Course Syllabus
Rocket Propulsion

Version 1.1, Revised: January 27, 2025

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Academic Year: 2024
Semester: Second

Contents

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

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

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

Course Outline

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

Evaluation

- Weekly Quizzes (Paper-Based, 1 Note Page Allowed) Topics to match Sutton chapters in Course Outline: 30%
- Homework Assigned Weekly via MCV (Submit as source code, pdf, to GitHub Repo): 30%
- Final Design Group Project: 40%

Homework Notes:

- **Contributions**: Homework can be submitted as improvements to existing code in the course repository, including:
  - Additional vectorized Python functions relevant to the coursework (optimizations are greatly encouraged)
  - Jupyter Lab notebooks solving specific textbook problems or problems created by students or the instructor
  - Corrections to any existing software or content

  There is no requirement to use software tools; assignments can also be submitted as PDF or Word documents.
- **Submission**: Submit homework code and the final project via the Course GitHub Repository in MATLAB, Python, or other relevant code formats.

- **GitHub Access**: Email your GitHub username to vkhansen@eng.chula.ac.th to be added to the repository.
- **Google Groups Mailing List:** Google Groups for discussions, updates, and Q&A:
  - Admin Panel: rocket-propulsion-2145473
  - Email: rocket-propulsion-2145473@googlegroups.com

Online Resources

- Course GitHub Repository (Python/MATLAB/Jupyter Notebook):
  Course Repository
- NotebookLM:
  Google NotebookLM
- Jeerasak Pitakarnnop Materials (pdf password "aeroise"):
  Web

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)

Document History

- Version 1.0 - 01/21/2024 - Initial draft by Viggo Hansen
- Version 1.1 - January 27, 2025- Revised to include detailed submission methods for homework and projects via GitHub, aligning with Code-First Learning principles.