Module Details

Module Code:	MATH S7005
Full Title:	Mathematics & Physics APPROVED
Valid From::	Semester 1 - 2021/22 (September 2021)
Language of Instruction:	English
Duration:	1 Semester
Credits::	5
Module Owner::	Matthew Molloy
Departments:	Agriculture, Food and Animal Health
Module Description:	This module will introduce the learner to fundamental physical concepts (mechanics, heat, electricity) through a Problem Based Learning (PBL) approach. The learner will use measurement & mathematical techniques to investigate & solve practical and real-world physics problems applied to agriculture. An introduction to critical mathematical concepts & tools (algebra, geometry, frequency charts) will aid the student's ability to solve scientific problems and analyse datasets. Students will demonstrate their understanding by communicating problems and solutions in written reports using graphs & diagrams where necessary and citing relevant sources.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	**Module Learning Outcome Description**
MLO1	Apply the principles of mechanics & electricity to perform calculations relating to motion (velocity, acceleration), force, energy, current, voltage & resistance. Build and repair simple DC circuits such as an electric motor and series/parallel lighting circuits.
MLO2	Apply the principles of Heat (Transfer), Gas Laws & Pressure to perform calculations relating to temperature, heat, heat capacity, compressed gasses and how they are affected by Temperature, Pressure & Volume.
MLO3	By implementing critical laboratory techniques (e.g., safety, measurement, recording), determine by experiment the physical (e.g., size, dimensions), mechanical (e.g., velocity, energy), electrical (e.g., resistance, voltage) or thermal (e.g., specific heat capacity) properties of a system. Communicate experimental results in a coherent laboratory report using appropriate diagrams, graphs & references.
MLO4	Use numerical, algebraic and graphing skills in a science environment to solve and communicate problems and ideas relating to agriculture & food production. Using trigonometric principles (e.g., Pythagoras' Theorem, Sine/Cosine Rule), calculate the areas & volumes of common shapes/spaces as well as oddly shaped areas (e.g., fields).
MLO5	Employ fundamental statistical techniques to summarise, analyse & interpret data of relevance to agriculture (e.g., crop yield, growth rates, financial data). Describe trends /distributions using descriptive statistics (e.g., mean, mode) and construct summary charts (e.g., histograms, ogives) to meaningfully visualise datasets.

Pre-requisite learning
Module Recommendations   *This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*
No recommendations listed

Module Indicative Content

Physics - Mechanics
S.I. system of units; Kinetics & Motion; Force, Mass and Weight; Work, Energy and Power; Momentum; Circular Motion.

Physics - Electricity
Electrostatic concepts; D.C. circuits, Energy and Power; Magnets; Magnetic Forces; Motors; Electromagnetic Induction, Generators and Transformers, A.C. and D.C. electricity.

Physics - Heat & Temperature
Heat as energy; Specific heat capacity; Latent heat; Thermal equilibrium; Thermal sensors.

Physics - Gas Laws & Pressure
Density; Measuring Pressure (Pascals, bar, atmospheres); The physics (and dangers) of compressed gas; The ideal gas law (including Boyle's/Charles'/Gay-Lussac law) and how Temperature, Pressure & Volume are related.

Mathematics - Principles of Measurement
Obtain scientific measurements with consideration of significant digits, measurement errors and instrument resolution; Units, scientific notation and use of a calculator; Unit conversions.

Mathematics - Algebra & Trigonometry
Solution of linear, quadratic & simultaneous equations; Transposition of formulae to include indices, logs & trigonometric functions; Measuring angles using degrees & radians, Use of trigonometric principles (e.g. Pythagoras' rule, Cosine rule etc.) to determine odd-shaped areas.

Mathematics - Data Analysis
Collate & organise data into sensible tables; Discrete & continuous data; Scatter plots and determining rates of change; Measure "goodness of fit" to evaluate correlations; Construct frequency tables and generate histograms; Use descriptive statistics to characterise distributions (e.g., mean, mode, variance etc.); Construct Ogives and determine percentiles.

Module Assessment

Assessment Breakdown	%
Course Work	100.00%

Module Special Regulation

Assessments

Part Time On Campus

Course Work			
Assessment Type	Short Answer Questions	**% of Total Mark**	50
Marks Out Of	100	**Pass Mark**	40
Timing	Every Week	**Learning Outcome**	4,5
Duration in minutes	0		

Assessment Description
Weekly homework assignments will require students to apply mathematical techniques to solve a number of short problems.

Assessment Type	Written Report	**% of Total Mark**	50
Marks Out Of	100	**Pass Mark**	40
Timing	n/a	**Learning Outcome**	1,2,3,4
Duration in minutes	0		

Assessment Description
Reports will be written that should adequately describe a scientific problem and its solution. Appropriate graphs and references will be required. A shared assessment with Mathematics and Physics, Soil Science & Sustainable Farming, and Biology & Chemistry in Agriculture will include a statistical analysis of laboratory data (standard deviation, % error, mean etc.).

No Project

No Practical

No Final Examination

Reassessment Requirement

A repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

Reassessment Description
Alternative repeat assessments will be available to students.

Module Workload

This module has no Full Time On Campus workload.

Workload: Part Time On Campus

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Lecturer Supervised Learning	Contact	Physics laboratory session.	Every Week	0.50	0.5
Lecture	Contact	Mathematics and PBL theoretical sessions.	Every Week	2.00	2
Online Contact	Contact	Online tutorial support.	Every Second Week	0.50	1
Independent Study	Non Contact	Group Work Outside Lab	Every Week	2.00	2
Directed Reading	Non Contact	Directed Reading	Every Week	2.00	2
				Total Weekly Learner Workload	7.00
				Total Weekly Contact Hours	3.00

Module Resources

Recommended Book Resources

O'Regan, Dan. (2000), Real World Physics, Folens, Dublin.

Anthony Croft,Robert Davison. Foundation Maths, [ISBN: 978-1292095172].

Gov. Pub.. Mathematical Tables, Dublin.

Supplementary Book Resources

Duncan, Tom. (2005), Physics for Today and Tomorrow Second Ed., John Murray, London.

Duncan, Tom. (2000), Advanced Physics, Fifth Ed., Hodder, London.

Duncan, T.and Kennett, H.. (2001), GCSE Physics, Hodder, London.

Nuffield Advanced Science. (2004), Book of Data, Longman, UK.

Henri Gwyn Davies,Gordon Allen Hicks. (1998), Mathematics for Scientific and Technical Students, Routledge, p.595, [ISBN: 9780582413887].

Bird, John. Engineering Mathematics2012, 7th Edition. Routledge, [ISBN: 9780415662802].

This module does not have any article/paper resources

Other Resources

Website, Fear of Physics website,
http://www.fearofphysics.com

Website, Physics website in Ireland,
http://www.physics.slss.ie

Website, DkIT Maths Learning Centre. Assistance with Maths,
https://www.dkit.ie/student-life/study-e xperience/maths-learning-centre.html

Website, Khan Academy. Maths Tutorials,
https://www.khanacademy.org/