ENGINEERING II

Advanced Design & Systems Integration

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: Year 2 — TBD	TennesseeRoboticsCenter.com
Prerequisites: Engineering I (C or better)	

SMART CREDENTIAL: Electrical Foundations — Carnegie Mellon Robotics Academy micro-certification

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

Building on Engineering I foundations, this advanced course challenges students to tackle complex, multi-system projects. Students master advanced CAD techniques, electrical system design, project management, and the integration of mechanical, electrical, and software systems into functional prototypes. The capstone project requires students to design, build, and document a complete integrated system.

REQUIRED TEXTBOOK

Engineering Fundamentals & Problem Solving

Arvid Eide et al., 7th Edition (McGraw-Hill)

ISBN: 978-0073385914

TIME COMMITMENT

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

COURSE UNITS (32 Weeks)

Unit	Topic	Weeks
1	**Advanced CAD & Simulation** Complex assemblies, stress analysis, motion studies, rendering	1-4
2	**Electrical Fundamentals ★ SMART** Circuit design, soldering, multimeter use, schematics, PCB basics	5-8
3	**Sensors & Input Devices** Switches, potentiometers, environmental sensors, signal conditioning	9-12
4	**Actuators & Output Devices** Motors, servos, solenoids, displays, motor drivers, PWM control	13-16
5	**Microcontroller Integration** Arduino basics, digital/analog I/O, serial communication, libraries	17-20

6	**Project Management** Gantt charts, timelines, design reviews, documentation standards	21-24
7	**Systems Integration** Combining mechanical, electrical, and software subsystems, debugging	25-28
8	**Capstone: Integrated System** Independent project with full engineering documentation and presentation	29-32

★ *SMART = Unit aligned to CMU SMART certification competencies*

GRADING

Reading Quizzes	10%
Engineering Documentation	15%
Unit Projects	30%
Skills Assessments	20%
Capstone Project	25%

Grading Scale:

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

REQUIRED MATERIALS

- *Engineering Fundamentals & Problem Solving* textbook
- Engineering notebook (continuation from Eng I)
- Laptop with CAD software
- Digital multimeter (provided, but may purchase own)
- Closed-toe shoes required every class

PATHWAY

Engineering I → **Engineering II** → Robotics Engineering / College Engineering

Engineering II provides advanced skills in electrical systems and project integration. Students completing this course are well-prepared for Robotics Engineering, FTC competition leadership roles, college engineering programs, or technical careers in product development.