

UNIT OUTLINE

Year: 2021

Accreditation: T

Timetable Period: Semester 1

Classroom Teacher: James Hall

Executive Teacher: Debbie O'Brien

Course Title	Physics integrating Australian Curriculum	Course Code	2172
Semester Unit	Unit 3: Gravity and Electromagnetism	Unit Code/Value	21665 / 1.0
Term Unit (a)	Unit 3a: Gravity and Electromagnetism	Unit Code/Value	21666 / 0.5
Term Unit (b)	Unit 3b: Gravity and Electromagnetism	Unit Value/Code:	21667 / 0.5

Specific Unit Goals:

By the end of this unit, students:

- understand that motion in gravitational, electric and magnetic fields can be explained using Newton's Laws of Motion
- understand how the electromagnetic wave model explains the production and propagation of electromagnetic waves across the electromagnetic spectrum
- understand transformations and transfer of energy in electromagnetic devices, as well as transformations and transfer of energy associated with motion in electric, magnetic and gravitational fields
- understand how models and theories have developed over time, and the ways in which physical science knowledge and associated technologies interact with social, economic, cultural and ethical considerations
- use science inquiry skills to design, conduct, analyse and evaluate investigations into uniform circular motion, projectile motion, satellite motion and gravitational and electromagnetic phenomena, and to communicate methods and findings
- use algebraic and graphical representations to calculate, analyse and predict measurable quantities related to motion, gravitational effects and electromagnetic phenomena
- evaluate, with reference to evidence, claims about motion, gravity and electromagnetic phenomena and associated technologies, and justify evaluations
- communicate physics understanding using qualitative and quantitative representations in appropriate modes and genres.

Content Summary:**Science Inquiry Skills**

- identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes (PHYT01)
- design investigations, including the procedure to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics (PHYT02)

- conduct investigations, including the manipulation of force measurers and electromagnetic devices, safely, competently and methodically for the collection of valid and reliable data (PHYT03)
- represent data in meaningful and useful ways, including using appropriate si units, symbols and significant figures; organise and analyse data to identify trends, patterns and relationships; identify sources of uncertainty and techniques to minimise these uncertainties; utilise uncertainty and percentage uncertainty to determine the uncertainty in the result of calculations, and evaluate the impact of measurement uncertainty on experimental results; and select, synthesise and use evidence to make and justify conclusions (PHYT04)
- interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the accuracy and precision of available evidence; and use reasoning to construct scientific arguments (PHYT05)
- select, construct and use appropriate representations, including text and graphic representations of empirical and theoretical relationships, vector diagrams, free body/force diagrams, field diagrams and circuit diagrams, to communicate conceptual understanding, solve problems and make predictions (PHYT06)
- select, use and interpret appropriate mathematical representations, including linear and non-linear graphs and algebraic relationships representing physical systems, to solve problems and make predictions (PHYT07)
- communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports (PHYT08)

Science as a Human Endeavour

- ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of datasets with which scientists work (PHYT09)
- models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power (PHYT10)
- the acceptance of science understanding can be influenced by the social, economic and cultural context in which it is considered (PHYT11)
- people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk (PHYT12)
- science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question (PHYT13)
- international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-Pacific region (PHYT14)
- scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability (PHYT15)

Science Understanding

Gravity and motion

- the movement of free-falling bodies in earth's gravitational field is predictable (PHYT16)
- all objects with mass attract one another with a gravitational force; the magnitude of this force can be calculated using newton's law of universal gravitation (PHYT17)
- objects with mass produce a gravitational field in the space that surrounds them; field theory attributes the gravitational force on an object to the presence of a gravitational field (PHYT18)

- when a mass moves or is moved from one point to another in a gravitational field and its potential energy changes, work is done on or by the field (PHYT19)
- gravitational field strength is defined as the net force per unit mass at a particular point in the field (PHYT20)
- the vector nature of the gravitational force can be used to analyse motion on inclined planes by considering the components of the gravitational force (that is, weight) parallel and perpendicular to the plane (PHYT21)
- projectile motion can be analysed quantitatively by treating the horizontal and vertical components of the motion independently (PHYT22)
- when an object experiences a net force of constant magnitude perpendicular to its velocity, it will undergo uniform circular motion, including circular motion on a horizontal plane and around a banked track (PHYT23)
- Newton's Law of Universal Gravitation is used to explain Kepler's laws of planetary motion and to describe the motion of planets and other satellites, modelled as uniform circular motion (PHYT24)

Electromagnetism

- electrostatically charged objects exert a force upon one another; the magnitude of this force can be calculated using Coulomb's Law (PHYT32)
- point charges and charged objects produce an electric field in the space that surrounds them; field theory attributes the electrostatic force on a point charge or charged body to the presence of an electric field (PHYT33)
- a positively charged body placed in an electric field will experience a force in the direction of the field; the strength of the electric field is defined as the force per unit charge (PHYT34)
- when a charged body moves or is moved from one point to another in an electric field and its potential energy changes, work is done on or by the field (PHYT35)
- current-carrying wires are surrounded by magnetic fields; these fields are utilised in solenoids and electromagnets (PHYT36)
- the strength of the magnetic field produced by a current is called the magnetic flux density (PHYT37)
- magnets, magnetic materials, moving charges and current-carrying wires experience a force in a magnetic field; this force is utilised in DC electric motors (PHYT38)
- magnetic flux is defined in terms of magnetic flux density and area (PHYT39)
- a changing magnetic flux induces a potential difference; this process of electromagnetic induction is used in step-up and step-down transformers, DC and AC generators, and AC induction motors (PHYT40)
- conservation of energy, expressed as Lenz's law of electromagnetic induction, is used to determine the direction of induced current (PHYT41)
- electromagnetic waves are transverse waves made up of mutually perpendicular, oscillating electric and magnetic fields (PHYT42)
- oscillating charges produce electromagnetic waves of the same frequency as the oscillation; electromagnetic waves cause charges to oscillate at the frequency of the wave (PHYT43)

Cost of Materials:

Students are expected to come to class with the following equipment:

- Pens and pencils
- A notebook
- A calculator
- A ruler
- A electronic device

Other stationary may be required from time to time.

During laboratory sessions, closed, sturdy footwear is required to be worn. Loose hair may need to be restrained.

Assessment:

TASK	DUE DATE	WEIGHTING
Practical Assignment	Week 9	20%
Test 1	Week 8	30%
Research Assignment	Week 16	20%
Test 2	Week 17	30%

NOTE THERE IS NO WEEK 10 IN THIS RECKONING

SPECIFIC ENTRY & EXIT REQUIREMENTS FOR TERM UNITS:

This is a Semester Unit; students wishing to enter or exit after the end of term must have the change approved by the Academy Executive Leader and need to complete 50% of the assessment

ASSESSMENT CRITERIA FOR ASSESSMENT AND REPORTING OF STUDENT ACHIEVEMENT

Students will be assessed on the degree to which they demonstrate:

- an ability to respond critically to texts and logically justify viewpoint
- an ability to evaluate and synthesise material to make meaning
- imagination and originality
- competent and effective use of language for a range of purposes and audiences
- control of appropriate medium.

Attendance and Participation

It is expected that students will attend and participate in all scheduled classes/contact time/structured learning activities for the units in which they are enrolled, unless there is due cause and adequate documentary evidence is provided. Any student whose attendance falls below 90% of the scheduled classes/contact time or 90% participation in structured learning activities in a unit, without having due cause with adequate documentary evidence will be deemed to have voided the unit. However, the principal has the right to exercise discretion in special circumstances if satisfactory documentation is supplied.

Completion of Assessment Items

Students are expected to substantially complete and submit all assessment items. Exemption from an item and/or alternative assessment without penalty is available to students providing adequate documentary evidence. To meet the minimum assessment requirements of a unit, a student must substantially complete and submit at least 70% of the total assessment. However, the principal has the right to exercise discretion in the award of a grade or score in special circumstances where satisfactory documentation is supplied.

Late Submission of Assessment Items

Students are encouraged to submit work on time as this is a valuable organisational skill. Students are also encouraged to complete work even if it is late as there are educational benefits in so doing. The following policy is to ensure equity for all students:

- All assessment tasks are expected to be submitted by the specified due date
- Where marks are awarded for assessment tasks, a late penalty will apply unless an extension is granted. The penalty for late submission is 5% of possible marks per calendar day late, including weekends and public holidays, until a notional zero is reached. If an item is more than 7 days late, it receives the notional zero. Submission on weekends or public holidays is not acceptable. Calculation of a notional zero is based on items submitted on time or with an approved extension (Refer to Notional Zeros)
- Where marks are not awarded, and a grade only is given for an assessment task, teachers will take into account the extent to which students have demonstrated their ability to complete and submit the task by the due date (taking into account any extensions granted) in awarding the grade
- Unless there are exceptional circumstances, students must apply for an extension to the specified due date in advance, providing due cause and adequate documentary evidence for late submission
- It may not be possible to grade or score work submitted late after marked work in a unit has been returned to other students
- The principal has the right to exercise discretion in the application of the late penalty in special circumstances where satisfactory documentation has been provided.

Notional Zeros

Where students fail to hand in assessment items for which marks are awarded, they will be awarded a notional zero for that assessment item. The notional zero will be a score, which lies between 0.1 of a standard deviation below the lowest genuine score for that item and zero. Note: if the lowest genuine score is zero, the notional zero is zero.

Cheating and Dishonest Practice

The integrity of the College's assessment system relies upon all involved acting in accordance with the highest standards of honesty and fairness. Plagiarism is the copying, paraphrasing or summarising of work, in any form, without acknowledgement of sources, and presenting this as a student's own work. Examples of plagiarism could include, but are not limited to:

- submitting all or part of another person's work with/without that person's knowledge
- submitting all or part of a paper from a source text without proper acknowledgement
- copying part of another person's work from a source text, supplying proper documentation, but leaving out quotation marks
- submitting materials which paraphrase or summarise another person's work or ideas without appropriate documentation
- submitting a digital image, sound, design, photograph or animation, altered or unaltered, without proper acknowledgement of the source.

Right to Appeal

The ACT system operates a hierarchy of reviews and appeals:

- Student seeks review from teacher regarding assessment task mark/grade, unit score, unit grade, course score
- Student seeks review from head of department, if required following review by teacher
- Student appeals to her/his college principal for a review of college assessment relating to assessment task grade/mark, unit grade, unit score, course score, penalty imposed for breach of discipline in relation to assessment
- Student, who has been through the college appeal process, may appeal to the Board against the college procedures by which the appeal decision was reached.

Further information on relevant BSSS policies can be found here:

<http://www.bsss.act.edu.au/The Board/policy and procedures manual>