



FIRST SEMESTER 2023-2024

Course Handout Part II

Date: 11-08-2023

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 space craft. 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	RB1:5

		Inclined motion in a gravitational field Motion in the atmosphere The gravity turn Basic launch dynamics	
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 nuclear thermal rocket engine	RB1:7
40-42	Advanced thermal rockets	Fundamental physical limitations Improving efficiency Practical approaches to SSTD Practical approaches and developments	RB1:8

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Midsem	90 Min.	20%	11/10 - 11.30 - 1.00PM	CB
Compre	180 Min.	40%	12/12 AN	CB
Project type assignment	-	20%		OB
Surprise Quiz	15 Mts	10%		CB
Assignment/Report	-	10%		OB

Chamber Consultation Hour: To be announced in the class room.

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 the 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

