Course Syllabus - Rocket Propulsion

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1 Course Information

- **Course No.**: 2145473
- **Credits**: 3 credits (3-0-6)
- **Program**: Aerospace Engineering (International Program)
- **Level**: Undergraduate
- **Prerequisites**: 2183-221 Thermodynamics, 2183-222 Fluid Mechanics

2 Course Description

Fundamentals of rocket propulsion, covering classical chemical rocket propulsion for launch, orbital, and interplanetary flight. Topics include:

- Flight mission and performance

- Rocket equations
- Nozzle theory and design
- Future trends in rocket propulsion
- Preliminary design of engine components

3 Course Objectives

Upon completing this course, students will:

- Classify rocket engine types and identify the roles of main components
- Analyze flight mission regimes and determine flight performance
- Perform conceptual and preliminary design of rocket engines

4 Course Outline

Week	Topic	Sutton Chapter
1-2	Introduction to Rocket Engines	Ch. 2
3	Nozzle Theory and Thermodynamic Relations	Ch. 3
4	Flight Mission and Performance	Ch. 4
5	Chemical Rocket Propellant Performance Analysis	Ch. 5
6-10	Liquid Propellant Rocket Propulsion Individual Project	Ch. 6-10
11-13	Solid Propellant Rocket Propulsion	Ch. 12-15
14-15	Hybrid Propellant Rocket Propulsion Design (Group Project)	Ch. 16

5 Evaluation

- Weekly Quizzes: 30% (Paper-based, one note page allowed)
- Homework: 30% (Weekly assignments and individual projects submit via MCV or additional optional methods discussed below)
- Final Design Group Project: 40%

6 Propulsion System Engineering Code Development

The course aims for foster modular and composable systems engineering skills, vital for the aerospace industry. Students may:

- **Contribute to Code:** Improve existing code in the course repository:
  - Add vectorized Python functions (optimizations encouraged)
  - Create Jupyter Lab notebooks for textbook or custom problems

  - Correct existing software or content

- **How to contribute:**

  1. **GitHub Submission**: Submit code (MATLAB, Python, etc.) to the course repository. [Email] GitHub username to instructor for access.

7 Online Resources

- Course GitHub Repository: Course Repository
- Course NotebookLM (Provide gmail account email address for access): Google NotebookLM
- Dr. Jeerasak Pitakarnnop Materials (pdf password "aeroise"): Web

8 Google Group Details

The Google Group for this course, rocket-propulsion-2145473, serves as the primary communication platform allowing asynchronous email communication.

How to Join:

1. **Via Web**: Navigate to the group's page at Google Groups and click on "Join group".
2. **Via Email**: Send an email to rocket-propulsion-2145473+subscribe@googlegroups.com with a subject or body indicating your request to join the group.

After joining, you can either:

- **Post messages**: Directly email to rocket-propulsion-2145473@googlegroups.com, or
- **Manage settings**: Access the group's page to adjust notification preferences, view archives, etc.

Note on Digest Mode: To manage your email load, consider enabling digest mode. This can be done through the group settings page by selecting the option to receive emails in digest form, where messages are batched together and sent in one email per day or week.

Participation in the Google Group is encouraged by sharing knowledge, asking questions, and staying updated with course developments.

9 Reading List

Required Textbook:

Sutton, G. P., and Biblarz, O., *Rocket Propulsion Elements*, 9th ed., Wiley, 2017.

References

[1] Gerald Hagemann, Hans Immich, Thong Van Nguyen, and Gennady E. Dumnov. *Advanced Rocket Nozzles*. Journal of Propulsion and Power, 14(5):620-629, 1998.

[2] Philip G. Hill and Carl R. Peterson. *Mechanics and Thermodynamics of Propulsion*. 2nd edition, Prentice Hall, 1992. ISBN: 978-81-317-2951-9

[3] Dieter K. Huzel and David H. Huang. *Design of Liquid Propellant Rocket Engines*. National Aeronautics and Space Administration, Washington, D.C., 1967. (NASA SP-125)