Course Code: 1501ENG
Course Name: Engineering Mechanics
Semester: Semester 1, 2015
Program: Diploma of Engineering
Credit Points: 10
Course Coordinator: Ali Binazir

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali Binazir</td>
<td><a href="mailto:ali.binazir@staff.qibt.qld.edu.au">ali.binazir@staff.qibt.qld.edu.au</a></td>
</tr>
<tr>
<td>Ehsan Eftekhari</td>
<td><a href="mailto:ehef@portal.qibt.qld.edu.au">ehef@portal.qibt.qld.edu.au</a></td>
</tr>
</tbody>
</table>

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 QIBT Portal under the "myTimetable" link.

Prerequisites
There are no prerequisites for this course. It is assumed that students undertaking this course will have the ability to manipulate algebraic equations and a prior knowledge of basic trigonometry.

Brief Course Description
Engineering Mechanics is both a foundation and a framework for most engineering disciplines. This course provides a basic knowledge of Newtonian mechanics, rigid-body mechanics, elasticity and structural analysis. In particular, the principles of statics and their applications in engineering, the methods of static analysis, and techniques of engineering computation are expounded. Students are expected not only to acquire a good grasp of the principles but also to develop the computational and analytical skills which are vital in obtaining correct engineering solutions. In practice, a wrong solution can lead to an engineering disaster. This course is designed to enable students to acquire fundamental knowledge in engineering. Engineering Mechanics 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.
It is assumed that students undertaking this course will have the ability to manipulate algebraic equations and a prior knowledge of basic trigonometry.

Rationale
Engineering Mechanics, 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
Engineering mechanics is a core engineering subject which defines a foundation for most engineering disciplines. This course provides a basic knowledge of Newtonian mechanics, rigid-body mechanics, elasticity and structural analysis. In particular, the principles of statics and their applications in engineering, the methods of static analysis, and techniques of engineering computation are expounded. Students are expected not only to acquire a good grasp of the principles but also to develop the computational and analytical skills which are vital in obtaining correct engineering solutions. In practice, a wrong solution can lead to an engineering disaster.

Learning Outcomes
After successfully completing this course you should be able to:
1. Solve practical problems using basic Newtonian mechanics principles, giving clear, accurate and complete solutions;
2. Conduct basic laboratory experiments in small groups, perform an uncertainty analysis of laboratory data, and write scientific/engineering reports;
3. Solve practical problems involving static equilibrium in two- and three-dimensions using conventional approaches, giving clear, accurate and complete solutions;
4. Distinguish different types of loading and supports and accurately calculate support reactions of structures under loading;
5. Determine structural stability and determinacy, apply free body diagram concepts to accurately analyse the structures including beams, trusses, frames and arches;
6. Calculate the centroid/centre of gravity and the second moments of area of simple shapes, giving clear, accurate and complete solutions.

**Texts and Supporting Materials**

**Required Resources**


**Recommended Resources**


**Organisation and Teaching Strategies**

The weekly class contact consists of 6 contact hours per week and 2 x 2 hour laboratory sessions. The 6 contact hours will be made up of 2 x 2 hour lectures, 2 hour tutorial/workshop.

The lectures will provide theoretical and practical understandings of the content areas.

The tutorial 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.

The laboratory sessions, where students work in small 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. The laboratory sessions will assist students to develop competency in laboratory skills and the interpretation of results.

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.

**Class Contact Summary**

**Attendance**

Your attendance in class will be marked three times during a six hour class. To receive full attendance, you must be present in the classroom on all occasions. Therefore, you are encouraged to attend and participate in all classes throughout the semester.

**Participation in Class**

You are expected to read the relevant chapters 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 the Mid-Semester and Final Examination. Peer study groups can be useful in assisting with your weekly preparation.

**Consultation 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@QIBT 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.

**Independent Learning**

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**

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 QIBT Policy Library--Program Progression Policy--for more information].

**Content Schedule**

1501ENG labs will be held in room G39_2.18 for Gold Coast campus students and N34_1.03 for Mount Gravatt campus students. Please note that you are yet to be allocated to a particular lab class.

*Please note* that you must attend the labs as per your timetable. Failure to do this will result in losing the mark for this assessment item. No second chance to do the lab/s will be given.
Laboratory 1: Rigid body motion - acceleration of a rolling steel ball under the force of gravity.

Laboratory 2: Principles of one-dimensional mechanics - collisions using an air-track apparatus.

### Weekly Teaching Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Activity</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Engineering Mechanics, velocity, acceleration, kinematics, motion in one dimension, units, measurements, errors; Learning Outcomes: 1</td>
<td>Lecture</td>
<td>HRW (Chapters 1,2)</td>
</tr>
<tr>
<td></td>
<td>Problems on units, definitions and kinematics of one dimensional motion, measurement, and uncertainty; Learning Outcomes: 1</td>
<td>Tutorial</td>
<td>HRW (Chapters 1,2)</td>
</tr>
<tr>
<td>2</td>
<td>Newton's laws, vectors, forces, friction, gravitation, interacting objects; Learning Outcomes: 1</td>
<td>Lecture</td>
<td>HRW (Chapters 3-6, 13)</td>
</tr>
<tr>
<td></td>
<td>Problems related to vectors, forces and Newton's laws of motion; Learning Outcomes: 1</td>
<td>Tutorial</td>
<td>HRW (Chapters 3-6, 13)</td>
</tr>
<tr>
<td>3</td>
<td>Circular motion, rotational motion and oscillatory motion; Learning Outcomes: 1</td>
<td>Lecture</td>
<td>HRW (Chapters 4,10,15)</td>
</tr>
<tr>
<td></td>
<td>Problems related to circular, rotational and oscillatory motion; Learning Outcomes: 1</td>
<td>Tutorial</td>
<td>HRW (Chapters 4,10,15)</td>
</tr>
<tr>
<td>4</td>
<td>Conservation of momentum and energy; Learning Outcomes: 1</td>
<td>Lecture</td>
<td>HRW (Chapters 7-9)</td>
</tr>
<tr>
<td></td>
<td>Problems related to the conservation of energy and momentum; Learning Outcomes: 1</td>
<td>Tutorial</td>
<td>HRW (Chapters 7-9)</td>
</tr>
<tr>
<td>5</td>
<td>Topic 1: Fundamentals of statics (I) (rigid body, moment, structures and elements, loading); Learning Outcomes: 4</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch1</td>
</tr>
<tr>
<td></td>
<td>Problems related to definitions, forces, moments and couples; Learning Outcomes: 4</td>
<td>Tutorial</td>
<td>All material</td>
</tr>
<tr>
<td>6</td>
<td>Topic 2: Fundamentals of statics (II) (equilibrium equations, component and resultant forces); Learning Outcomes: 3</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch2</td>
</tr>
<tr>
<td></td>
<td>Problems related to equilibrium equations, component and resultant forces; Learning Outcomes: 3</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch2</td>
</tr>
<tr>
<td>7</td>
<td>Topic 3: Supports and support reactions, determinacy and stability, freebody diagram; Learning Outcomes: 3, 4</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch 3</td>
</tr>
<tr>
<td></td>
<td>Problems related to topic 3; Learning Outcomes: 3, 4</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch 3</td>
</tr>
<tr>
<td>8</td>
<td>Topic 4: Structures with internal hinge connections; Learning Outcomes: 3, 4, 5</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch 3-4</td>
</tr>
<tr>
<td></td>
<td>Problems related to topic 4; Learning Outcomes: 3, 4, 5</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch 3-4</td>
</tr>
<tr>
<td>9</td>
<td>Topic 5: Analysis of trusses (I); determinacy and stability, zero- force members, method of joints; Learning Outcomes: 3, 5</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch 4</td>
</tr>
<tr>
<td></td>
<td>Trusses (I): Problems related to the method of joints; Learning Outcomes: 3, 5</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch 4</td>
</tr>
<tr>
<td>10</td>
<td>Topic 6: Analysis of trusses (II): method of sections; Learning Outcomes: 3, 5</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch 4</td>
</tr>
<tr>
<td></td>
<td>Trusses (II): Problems related to the method of sections; Learning Outcomes: 3, 5</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch 4</td>
</tr>
<tr>
<td></td>
<td>In-Class Quiz 2 (during 1st lecture timeslot);</td>
<td>Examination</td>
<td>Loo &amp; Guan Ch 4</td>
</tr>
<tr>
<td>11</td>
<td>Topic 7: Analysis of forces and moments in three- dimensional space; Learning Outcomes: 3</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch 5</td>
</tr>
<tr>
<td></td>
<td>Three-dimensional problems: Problems related to static equilibrium in three dimensions; Learning Outcomes: 3</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch 5</td>
</tr>
<tr>
<td>12</td>
<td>Topic 8: Centroids, centres of gravity and moments of inertia of simple and composite shapes; Learning Outcomes: 6</td>
<td>Lecture</td>
<td>Loo &amp; Guan Ch 6 and 7</td>
</tr>
<tr>
<td></td>
<td>Centroids and moments of area: Problems related to lecture topic 8; Learning Outcomes: 6</td>
<td>Tutorial</td>
<td>Loo &amp; Guan Ch 6 and 7</td>
</tr>
<tr>
<td>13</td>
<td>Revision</td>
<td>Tutorial</td>
<td>All material</td>
</tr>
</tbody>
</table>

### Assessment

This section sets out the assessment requirements for this course.

#### Summary of Assessment

<table>
<thead>
<tr>
<th>Item</th>
<th>Assessment Task</th>
<th>Weighting</th>
<th>Relevant Learning Outcomes</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laboratory Report 1</td>
<td>5%</td>
<td>2</td>
<td>Laboratory report one week after the lab</td>
</tr>
<tr>
<td>2</td>
<td>Laboratory Report 2</td>
<td>5%</td>
<td>2</td>
<td>Laboratory report one week after the lab</td>
</tr>
<tr>
<td>3</td>
<td>Tutorial Assignment - Dynamics</td>
<td>6%</td>
<td>1</td>
<td>2,3,4,5</td>
</tr>
<tr>
<td>4</td>
<td>Tutorial Assignment - Statics</td>
<td>9%</td>
<td>3,4,5,6</td>
<td>9,12</td>
</tr>
</tbody>
</table>

Assessment Details

Laboratory Reports
The laboratory reports assess the ability of the student to apply the principles of Newtonian mechanics to analysis and interpretation of actual experimental data. The students' understanding of experimental uncertainty and the ability to present their results clearly and concisely will be assessed. Lab reports are individual.

Tutorial Assignments
The tutorial exercises assess the ability of students to apply theory to problems and their understanding of the concepts. Through these tutorials, students' problem solving skills and computational skills will be developed. Marks will be awarded according to the correctness of the final answers, the accuracy of the solution and the clarity of the presentation. Tutorial assignments are individual work.

In-class Quizzes
The in-class quizzes are closed book.

The in-class quizzes encourage the students to keep up to date with their work. It also provides feedback to both the students and the teaching team regarding progress and conduct of the course. Marks will be awarded according to correctness of the procedure, accuracy of the solution and clarity of the presentation.

Final Examination
The final examination will be 190 minutes in duration, including 10 minute perusal, and closed book.

The final examination 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.

Other Assessment Information
Assessment is based on the student's grasp of the underlying principles of the course matters and their ability to apply such principles to practical engineering problems. To be eligible to pass the course, students are required to attempt and complete all types of assessment and must demonstrate a reasonable degree of competence in the required learning objectives for each type of assessment. To receive a grade pass or better for the course, the student must:
1) achieve an aggregate mark of at least 50% overall
2) achieve at least 40% for final examination

Submission and Return of Assessment Items
Normally you will be able to collect your assignments in class within fourteen [14] days of the due date for submission of the assignment.

Retention of Originals
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 QIBT website - 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. Assessment submitted more than five days late will be awarded a mark of zero (0). 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%

Note:
- 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 calculating the 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 QIBT 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.

**Generic Skills**

QIBT 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:

<table>
<thead>
<tr>
<th>Generic Skills</th>
<th>Taught</th>
<th>Practised</th>
<th>Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Communication</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Oral Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Literacy</td>
<td></td>
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<tr>
<td>Secondary Research</td>
<td></td>
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<tr>
<td>Critical and Innovative Thinking</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Academic Integrity</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Self Directed Learning</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Team Work</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Cultural Intelligence</td>
<td></td>
<td></td>
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<tr>
<td>English Language Proficiency</td>
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</tbody>
</table>

**Additional Course Generic Skills**

**Additional Course Information**

Overall, there is a high level of satisfaction among students for this course. The results were particularly high on the teaching, engagement and the quality of this course.

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 QIBT’s online evaluation tool whenever these are available.

**Academic Integrity**

QIBT 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, QIBT 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 QIBT, 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.

Please ensure that you are familiar with the QIBT 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 QIBT website – Policy Library.

**Risk Assessment Statement**

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