



Birla Institute of Technology & Science, Pilani

Hyderabad Campus

FIRST SEMESTER 2021-2022

Course Handout Part II

Date: 20-08-2021

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : ME F418
Course Title : Rocket and Spacecraft Propulsion
Instructor-in-Charge : Dr. Supradeepan K

Scope and Objective of the Course: This is an introductory multi-disciplinary course aimed at providing a comprehensive overview of the propulsive systems in rocket and spacecraft. It also aims at understanding the principles and practices in rockets and spacecraft propulsion

Textbooks:

1. **George P. Sutton, Oscar Biblarz**, Rocket Propulsion Elements, John Wiley & Sons 2010.

Reference books

1. Martin J. L Turner, Rockets and spacecraft propulsion, Springer Science & Business Media, 3rd Edition.
2. C. J. Bora, Introduction to Rockets and spacecraft propulsion, Online Gatha; First Edition (2017).

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-4	Introduction	History and principles of rocket propulsion	TB1:1
5-8	The thermal rocket engine	thermodynamics of the rocket engine, thrust equation, engine performance	TB1:3
9-14	Liquid propellant rocket engines	configuration of the liquid propellant engine, combustion chamber and nozzle Liquid propellant distribution systems Cooling of liquid-fuelled rocket engines Combustion and the choice of propellants	TB1:7
15-21	Solid propellant rocket motors	Basic configuration, Properties and the design of solid motors, Propellant composition, Integrity of the combustion chamber, Ignition, Hybrid Rocket motors	TB1:11,12
22-27	Launch vehicle dynamics	rocket equation, Vertical motion in the Earth's gravitational field, Inclined motion in a gravitational field, Motion in the atmosphere, The gravity turn, Basic launch dynamics	RB1:5
28-33	Electric propulsion	Principles of electric propulsion, Electric thrusters, Electromagnetic thrusters, Plasma thrusters, Low-power electric thrusters	TB1:19
34-39	Nuclear propulsion	Nuclear fission basics, The principle of nuclear thermal propulsion, The fuel elements, Exhaust velocity of a nuclear thermal rocket, Increasing the operating temperature, The	RB1:7





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		nuclear thermal rocket engine	
40-42	Advanced thermal rockets	Fundamental physical limitations, Improving efficiency, Practical approaches to SSTO, Practical approaches and developments	RB1:8

Evaluation Scheme:

Component	Duration (min.)	Weightage (%)	Date & Time	Nature of Component
Midsem	As announced in the timetable	30	21/10/2021 1.30 - 3.00PM	OB If the exam is online
Project	-	20	Evenly spaced throughout the semester during the tutorial hour	OB
Quiz	15	10	Evenly spaced throughout the semester	OB
Comprehensive Exam	As announced in the timetable	40	17/12 FN	OB If the exam is online

Chamber Consultation Hour: To be announced in the classroom.

Notices: All notices concerning this course shall be communicated only through **CMS** (the institute's web-based course management system) students are advised to visit CMS regularly for latest updates.

Make-up Policy: Make-up shall be given only to genuine cases with prior confirmation.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester, and no type of academic dishonesty is acceptable.

Dr. Supradeepan K
INSTRUCTOR-IN-CHARGE
ME F418

