School of Minerals and Energy Resources Engineering

T2, 2020
Course Outline

MINE2610
Mining Services (Electrical and Surveying)

COURSE STAFF

Course Convenor and teacher of Electrical component:
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*The surveying specific matters in this course outline begin on page 8.

Consultations: You are encouraged to ask questions on the course material, after the class times and via email. Lecturer consultation times will be advised on Moodle. ALL email enquiries should be made from your student email address with MINE2610 in the subject line, otherwise risk not being answered.

Keeping Informed: Announcements may be made during classes, via email (to your student email address) and/or via online learning and teaching platforms – in this course, we will use Moodle https://moodle.telt.unsw.edu.au/login/index.php and MS Teams. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

COURSE SUMMARY

Contact Hours

Lecture:	Week 1 – Introduction, online. Pre-recorded video lectures provided. Lecture time used for tutorial and problem solving support. No additional face-to-face lectures required.			
Lec/Tutorials:	Tue	9am-11pm	Week 1,2,3,4	Online
Laboratories:	Wed	1pm-3pm	Week 1,2,3,4	Online

No other contact hours required for the Electrical Engineering part of the course.

Context and Aims

MINE2610 (Electrical) is an introduction to Electrical Engineering. It gives an overview of the fundamental aspects of electrical engineering. The course provides an introduction to electrical principles and provides basic technical skills to analyse simple practical circuits. In the practical section it provides experience in analysing simple circuits. It is packaged in such a way that students, having taken this course, can recognise, identify and analyse relevant practical, useful circuits and devices afterwards.

Indicative Learning Schedule

Indicative Lecture Schedule

Period	Lecture Set No.	Summary of Lecture Program
Week 1	1	Introduction, Circuit Basics Overview + Lab Safety.
Week 2	2	Kirchhoff's laws, Series & Parallel
Week 3	3	Node Equations & Circuit analysis
Week 3	4	Power & Energy
Week 4	6	Introduction to inductors and capacitors, alternating current
Week 6		Consultation, no lecture, tutorial or lab
Week 7		**Midsession exam**

Indicative Laboratory Schedule

Period	Summary of Laboratory Program
Week 1	Familiarisation
Week 2	Series & Parallel Circuits
Week 3	KCL & KVL
Week 4	Power & Energy

Assessment

You are expected to view all lectures and attend all tutorials, labs and quizzes, in order to maximize learning. **It is important to prepare your tutorial questions in advance of attending the tutorial**

classes. **You must prepare well for your laboratory classes, and will be tested on this preparation at the beginning of each lab exercise**. In addition to the lecture notes, you should read relevant sections of the recommended text. Reading additional texts would further enhance your learning experience. Group learning is also encouraged.

MINE2610 (Electrical)

Activity	Assessment (As total % of course)
Laboratory Practical Experiments	10%
On-line Fortnightly Quizzes **Held in Week 2, 4 worth 10% total.**	10%
Midsession exam	30%
TOTAL	50%

COURSE DETAILS

Credits

Course MINE2610 is 6 UOC course. The expected average workload for the electrical engineering component is approximately 12-14 hours per week from Week 1-4.

Pre-requisites and Assumed Knowledge

There are no pre-requisites for this component of MINE2610.

Working knowledge of basic mathematics including differentiation and integration techniques.

Learning outcomes

After successful completion of this course, you should be able to:

1. Have an understanding of the breadth of Electrical Engineering.
2. Use Kirchhoff's laws, circuit theorems and node voltage methodology to solve simple circuits,
3. Apply simple steady state sinusoidal analysis to circuits.
4. Demonstrate a basic understanding of transformer operation.
5. Demonstrate a basic understanding of electric machines.

This course is designed to provide the above learning outcomes which arise from targeted graduate capabilities listed in ***Appendix A***. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (listed in ***Appendix B***). This course also addresses the Engineers Australia (National Accreditation Body) Stage I competency standard as outlined in ***Appendix C***.

TEACHING STRATEGIES

Delivery Mode

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Lectures provided as pre-recorded videos, which provide you with a focus on the core analytical material in the course, together with qualitative, alternative explanations to aid your understanding.
- Tutorials which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material and
- Laboratory sessions which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, which support and reinforce the lectures and tutorials in understanding the core analytical material.

Lectures

The electrical engineering part of the course will be delivered using pre-recorded video lecture presentations. You will need to watch these video lectures in your own time before the tutorials and labs. Advantages of the video recordings are:

- You will be able to watch them at your own pace.
- You can revisit the lecture content as many times as you like.
- Things that you might miss in a normal live lecture (e.g. difficult mathematical concepts) are available on the recording.

Laboratory

Students are required to attend laboratory from Week 1 to Week 4 as outlined in the Contact hours on Page 1. Laboratory attendance WILL be kept, and student MUST attend at least 3 out of 4 labs.

Students are encouraged to complete the Moodle OH&S Safety course before starting the laboratory component in Week 1 (we will run the lab online this year).

To access the *Moodle OH&S Safety* course, from *Moodle Site Home*, using '*Search courses'*, find '*Electrical OH&S'*. You should be able to enrol and complete the course with the enrolment key "*elecmood*".

Tutorials

Students are required to attend tutorials from Week 1 to Week 4 as specified in the Contact hours on Page 1. **Tutorials are not in place as another form of lecture. It is important that you come to tutorials prepared**. The tutorials will be run in the designated lecture time and will be used as problem solving sessions after the viewing of lecture material.

Note that no marks are awarded directly for any part of the tutorial program in this course. However, they should still be treated as an important aspect of the course, not to be taken lightly. There are two components of the tutorial program:

1. Sets of problems are provided to give the student personal practice in solution and understanding. These problems will be related to recent lecture material with an emphasis on the basic concepts.

2. Demonstrations of important problem solving techniques by tutors.

ASSESSMENT DETAILS

You are expected to view all lectures and attend all tutorials, labs and quizzes, in order to maximize learning. It is important to prepare your tutorial questions in advance of attending the tutorial classes. You must prepare well for your laboratory classes, and will be tested on this preparation at the beginning of each lab exercise. In addition to the lecture notes, you should read relevant sections of the recommended text. Reading additional texts would further enhance your learning experience. Group learning is also encouraged.

As shown in the table of page 2, there are three components to the overall assessment, namely:

Laboratory Assessment

After completing each experiment, your work will be assessed by the laboratory demonstrator. **You have to attend at least 3 out of 4 of the lab weeks AND attain a pass assessment in labs.**

Students must complete the *Moodle OH&S Safety* course before starting the practical laboratory component. If a student attends laboratory sessions without having completed the *Moodle OH&S Safety* course, the marks for those labs will be **zero.**

A satisfactory performance in the laboratory component is a necessary requirement to pass this course. This means that even if you score 100% on the final written examination and on the quizzes, you will not pass the course if your laboratory assessment is not satisfactory.

***In Summary* to pass the laboratory component and therefore the course you MUST do all of the following:**

- **Complete the *Moodle OH&S Safety* course.**
- **You must attend at least 3 out of 4 the lab classes.**
- **Obtain a pass mark average for the laboratory experiments.**

Quizzes

The lecture videos will be split up into approximately 3 “sets”, each being associated with a small online quiz. Only two quizzes are used for assessment. Quizzes must be taken at the end of Weeks 2 and 4, and will be available for 3-4 days only.

Note: Negative Marks

- **The quizzes will attract negative marks for incorrect answers or guessed answers.**

There is no limit to how many times each quiz may be attempted. However the mark which contributes to the final grade will be taken as the maximum of the first and second attempt only.

Midsession examination

The final exam will be a closed book 2-hour exam (until further notice). In principle, the examination may cover any aspect of the course that has been presented in lectures, tutorials and/or laboratories. **You MUST gain a mark of at least 40% in the exam to pass the subject.**

Note: For all class assessment tasks ie Laboratory and quizzes, if the student is unable to attend for medical or other serious reasons (e.g. a death in the family) the student must apply for special consideration. ALL relevant documentation (e.g. medical certificates) must be presented. Please see https://student.unsw.edu.au/special-consideration for more information. In the case of missing a quiz for one of the reasons above, the assessment will most likely be carried over to the final exam ie the final exam will become a higher % of the assessment. Please note that application for special consideration does not guarantee that it will be granted!

Note: For repeat students who have a laboratory exemption, the laboratory exam mark from the previous years WILL NOT be counted again, but the final examination will be worth a higher % of their final mark. **A laboratory exemption is only available on application before the end of Week 5** and is only available to students who had a satisfactory laboratory assessment. All other students who have previously failed this course are expected to attend at their scheduled laboratory times and to repeat all aspects of the laboratory.

Relationship of Assessment Methods to Learning Outcomes

	Learning outcomes				
Assessment	**1**	**2**	**3**	**4**	**5**
Laboratory practical assessments		✓	✓	✓	
Quizzes	✓	-	✓	✓	✓
Exam	✓	✓	✓	✓	✓

COURSE RESOURCES

Textbooks

References

- Allan R Hambley, Electrical Engineering Principles and Applications, Prentice Hall, 2011.
- Alexander & Sadiku, Fundamentals of Electric Circuits, McGraw Hill.
- L.S. Bobrow, Elementary Linear Circuit Analysis, Oxford, 1987 [P621.3192/106].

- R.L. Boylestad, Introductory Circuit Analysis, 9th Edition, Prentice-Hall, 2000 [PQ621.3815/198].

- J.R. Cogdell, Foundations of Electrical Engineering, 2nd Edition, Prentice Hall, 1990 [P621.3/198].

On-line resources

Moodle

As a part of the teaching component, Moodle will be used to disseminate teaching materials, host forums and occasionally quizzes. Assessment marks will also be made available via Moodle: https://moodle.telt.unsw.edu.au/login/index.php.

Mailing list

Announcements concerning course information will be given in the lectures and/or on Moodle and/or via email (which will be sent to your student email address).

SURVEYING MATTERS

In the table below L = on line lec, T = on line tut, all in Blackboard Collaborate via a link in Moodle

Wk	Tue 9 – 11 am	Wed 1 – 3pm
5	L1: Intro to course. Overview of Mine Surveying L2: Heights by Levelling	L3: Angles by theodolite & total station T1: Calculation of Heights by Levelling
7		L4: Distance measurement & Map Projection L5: Coordinate calculations
8	L6: Traverses and Control Surveys T2: Coordinate calculations	L7: Detail surveys, CAD. GIS in mines T3: Traverse calculations
9	L8: GPS. Areas, Volumes. UAV mapping L9: Underground surveys. Shaft surveys	L10: Deformation surveys. Gyrotheodolites T4: Areas, volumes, UG surveys
10	L11: Road surveys at mines L12: Mine surveying legislation. More examples of mine surveying	L13: Revision & tutorial T5: "Past" exam questions

ASSESSMENT IN THE SURVEYING PART OF THE COURSE

Assessment for the course includes:

- Assignment 1: 5 marks — Due at 9am Wed week 8
- Assignment 2: 5 marks — Due at 9am Wed week 10
- Final exam: 40 marks — In formal exam period

Total marks for surveying component: 50

EDUCATIONAL ASPECTS OF THE SURVEYING PART OF THE COURSE

Aim of the Course

This course provides the fundamental principles and relevance of services provided by Surveyors as part of surface and underground mining operations. Topics: Principles of surveying; measurements, calculations, instrument and survey errors; map projection coordinates and calculations; traversing and control surveys; an overview of Geographical Information Systems; GPS positioning; UAV mapping, deformation monitoring surveys; and correlation of surface surveys with underground surveys. The theory presented in lectures will be reinforced with active learning exercises.

Learning Outcomes

By the end of this course students should be able to:

- Critically assess the quality of spatial survey data.
- Undertake basic survey computations from raw field observations to support a range of surveying and engineering applications such as levelling, traversing, detail and contour survey and set-out surveys.
- Actively participate in (but not lead) mine surveys during industrial training placements.
- Understand the basics of relevant surveying technologies and how they are applied at mine sites.
- Appreciate the range of surveying activities at mine sites and that there are legislative requirements.

Teaching Strategies

The surveying teacher in 2020 has taught this course several times. He has also taught Mining Surveying at Postgraduate level with people who work at mine sites and some of their work examples and case studies will be used to illustrate this MINE2610 course. In recent years the surveying classes of MINE2610 were taught jointly with a subset of GMAT1110. In 2020 we return to teaching the Mining Engineering students separately with a smaller class and to

align the course more strongly with mining.

The lectures introduce the course material and are supported by relevant chapters from the reference book for this course (Uren and Price). All notes can be accessed from the class Moodle website. The lectures will be delivered live and recorded via Blackboard Collaborate. Despite this it is **highly recommended that the student attend all lectures**. I will ask questions in the lectures to stimulate debate, deepen your understanding of the topics and to give you some idea of how to apply the theory to real world mining situations. Students are encouraged to talk with microphone or typed chat during the lectures. Some reading of reference material and practice with calculations outside of class is expected.

Active learning classes will support the lectures. The questions can be accessed from the class Moodle website. This course is computational in nature and it is very important that the student practice all of the problems prior to the examination. The problems are very similar to the questions you could expect in the final exam.

Two new assignments have been set to help the student appreciate how to apply basic surveying techniques to real world situations. in a COVID19 restriction environment.

Suggested Learning Methods

Download course notes from the webpage and read them. Read chapters in the reference book to help your understanding, but don't try to memorise everything. It is not necessary to take detailed notes in lectures. However, it is important to complete all the tutorials and practical reports. Further, be involved in the field practical and prepare for it, don't just be a tag along member of the group otherwise you won't learn much. For the tutorials I will put the questions and answers on the web site when we commence the relevant topic, but I will not put the full worked solutions onto the web site until students have had time to tackle the problems. The worked solutions will be available before the examination, but simply reading a solution instead of solving the problem yourself will give you a false confidence and a lack of ability.

Students will be expected to follow carefully the timetable given in this document and attend all classes.

UNSW Graduate Attributes

This surveying part of this course provides an environment that fosters in our students the following attributes is listed:

the skills involved in scholarly enquiry	Significant problem solving
an in-depth engagement with relevant disciplinary knowledge in its interdisciplinary context	Some – applying surveying to mining
the capacity for analytical and critical thinking and for creative problem solving	Significant – in assignments and in tutorials
the ability to engage in independent and reflective learning	Some
the skills to locate, evaluate and use relevant information (Information Literacy)	Some – a wide range of reference material
the capacity for enterprise, initiative and creativity	Some
an appreciation of, and a responsiveness to, change	Some – applying new surveying methods to old or existing problems
a respect for ethical practice and social responsibility	Some – understanding the importance of surveying contributions to mine safety, and the environment
the skills of effective communication	Minor, assignment reports

COURSE SURVEYING RESOURCES

Lecture Material (check the course Moodle website):

The PowerPoint lecture slides, instructions for field practicals, and questions are available for download as PDF files at the course website.

Text and Reference Books

It is not compulsory to but a textbook for this course, but the following books in our library do provide useful reading material. Newer editions are fine ☺. There are other similar books which are also useful.

Uren, J & Price, WF. (2010) "Surveying for Engineers", 5th edition

Schofield, W. & Breach, M. (2007) "Engineering Surveying", 6th edition.Elsevier.

Bannister, A., Raymond, S. Baker, R. (1992) Surveying, 6th Edition, Pitman, London. Or later editions.

Kavanagh, B.F. (2003) Surveying: Principles and Applications, 6th Ed, Prentice Hall, ISBN 0-13-099582-7

Computational Aids

Students are required to provide their own pocket calculators for examinations, and for use in all classes in this course. The type of calculator allowed is described by the University. Students will be expected to have access to MS Excel. Students will be expected to have access to a mobile smart phone with GPS or GNSS on board for one assignment. If this type of phone is not available, please contact the lecturer asap.

OTHER MATTERS

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see:

http://www.lc.unsw.edu.au/plagiarism.
To find out if you understand plagiarism correctly, try this short quiz:
https://student.unsw.edu.au/plagiarism-quiz.

Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://my.unsw.edu.au/student/atoz/ABC.html), and particular attention is drawn to the following:

Workload

It is expected that you will spend at least twelve to fourteen hours per week studying a 6 UoC course, from Week 1 until the final assessment, including both face-to-face classes and independent, self-directed study. In periods where you need to need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a common source of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

General Conduct and Behaviour

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

Work Health and Safety

UNSW policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others.

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You should seek assistance early if you suffer illness or misadventure which affects your course progress. All applications for special consideration must be lodged online through myUNSW, not to course or school staff. For more detail, consult:

https://student.unsw.edu.au/special-consideration

Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for all students. Please forward any feedback (positive or negative) on the course to the course convener or via the myExperience survey. As a result of previous feedback obtained for this course and in our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods.

Appendices

Appendix A: Targeted Graduate Capabilities

Electrical Engineering and Telecommunications programs are designed to address the following targeted capabilities which were developed by the school in conjunction with the requirements of professional and industry bodies:

- The ability to apply knowledge of basic science and fundamental technologies;
- The skills to communicate effectively, not only with engineers but also with the wider community;
- The capability to undertake challenging analysis and design problems and find optimal solutions;
- Expertise in decomposing a problem into its constituent parts, and in defining the scope of each part;
- A working knowledge of how to locate required information and use information resources to their maximum advantage;
- Proficiency in developing and implementing project plans, investigating alternative solutions, and critically evaluating differing strategies;
- An understanding of the social, cultural and global responsibilities of the professional engineer;
- The ability to work effectively as an individual or in a team;
- An understanding of professional and ethical responsibilities;
- The ability to engage in lifelong independent and reflective learning.

Appendix B: UNSW Graduate Capabilities

The course delivery methods and course content directly or indirectly addresses a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline, through lectures and solution of analytical problems in tutorials and assessed by assignments and written examinations.
- Developing rigorous analysis, critique, and reflection, and ability to apply knowledge and skills to solving problems. These will be achieved by the laboratory experiments and interactive checkpoint assessments and lab exams during the labs.
- Developing capable independent and collaborative enquiry, through a series of tutorials spanning the duration of the course.
- Developing digital and information literacy and lifelong learning skills through assignment work.
  Developing ethical practitioners who are collaborative and effective team workers through group activities, seminars and tutorials.
- Developing independent, self-directed professionals who are enterprising, innovative, creative and responsive to change, through challenging design and project tasks.
- Developing citizens who can apply their discipline in other contexts, are culturally aware and environmentally responsible, through interdisciplinary tasks, seminars and group activities.

Appendix C: Engineers Australia (EA) Professional Engineer Competency Standard

	Program Intended Learning Outcomes	
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals	✓
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing	✓
	PE1.3 In-depth understanding of specialist bodies of knowledge	
	PE1.4 Discernment of knowledge development and research directions	
	PE1.5 Knowledge of engineering design practice	
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice	
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving	✓
	PE2.2 Fluent application of engineering techniques, tools and resources	✓
	PE2.3 Application of systematic engineering synthesis and design processes	
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability	
	PE3.2 Effective oral and written communication (professional and lay domains)	
	PE3.3 Creative, innovative and pro-active demeanour	
	PE3.4 Professional use and management of information	
	PE3.5 Orderly management of self, and professional conduct	
	PE3.6 Effective team membership and team leadership	