



Birla Institute of Technology & Science, Pilani

Hyderabad Campus

FIRST SEMESTER 2020-2021

Course Handout Part II

Date: 17-08-2020

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 SSTD, Practical approaches and developments	RB1:8

Evaluation Scheme:

Component	Duration (min.)	Weightage (%)	Date & Time	Nature of Component
Test 1	30	15	September 10 –September 20 (during scheduled class Hour)	OB
Test 2	30	15	October 9-October 20(during scheduled class hour)	OB
Test 3	30	15	November 10-November 20 during scheduled class hour)	OB
Project	-	10	Evenly spaced throughout the semester during the tutorial hour	OB
Quiz	15	10	Evenly spaced throughout the semester	OB
Comprehensive Exam	120	35	As announced in the timetable	OB

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

