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| Course Code: | 1018ENG |
| Course Name: | Engineering Science |
| Trimester: | Trimester 1, 2017 |
| Program: | Diploma of Engineering |
| Credit Points: | 10 |
| Course Coordinator: | Dr Saeed Shaeri |
| Document modified: | 13/06/2017 |

**Teaching Team**

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

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**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 "myTimetable" link.

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**Prerequisites**

This course does not have a pre-requisite. However, exposure to high school mathematics and physics can assist in better understanding the taught concepts. Nevertheless, all the basic and required principles of mathematics and physics will be covered during the course of trimester.

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**Brief Course Description**

This experiential learning based course introduces the natural and physical sciences that underpin the practice of engineering. Through experiments students will apply science fundamentals to the systematic investigation, interpretation, and analysis of some engineering problems. Topics covered include Newtonian mechanics and electrical principles.

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## Rationale

This course aims to expose students to the power of physics for the understanding and control of natural phenomena, both at an empirical and experimental level, and also at a deductive, theoretical and mathematical level. It further aims to use these insights to provide practical tools for analysis of problems in applied disciplines such as engineering, aviation and the sciences for students from a variety of educational backgrounds.

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## Aims

This course aims to introduce fundamentals of Physics which are used in engineering studies. A variety of essential principles and rules, such as Newton's laws, Vector operations, Kinematics, Electricity and Electromagnetics, covering a wide range and varied spectrum of necessary knowledge of Physics, are taught and their application into other branches of engineering are explained through hands-on activities and laboratory experimentation.

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## Learning Outcomes

After successfully completing this course you should be able to:

1. Describe important physical science concepts that underpin the engineering profession (for example, Newtonian mechanics, rigid-body mechanics, electricity and electromagnetics principles).
2. Design and perform experiments and critically analyse the data received to support a theory or experimental objective.
3. Apply mathematical techniques to the analysis of simple engineering systems.
4. Work as an effective team member to develop simple engineering projects.
5. Use oral and/or written communication skills to relay engineering science concepts.

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## Texts and Supporting Materials

Halliday, David, Robert Resnick, and Jearl Walker. (2013). Fundamentals of Physics Extended.10$^{th}$ edition, Somerset: Wiley.

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## Organisation and Teaching Strategies

***Class Contact Summary***

<u>Lectures:</u>
The basic concepts and analytic skills will be taught during 1 x 2 hrs per week lecture. Students are expected to attend the lectures and information may be given to students in lectures that will not necessarily be reproduced on the Griffith College Portal site for the course.

<u>Tutorial Classes:</u>
Students will be guided through key problems associated with the Lectures during 1 x 2 hr per week tutorial and problem solving class.

Workshop Classes:
Discussion of the issues and misconceptions associated with the week's material, demonstrations and simulations to solidify concepts will be presented through 1 x 2 hr per week workshop classes.

Lab Classes:
Students are required to attend and participate in two lab experiments (Mechanics and Electricity) which consist of 8 hours of both guided and experiential laboratory classes (4 × 2 hours in specified weeks during the trimester). Students have access to a lab task description sheet for each experiment and a lab demonstrator provides feedback on the approach that students take in each of the labs.
Each experiment has a pre-lab quiz valued 20% of the experiment mark. A 10% mark for full attendance and performance is given at the end of each laboratory session. The data collected in each lab session is analysed and reported through separate lab reports for each session (i.e. two reports for each experiments and four reports in total for the course). The mark for each report is 30% of the experiment mark.
These laboratory activities carry a total of 30% (1 × 10% and 1 × 20%) of the total marks for the course. Failure to attend and participate in all laboratory sessions may result in failing the course.

**Attendance**
Your attendance in class will be marked twice during every four hour class. To receive full attendance, you must be present in the classroom on both occasions. Therefore, you are encouraged to attend and participate in all classes throughout the trimester.

**Preparation and Participation in Class**
You are expected to read the relevant chapter/s and complete all work stated in the content schedule before the required class. This weekly preparation both in-class and independently will help in preparing you for each of the assessments. Peer study groups can be useful in assisting with your weekly preparation.

**Consultation Times**
Attendance during consultation times is optional and students are encouraged to use this extra help to enable them to meet the stated learning outcomes.

**Course Materials**
Lecture notes will be made available to students on the student portal and it is advised to print these out and bring them to each class so that extra notes can be added.

**Independent Study**
You are expected to reinforce your learning from class time by undertaking sufficient independent study (approximately 6 hours per week outside of class time) so that you can achieve the learning outcomes of the course.

**Program Progression**
Students 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 (Australian students) or equal to or greater than 4.0 (International students) in any trimester. Please see Griffith College Policy Library – Program Progression Policy for more information.

**Course Content Schedule**

| Week | Topic | Activity | Readings* |
|---|---|---|---|
| | Part A) Introduction to the course, Part B) Units, Measurement and Uncertainties, and Part C) Vectors and Operations | Lecture / Tutorial | Ch. 1 and 3 |
| | No session | Workshop | |
| | Part A) One Dimensional Motion (Average motion, instantaneous motion, constant acceleration, acceleration due to gravity), and Part B) Forces and Motion I (Newton's Laws) | Lecture / Tutorial | Ch. 2 and 5 |
| | Part A) Units, Measurement and Uncertainties, and Part B) Vectors Operations | Workshop | |
| | Part A) Forces and Motion II (Friction), Part B) Energy (kinetic and potential energy, conservation of mechanical energy) and Work, and Part C) Linear Momentum (conservation of momentum), Collision (elastic and inelastic) and Impulse | Lecture / Tutorial | Ch. 6, 7, 8 and 9 |
| | Part A) One Dimensional Motion (Average motion, instantaneous motion, constant acceleration, acceleration due to gravity), and Part B) Forces and Motion I (Newton's Laws) | Workshop | |
| | Part A) Uniform Circular Motion (angular displacement, velocity and acceleration), and Part B) Rotational motion (rotational inertia, rotational energy, rolling motion) and Torque | Lecture / Tutorial | Ch. 10 and 11 |
| | Part A) Forces and Motion II (Friction), Part B) Energy (kinetic and potential energy, conservation of mechanical energy) and Work, and Part C) Linear Momentum (conservation of momentum), Collision (elastic and inelastic) and Impulse | Workshop | |
| | Review of Mechanics | Lecture / Tutorial | |
| | Part A) Uniform Circular Motion (angular displacement, velocity and acceleration), and Part B) Rotational motion (rotational inertia, rotational energy, rolling motion) and Torque | Workshop | - |
| | Part A) Coulomb's Law (charges and forces), and Part B) Electric Field and Potential | Lecture / Tutorial | Ch. 21, 22 and 24 |
| | Mid-trimester exam | Workshop | |
| | Experiment 1 – First Session | Laboratory | |
| | Part A) Current and batteries, and Part B) Resistance, conductivity and Ohm's law | Lecture / Tutorial | Ch. 26 |
| | Part A) Coulomb's Law (charges and forces), and Part B) Electric Field and Potential | Workshop | |
| | Part A) Capacitance (capacitors and dielectrics) and Part B) Circuits, electromotive force, Kirchoff's laws and multiloop circuits | Lecture / Tutorial | Ch. 25 and 27 |
| | Part A) Current and batteries, and Part B) Resistance, conductivity and Ohm's law | Workshop | |
| | Experiment 1 – Second Session | Laboratory | |

| Week | Topic | Activity | Readings* |
|---|---|---|---|
| 9 | Magnetic Fields (magnetic force and fields, charged particles in a magnetic field, origin of magnetic fields, magnetic dipoles and material, Ampere's Law) | Lecture / Tutorial | Ch. 28 and 29 |
| | Part A) Capacitance (capacitors and dielectrics) and Part B) Circuits, electromotive force, Kirchoff's laws and multiloop circuits | Workshop | |
| | Principles of Fluid Mechanics-I (Volume and density, pressure and pressure measurement) | Lecture / Tutorial | Ch. 14 |
| | Magnetic Fields (magnetic force and fields, charged particles in a magnetic field, origin of magnetic fields, magnetic dipoles and material, Ampere's Law) | Workshop | |
| | Experiment 2 – First Session | Laboratory | |
| | Principles of Fluid Mechanics-II (buoyancy and Archimedes' Principle, fluid flow and Bernoulli's equation) | Lecture / Tutorial | Ch. 14 |
| | Principles of Fluid Mechanics-I (Volume and density, pressure and pressure measurement) | Workshop | |
| | Review of Electricity and Fluid Mechanics | Lecture / Tutorial | |
| | Principles of Fluid Mechanics-II (buoyancy and Archimedes' Principle, fluid flow and Bernoulli's equation) | Workshop | |
| | Experiment 2 – Second Session | Laboratory | |

* The chapter numbers refer to the course textbook.

**Assessment**

This section sets out the assessment requirements for this course.

***Summary of Assessment***

| Item | Assessment Task | Weighting | Relevant Learning Outcomes | Due Date |
|---|---|---|---|---|
| 1 | On-line Quizzes (10 Wiley Plus quizzes) | 20% | 1, 3 and 5 | From week 3 to week 12 |
| 2 | Mid-trimester exam | 20% | 1,3, and 5 | Week 7 |
| 3 | Laboratory Activities - Mechanics (Experiment 1, 2 sessions) | 10% | 1, 2, 3, 4 and 5 | various weeks |
| 4 | Laboratory Activities – Electricity (Experiment 2, 2 sessions) | 10% | 1, 2, 3, 4 and 5 | various weeks |
| 5 | Final exam | 40% | 1, 3 and 5 | TBA |

***Assessment Details***

**On-line Quizzes**
The On-line Quizzes will assess students' knowledge and understanding of the Physics science concepts covered in the course and the ability to apply that understanding to the solution of practical problems.

**Mid-trimester exam**
The mid-trimester exam is a closed-book test which provides feedback to both the students and the teaching team regarding progress and conduct of the course halfway through the course. This exam also encourages the students to keep up to date with their work.

**Laboratory Activities**
The laboratory activities assess the ability of the student to apply the taught principles to design, conduct, analyse and interpret actual experimental data. Also the laboratory activities will allow students to verify the fundamental laws of various systems and to compare the predicted response to the theoretically calculated behaviour of those system. Experiment 1 (Mechanics) deals with the concept of momentum, energy conservation and collision. Experiment 2 (Electricity) deals with the concept of resistors, currents and circuits.

**Final exam**
The final exam will be 180 minutes in duration, plus 10 minutes perusal, and will be closed book. The final exam will assess the student's knowledge and understanding of the topics covered in the course and the ability to apply that understanding to the solution of practical problems. The examination paper is devised also to test the students' computational skills, as well as the ability to apply that knowledge to engineering design problems. Marks will be awarded according to correctness of the procedure, accuracy of the solution and clarity of the presentation.

**Requirements to pass the course:**
Students are required to complete all items of assessment and achieve at least 40% in each of the above-mentioned assessment items. Students must also achieve an aggregate mark of at least 50% overall in order to achieve a grade of "Pass" or above.

***Submission and Return of Assessment Items***

<u>Retention of Originals</u>
You must be able to produce a copy of all work 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 assessment item you must submit a written request to your lecturer via the Student Website at least 48 hours before the date the assessment item 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. medical certificate). Please refer to the Griffith College - Policy Library for guidelines regarding extensions and deferred assessment.

***Penalties for late submission without an approved extension***

Penalties apply to assignments that are submitted after the due date without an approved extension. Assessment submitted after the due date will be penalised 10% of the TOTAL marks available for

assessment (not the mark awarded) for each day the assessment is late. For example:

- > 5 minutes and <= 24 hours 10%
- > 24 hours and <= 48 hours 20%
- > 48 hours and <= 72 hours 30%
- > 72 hours and <= 96 hours 40%
- > 96 hours and <= 120 hours 50%
- > 120 hours 100%

Assessment submitted more than five days late will be awarded a mark of zero (0)

Note that:

- Two-day weekends will count as one day in the calculation of a penalty for late submission.
- When a public holiday falls immediately before or after a weekend, the three days will count as one day in the calculation of a penalty for late submission.
- When two public holidays (e.g. Easter), fall immediately before or after, or one day either side of a weekend, the four days will count as two days in the calculation of a penalty for late submission .
- When a single public holiday falls mid-week, the day will not be counted towards the calculation of a penalty.

Please refer to the Griffith College website - Policy Library > Assessment Policy for guidelines and penalties for late submission.

***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.

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**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 | Practised | Assessed |
|---|---|---|---|
| Written Communication | Yes | Yes | Yes |
| Oral Communication | | Yes | Yes |
| Information Literacy | Yes | Yes | Yes |
| Secondary Research | | | |
| Critical and Innovative Thinking | Yes | Yes | Yes |
| Academic Integrity | Yes | Yes | Yes |
| Self-directed Learning | | Yes | Yes |
| Team Work | | Yes | Yes |
| Cultural Intelligence | Yes | Yes | Yes |
| English Language Proficiency | | Yes | |

***Additional Course Information***

**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.



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