

Engineering Science YAG

One Credit | Single-Blocked | Full Year | 36 Weeks (4 Grading Periods) | Recommended Grades 10–12

Course Information: Prerequisites: Algebra I, one credit in biology, and at least one credit in a course from the science, technology, engineering, and mathematics career cluster. Recommended prerequisites: Geometry, Integrated Physics and Chemistry (IPC), one credit in chemistry, or one credit in physics. ES = §127.397 Engineering Science. The course satisfies a high school science graduation requirement. At least 40% of instructional time is devoted to classroom, laboratory, and field investigations. CTE Employability Skills §127.15(d)(2) are integrated throughout. ACCESS may support engineering career exploration, postsecondary planning, credential research, and portfolio development.

GP	Wks	Unit & Focus	Major Learning Tasks & Assessments	Integrated TEKS	Extension Activities
1	1–2	Unit 1 – Engineering Science Foundations, Careers & Scientific Practices	- Differentiate engineering, engineering technology and pure science; compare engineering disciplines and careers - Ask questions, define problems and distinguish hypotheses, theories and laws - Use technical communication and investigate contributions of diverse scientists and engineers - Establish safe investigation, data collection, engineering notebook and model-development routines	- ES1(A–H), ES3(A–C), ES4(A–C), ES5(A–D) §127.15(d)(2)	- ACCESS: engineering pathways - Career/discipline comparison - Technical communication task
1	3–5	Unit 2 – Engineering Design, Teams & Experimental Analysis	- Solve design problems individually and collaboratively using a design process - Develop design briefs with specifications and constraints - Conduct descriptive, comparative and experimental investigations - Analyze quantitative/qualitative data, statistical features, error and model limitations - Evaluate experimental and engineering designs and communicate evidence-based solutions	ES1(A–G), ES2(A–D), ES3(A–C), ES6(A–E)	- Team design challenge - Design brief - Experimental design lab
1	6–9	Unit 3 – Mechanisms, Simple Machines, Work & Power	- Explain gears, sprockets, pulley systems and the six simple machines - Measure forces and distances in mechanisms - Calculate work, power, mechanical advantage and drive ratios - Experimentally determine mechanical-system efficiency - Design/test a mechanism and analyze performance using data and models	ES7(A–G), ES1(A–G), ES2(A–D), ES3(A–C)	- Mechanism build - Efficiency investigation - Gear/drive-ratio challenge
2	10–12	Unit 4 – Electrical Energy, Circuits & Power	- Classify renewable, nonrenewable and inexhaustible energy sources - Define/calculate work and power in electrical systems - Analyze electrical-to-mechanical energy conversion - Define voltage, current and resistance and apply Ohm's law - Construct/analyze series, parallel and combination circuits using safe practices and multimeters	ES8(A–D), ES1(C–G), ES2(B–D)	- Circuit lab - Energy-source comparison - Electrical power challenge
2	13–15	Unit 5 – Energy Management, Thermal Transfer & Efficiency	- Explain energy management and evaluate system energy requirements - Design systems combining multiple energy sources - Explain hydrogen fuel cells and solar cells - Measure/analyze conduction, convection and radiation - Calculate resistance, efficiency and power transfer for material properties in transmission/distribution applications	ES9(A–G), ES1(A–G), ES2(A–D), ES3(A–C)	- Heat-transfer lab - Hybrid-energy design - Efficiency analysis
2	16–17	Unit 6 – Integrated Energy & Mechanisms Engineering Challenge	- Apply mechanisms, electrical circuits and energy-conversion concepts to a real-world design problem - Develop a team design brief and constraints - Build/model, test and evaluate a solution using empirical data - Calculate work, power and efficiency and justify design decisions - Document and communicate results in technical formats	- ES1–3, ES6–9 §127.15(d)(2)	- Integrated design challenge - Engineering notebook review - Technical presentation

2	18	Semester 1 Exam – Engineering Science	• Cumulative written/performance assessment • Laboratory/data-analysis application • Engineering design and technical communication task	• Cumulative: ES1–9 • §127.15(d)(2)	• Targeted review/remediation
3	19–22	Unit 7 – Statics, Vectors, Forces & Trusses	• Illustrate, calculate and experimentally measure forces acting on bodies • Differentiate scalar/vector quantities and resolve vector components • Locate centroids and calculate moments of inertia • Calculate moments, static equilibrium and unknown forces • Analyze internal/external forces in statically determinate trusses	• ES10(A–J), ES1(A–G), ES2(A–D)	• Truss lab • Vector/force analysis • Structural design challenge
3	23–24	Unit 8 – Materials, Manufacturing & Product Investigation	• Conduct non-destructive material-property tests on common products • Calculate/measure weight, volume, mass, density and surface area • Identify manufacturing processes used to create products • Connect material properties and manufacturing choices to product function and engineering design	• ES11(A–C), ES1(C–G), ES2(A–D)	• Product dissection • Material property lab • Manufacturing process analysis
3	25–27	Unit 9 – Stress-Strain, Material Testing & Design Selection	• Use a design process and mathematical formulas to solve/document material design problems • Measure material samples and conduct tests for reliability, safety and predictability • Create/interpret stress-strain curves • Identify elastic range, proportional/elastic limits, resilience, yield, plastic deformation, ultimate strength, failure and ductility • Select materials for a design using test evidence	• ES12(A–E), ES1(A–G), ES2(A–D), ES3(A–C)	• Stress-strain investigation • Material-selection matrix • Design recommendation
4	28–29	Unit 10 – Control Systems, Flowcharts & Programming	• Create detailed flowcharts using software • Create control-system operating programs and apply flowchart logic • Select input/output devices for technological systems • Compare open- and closed-loop control systems • Design/test a control solution and evaluate reliability	• ES13(A–E), ES1(G), ES2(D), ES6(A–E)	• Control-system simulation • Flowchart/programming task • Sensor/I–O design
4	30–31	Unit 11 – Fluid Power: Pneumatics & Hydraulics	• Identify components/functions of fluid power devices • Differentiate pneumatic/hydraulic and hydrodynamic/hydrostatic systems • Apply Pascal's Law to fluid power calculations • Distinguish gauge/absolute pressure and temperature/absolute temperature • Apply ideal gas laws and experiment with hydraulic flow rate, velocity and mechanical advantage	• ES14(A–F), ES1(A–G), ES2(C–D)	• Pneumatic/hydraulic lab • Pascal's Law challenge • Fluid-power model
4	32–33	Unit 12 – Engineering Statistics & Probability	• Calculate theoretical probability and experimental frequency distributions • Apply Bernoulli processes and AND/OR/NOT logic • Apply Bayes's theorem to multiple-event scenarios • Calculate mean, median, mode, range, standard deviation and variance • Create/interpret histograms and apply statistics to engineering design decisions	• ES15(A–H), ES2(A–C), ES3(A–C)	• Probability experiment • Statistical quality analysis • Histogram/data report
4	34–35	Unit 13 – Kinematics & Engineering Capstone	• Calculate distance, displacement, speed, velocity and acceleration • Experimentally determine acceleration due to gravity • Resolve projectile-motion X/Y components and determine/test launch angle for a specified range • Integrate design, data analysis, statistics, mechanics/materials or control concepts into a capstone solution • Present evidence-based conclusions and engineering implications	• ES16(A–D), ES1–6 reinforcement, ES15 reinforcement • §127.15(d)(2)	• Projectile investigation • Engineering capstone • ACCESS: postsecondary/portfolio planning
4	36	Semester 2 Exam & Engineering Science Showcase	• Cumulative written/performance assessment • Laboratory investigation and quantitative problem-solving application • Capstone presentation, engineering notebook and reflection	• Cumulative: ES1–16 • §127.15(d)(2)	• Stakeholder showcase

Engineering Science TEKS Coverage Checklist

Coverage verification: All 16 Engineering Science strands and every student expectation are intentionally addressed. Scientific and engineering practices are integrated throughout, and at least 40% of instructional time is reserved for classroom, laboratory, and field investigations. CTE Employability Skills §127.15(d)(2) are integrated throughout.

Strand	Student Expectations	YAG Placement	Coverage
ES1	A–H	Units 1–13	100%
ES2	A–D	Units 2–13	100%
ES3	A–C	Units 1–13	100%
ES4	A–C	Unit 1; reinforced throughout	100%
ES5	A–D	Unit 1; reinforced throughout	100%
ES6	A–E	Units 2, 6, 10; reinforced in capstone	100%
ES7	A–G	Units 3 and 6	100%
ES8	A–D	Units 4 and 6	100%
ES9	A–G	Units 5 and 6	100%
ES10	A–J	Unit 7	100%
ES11	A–C	Unit 8	100%
ES12	A–E	Unit 9	100%
ES13	A–E	Unit 10	100%
ES14	A–F	Unit 11	100%
ES15	A–H	Units 12–13	100%
ES16	A–D	Unit 13	100%
CTE Employability	§127.15(d)(2)	Integrated throughout	100%

Implementation Notes

- Engineering Science is a one-credit course recommended for Grades 10–12. Prerequisites are Algebra I, one credit in biology, and at least one credit in a course from the science, technology, engineering, and mathematics career cluster. Recommended prerequisites include Geometry, IPC, one credit in chemistry, or one credit in physics.
- The course satisfies a high school science graduation requirement. At least 40% of instructional time should involve students asking questions, identifying problems, and safely conducting classroom, laboratory, and field investigations using appropriate tools and models.
- Scientific and engineering practices in ES1–ES4 should be integrated throughout content units rather than treated only as introductory skills. Students should routinely collect and analyze data, use mathematics and models, evaluate designs, construct evidence-based explanations, and communicate findings.

- Engineering notebooks, spreadsheets, graphs, charts, models, simulations, technical reports, laboratory investigations, and design challenges should provide recurring evidence of student mastery.
- Weeks 18 and 36 are reserved for cumulative semester exams. No instructional unit crosses the semester boundary, and no calendar-specific dates are included.