Course Code:	1301ENG
Course Name:	Electric Circuits
Semester:	Trimester 2, 2018
Program:	Diploma of Engineering
Credit Points:	10
Course Coordinator:	Dr James A. Kirkup
Document modified:	4th May 2018

Teaching Team

Your lecturer/tutor can be contacted via the email system on the portal.

Dr James Kirkup: james.kirkup@staff.griffithcollege.edu.au

Staff Consultation

Your lecturer/tutor is available each week for consultation outside of normal class times. Times that your lecturer/tutor will be available for consultation will be given in the first week of lectures. A list of times and rooms will be published on the Griffith College Portal under the “MYSTUDY” link.

Prerequisites

Students are required to have completed 1018ENG Engineering Science before undertaking this course.

Brief Course Description

Electric Circuits is a 10 credit point course within the Diploma of Engineering. The course is situated within the second semester of the program. The Diploma of Engineering is designed to provide students with a pathway to:

* further university studies in Engineering and related degrees; or
* direct employment.

This course introduces students to four fundamental engineering concepts related to electrical and electronic engineering: storage of electrical energy and transport of an electrical charge, interconnection of passive components to make small or large systems, operation of systems under conditions of constant electrical load or excitation, and the operation of systems under conditions of variable electrical load or excitation. The concepts are studied using the physical processes within the components and circuits of electrical systems in a practical context. The fundamental rules used to analyse electrical circuits are also covered in the course.

Rationale

Electrical Circuits, within the Diploma of Engineering, is an important foundation course for degree programs in Engineering. The course is also an important foundation for graduates wishing to commence employment in relevant fields.

Aims

The aim of this course is to introduce students to the principles and practice of electrical and electronic engineering. In the process the course will cover the basic concepts of DC and AC circuits, the behaviour of various electronic components, systems for electronic measurement of engineering processes, electrical generation, distribution and safety, and electrical and electronic systems and circuits.

Much of engineering practice involves the detection and measurement of various engineering and physical properties (like force and deflection). As most detection and measurement systems are currently electronic in nature, knowledge of the fundamental principles of electric circuits is essential for all engineers.

To enable students to develop an understanding of measurement systems and their applications, the course will cover concepts of DC and AC electric circuits, AC to DC conversion and the processing of signals. As the application of these systems often involves mains power, electrical power generation, distribution and safety will be covered.

Learning Outcomes

After successfully completing this course students will be able to:

1. Describe the purpose and use of simple circuit components, devices and signal sources;
2. Analyse and apply established theoretical laws and frameworks on simple electrical and electronic circuits;
3. Design, construct and test simple circuits;
4. Use typical electronic laboratory instruments utilized in various engineering disciplines for the measurement of electrical quantities including, voltage, current, resistance and power;
5. Produce written technical reports, both individually and in groups, from practical activities that display and analyse results while providing logical and comprehensive conclusions;
6. Understand the principles of generation, distribution and safety systems of electrical power.

Texts and Supporting Materials

Learning Resources

Boylestad, Robert, L., 2016 Introductory Circuit Analysis, Global Edition, 13/E, Pearson Education, ISBN-10: 1292098953, ISBN-13: 9781292098951.

Secondary (Optional)

Hambley, A.R., (2017) Electrical Engineering: Principles & Applications, 7/E (5th Edition or greater acceptable) Pearson Education, United States, ISBN-13: 9780134484143.

Organisation and Teaching Strategies

Summary of student contact hours in the semester:

Total number of Lectures (hours): 11 lectures x 2 hours = 22 hours (week 12: revision)
Total number of tutorial/workshops (hours): 10 weeks x 2 hours = 20 hours
Total number of Laboratories (hours): 10 weeks x 2 hours = 20 hours

The laboratories will consist of the following.
Scaffolding laboratory 1: Introduction to Electronic Lab & Circuits, 1 week x 2 hours
Project 1 computer laboratories 4 weeks x 2 hours = 8 hours
Scaffolding laboratory 2: Electrical measurements & AC to DC conversion, 1 week x 2 hours
Project 2 laboratories – 4 weeks x 2 hours = 8 hours

The lectures will provide theoretical and practical understandings of the content areas. Where possible the development of course material will be problem based. Problem solving exercises, elaborating the lecture material, will be introduced during the lecture time. During lecture sessions the relationships between content segments will be highlighted.

The tutorials will provide students with the opportunity to clarify their own ideas on the content material, and to develop necessary problem solving skills. Problem solving

techniques will be emphasised. The sessions also provide students with the opportunity to seek further explanation of concepts introduced in lecture sessions. The workshop provides you with practical questions to be completed in class to demonstrate your level of competency. The tutor will guide you through the process as needed.

There will be a weekly online or in-class multiple choice quiz to promote some independent (blended) learning.

The laboratory sessions, where students work in groups, will provide students with the opportunity to clarify their own ideas on the content material, to develop teamwork and necessary problem solving skills, and to develop written communication skills. In addition to demonstrating physical concepts, the sessions will assist students to develop competency in engineering measurement skills. The laboratory sessions will incorporate experiential learning concepts where students will learn through refection on doing.

You are expected to commit, on average, 1 hour per credit point per week on course related activities. Attendance at lectures, tutorials and workshops is a requirement. In independent study time you are expected to read the prescribed text, complete weekly exercises in your workbook and prepare for summative assessment. It is not expected that the workload should exceed normal expectations for a 10 credit point course.

Failure to attend contact sessions and participate in tutorials and workshops may be taken into consideration if you request out of hours assistance or special consideration.

WARNING: If you arrive 15 minutes late to laboratory classes you will be turned away. You cannot change lab groups without permission of the Course Convenor.

Class Contact Summary

Attendance

You will greatly advance your chances of success in the course by fully using the contact time you have available with your lecturers and tutors. The contact time provided in lectures, tutorials, workshops and consultation is for your benefit; it is your opportunity to have any questions about course content or requirements clarified.

Participation in Class

You are expected to actively participate in classes each week.

Consultant Times

Attendance during consultation times is optional but you are encouraged to use this extra help to improve your learning outcomes.

Course Materials

Lecture notes will be made available to you on the Learning@Griffith College site on the student portal and you are advised to print these out and bring them to each class so that extra notes can be added.

Active Learning

You are expected to reinforce your learning gained during contact time by undertaking sufficient independent study. For this 10 CP course, you will need to spend at least 10 hours per week engaged in activities that will help your learning and fulfill the course objectives. Thus, provided you have well used the class contact hours per week, you would then complete addition hours (at least up to 10 hours) per week of independent study.

Program Progression

You are reminded that satisfactory Program Progression requires that attendance in classes is maintained at equal to or greater than 80%, and that GPA is maintained at equal to or greater than 3.5 [please see Griffith College Policy Library - Program Progression Policy - for more information].

Content Schedule

Weekly Teaching Schedule

Week	Topic	Activity	Readings
1	Introductory Concepts	Lecture	Boylestad Chapters 1 - 4
	Introduction to the course and content. Charge, electric field, current, voltage, power, measuring voltage and current, circuit elements, basic circuit laws, conductors and insulators.		
	No Laboratory this week		
2	Basic Electrical Concepts	Lecture	Boylestad Chapters 5 - 9
	Charge, electric field, voltage, current, power, circuit elements, and basic circuit laws including voltage and current divider rule, Kirchoff's voltage and current laws and power dissipation.	Tutorial	
	Project 1	Project	
	Scaffolding Lab 1	Laboratory	
3	Resistive Circuits	Lecture	Boylestad

	Resistance in series and parallel, equivalent resistance, voltage and current divider circuits, ammeter and voltmeter, node and mesh analysis, Thevenin and Norton Equivalent, superposition principle, Wheatstone bridge.	Tutorial	Chapter 9
	Computer Lab	Laboratory	
4	Capacitance:	Lecture	Boylestad Chapter 10
	Electrostatics, electric charge, Coulomb's law, electric field, electric potential, dielectrics , physical design equation, series and parallel.	Tutorial	
	Computer Lab	Laboratory	
5	Inductance	Lecture	Boylestad Chapter 11-12, 23
	Electromagnetics, Magnetism, magnetic field, magnetic induction, Faraday's law, Lenz's law, transformers, physical design equation, series and parallel.	Tutorial	
	Computer Lab	Laboratory	
6	DC RCL Circuits	Lecture	Boylestad Chapter 10-12
	DC Charge/Discharge, time constant, transients, DC steady state.	Tutorial	
	Computer Lab	Laboratory	
7	AC RLC Circuits	Lecture	Boylestad Chapter 13
	Sinusoidal signal representation, phasors, average and effective values (RMS), power in ac circuits, AC generation, Wheatstone Bridge.	Tutorial	
	Project 2	Project	
	Scaffolding lab 2	Laboratory	

	Mid-Trimester Exam (time and venue to be advised)	Examination	
8	Steady state sinusoidal analysis	Lecture	Boylestad Chapter 13-20
	AC response of capacitors and inductors, reactance and impedance, filters, capacitor and inductor balancing, resonance.	Tutorial	
	Computer Lab	Laboratory	
9	AC Electrical Circuits	Lecture	Boylestad Chapters 13-20,
	AC voltage, current and power, complex numbers, phasor analysis, power in ac circuits.	Tutorial	
	Computer Lab	Laboratory	
10	AC to DC Conversion	Lecture	Boylestad Chapter 7
	A basic introduction to AC to DC conversion.	Tutorial	
	Computer Lab	Laboratory	
11	Electrical Power and Safety	Lecture	Boylestad Chapters 4, 20, 24
	Principle of operation single and three phase generators and motors. Power generation, distribution, and usage. Electrical safety including fuses, circuit breakers, earth leakage and earthing systems.	Tutorial	
	Computer Lab	Laboratory	
12	Final Exam Revision	Lecture	
13/14	**Final Exam (time and venue to be advised)**	Examination	

Assessment

This section sets out the assessment requirements for this course.

Summary of Assessment

Item	Assessment Task	Weighting	Relevant Learning Outcomes	Due Date
1	Test or quiz In Class Quizzes	10%	1,2,6	Weeks 2 - 11
2	Scaffolding Lab 1	5%	1,2,3,4,5	Week 2
3	Project 1	10%	1,2,3,4,5	Week 6
4	Mid-Trimester Exam	15%	1,2	Week 7
5	Scaffolding Lab 2	5%	1,2,3,4,5,6	Week 7
6	Project 2	20%	1,2,3,4,5,6	Week 12
7	Final Exam	35%	1,2,6	Examination Period

Assessment Details

Weekly Quizzes

Each week there will be an online or in-class multiple choice quiz to promote some independent (blended) learning. Out of the 10 quizzes for the course the student's top five Quiz marks will be counted towards a maximum of 10% where each quiz is worth 2%. There is no deferment or repeat of a quiz no matter what reason.

Scaffolding Laboratory

The Scaffolding Laboratory activities will be used to verify fundamental laws of various electrical systems and provide additional foundation learning for the course projects.

Scaffolding Laboratory 1

This laboratory covers the use of a Digital Mustimeter (DMM) to measure Voltage, Current and Resistance, to examine resistors and capacitors and their naming codes and to consider various electrical circuit concepts using a variety of light bulb circuits.

Scaffolding Laboratory 2

This laboratory introduces students to basic Electrical/Electronic test and measurement equipment (Digital Storage Oscilloscope & Signal Generator) by investigating simple AC to DC conversion through the use of transformers, rectifiers and regulators.

Criteria & Marking:
Each scaffolding laboratory worksheet will be marked out of ten (10) with each worth 5%. Marks will be deducted for incomplete or incorrect work.

Computer Laboratory

There are four computer laboratory sessions available for each project. There is no grading for these sessions. Students are expected to use these sessions towards the completion of their projects.

Projects

Students are required to complete two projects during the course using circuit simulation software (Tinkercad and Lushprojects). These projects are circuit-based practical development exercises using real world examples. Details of the task for each project will be provided on an assignment sheet that will be available from the course website.

Project 1 is a group based project following on from scaffolding lab 1 and the content covered in the lectures. Project 1 is due in week 6.

Criteria & Marking:
A report based on the project task and final product. Marking will be done by rubric given at the start of the semester. Report Presentation: 15%. Product and Deliverables: 85%.

Project 2 is an individual based project following on from scaffolding lab 2 and the content covered in the lectures. Project 2 is due in week 12.

Criteria & Marking
A report based on the project task and final product. Marking will be done by rubric given at the start of the semester. Report Presentation: 15%. Product and Deliverables: 85%.

Mid-Trimester Exam

The 2 hour mid-trimester exam is a closed book exam, which covers weeks 1 to 6 of the course content. The 2hr closed-book assessment will evaluate theoretical understanding of electric circuits.

Final Exam

The 2 hour final exam is a closed book exam, which covers weeks 7 to 12 of the course content including some underlying content from weeks 1 to 6. The 2hr closed-book assessment will evaluate theoretical understanding of electric circuits.

Rationale for Assessment

Both the mid-trimester and final examinations are both knowledge based and problem solving. They are designed to assess the ability of the student to bring together the topics covered in lectures and experience from the workshops, and to develop the ability to apply that knowledge to the solution of practical problems.

The scaffolding laboratory worksheets are designed to encourage students to develop a solid understanding of the concepts being covered in the laboratory sessions and their electronics skills. Students are required to demonstrate to the laboratory demonstrator, in laboratory classes, that they have completed and understood all the requirements of each activity. These scaffolding laboratories provide a foundation for the course projects.

Submission and Return of Assessment Items

Submitted laboratory worksheets and documentation are not returned.

Retention of Originals

You must be able to produce a copy of all work, except laboratory worksheets submitted if so requested. Copies should be retained until after the release of final results for the course.

Extensions

To apply for an extension of time for an assignment, you must submit an Application for Extension of Assignment form to your teacher at least 24 hours before the date the assignment is due. Grounds for extensions are usually: serious illness, accident, disability, bereavement or other compassionate circumstances and must be able to be substantiated with relevant documentation [e.g. Griffith College Medical Certificate]. Please refer to the Griffith College website - Policy Library - for guidelines regarding extensions and deferred assessment.

Assessment Feedback

Marks awarded for assessment items will also be available on the on-line grades system on the Student Website within fourteen [14] days of the due date.

Generic Skills

Griffith College aims to develop graduates who have an open and critical approach to learning and a capacity for lifelong learning. Through engagement in their studies, students are provided with opportunities to begin the development of these and other generic skills.

Studies in this course will give you opportunities to begin to develop the following skills:

Generic Skills	Taught	Practiced	Assessed
Written Communication	Yes	Yes	Yes
Oral Communication		Yes	
Information Literacy	Yes	Yes	Yes
Secondary Research			
Critical and Innovative Thinking	Yes	Yes	Yes
Academic Integrity		Yes	Yes
Self Directed Learning		Yes	
Team Work		Yes	
Cultural Intelligence		Yes	
English Language Proficiency		Yes	

Additional Course Generic Skills

Specific Skills	Taught	Practiced	Assessed
Ethical behaviour in social/professional/work environments	Yes	Yes	Yes
Work autonomously	Yes	Yes	Yes

Additional Course Information

Teacher and Course Evaluations

Your feedback is respected and valued by your lecturers and tutors. You are encouraged to provide your thoughts on the course and teaching, both positive and critical, directly to your lecturer and tutor or by completing course and lecturer evaluations via Griffith College's online evaluation tool whenever these are available.

Academic Integrity

Griffith College is committed to maintaining high academic standards to protect the value of its qualifications. Academic integrity means acting with the values of honesty, trust, fairness, respect and responsibility in learning, teaching and research. It is important for students, teachers, researchers and all staff to act in an honest way, be responsible for their actions, and

show fairness in every part of their work. Academic integrity is important for an individual's and the College's reputation.

All staff and students of the College are responsible for academic integrity. As a student, you are expected to conduct your studies honestly, ethically and in accordance with accepted standards of academic conduct. Any form of academic conduct that is contrary to these standards is considered a breach of academic integrity and is unacceptable.

Some students deliberately breach academic integrity standards with intent to deceive. This conscious, pre-meditated form of cheating is considered to be one of the most serious forms of fraudulent academic behaviour, for which the College has zero tolerance and for which penalties, including exclusion from the College, will be applied.

However, Griffith College also recognises many students breach academic integrity standards without intent to deceive. In these cases, students may be required to undertake additional educational activities to remediate their behaviour and may also be provided appropriate advice by academic staff.

As you undertake your studies at Griffith College, your lecturers, tutors and academic advisors will provide you with guidance to understand and maintain academic integrity; however, it is also your responsibility to seek out guidance if and when you are unsure about appropriate academic conduct.

In the case of a breach of academic integrity made against a student he or she may request the guidance and support of a Griffith College Student Learning Advisor or Student Counsellor.

Please ensure that you are familiar with the Griffith College Academic Integrity Policy; this policy provides an overview of some of the behaviours that are considered breaches of academic integrity, as well as the penalties and processes involved when a breach is identified.

For further information please refer to the Academic Integrity Policy on the Griffith College website – Policy Library.

Risk Assessment Statement

There are no out of the ordinary risks associated with this course.

Note: For all Diploma level programs, Griffith College acknowledges content derived from Griffith University.