ENGR H3603: Introduction to Space Engineering

Module Title:	Introduction to Space Engineering
Language of Instruction:	English

Credits:	5

NFQ Level:	7

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	The module will be delivered with a blend of lectures and problem-solving sessions. Students will perform practical project activity for assigned tasks.

Module Aim:	This module aims to provide an introductory understanding of space engineering. Introduction to space propulsion: chemical, electric propulsion and advanced propulsion concepts. Space standards and current space industrial trends and practice.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Demonstrate knowledge of space environment, planets, celestial bodies of interest.
LO2	Analyse recent mission design elements and basic orbital maneuvers.
LO3	Evaluate the elements of satellite and spacecraft and applications of small satellites.
LO4	Describe the elements of space propulsion from launch systems to deep space propulsion and perform basic calculations.
LO5	Review various Space Standards, current space industry trends and practices.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
Space Environment & Celestial Bodies Aspect of Space Environment, Challenges for space mission and human flights. Near Earth Environment, Solar System, Interstellar and Intergalactic Space Environment. International Space Station (ISS), Near Earth Asteroid, Earth-Moon System, Earth Sun System, Planets of Interest, Issues of Orbital Debris
Mission Design Concepts Types of space missions and their objectives. Fundamental laws of orbital mechanics, Terminology and Orbit Types: Very Low Earth Orbit (VLEO), Geostationary Orbit (GEO), Low-earth Orbit (LEO), Medium Earth Orbit (MEO), Polar orbit and Sun-synchronous orbit (SSO),Transfer orbits and geostationary transfer orbit (GTO), Concepts of Orbital Maneuvers and Transfers, Orbital Rendezvous, Interplanetary Missions, Launch, Entry Descent Landing Concepts.
Elements of Spacecrafts Anatomy of Spacecraft, systems approach to spacecraft and payload design, key design drivers and payload requirements. Attitude Determination and Control systems, Thermal control systems and subsystem design, Command and Data System, Telecommunications
Space Propulsion Overview of spacecraft propulsion, Rocket Propulsion, Electric Propulsion Systems and performance evaluation. Spacecraft power subsystem, battery and solar array cells and sizing of a power subsystem, Brief on Advanced Space Propulsion Concepts: Laser, Microwave Propulsion, Solar Sail.
Space Industry Standards Overview of emerging space industry trends, Small-satellite Trends and applications. Various European Cooperation for Space Standardization (ECSS) and International Standard Organization (ISO) and other standards applicable to Space Industry, Space Law Treaties and Principles

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	30.00%
End of Module Formal Examination	60.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	Students will complete a test covering Learning Outcomes 1 to 3.	1,2,3	10.00	Week 6

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Projects will be assigned and weekly progress will be monitored throughout the module.	1,2,3,4,5	20.00	Every Week
Practical/Skills Evaluation	Final Project report and presentation will be evaluated near the end of term.	1,2,3,4,5	10.00	End-of-Semester

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	A formal written exam where students will be required to perform calculations and answer descriptive questions.	1,2,3,4,5	60.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	12 Weeks per Stage	2.00
Lab/Lecture	12 Weeks per Stage	2.00
Independent Learning	15 Weeks per Stage	5.13
	Total Hours	125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EEAER_B	Bachelor of Engineering (Honours) in Aerospace Engineering	5	Mandatory