



**School of Physics
Faculty of Engineering and Information Sciences**

Subject Code: PHYS235
Subject Name: Mechanics and Thermodynamics
Credit Points: 6cp
Offered: Autumn Session 2015

CONTACTS

Subject Coordinator and Lecturer (Thermodynamics)

Professor Chao Zhang
School of Physics, Building 4, Room 117
Telephone: +61 2 42 213458
Email: czhang@uow.edu.au

Consultation times: Tuesday 10:30-12:30 (Rm6.314) and Thursday 10:30-12:30 (Rm4.117)

Subject Coordinator and Lecturer (Mechanics)

Dr George Takacs
School of Physics, Building 4, Room G17
Telephone: +61 2 42 214897
Email: gjt@uow.edu.au

Consultation times: Wednesday 1:30-3:30 (Rm 6.314) and Friday 2:30-4:30 (Rm 4G17)

Students will be contacted throughout the Session via UOW SOLS Mail with important information relating to this subject.

N.B. UOW email and UOW SOLS mail are not the same. Messages sent to SOLS mail do not go to your email account and vice-versa.

Subject outcomes and brief outline:

Outcomes:

Mechanics: After completing the subject, the student should be able to solve mechanics problems at the intermediate level using the Newtonian, Lagrangian and Hamiltonian formalisms.

Thermodynamics: After completing the subject the student will be able to (i) obtain all the properties of a system without knowing anything about the microscopic properties of the system if certain macroscopic properties of the system can be experimentally determined; (ii) determine the microscopic properties of the system by using the method of kinetic theory and statistical mechanics to calculate the dependence of a system on thermodynamical variables. The subject will also provide students with skills in partial differentiation, the solution of differential equations, integration and statistics.

Outline: Vector calculus; kinematics of a particle; dynamics of a particle; moving reference systems; central forces; dynamics of a system of particles; mechanics of rigid bodies; Lagrange's Equations. Thermodynamic systems; equations of state; work; the first law of thermodynamics and its consequences; the second law of thermodynamics; entropy; combined first and second laws; thermodynamics potentials; applications of thermodynamics; kinetic theory of the ideal gas; molecular velocity distribution.

Lecture times, and tutorial/lab times (where possible) - subject to change

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Lecture 1	Wed	11:30	12:30	67-102
Lecture 2-3	Thur	13:30	15:30	20.3
Lecture 4-5	Fri	10:30	12:30	20.3
Practical	Tue	09:30	12:30	6-314; 6-316

Lecture schedule

	Lecture 1 (Wed)	Lecture 2-3 (Thursday)	Lecture 4-5 (Friday)
Week 1, 02/03	Thermodynamics	Thermodynamics	Mechanics
Week 2, 09/03	Thermodynamics	Thermodynamics	Mechanics
Week 3, 16/03	Mechanics	Thermodynamics	Mechanics
Week 4, 23/03	Mechanics	Thermodynamics	Mechanics
Week 5, 30/03	Mechanics	Thermodynamics	Good Friday (03/04)
Week 6, 13/04	Mechanics	Thermodynamics	Mechanics
Week 7, 20/04	Mechanics	Thermodynamics	Mechanics
Week 8, 27/04	Mechanics	Thermodynamics	Mechanics
Week 9, 04/05	Mechanics	Thermodynamics	Mechanics
Week 10, 11/05	Mechanics	Thermodynamics	Mechanics
Week 11, 18/05	Mechanics	Thermodynamics	Mechanics
Week 12, 25/05	Mechanics	Thermodynamics	Mechanics
Week 13, 01/06			

In total, there are 32 Mechanics lecture hours and 26 Thermodynamics lecture hours.

Mechanics Lecture Outline

Week(s) Lecturer	Material Covered	Related Experiments
Week 1-3	Mechanics Fundamentals • Coordinate systems and notation • Newton's laws • Projectiles • Charged particles	• Air resistance
Week 4-6	Mechanics of Motion • Angular momentum • Energy • Forces • Potential energy • Central forces • Multi-particle systems • Euler-Lagrange equation	• Cavendish experiment • Ruchardt's experiment
Week 7-12	Mechanics of Complex Systems • Lagrange's equations • Constrained systems • Two body forces • Non-inertial frames • Hamiltonian mechanics • Lagrange vs Hamilton	

Chapters to be covered in thermodynamics:
1-9, 11-14, 16-20, 28

Attendance requirements

The University Code of Practice Students states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the subject outline.

Graduate Qualities

This subject contributes to student development of UOW Graduate Qualities. Also see <http://cedirsd.uow.edu.au/eng/index.aspx>

- Problem solving skills

Textbooks

"**Classical Mechanics**" John R. Taylor, University Science Books, 2005.

"**Concepts in thermal physics**", Stephen J. Blundell and Katherine M. Blundell, 2nd edition, Oxford University Press, 2010

Recommended Reading

Use the Library catalogue and databases to locate additional resources.

Any material that needs to be purchased, and where possible the costs.

No materials need be purchased. Additional notes on thermodynamics can be found at: <http://www.uow.edu.au/~czhang/Phys235>

Assessment Guidelines:

Your final subject mark will be calculated from the following:

Mechanics assigned work	10%;
Mechanics examination	30%
Thermodynamics assignments	10%;
Thermodynamics examination	30%
Laboratory	20%

Satisfactory performance (40% minimum) in the combined final exams (mechanics and thermodynamics) is required for an overall pass. Failure to perform satisfactorily in the final exam or complete the practical work will result in a **technical fail** being recorded as your grade. Marks are not normally scaled or modified.

Laboratory work: in the laboratory class, (More information in page 6)

Mechanics assigned work: to be handed in at the lecture on the dates specified.

Thermodynamic assignments: to be handed in at the lecture on the dates specified.

Late Work:

Late work will not be marked.

Details about assessment of assigned work in Mechanics:

At each class, problems from the textbook will be assigned. These should be attempted in the exercise books supplied. The exercise books will be distributed at the beginning of the class and collected at the end of the class. Exercise books are not to be removed from the classroom.

The problems will be graded as follows:

A	85-100%
B	75-85%
C	65-75%
D	50-65%
0	zero

At the end of the session, the grades will be totalled and a final mark calculated. To account for missed classes due to illness or other misadventure, the marks from the poorest 4 (out of 30 total) classes will be discarded before the average is calculated. The exercise books will be given to the students at the end of the session so that the work in them may be consulted in preparing for the examination. The total mark from the exercise books constitutes 10% of the marks in the subject.

Academic consideration:

Academic consideration may be granted if a good reason is demonstrated. The school is under no obligation to make allowance for poor performance related to illness or other circumstances beyond the student's control and no such allowance will normally be considered without documented evidence and a request submitted via SOLS as soon as possible after the event. A doctor's certificate does not remove the obligation to undertake the assessment. In the event of a missed test and the school decides to offer a supplementary test, then the test may be held after the end of session examination period. The school reserves the right to determine the student's grade on performance in other aspects of the subject. Any supplementary exam will be structured so that no unfair advantage is gained from the extra study time available.

A student with a disability may be entitled to reasonable adjustment to assessment.

A reasonable adjustment document obtained through the Disability Services is a recommendation that needs to be discussed and ratified by subject coordinators. Normal subject assessment requirements can only be adjusted with explicit written permission of the subject coordinator. In particular students cannot assume that a reasonable adjustment document automatically gives a right to deferred or supplementary exams.

University and Faculty Policies:

Students should make themselves aware of the University and/or Faculty Policies regarding

<http://www.uow.edu.au/about/policy/students/index.html>

- Academic Integrity and Plagiarism Policy
- Admissions and Advanced Standing Policy
- Code of Practice – Teaching and Assessment
- Course Progress Policy
- Examination Rules
- Examination Procedure
- Fees Policy
- General Course Rules
- Good Practice Assessment Guidelines
- Graduate Qualities Policy
- Information Literacy Integration Policy
- Student Academic Consideration Policy and Guidelines
- Supplementary Assessment Guidelines
- Copyright Policy
- IP Intellectual Property Policy and Guidelines
- IP Student Assignment of Intellectual Property Policy and Guidelines

Plagiarism:

Plagiarism will not be tolerated and has led to exclusion. Further information on plagiarism can be found in the Faculty Policy document, with full details available at:

<http://www.uow.edu.au/about/policy/UOW058648.html>

Exams:

- Foreign language translation dictionaries are not permitted in exams.
- Calculators approved for use in exams must be identified by a UOW tamper-evident label.
- Where students are permitted to use textbooks and other reference materials in an exam, the materials may contain annotations of any kind, and UOW Library books shall be permitted.

Supplementary Assessment:

Students who receive a mark of 48 or 49% will be considered for supplementary assessment. The offer of supplementary assessment is not automatic and will be considered on a case by case basis. The precise form of supplementary assessment will be determined at the time the offer of a supplementary assessment is made. Students must make themselves available during the supplementary examination period to take up any offer of supplementary assessment.

Reasonable Adjustment to Assessment:

A student with a disability may be entitled to reasonable adjustment to assessment.

A reasonable adjustment document obtained through the Disability Services is a recommendation that needs to be discussed and ratified by subject coordinators. Normal subject assessment requirements can only be adjusted with explicit written permission of the subject coordinator. In particular students cannot assume that a reasonable adjustment document automatically gives a right to deferred or supplementary exams. <http://www.uow.edu.au/about/policy/UOW058672.html>

Recent improvements include incorporating student feedback on the class book system and exams.

Dr George Takacs
Prof Chao Zhang
February 21, 2015

School of Physics 200 Level Laboratories PHYS235 Laboratory Information

Introduction: The laboratory component for PHYS235 consists of 5 assessment tasks. These are 3 regular experiments and reports, a numerical assignment and 1 experiment and formal report, which all have the same weighting. The experiments all take one lab class to complete. You will work as a team during lab classes and the 3 regular experiments and reports will be performed as a team. The two other tasks will be individual work.

Experiments: Each experiment will be allotted to you in advance. All the notes for the experiments are available on eLearning.

Class and Book Assessment: For each regular experiment your team will get three marks – two in class marks (one based on your preparation and the other for your performance in class) and a book mark. You will take responsibility for one of these three tasks and your overall mark for that experiment will be weighted accordingly. The class marks are for work done during the scheduled laboratory class time and the book mark is based upon work submitted in your team log book. You hand the book in before you start your next class, one week later. You must get your work checked and marked by a demonstrator before you leave the class. The demonstrator will sign you off when you have reached the required standard of work.

Formal Report: *The PHYS235 formal report is due in by the end of week 13.* Students will need to write one formal report for PHYS235. The assessment of which will be based on the quality of your experimental analysis and the clarity of presentation of the work. Details of which experiment is to be written as the formal report will be given to you during the session.

Numerical Exercises: *The PHYS235 numerical exercise is due in by the end of week 4.* There is one numerical exercise for PHYS235. The numerical exercise is equivalent to one experiment and must be completed in your own time. The exercises can be downloaded from eLearning.

Numerical assignments and formal reports should be typed and handed in as stapled pages to EIS Central with a standard Faculty of Engineering cover sheet attached. See subject handout for details.

Laboratory Staff: Academic in Charge: A/Prof. Michael Lerch (mlerch@uow.edu.au) 4221 4954, 4.114, Laboratory Supervisor: Duncan Fisher (duncan@uow.edu.au) 4221 3526, 6.317D

Class marks: You will work as a team and you should cooperate and collaborate fully during the class time. Demonstrators will assess your log book and ask you questions throughout the lab class.

Preparation Mark (out of 10): (Based on how well you have prepared for the experiment. Including background reading, understanding of the physical principles being investigated, the method to be used and so on).

Data Collection and Analysis Mark (out of 10): (Based on your performance in class. Including how well you have taken and recorded the data required and any preliminary analysis of that data in class. A consideration of the uncertainties involved in the experiment is also expected.)

Book mark (out of 10): Finish writing up your work on each experiment outside of the class. One log book per team is to be submitted.

- **Completed analysis (4 marks)**
- **Uncertainties (2 marks)**
- **Questions (2 marks)**
- **Discussion/Conclusion (2 marks)**

Experiment List:

PHYS235 Experiments	Weighting
Cavendish – Cavendish	1
Ruchardt – Cp and Cv in air	
Glass TC – thermal conductivity of glass tubing	1
Stef.Boltz – Stefan Boltzmann	1
Formal Report – Cp/Cv	1
Numerical exercise – Air resistance	1

Thermodynamics assignments:

Marker: Mathew Sanderson, Rm 4.113, ms919@uowmail.edu.au

Concepts in Thermal Physics by *Blundell, 2nd Edition*

All assignments are due in two weeks after the chapter is completed in lectures.

Chapter 1: Q3, Q5
 Chapter 2: Q1, Q2
 Chapter 3: Q1, Q3, Q4
 Chapter 4: Q1, Q2, Q8
 Chapter 5: Q1
 Chapter 6: Q3, Q5, Q9
 Chapter 7: Q4, Q8
 Chapter 8: Q1
 Chapter 9: Q1, Q2
 Chapter 11: Q1, Q2
 Chapter 12: Q1, Q3, Q5, Q6
 Chapter 13: Q4, Q5
 Chapter 14: Q1, Q3, Q6, Q7
 Chapter 16: Q1, Q2, Q5, Q6
 Chapter 17: ALL QUESTIONS
 Chapter 19: Q1
 Chapter 20: Q5
 Chapter 28: Q1, Q3, Q5, Q6