**
Test 1	20%
Test 2	20%
Test 3	20%
Tutorials/Quizzes	10%

Labs and Lab Test, 15% and 15% - In process evaluation	30%
Total	**100%**

School Specific Field:
As a college student, you are responsible for attendance, punctuality, and facilitating a positive and productive learning environment. There is a strong connection or relationship between attendance and grades: higher grades are associated with regular class attendance.
Late assignments are subject to a reduction in the grade earned. Barring extraordinary circumstances such as for which documentation may be required, late penalties are 5% for assignments received later the same day and 10% per day.

A passing grade for this course is 50%. To get an overall passing grade in this course, students must independently pass the Tests and the Labs/Assignments portions of the course. If one or more of these sections is less than 50% then the final grade for the course will be the lower of the two marks.

Modules of Study

Module and topic	Course Learning Outcomes	Resources	Assessments
1 Quantities and Units	Units of measurements Scientific notation Engineering notation and Metric Prefixes Metric Unit Conversions Significant Digits Rounding off numbers	Chapter 1 Lab safety and precautions (Text book pages: 58 – 61) Lab 0 – Lab safety rules and lab policies. Identification of the equipment in the lab. Analog and Digital meters Lab Manual Lab 1 Evaluation and Review Questions on Units and Measurements	Lab 0 – Lab safety rules and lab policies. Identification of the equipment in the lab. Analog and Digital meters Lab Manual Lab 1 Evaluation and Review Questions on Units and Measurements

2 Voltage, Current and Resistance	Atomic structure Categories of materials Electric Charge and unit of charge Voltage and basic voltage sources Current and ideal current source Resistance and unit of resistance Types of resistors Color codes and value of resistors Resistance of wires Basic Electric circuit Electrical Safety	Chapter 2 Lab Manual	Lab 2 Evaluation and Review Questions on different analog and digital meters and setting different scales and reading values of analog and digital meters Lab 3 Measurement of Resistance. Color coded values, resistor values using the Ohmmeter. Potentiometer and variable resistor using potentiometer.
3 Ohm's Law	Relationship among Current, Voltage and Resistance Linear relationship (graphical representation of linear relationship) Current calculations Voltage calculations Resistance calculations Applications and troubleshooting	Chapter 3 Lab Manual	Lab 4 Ohm's Law
4 Energy and Power	Energy Power	Chapter 4 Lab Manual	

Chapter 4 Lab Manual 5 Series Circuits	Kilowatt-hour and unit of energy Power in Electric circuit Resistor power ratings Energy conversion and voltage drop in resistors Power supplies and batteries Ampere-Hour ratings of batteries Resistors in series Total (equivalent) resistance in a series circuit Current in series circuit Voltage calculations in a series circuit Power calculations in series circuits Voltage sources connected in series Kirchoff's Voltage Law Voltage divider circuits Potentiometer and voltage divider Applications of series circuits and voltage divider circuits Troubleshooting (open and short circuited)..	Chapter 5 Lab Manual Chapter 6 Lab Manual	Lab 5 Power in DC Circuits Lab 6 Series Circuits Lab 7 The Voltage Divider Lab 8 Circuit Ground

6 Parallel Circuits	Resistors connected in parallel Voltage in a parallel circuit Kirchoff's Current Law Total Parallel Resistance Conductance and units of conductance Ohms law and parallel circuits Current sources connected in parallel Current divider circuits Power calculations in a parallel circuit Applications of parallel circuits Troubleshooting with open and short circuited branch resistors	Chapter 7 Lab Manual	Lab 9 Parallel Circuits
7 Series-Parallel Circuits	Identification of series and parallel relationship in a given circuit Analysis of series parallel resistive circuits Determining the total resistance, total current and the total voltage across series-parallel combination in a circuit Determine voltage, current and power dissipation in each component		Lab 10 Series-Parallel Combination Circuits

8 Circuit Theorems and Conversions	in a series-parallel combination of resistors Determine branch current in a series-parallel circuit Determine voltage drops in each branch Voltage dividers and resistive loads Load current and Bleeder current Loading effect of a voltmeter Applications of Series-Parallel resistive circuit DC Voltage source and loading of voltage source DC Current source DC Source Conversions The Superposition Theorem Thevenin's Theorem Applications of Thevenin's theorem Norton's Theorem Applications of Norton's theorem Maximum Power Transfer Theorem Application of maximum power transfer theorem	Chapter 8 Lab Manual Chapter 11 (Pages: 420 – 429) and related end problems Lab Manual	Lab 11 The Superposition Theorem Lab 12 Thevenin's Theorem

9 Introduction to Alternating Current and Voltage	Sinusoidal waveform Period of a sine wave Frequency of a sine wave Peak value and Peak-to-Peak value of a sine wave RMS value of a sine wave Square wave, time period and frequency of a square wave	Chapter 12 (Pages: 484 – 513) and related end problems	Lab 18 Sine-Wave Measurements
10 Capacitors	Construction of a capacitor Capacitance and units Relationship among Capacitance, charge and voltage Voltage rating of capacitor Physical characteristics of capacitor Types of capacitors Labeling of capacitors Capacitors connected in series Capacitors connected in parallel Capacitors connected in series-parallel combination Capacitors in DC circuits Charging and discharging capacitors and time-constant		Lab Experiment: Charging Time constant and Discharging Time constant

Please note: this course schedule may change as resources and circumstances require.

Required Resources, Tools and/or Equipment:

Text book: Floyd, Thomas L., Buchla, David M. (2020). *Principles of Electric Circuits: Conventional Current Version (10th Ed.).* Upper Saddle River, NJ: Pearson. ISBN: 9780134879482

Lab book: Buchla, David M. (2020). *Experiments in Basic Circuits: Theory and Application (10th Ed.).* Upper Saddle River, NJ: Pearson. ISBN: 9780134879987

Bundle: Note that the two titles above are packaged together and are sold by Humber's bookstore as such, under a single ISBN number; ISBN-13: 9780136596769. All students are expected to buy these books as a package. The pages of the lab book are perforated, so that the result sheets can be torn out and submitted to the lab instructor after they are completed. Note that this textbook and the accompanying lab book will be used also for TECH 156, AC Circuits, in the 2nd semester.

Additional items required:
Electronics Parts Kit – mandatory for all students
Scientific Calculator

Supplemental Resources:

Digital Multimeter

Prior Learning Assessment and Recognition (PLAR)

Students who have prior learning in the material of this course may be eligible for a course credit in recognition of their prior learning. The following table indicates the method that is used to assess prior learning for this course, or it indicates that such an assessment is not available. Students must apply for consideration for a prior learning assessment through the Office of the Registrar, and there is usually a fee associated with the application.

Portfolio	Challenge Exam	Skills Test	Interview	Other (Specify)	Not Available For PLAR
☐	x	x	x	☐	☐

Policies and Procedures
It is the student's responsibility to be aware of their obligations under Humber Policies and Procedures.

Academic Regulations
It is the student's responsibility to be aware of the College Academic Regulations. The Academic Regulations apply to all applicants to Humber and all current students enrolled in any program or course offered by Humber, in any location. Information about **academic appeals** is found in the Academic Regulations.

Accessible Learning Services
Humber strives to create a welcoming environment for all students where equity, diversity and inclusion are paramount. Accessible Learning Services facilitates equal access for students with disabilities by coordinating academic accommodations and services. Staff in Accessible Learning Services are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. If you require academic accommodations, contact:
Accessible Learning Services: http://www.humber.ca/student-life/swac/accessible-learning
North Campus: (416) 675-6622 X5090
Lakeshore Campus: (416) 675-6622 X3331

Academic Integrity
Academic integrity is essentially honesty in all academic endeavors. Academic integrity requires that students avoid all forms of academic misconduct or dishonesty, including plagiarism, cheating on tests or exams or any misrepresentation of academic accomplishment.

Disclaimer

While every effort is made by the professor/faculty to cover all material listed in the outline, the order, content, and/or evaluation may change in the event of special circumstances (e.g. time constraints due to inclement weather, sickness, college closure, technology/equipment problems or changes, etc.). In any such case, students will be given appropriate notification.

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