



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie

Department of Mechanical and Aeronautical Engineering

Manufacturing and Design MOW217

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Table of Contents

1. GENERAL PREMISE AND EDUCATIONAL APPROACH	4
2. LECTURERS, VENUES AND CONSULTING HOURS	4
3. STUDY MATERIALS AND PURCHASES	4
4. LEARNING ACTIVITIES	5
4.1. Contact times and learning hours	5
4.2. Lectures	5
4.3. Tutorial classes and assignments	5
5. RULES OF ASSESSMENT	5
6. GENERAL	6
7. MODULE STRUCTURE	7
8. STUDY THEMES.....	7
8.1. Study Theme 1: Engineering Materials.....	7
8.1.1. Learning Outcomes.....	7
8.1.2. Study units.....	7
8.2. Study Theme 2: Bearings	7
8.2.1. Learning outcomes.....	7
8.2.2. Study units.....	7
8.3. Study Theme 3: Solidification Processes.....	8
8.3.1. Learning Outcomes.....	8
8.3.2. Study Units	8
8.4. Study Theme 4: Particulate Processes	8
8.4.1. Learning Outcomes.....	8
8.4.2. Study units.....	8
8.5. Study Theme 5: Transmission Systems	8
8.5.1. Learning Outcomes.....	8
8.5.2. Study units.....	8
8.6. Study Theme 6: Metal Forming	8
8.6.1. Learning Outcomes.....	8
8.6.2. Study units.....	8
8.7. Study Theme 7: Material Removal Processes	9
8.7.1. Learning Outcomes.....	9
8.7.2. Study units.....	9
8.8. Study Theme 8: Property Enhancement	9
8.8.1. Learning Outcomes.....	9

8.8.2. Study units.....	9
8.9. Study Theme 9: Joining and Assembly Processes	9
8.9.1. Learning Outcomes.....	9
8.9.2. Study units.....	9
8.10. Study Theme 10: The Design Process	9
8.10.1. Learning Outcomes	9
8.10.2. Study units	9

1. GENERAL PREMISE AND EDUCATIONAL APPROACH

The general objective with this module is to emphasise understanding rather than memorising, in order to stimulate creative thinking and the development of innovative skills amongst students in the field of machine design. A problem-driven approach to learning is followed. Student-centred and co-operative learning and teaching methods are applied during lectures and tutorials classes in order to optimally develop the above skills, as well as to stimulate the development of communication skills, interpersonal skill and group dynamics.

You are expected to participate in discussions during lectures and tutorials. As your fellow students are dependent on the inputs you make, your participation is crucial. After all, you are also dependent on their contribution.

The effective use of machine design is an essential tool to the solution of engineering problems. In this module, the learner is taught the skills to visualize an engineering solution to a problem, conceptualize the solution, do the mathematical calculations and communicate the design by making use of free hand sketches.

2. LECTURERS, VENUES AND CONSULTING HOURS

	Name	Office No.	Telephone No.	Email Address
Lecturer	Dr. L du Plessis	Eng I, 10-17	012 420 2431	lukas.duplessis@up.ac.za
Instructor	Mr. W. Murray	Eng I, 9-9	012 420 2686	wim.murray@up.ac.za

Location of Classes: See departmental timetable.

Consulting Hours: Hours for consultation of lecturers, tutors and teaching assistants will be announced at the commencement of the semester, and will also be posted on ClickUP. Students may consult lecturers, tutors and teaching assistants only during the consulting hours as indicated, or by appointment. This policy also holds before tests and exams. In other words, lecturers, tutors and teaching assistants are only available during their normal consulting hours on the day before a test or examination. This policy aims to encourage students to plan their work and to work continuously.

3. STUDY MATERIALS AND PURCHASES

Prescribed Textbook:

Principles of Modern Manufacturing, 5th SI Edition, Mikell P. Groover, Wiley, 2013.

4. LEARNING ACTIVITIES

4.1. Contact times and learning hours

Number of lectures:	3 weekly (Afrikaans and English)
Number of tutorial classes:	approx. 6 of 2-4 hours each

This module carries a weight of 16 credits, indicating that on average a student should spend some 160 hours to master the required skills (including time for preparation of tests and examinations). The average contact time is approximately 6 hours per week, meaning that another 6 hours per week of own study time should be devoted to the module.

4.2. Lectures

Lectures are presented in a style of cooperative and student-centred learning. Brief clarification and explanation of the subject matter and concepts are given during the lectures. Students are advised to attend classes and to participate actively in discussions during lectures and tutorial classes.

4.3. Tutorial classes and assignments

The timetable provides for one 2-4 hour tutorial session each week. All tutorial classes will be spent on the theory covered in the lectures. During or before each tutorial class a problem statement or exercise, covering the relevant theory, is handed out. It is expected of the student to design a solution. The lecturer and the instructor will be available for consultation and assistance to students during tutorial sessions. At the start of certain of the tutorial sessions a small test related to the contents of the work may be written. The test marks will be incorporated in the semester mark.

5. RULES OF ASSESSMENT

Also see the examination regulations in the Year Books of the Faculty of Engineering, Built Environment and Information Technology (Part 1: Engineering, or Part 2: Built Environment and Information Technology).

Pass requirements: In order to pass the module a student must obtain a final mark of at least 50%. A minimum average of 40% is required for the tutorial classes to obtain exam entrance.

Calculation of the final mark:

Semester mark: 50%

Examination mark: 50% (The duration of the final examination is 3 hours.)

Calculation of the semester mark:

Semester tests: 60%

Tutorial classes: 25% (An average above 40% is required for the tutorial assignments)

Group Project: 15%

Semester tests: Two tests of 180 minutes each will be written during the scheduled test weeks of the School of Engineering:

Dates, times and venues will be announced as soon as the timetables become available.

6. GENERAL

Students are expected to attend all tutorial sessions. Students that cannot submit a tutorial assignment for a valid reason must submit a written statement to the module manager.

Although students are encouraged to ask questions of the lecturer and instructors during tutorial sessions, each student must do his own work. This aspect applies especially to the computer work. Under no circumstance is a student allowed to copy the work of somebody else.

Students are required to bring their textbooks and notes to all practical sessions and lectures. Students should come to the tutorial sessions fully prepared.

Departmental Study Guide

This study guide is a crucial part of the general study guide of the Department. In the study guide of the Department, information is given on the mission and vision of the department, general administration and regulations (professionalism and integrity, course related information and formal communication, workshop use and safety, plagiarism, class representative duties, sick test and sick exam guidelines, vacation work, appeal process and adjustment of marks, university regulations, frequently asked questions), ECSA outcomes and ECSA exit level outcomes, ECSA knowledge areas, CDIO, new curriculum and assessment of cognitive levels. It is expected that you are very familiar with the content of the Departmental Study Guide. It is available in English and Afrikaans on the Department's website.

English:

<http://www.up.ac.za/media/shared/120/Noticeboard/2017/departamental-studyguide-eng-2017.zp107056.pdf>

Afrikaans:

<http://www.up.ac.za/media/shared/120/Noticeboard/2017/departementele-studiegids-afr-2017.zp107058.pdf>

Take note of the specific instructions in the above study guide on:

- Safety
- Plagiarism
- What to do if you were sick (very important)
- Appeal process on the adjustment of marks

7. MODULE STRUCTURE

	Study Theme	Notional Hours	Contact Sessions
1	Engineering Materials	20	5
2	Bearings	35	7
3	Solidification Processes	12	3
4	Particulate Processes	8	2
5	Transmission Systems	25	5
6	Metal Forming	12	3
7	Material Removal Processes	15	3
8	Property Enhancement	12	3
9	Joining and Assembly Processes	15	3
10	The Design Process	6	2
	Total	160	36

8. STUDY THEMES

8.1. Study Theme 1: Engineering Materials

8.1.1. Learning Outcomes

After completion of this study theme the student should:

- know the materials available to engineers.
- have a rough understanding of their physical and mechanical properties.
- be able to select a material for a specified application.

8.1.2. Study units

Groover Chapters 2-6

8.2. Study Theme 2: Bearings

8.2.1. Learning outcomes

After completion of this study theme the student should be able to:

- Select and calculate the correct rolling element or plain bearing to satisfy a specific application.
- Correctly specify the mounting of a bearing including seals and lubrication.

8.2.2. Study units

Class notes and catalogues.

8.3. Study Theme 3: Solidification Processes

8.3.1. Learning Outcomes

After completion of this study theme the student should be able to:

- describe the various solidification processes.
- select an adequate process for a given application.
- design a component appropriate for a solidification process.

8.3.2. Study Units

Groover Chapters 7-11.

8.4. Study Theme 4: Particulate Processes

8.4.1. Learning Outcomes

After completion of this study theme the student should be able to:

- describe the various particulate processes.
- select an adequate process for a given application.
- design a component appropriate for a particulate process.

8.4.2. Study units

Groover Chapters 12-13.

8.5. Study Theme 5: Transmission Systems

8.5.1. Learning Outcomes

After completion of this study theme the student should be able to:

- Distinguish between the different types of power transmission systems.
- Understand the operating principles of power transmission systems.
- Select the correct belt, chain, or gear drive to satisfy a specific application.
- Perform theoretical calculations for belt, chain, and gear drives.
- Incorporate belt, chain, and gears drives into a mechanical design.

8.5.2. Study units

Class notes and catalogues.

8.6. Study Theme 6: Metal Forming

8.6.1. Learning Outcomes

After completion of this study theme the student should be able to:

- describe the various metal forming and sheet metalworking processes.
- describe the effects that the processes have on material properties.
- create a workflow for a sheet metal part.

8.6.2. Study units

Groover Chapters 14-16.

8.7. Study Theme 7: Material Removal Processes

8.7.1. Learning Outcomes

After completion of this study theme the student should be able to:

- describe the various material removal processes.
- create a workflow for a part using material removal processes.

8.7.2. Study units

Groover Chapters 17-22.

8.8. Study Theme 8: Property Enhancement

8.8.1. Learning Outcomes

After completion of this study theme the student should be able to:

- describe the various property enhancement techniques.
- prescribe an enhancement technique when necessary.

8.8.2. Study units

Groover Chapters 23-24.

8.9. Study Theme 9: Joining and Assembly Processes

8.9.1. Learning Outcomes

After completion of this study theme the student should be able to:

- describe the various joining and assembly processes.
- prescribe a joining process for a given assembly and application.

8.9.2. Study units

Groover Chapters 25-28.

8.10. Study Theme 10: The Design Process

8.10.1. Learning Outcomes

After completion of this study theme the student should be able to:

- follow the appropriate steps through the various design phases.
- perform a functional analysis.
- compile a design specification.
- generate and evaluate concepts.

8.10.2. Study units

Class notes.