ENEM13018 *Materials and Manufacturing*
Term 2 - 2020

Profile information current as at 09/05/2024 02:51 pm

General Information

Overview

This unit offers extended information on material behaviours and manufacturing properties, principles of manufacturing processes and technologies. The unit aims to deepen the understanding of the material selection process and enables you to identify appropriate manufacturing processes for a particular product design and development. You will study a wide variety of manufacturing processes such as bulk deformation processes, material removal processes, finishing and joining processes, micro/nano scale manufacturing, and other modern manufacturing techniques and learn product design, quality management, and manufacturing in a competitive environment. You will apply information literacy skills to obtain relevant engineering information and identify appropriate standards and practices. Students enrolled in distance mode can opt to attend a Residential School.

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: (ENEG11008 Materials for Engineers or ENEG12005 Materials Science & Engineering) and MATH11218 Applied Mathematics or MATH11219 Engineering Mathematics
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 - 2020

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Mixed Mode
- 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).

Residential Schools

This unit has a Optional Residential School for distance mode students and the details are:
Click here to see your Residential School Timetable.

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. **Practical and Written Assessment**
Weighting: 20%
2. **Written Assessment**
Weighting: 20%
3. **Written Assessment**
Weighting: 20%
4. **Online Test**
Weighting: 40%

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 Have Your Say

Feedback
Machine shop visit too early in the term.

Recommendation
The visit is presently scheduled in Week 3 of the term. This aspect was recognised by the UC but could not be postponed due to the VET staff's inability to host it in the middle of the HE term. Negotiations are underway to see how this issue can be sorted.

Feedback from In class

Feedback
Machine shop practice is an invaluable learning experience.

Recommendation
The machine shop practice underscores the practical aspects enshrined in this unit. Every effort will be made to make it more inclusive and intensive in future offerings.

Feedback from Have Your Say

Feedback
Discrepancies in the use of some formulas across chapters.

Recommendation
This issue is recognised by the UC and sufficient emphasis was placed on it during the relevant tutorial sessions. This is the result of developing lecture material from several textbooks, resources and the UC's own experience in the field. Efforts will be made to homogenise the formulas and avert this confusion in future offerings.

Unit Learning Outcomes

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

1. Clearly establish the relationships between the microstructural of materials and their mechanical and manufacturing properties
2. Explain various bulk deformation and material removal processes as applicable to ductile and brittle materials and the machine tools that are used to carry out these operations
3. Calculate numerically the forces, torques and power requirements for various processing of different materials for bulk deformation
4. Mathematically analyse the mechanics of metal cutting and the control of various process parameters to achieve optimum material removal and machining economics
5. Apply the knowledge of engineering metrology, instrumentation and quality assurance of manufacturing of products
6. Apply information literacy skills, obtain relevant engineering information and identify appropriate standards and practices
7. Work, learn and communicate in an ethical, professional manner, both individually and in teams.

The learning outcomes are linked to Engineers Stage 1 Competencies and also discipline capabilities. You can find the mapping for this on the Engineering Undergraduate Course website.

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	7
1 - Practical and Written Assessment - 20%		•	•			•	•
2 - Written Assessment - 20%		•	•	•	•	•	
3 - Written Assessment - 20%	•	•	•			•	
4 - Online Test - 40%	•	•	•	•	•		

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
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 - Practical and Written Assessment - 20%	•	•			•			•		
2 - Written Assessment - 20%		•	•	•		•				
3 - Written Assessment - 20%		•	•	•		•				
4 - Online Test - 40%	•	•	•					•		

Textbooks and Resources

Textbooks

ENEM13018

Prescribed

Manufacturing Engineering & Technology
Edition: 7 (2014)
Authors: Serope Kalpakjian, Steven Schmid
Pearson Higher Ed
ISBN: 9780133128741
Binding: Paperback

Additional Textbook Information
If you prefer to study with a paper copy, they are available at the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code). eBooks are available at the publisher's website.

View textbooks at the CQUniversity Bookshop

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 style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Abdul Mazid Unit Coordinator
a.mazid@cqu.edu.au

Schedule

Week 1 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Manufacturing Processes; Mechanics of metal cutting: Merchants theory, Chips formation, Cutting forces;	Textbook Chapter 20	Tutorial via Zoom

Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Cutting tools: classification, materials, geometry; Cutting fluids;	21	Tutorial via Zoom

Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic

Turning operations and lathe machines; Tools and turning parameters;	22	Tutorial via Zoom

Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Drilling processes, drilling machines and tools	22	Tutorial via Zoom

Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Milling processes, Milling machines and tools	23	Tutorial via Zoom **Problem solving on manufacturing processes** Due: Week 5 Friday (14 Aug 2020) 11:45 pm AEST

Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Study break - work on assignments	20 - 23	

Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Machining centers; Numerical control machine tools and CIM	24	Tutorial via Zoom

Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Dynamic systems of machine tools: vibrations and chatter in machining; Machinability and machining economics;	Lecture notes and Chapter 20	Tutorial via Zoom

Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Abrasive machining: Grinding processes and machines, grinding wheels and fluid	25	Tutorial via Zoom

Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Welding processes: Oxyfuel gas welding, Arc welding, TIG and MIG welding; Micro-structure and quality of weld;	27	Tutorial via Zoom **Production processes development** Due: Week 9 Friday (18 Sept 2020) 11:45 pm AEST

Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Forming processes: Cold and hot forming processes, Micro-structure and anisotropy;	13	Tutorial via Zoom

Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Casting metals and plastics: Conventional and die casting processes; plastic moulding, cast quality;	11	Tutorial via Zoom

Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Additive and advanced manufacturing processes (Selected only)	H El-Hofy - Advanced machining processes (McGraw-Hill) and lecture notes	Tutorial via Zoom **Research Report** Due: Week 12 Friday (9 Oct 2020) 11:45 pm AEST

Review/Exam Week - 12 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 19 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
		On-line Test / QUIZ Due: Exam Week Wednesday (21 Oct 2020) 3:00 pm AEST

Term Specific Information

Due to social restriction caused by COVID-19 laboratory experiments will be replaced by a written assignment in T2-2020. For the same reason final examination also will be replaced by on-line test/quiz in T2-2020.

Assessment Tasks

1 Problem solving on manufacturing processes

Assessment Type
Practical and Written Assessment

Task Description
This assessment item involves design analysis and numerical problem solving based on theories and mechanics of metal machining, machine tools and tooling. This will instill your theoretical knowledge gained in areas of turning, milling, drilling and other machining processes with reflection on real life scenario of manufacturing processes. A set of relevant problems will be provided at the beginning of the Term.

Assessment Due Date
Week 5 Friday (14 Aug 2020) 11:45 pm AEST

Return Date to Students
Week 7 Friday (4 Sept 2020)

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria

Each problem-solving answer will be assessed considering the following factors:

1. Correct approach and schematic of the problem demonstrating clear understanding of it (20% marks);
2. Selection and appropriate use of right theory/equations and procedures (20% marks);
3. Appropriate solving methodology using the right theory/equations and procedures (50% marks);
4. Neat and cleanliness, and orderly work-flow (10% marks).

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Explain various bulk deformation and material removal processes as applicable to ductile and brittle materials and the machine tools that are used to carry out these operations
- Calculate numerically the forces, torques and power requirements for various processing of different materials for bulk deformation
- Apply information literacy skills, obtain relevant engineering information and identify appropriate standards and practices
- Work, learn and communicate in an ethical, professional manner, both individually and in teams.

Graduate Attributes

- Communication
- Problem Solving
- Team Work
- Ethical practice

2 Production processes development

Assessment Type
Written Assessment

Task Description
This assessment item involves selecting one machine part and developing complete manufacturing processes routed from machine to machine for individual operation in an economic way considering the part handling and operation time. The designed well-routed processes will transform a work-piece into a finished product. Initially students are supposed to prepare manufacturing drawing/s of selected part/s in 2D form (follow ISO or AS1100) showing geometric dimensions with tolerances and surface finish grades (where necessary). Considering the created part design students will design, step by step, the machining processes using all or some of the processes like turning, milling, drilling, grinding, etc. For each of the processes chosen you need to choose cutting tool/s and using the data you need to calculate/estimate/select operational parameters like cutting speed, feed rate and depth of cut considering the accepted dimensional tolerances and surface roughness. Each step of operations must be appropriately documented for helping the machine operator for production. At the end you may wish to calculate the production cost of the part using your designed processes and routing.

Assessment Due Date
Week 9 Friday (18 Sept 2020) 11:45 pm AEST

Return Date to Students
Week 11 Friday (2 Oct 2020)

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
Marking criteria for this creative assignment are:

1. Production of ISO standard (AS1100) part drawing in 2D showing all necessary dimensions with tolerances and surface finish grades (20% marks);
2. Creation of appropriate documentation of economic operation routing and machining operation instruction demonstrating the operation in drawing, selecting/estimating values of operation parameters (v, f,d), cutting tool, job clamping methods and engineering metrology procedures. This document must help machine operators in machine setting, tool selection and cutting regime (v, f, d) setting without any physical presence or help of engineers. (60% marks);
3. Production cost calculation of your part (10% marks);
4. Appropriate presentation of all process documentation for easy and friendly uses and neatness (10%).

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Maximum four students in group; first named student on title page is supposed to upload assignment in pdf version.

Learning Outcomes Assessed

- Explain various bulk deformation and material removal processes as applicable to ductile and brittle materials and the machine tools that are used to carry out these operations
- Calculate numerically the forces, torques and power requirements for various processing of different materials for bulk deformation
- Mathematically analyse the mechanics of metal cutting and the control of various process parameters to achieve optimum material removal and machining economics
- Apply the knowledge of engineering metrology, instrumentation and quality assurance of manufacturing of products
- Apply information literacy skills, obtain relevant engineering information and identify appropriate standards and practices

Graduate Attributes

- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

3 Research Report

Assessment Type
Written Assessment

Task Description
This is an assignment to develop your skills and understanding of workpiece/part manufacturing using any of the processes like casting, forming, hot- and cold rolling, welding, powder metallurgy, etc. At the end you will produce a technical report in a fruitful and constructive manner for assessment. Students will select a topic in consultation with UC/Lecturer/Tutor. Students are supposed accomplish enhanced research within their selected topic area and produce review output of the selected processes. You may need to visit several databases exploring technical journals and conferences, textbooks, and industry websites to gather information. Structure of the report to be submitted may contain title page, aim and objectives, introduction and background, full process description and explanation including illustrations, schematics, images etc., applications and economic aspects as necessary.

Assessment Due Date
Week 12 Friday (9 Oct 2020) 11:45 pm AEST

Return Date to Students
Exam Week Friday (23 Oct 2020)

Weighting
20%

Assessment Criteria
The technical report assessment will be guided by the following factors:

1. Minimum 10 resources (published articles, company websites, videos, and promotional presentations, etc.) to be visited and studied. Out of these at least 05 well reputed published articles and very related resources will be appreciated. Complying all of these in perfection may carry 20% marks.
2. Demonstration of skills of narration including methods, procedures and materials involved in the processes, economic and environmental aspects of the processes, and critical comments, appreciation, and criticism will carry 50% marks.
3. Demonstration of enough evidences like graphs, labelled images, figures with perfect explanations and any other necessary data/information on economic impact and relevant government policies referencing in relevant to the technology in the report will carry 30% marks.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Clearly establish the relationships between the microstructural of materials and their mechanical and

manufacturing properties
- Explain various bulk deformation and material removal processes as applicable to ductile and brittle materials and the machine tools that are used to carry out these operations
- Calculate numerically the forces, torques and power requirements for various processing of different materials for bulk deformation
- Apply information literacy skills, obtain relevant engineering information and identify appropriate standards and practices

Graduate Attributes

- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

4 On-line Test / QUIZ

Assessment Type
Online Test

Task Description
On-line test/quiz may contain short and/or long questions, manufacturing processes design based questions, analysis and numerical problem solving spreading over the study materials of all 12 weeks.

Assessment Due Date
Exam Week Wednesday (21 Oct 2020) 3:00 pm AEST

Return Date to Students

Weighting
40%

Minimum mark or grade
50%

Assessment Criteria
Marks selection will be indicated for each of the question or for each portion of the questions providing enough factors of assessment.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Clearly establish the relationships between the microstructural of materials and their mechanical and manufacturing properties
- Explain various bulk deformation and material removal processes as applicable to ductile and brittle materials and the machine tools that are used to carry out these operations
- Calculate numerically the forces, torques and power requirements for various processing of different materials for bulk deformation
- Mathematically analyse the mechanics of metal cutting and the control of various process parameters to achieve optimum material removal and machining economics
- Apply the knowledge of engineering metrology, instrumentation and quality assurance of manufacturing of products

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- 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