AEROSPACE ENGINEERING

Rocketry, Flight Systems & Space Mission Design

COURSE INFORMATION	INSTRUCTOR
Grade Level: 10th - 12th	**Michael Puckett, M.Ed.**
Credits: 1.0 CTE/Elective	michael@trceducation.com
Duration: 32 weeks (Full Year)	615-796-4632
Schedule: TBD	TennesseeRoboticsCenter.com
Prerequisites: Engineering I + Applied Physics	

COMPETITION PATHWAY: The American Rocketry Challenge (TARC) — World's largest student rocket competition

CLASS STRUCTURE (2.5 Hours)

INSTRUCTION	SNACK/DEVOTION	HANDS-ON LAB
4:30 - 5:30 PM	5:30 - 6:00 PM	6:00 - 7:00 PM
60 minutes	30 minutes	60 minutes

Students may bring a peanut-free snack. The devotion time focuses on character development and the 'Dare Mighty Things' mission mindset.

COURSE DESCRIPTION

This advanced course applies physics and engineering principles to aerospace systems—rockets, aircraft, and spacecraft. Students design, build, and launch high-power model rockets while learning aerodynamics, propulsion, orbital mechanics, and space mission planning. The year culminates in competition at The American Rocketry Challenge (TARC), where teams must design a rocket to meet precise altitude and flight duration requirements.

REQUIRED TEXTBOOKS

Primary Text (Practical/Hands-On):

Handbook of Model Rocketry — G. Harry Stine & Bill Stine

7th Edition (NAR Official Handbook) • **ISBN:** 978-0471472421

Secondary Text (Aerospace Theory):

Introduction to Flight — John D. Anderson Jr. & Mary L. Bowden

9th Edition • **ISBN:** 978-1260226744

TIME COMMITMENT

In-class instruction and lab time	2.5 hours/week
Textbook reading & research	1-2 hours/week
Design work, simulations & documentation	2-3 hours/week
TOTAL WEEKLY COMMITMENT	**6-8 hours/week**

COURSE UNITS (32 Weeks)

Unit	Topic	Weeks
1	**Introduction to Aerospace & Rocketry** History of flight, aerospace careers, NAR safety code, first launches	1-4
2	**Aerodynamics & Flight Principles** Four forces of flight, lift, drag, Bernoulli's principle, airfoils, wind tunnels	5-8
3	**Rocket Propulsion** Newton's 3rd Law, motor classification, thrust curves, impulse, propellants	9-12

4	**Rocket Stability & Design** Center of pressure, center of gravity, fin design, nose cones, OpenRocket simulation	13-16
5	**Construction & Recovery Systems** Body tubes, motor mounts, parachutes, streamers, dual deployment, altimeters	17-20
6	**Space Systems & Orbital Mechanics** Kepler's Laws, orbital velocity, satellite systems, Artemis mission analysis	21-24
7	**TARC Competition Design ★ COMPETITION** TARC rules, design constraints, team roles, prototype builds, test flights	25-28
8	**TARC Qualification & Finals ★ COMPETITION** Qualification flights, data analysis, iteration, competition submission	29-32

★ COMPETITION = TARC (The American Rocketry Challenge) qualification period

ABOUT THE AMERICAN ROCKETRY CHALLENGE (TARC)

TARC is the world's largest student rocket competition, with 5,000+ students competing annually.

Teams design rockets to reach a target altitude and flight duration while safely returning a raw egg.

Top 100 teams qualify for nationals in Washington, D.C. — with $100,000+ in prizes and scholarships.

GRADING

Reading Quizzes	10%
Engineering Documentation	15%
Unit Projects & Rocket Builds	30%
Flight Performance & Data Analysis	20%
TARC Competition Project	25%

Grading Scale:

A: 90-100% | B: 80-89% | C: 70-79% | D: 60-69% | F: Below 60%

REQUIRED MATERIALS

- *Handbook of Model Rocketry* textbook (7th Edition)
- *Introduction to Flight* textbook (9th Edition)
- Scientific calculator
- Engineering notebook for design documentation
- Laptop with OpenRocket software (free)
- Safety glasses (provided, but may bring own)
- Closed-toe shoes required every class

Note: Course includes materials fee for rocket kits, motors, and launch supplies. TARC registration fee (~$130/team) is additional.

PATHWAY

Engineering I + Applied Physics → **Aerospace Engineering** → College Aerospace/Mechanical Engineering

Aerospace Engineering is the capstone experience for students pursuing aerospace careers. Students completing this course are prepared for college aerospace or mechanical engineering programs, Air Force ROTC, NASA internships, or careers in the growing commercial space industry.

"Dare Mighty Things"

— NASA/JPL motto, from Theodore Roosevelt's "Strenuous Life" speech