ENEM13015 *Design of Machine Elements*
Term 2 - 2018

Profile information current as at 17/05/2024 09:46 pm

Corrections

General Information

Overview
Design of Machine Elements is aimed at integrating and applying prior knowledge in fundamental design, materials sciences, mechanics of materials, statics and dynamics coupled with design strategies and knowledge of machine elements to design various machine components. These skills and knowledge will help you to design, analyse, synthesize and deliver robust engineering solutions. You will acquire strong analytical knowledge of machine elements, their design and load carriage and power transmission mechanics.

Details
Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
Prerequisites: MATH11219 Engineering Mathematics AND (ENEM12009 Structural Mechanics OR ENEM14012 Solid Mechanics and Computational Analysis)
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 2 - 2018

- Bundaberg
- Cairns
- Distance
- Gladstone
- Mackay
- Rockhampton

Attendance Requirements
All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website
This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 20%
2. **Group Work**
Weighting: 50%
3. **Practical Assessment**
Weighting: 30%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Moodle, Email, telephone

Feedback
Vast content in the unit demands far more number of hours per week than nominated.

Recommendation
The Mechanical Discipline is considering to convert this to a 12 cp unit since it is one of the most important core courses in the field. It is hoped that this change will be implemented in time for the next iteration in T2/2018.

Feedback from Moodle

Feedback
80% of assessment on Group Activities

Recommendation
It being a PBL course, students have to undertake two group based design projects. The present allocation will remain but better peer assessment and management practices will be introduced in the next iteration.

Feedback from Moodle, Email

Feedback
Students claim this was the best unit they have encountered in their course.

Recommendation
This is heartening. The unit will be made more interesting with the inclusion of more number of machine elements that students will design and build, invoking relevant design standards and codes.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Develop detailed design of machine components to Australian and International Standards
2. Apply the formal procedures of detailed machine design, including requirements, solutions, modelling and evaluation to solve problems
3. Analyse and design a range of machine elements, explain the physical basis of their design, usage and operational limitations
4. Interpet various design codes and standards
5. Work effectively in teams by: identifying individual roles and responsibility, interacting positively with colleagues, and communicating effectively at group meetings
6. Communicate as professionals through the production of drawings (computer aided) and Bill of Materials, and through written technical reports.

Learning outcomes are linked to Engineers Australia Stage 1 Competencies and also discipline capabilities.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level | ◦ Introductory Level | • Intermediate Level | • Graduate Level | ◦ Professional Level | ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Written Assessment - 20%		•	•			
2 - Project (applied) - 50%	•	•		•	•	•
3 - Project (applied) - 30%	•		•	•		•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Communication			•		•	•
2 - Problem Solving	•	•	•			
3 - Critical Thinking	•	•	•	•		
4 - Information Literacy	•	•		•		
5 - Team Work					•	
6 - Information Technology Competence					•	•
7 - Cross Cultural Competence					•	
8 - Ethical practice	•				•	•
9 - Social Innovation						
10 - Aboriginal and Torres Strait Islander Cultures						

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 20%		•	•							
2 - Project (applied) - 50%	•	•	•	•	•	•	•	•		
3 - Project (applied) - 30%		•	•	•		•				

Textbooks and Resources

Textbooks

ENEM13015

Prescribed

Shigleys Mechanical Engineering Design (SI Units)
Edition: 10th edn (2014)
Authors: Richard G Budynas and Keith J Nisbett
McGraw Hill
ISBN: 9789813151000
Binding: Paperback

Additional Textbook Information
Access to an ebook will be provided closer to the term date.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing styles below:

- Harvard (author-date)
- Turabian

For further information, see the Assessment Tasks.

Teaching Contacts

Prasad Gudimetla Unit Coordinator
p.gudimetla@cqu.edu.au

Schedule

Week 1 - 09 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic

1. Introduction to design of machine elements 2. Design Standards and Design Codes 3. Design for Strength & Stiffness - Review of static design methods	Lecture Notes Chapters 1 - 4, Shigley	1. Discussion on Assignments, Major and minor projects. 2. Assignment 1 (Individual): Design Analysis Problems - 20% total weighting 3. Assignment 2 (Group): Group Design Project - 50% total weighting 4. Assignment 3 (Individual): Individual Design Project - 30% total weighting 5. Form Groups **Assignment 2: Group Design Project** - Finalize the selection of group design project and submit a 1 page proposal via the submission link on unit Moodle site. Refer to assignment documentation for further details.

Week 2 - 16 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Failure Modes and Prevention in Machine Elements 2. Failure Theories and Design for Static Loading	Lecture Notes Chapter 5, Shigley	Solved example problems, Design case study

Week 3 - 23 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design for Variable Loading 2. Fatigue Life Methods - Stress-life & Strain-life Methods 3. Linear Elastic Fracture Mechanics (LEFM) Method	Lecture Notes Chapters 6, Shigley	Solved example problems

Week 4 - 30 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design of Shafts – materials, shaft layout, shaft design for stress deflection considerations, critical speeds, limits and fits 2. Design of shaft components - keys and keyways	Lecture Notes Chapter 7, Shigley	Solved example problems, Design case study

Week 5 - 06 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design & Selection of Roller Bearings - Variable loading, Selection of ball, cylinder and tapered roller bearings 2. Design assessment, lubrication, mounting and enclosure design	Lecture Notes Chapter 11, Shigley	Solved example problems, Design case study

Vacation Week - 13 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 20 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic

1. Gears – types of gears, Spur gear terminology, Lewis Bending equation 2. AGMA Stress equations, AGMA Strength equations, dynamic, overload, size, surface condition factors	Lecture Notes Chapter 13, Shigley	Solved example problems, Design case study **Submission (S1): Assignment 1 Due, Friday, 24th Aug 2018, 11:45 p.m.** **Problem Solving** Due: Week 6 Friday (24 Aug 2018) 11:45 pm AEST

Week 7 - 27 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design of Spur & Helical Gears – Load distribution, hardness ratio, stress cycle life, temperature, reliability factors 2. Design of gear trains - calculation of reduction ratios, power transmission	Lecture Notes Chapter 14, Shigley	Solved example problems, Design case study

Week 8 - 03 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design of Bevel Gears 2. Design of Worm Gears	Lecture Notes Chapter 15, Shigley	Solved example problems, Design case study

Week 9 - 10 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design of Machine frames & Housings 2. Design of Non-permanent Joints - Threads, Screws and Fasteners	Lecture Notes Chapter 8, Shigley	Solved example problems, Design case study **Submission (S2): Assignment 2 Due, Friday, 14th Sept 2018, 11:45 p.m.** **Group Design Project** Due: Week 9 Friday (14 Sept 2018) 11:45 pm AEST

Week 10 - 17 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design of Permanent Joints - Static Design of Welds 2. Adhesive Bonding	Lecture Notes Chapter 9, Shigley	Solved example problems

Week 11 - 24 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Design of Mechanical Springs	Lecture Notes Chapter 10, Sigley	Solved example problems, Design case study

Week 12 - 01 Oct 2018

Module/Topic	Chapter	Events and Submissions/Topic
1. Tribology, Wear & Lubrication of Machine Elements 2. Design & Selection of Journal Bearings	Lecture Notes Chapter 12, Shigley	Solved example problems, Design case study **Submission (S3): Assignment 3 Due, Friday, 5th Oct 2018, 11:45 p.m.** **Individual Design Project** Due: Week 12 Monday (1 Oct 2018) 11:45 pm AEST

Review/Exam Week - 08 Oct 2018

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 15 Oct 2018

Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Problem Solving

Assessment Type
Written Assessment

Task Description
This assignment will consist of 5 numerical problems which you will solve and submit during the term. Each problem set will be related to a portion of the syllabus covered in some weeks and will be an extension of the solved examples and tutorial problems you will encounter in the unit.

Assessment Due Date
Week 6 Friday (24 Aug 2018) 11:45 pm AEST

Return Date to Students
Week 8 Monday (3 Sept 2018)

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
The main criteria for assessment are:
1. Development of accurate free body diagrams (FBDs) for the problems
2. Application of relevant theory and design equations to calculate required unknowns
3. Comment on the final results obtained

Referencing Style

- Harvard (author-date)
- Turabian

Submission
Online

Learning Outcomes Assessed

- Develop detailed design of machine components to Australian and International Standards
- Apply the formal procedures of detailed machine design, including requirements, solutions, modelling and evaluation
- Interpet various design codes and standards

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence
- Ethical practice

2 Group Design Project

Assessment Type
Group Work

Task Description
The Group Project will involve the design and drawing of a given component or assembly that you will solve as a part of a 4-member team. You will assess your designs for 3D printability and rescale your original drawings for 3D printing. You will follow the instructions provided on the unit unit Moodle site and submit a comprehensive report and engineering drawings. There will be one report per group.

Assessment Due Date
Week 9 Friday (14 Sept 2018) 11:45 pm AEST

Return Date to Students
Week 11 Monday (24 Sept 2018)

Weighting
50%

Minimum mark or grade
50%

Assessment Criteria
The following are the main assessment criteria for the gearbox assignment:
1. Succinct development of the design project case
2. Present and discuss appropriate assumptions, justifications and reflections on the scope and limitations of the design
3. Detailed design calculations for all components
4. Detailed, accurate and scaled engineering drawings with BOMs and all relevant specifications according to AS standards, for 3D printability
5. Comprehensive documentation of the design procedure with a list of references.
Refer to the unit Moodle site for more detailed information.

Referencing Style

- Harvard (author-date)
- Turabian

Submission
Online

Learning Outcomes Assessed

- Develop detailed design of machine components to Australian and International Standards
- Apply the formal procedures of detailed machine design, including requirements, solutions, modelling and evaluation
- Analyse and design a range of machine elements, the physical basis of their design, usage and operational limitations
- Work effectively in teams by: identifying individual roles and responsibility, interacting positively with colleagues, and communicating effectively at group meetings
- Communicate as professionals through the production of drawings (computer aided) and Bill of Materials, and through written technical reports

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

3 Individual Design Project

Assessment Type
Practical Assessment

Task Description
In this task, you will design a bracket using the individual specifications provided to you.

Assessment Due Date
Week 12 Monday (1 Oct 2018) 11:45 pm AEST

Return Date to Students
Exam Week Monday (15 Oct 2018)

Weighting
30%

Minimum mark or grade
50%

Assessment Criteria
The following are the main assessment criteria for the gearbox assignment:
1. Succinct development of the design project case
2. Detailed design calculations for all aspects of the bracket

4. Detailed, accurate and scaled engineering drawings all relevant specifications according to AS standards for 3D printability
5. Comprehensive documentation of the design procedure with a list of references.
Refer to the unit Moodle site for more detailed information.

Referencing Style

- Harvard (author-date)
- Turabian

Submission
Online

Learning Outcomes Assessed

- Develop detailed design of machine components to Australian and International Standards
- Apply the formal procedures of detailed machine design, including requirements, solutions, modelling and evaluation
- Analyse and design a range of machine elements, the physical basis of their design, usage and operational limitations
- Work effectively in teams by: identifying individual roles and responsibility, interacting positively with colleagues, and communicating effectively at group meetings
- Communicate as professionals through the production of drawings (computer aided) and Bill of Materials, and through written technical reports

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem