## School of Information and Physical Sciences

# PHYS2111: Classical Physics 1

Callaghan
Semester 2 - 2025

COURSE OUTLINE

# OVERVIEW

**Course Description**

Applications of classical mechanics to the motion of large-scale systems are fundamental to the engineering and technology of structures, machines, and devices, from rocket launching to satellite orbiting. This course will also help to understand the flow of liquids and gases, from weather systems to swimming plankton; and why a cup of tea left on a counter always cools down and never heats up. At its core Classical Physics 1 studies the motion of particles, fluids and energy using the concepts of Newtonian mechanics. This course requires an intermediate level of calculus to analyse systems in mechanics, fluid mechanics and thermodynamics. Blended problem-based conceptual learning (lectorials) will be used to gain an understanding of key developments, ideas and theories covered in Classical Physics 1. Blended problem-based hands-on learning (laboratory workshops) will be used to gain an understanding of key experiments, models and analysis covered in Classical Physics 1. Students will complete written reports, oral presentations, and a poster presentation related to the laboratories.

**Academic Progress Requirements**

Nil

**Requisites**

Course Pre-Requisite:
Must have successfully completed the following course(s):
PHYS1210
Must have successfully completed the following course(s):
At least one course from:
MATH1120
MATH1210
MATH1220

Course Replacement:
You cannot enrol if you have successfully completed any of the following course(s):
PHYS2250

**Contact Hours**

**Callaghan**
**Laboratory**
Face to Face On Campus
3 hour(s) per week(s) for 11 week(s) starting Week 2

**Lectorial**
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1
Lectorials will use a combination of online and face-to-face content.
**Tutorial**
Face to Face On Campus
1 hour(s) per week(s) for 12 week(s) starting Week 1

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| **Unit Weighting** | 10 |
| **Workload** | Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course. |

# CONTACTS

**Course Coordinator**

**Callaghan**
Dr Tom Evans-Soma
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Consultation:

**Teaching Staff**

Prof David Pontin
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**School Office**

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+61 2 4921 5538
9am-5pm (Mon-Fri)

# SYLLABUS

**Course Content**

Classical mechanics

- Motion in a uniform force field
- Motion in a central force field, gravitation and Kepler's laws
- Rigid body motion and moments of inertia
- Rotating coordinates and non-inertial reference frames
- Lagrangian and Hamiltonian formulation

Thermal physics

- Definition of thermodynamics
- Zeroth, First and Second Law of thermodynamics
- Multiplicity, Entropy and the origin of irreversibility
- Temperature, pressure and chemical potential
- Ideal gases, two-state systems, Einstein solid

Fluid mechanics

- Conservation of mass, momentum and energy in a fluid
- Incompressible flow, irrotational flow, and Bernoulli’s equation
- Viscous flows; the Navier-Stokes equation and Reynolds number
- Fluids modelling, turbulence and non-Newtownian fluids

**Course Learning Outcomes**

**On successful completion of this course, students will be able to:**
1. Describe how the basic concepts of classical mechanics, fluid mechanics and thermal physics are used to develop models of motion and energy transfer.

2. Solve qualitative and quantitative problems, using mathematics and computer programming.

3. Perform experiments, in laboratory and in computer models, keeping an accurate record of experimental work and analysing results and reaching non-trivial conclusions from them.

4. Communicate the results of both theoretical and experimental work in various forms including written reports, oral presentations and poster presentations.

5. Contribute to team and group work for scientific investigations and for the process of learning.

**Course Materials** Please check the course canvas site.

# SCHEDULE

# ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

| | Assessment Name | Due Date | Involvement | Weighting | Learning Outcomes |
|---|---|---|---|---|---|
| **1** | Quizzes | | Individual | 15% | 1, 2 |
| **2** | Take-home Written Assignment | | Individual | 15% | 1, 2 |
| **3** | Tutorial/Laboratory Exercises | | Combination | 30% | 3, 4, 5 |
| **4** | Formal Examination | | Individual | 40% | 1, 2 |

**Late Submissions** The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by up to 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

## Assessment 1 - Quizzes

**Assessment Type** Quiz
**Description**
**Weighting** 15%
**Due Date**
**Submission Method**
**Assessment Criteria**
**Return Method**
**Feedback Provided**
**Opportunity to Reattempt** Students will not be given the opportunity to reattempt this assessment.

## Assessment 2 - Take-home Written Assignment

**Assessment Type** Written Assignment
**Description**
**Weighting** 15%
**Due Date**
**Submission Method**
**Assessment Criteria**

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| **Return Method** | |
| **Feedback Provided** | |
| **Opportunity to Reattempt** | Students will not be given the opportunity to reattempt this assessment. |

## Assessment 3 - Tutorial/Laboratory Exercises

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| **Assessment Type** | Tutorial / Laboratory Exercises |
| **Description** | |
| **Weighting** | 30% |
| **Due Date** | |
| **Submission Method** | |
| **Assessment Criteria** | |
| **Return Method** | |
| **Feedback Provided** | |
| **Opportunity to Reattempt** | Students will not be given the opportunity to reattempt this assessment. |

## Assessment 4 - Formal Examination

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| **Assessment Type** | Formal Examination |
| **Description** | |
| **Weighting** | 40% |
| **Due Date** | |
| **Submission Method** | |
| **Assessment Criteria** | |
| **Return Method** | |
| **Feedback Provided** | |
| **Opportunity to Reattempt** | Students will not be given the opportunity to reattempt this assessment. |

# ADDITIONAL INFORMATION

**Grading Scheme**

This course is graded as follows:

| Range of Marks | Grade | Description |
|---|---|---|
| 85-100 | High Distinction (HD) | Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives. |
| 75-84 | Distinction (D) | Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives. |
| 65-74 | Credit (C) | Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes. |
| 50-64 | Pass (P) | Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes. |
| 0-49 | Fail (FF) | Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action. |

*Skills are those identified for the purposes of assessment task(s).

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| **Communication Methods** | Communication methods used in this course include: |
| **Course Evaluation** | Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement. |
| **Learning Analytics** | The University uses an evidence-based approach to enhancing student learning and delivering support. Our careful analysis of data through learning analytics informs decision making processes related to student learning, academic outcomes, and support services. Learning analytics may be used to identify targeted individual opportunities for additional support services or interventions. |
| **Interviews on Assessment Items** | An Interview may be conducted on any assessment item in this course, in accordance with the Interview on Assessment Items Procedure. The purpose of the interview is to verify the author of the material submitted in response to the assessment task and provide a quality assurance measure.<br><br>In the event the Course Coordinator is not satisfied that a student's oral responses are consistent with the work originally submitted, the matter will be referred to the Student Academic Conduct Officer, who will take appropriate action under the Student Conduct Rule. |
| **Academic Integrity and Ethical Academic Conduct Policy** | All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations.<br><br>Please refer to the Academic Integrity and Ethical Academic Conduct Policy |
| **Adverse Circumstances** | The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s).<br><br>Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:<br><br>1. the assessment item is a major assessment item; or<br>2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;<br>3. you are requesting a change of placement; or<br>4. the course has a compulsory attendance requirement.<br><br>Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure. |
| **Use of generative artificial intelligence in course assessments** | It is critical that any work submitted for assessment is your own original work. Before using generative AI tools (such as ChatGPT, Perplexity, Microsoft Copilot, etc) in any assessable work you must ensure that such use is in line with the requirements for the course and expectations of your Course Coordinator<br><br>Misuse of AI tools may be considered a breach of the University's Student Conduct Rule and could result in disciplinary action.<br><br>Artificial Intelligence detection software may be used to review any work you submit. If you have used AI in any way other than has been expressly permitted by your course coordinator, you may be engaging in academic misconduct and be subject to penalties.<br><br>For information, refer to:<br>• Generative AI Tools<br>• Academic Integrity |

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| **Important Policy Information** | The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University |

*This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.*