الكلية العسكرية التقنية
MILITARY TECHNOLOGICAL COLLEGE

Module Descriptor

Academic Session	2024/25
Module Title	Physics
MTC Module Code	MTCG1017
MTC Owning Department	Foundation Programme Department
MTC Module Coordinator	Dr. Karim Mohammed Sellami

Term Taught	2
Notional Hours	120
Scheduled Hours	66

Overview

The module starts with an overview of the structure of matter and its properties. The principles of statics, kinetics and dynamics are explained. Thermodynamics principles and calculations performed using simple and appropriate methodologies. The principles of sound and electromagnetic wave propagation are explored. The propagation of light and basic properties of light are covered with a view to explain its use in fibre optics and engineering applications.

Notes/Accreditation Information

The contents of this module meet the requirements of Public Authority for Civil Aviation (PACA) Oman and the European Aviation Safety Agency Part 66 Module 2 for Licensed Aircraft Engineering (all the learning outcomes), except their assessment strategies.
Aeronautical Engineering Students: The content of this unit (excluding its assessment), also meets the requirements of the European Aviation Safety Agency Part 66 Module 6.

Requisite Modules	
Module Title	**MTC Code**
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Aims	
1.	To explain the nature, properties and relationships of solids, fluids, gases, atomic structures, molecules and compounds
2.	To understand, relate the terms, explain the principles and evaluate problems associated with statics and kinetics.
3.	To relate the concepts of dynamics and fluid dynamics for different applications.
4.	To explain the principles and evaluate the problems associated with thermodynamics.
5.	To contextualise the terms and principles and evaluate problems associated with light propagation and optics.
6.	To explain the principles and evaluate the problems associated with wave motion and sound and perform any associated calculations.

Learning Outcomes – On successful completion of this module, students should be able to:	
1.	Recognise and distinguish types of matter and interrelated properties.
2.	Describe objects/systems for work and energy and experimentally demonstrate work and energy, identify simple applications to mechanics.

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3.	Demonstrate theories, concepts and applications of fluid dynamics.
4.	Describe the theories, concepts and applications of thermodynamics.
5.	Define, analyse and demonstrate the concept of light and electromagnetic waves.
6.	Define and demonstrate the nature and applications of sound waves.
7.	Collect and record basic experimental data and present the results in the form of a report.

Syllabus - The topics covered in the unit will include:	
1.	Introduction: Base units, basic units, derived units converting units of measurements prefixes, S.I system.
2.	Matter: Nature of matter, structure of an atom, shell, nucleus, molecules, periodic table, chemical compounds, different states of matter (solid, liquid gas and plasma), changes of states.
3.	Statics: Vector & scalar quantities, adding vectors (using force concept), graphical method, triangular forces, equilibrium, polygon of forces, mathematical solution, moment & couples, moment & equilibrium, mechanical properties of matter stress, tension compression, torsion, bending, shear, strain and Young's modulus.
4.	Kinetics: Velocity, acceleration, equation of linear motion with examples, linear movement, gravity & weight, centre of gravity, free fall, rotational motion, centripetal and centrifugal forces, periodic motion, pendulum, spring mass system, frequency & period, harmonics, resonance. Velocity ratio, mechanical advantage & efficiency, levers (first, second and third class), pulleys, gears, internal gears, inclined plane, bolts & nuts.
5.	Dynamics: Newton's laws of motion, mass, inertia, work, power, energy, conservation of energy, momentum, impulse, conservation of momentum, torque, moment of inertia, angular momentum, conservation of angular momentum, gyroscopes, rigidity, precession, friction, coefficient of friction.
6.	Fluid dynamics: Adhesion & cohesion, capillarity, surface tension, diffusion, pressure in liquids, Pascal's vases, calculating pressure in a liquid, hydraulics, pressure measurements, absolute pressure, atmospheric pressure, mercury barometer, aneroid barometer, buoyancy, Pascal's law, Bramah's law, Archimedes' law density with examples, hydrometer, viscosity, fluid resistance & aerodynamic drag, parasitic drag, skin friction, interference drag, the effects of streamlining, the compressibility of fluids, static & dynamic pressure & Bernoulli's theorem.
7.	Thermodynamics: Temperature, Celsius scale, Fahrenheit scale, absolute temperature scale, heat, thermometers, heat capacity, specific heat capacity, change of state, latent heat, sensible heat, heat transfer, conduction, convection and radiation. Expansion, contraction, linear, areal, (volume/liquid) expansion, laws of thermodynamics, gas law, volume temperature, pressure, Charles's law, Gay-Lussac's law, Dalton's law, specific heats of gases, pressure & volume graphs, isothermal, adiabatic, isobaric and isometric process, refrigerators, air conditioners, heat pumps, air-source heat pump operation, heat of fusion, heat evaporation, heat vaporisation and heat combustion.

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8.	Optics: Speed of light (light velocity), laws of reflection, plane & curved mirrors, focus and focal length, real and virtual images, frequency and wavelength, refraction and refractive index, direction of bending of light, Snell's law, and critical angle, and total internal reflection, refraction in convex and concave lenses, fibre optics and fibre optic imaging.
9.	Wave motion & Sound: Wave motion, the anatomy of wave, crest, trough, nodes and antinodes, categories of wave, wavelength, frequency and period of wave, interference phenomena, constructive and destructive interference, sound, speed of sound, intensity, pitch, sound interval and Doppler effect.

Learning and Teaching Strategy

The module adopts an integrated / a student-centered approach to learning & teaching.
Formal lectures will provide the theory of science i.e., (physical sciences) and highlight the application of theory by examples. This will be underpinned with associated laboratory exercises. Students will be provided with course material including worked examples with model answers.

Students will complete practical exercises and verify results using appropriate mathematical concepts. This will develop an understanding of the theoretical content. Students will produce written reports on exercises and assignments.

Students will undertake Guided Self Study including the use of the VLE including web-based physics problems, and directed to resources such as online tutorials, notes, workbooks, interactive presentations and simulations.

Formative tests, with feedback, will be given throughout the module to help the student to prepare for the summative assessment of the module.

Scheduled Activities						
#	**Activity Type**	**QAA Activity**	**Description**	**No. of sessions**	**Duration**	**Hours**
1.	Lecture	Lecture	6 hours per week	60+4=64	50 minutes	64
2.	Practical	Demonstration	2 hours	2	50 minutes	2

Assessment Strategy and Schedule

The module will be assessed through formative and summative assessments, namely: Continuous Assessment-1(CA1), Continuous Assessment-2(CA2), Laboratory work and the Final Exam.
The Generic feedback on CA1 & CA2 will be provided to the students through Moodle/ Module Teacher. Generic feedback on the Final Exam will also be provided on Moodle.
The minimum passing mark is overall 50%.
Deferred First Attempt Assessment (DFAA): DFAA for Continuous Assessment 1, 2 and final exams will be a different set of exams but will cover the same Learning Outcomes of exam(s) missed. The deferred assessment will also have the same exam duration as the first attempt assessment.
Second Attempt Assessment (SAA/Re-sit): SAA will be 90 minutes examination to cover all Learning Outcomes.

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The maximum marks obtained by the students will be capped at 50% (minimum passing requirements).

Item	Assessment	Artefact Code	Weighting	Assessment Type	Final Artefact	Description
1.	CA1	PHA1	20%	Written Exam	N	30 Minutes duration
2.	CA2	PHA2	30%	Written Exam	N	45 Minutes duration
3.	Laboratory work	PHA3	10%	Lab Report	N	N/A
4.	Final Exam	PHA4	40%	Written Exam	Y	75 Minutes duration

Indicative Reading		
#	**Title/Edition/Author**	**ISBN**
1	Advanced Level Physics -7th Edition, 1986 By Michael Nelkon and Philip Parker	ISBN-13 : 978-0435923037 ISBN-10 : 043592303X
2	Physics-5th Edition, 2016 by Walker S. James	ISBN-13: 978-0321- 97644-4 ISBN-10: 0-321- 97644-4
3	Advanced Physics for You –2nd Edition, 2015 by Keith Johnson, Simmone Hewett, Sue Holt, John Miller	ISBN: 9780198355991
4	College Physics-11th Edition,2017 By Raymond A. Serway, Jerry S. Faughn	ISBN-13: 978-1305952300 ISBN-10: 9781305952300
5	College Physics-12th Edition,2024 By Raymond A. Serway, John Hughes, Chris Vuille	ISBN-13 979-8214046679 ISBN-9798214046679