

**CAREER
PATHS**

Denise Paulsen, PE
Jenny Dooley

ELECTRICAL ENGINEERING



Express Publishing

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Tel.: (0044) 1635 817 363

Fax: (0044) 1635 817 463

email: inquiries@expresspublishing.co.uk

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ENGINEERING

Book

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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	The Electrical Engineer	Occupational handbook excerpt	control system, design, develop, electricity, electronics, magnetism, motor control, power transmission, signal processing, supervise, telecommunication, test	Talking about experience
2	Basic Math	Chart	-hundred, add, comes to, divide by, equals, is, less, minus, multiply by, over, plus, subtract, times	Talking about cost
3	Working with Large Numbers	Memo	cubed, exponent, hundredths, leading zero, rounding error, scientific notation, significant figure, squared, tenths, thousandths, to the -th power	Making a suggestion
4	Analyzing Quantities	Textbook excerpt	decimal number, fraction, mixed number, – out of –, percent, percentage, point (.), quantity, reduce, whole number	Making predictions
5	SI Units	Webpage	ampere (amp), base unit, candela (cd), derived unit, Kelvin (K), kilogram (kg), meter (m), mole (mol), second (s), SI	Discussing necessity
6	SI Quantities	Poster	amount of substance, base quantity, derived quantity, electric current, length, luminous intensity, mass, thermodynamic temperature, time	Confirming information
7	Electrical Units	Course description	coulomb, equation, Farad, Henry, Hertz, Joule, Ohm, symbol, Volt, Watt	Performing calculations
8	Electrical Quantities	Appendix chart	capacitance, charge, current, energy, frequency, impedance, inductance, power, reactance, resistance, voltage	Expressing uncertainty
9	Prefixes	Textbook excerpt	giga (G), kilo (k), mega (M), micro (μ), milli (m), nano (n), pico (p), prefix, tera (T), value	Asking for help
10	Measurements	Textbook chapter	angular frequency, centimeter, decibel, inch, micron, milibar, millimeter, phase angle, time constant, Watt-hour	Expressing an opinion
11	Electrical Measuring Instruments	Tutorial	ammeter, circuit, connect, multimeter, ohmmeter, parallel, terminal, universal, voltmeter	Expressing possibility
12	Electric Current	Web tutorial	atom, conductor, drift, electrically balanced, electron, insulator, ion, negative charge, neutron, nucleus, particle, positive charge, proton	Expressing confusion
13	Effects of Electric Current	Lecture description	basic, chemical effect, decomposition, effect, flow, heat effect, magnetic effect, magnetic field, mechanical force, presence	Asking for an opinion
14	Personal Protective Equipment (PPE)	Company excerpt	arc flash hood, arc flash suit, coveralls, earplugs, electrical hot gloves, face shield, flame resistant, hard hat, insulated, leather gloves, rubber-soled, safety glasses	Giving a reminder
15	Electrical Safety	Safety poster	burn, de-energize, electrocution, hazard, live wire, lockout-tagout procedure, paralyze, risk, shock, static electricity	Showing understanding

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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Career Options	Prospectus excerpt	application engineer, architecture, automotive, design engineer, manufacturing, medical, navigation, project engineer, prototype, research engineer, system engineer, test engineer	Requesting more information
2	Problem Solving	Textbook excerpt	analysis, application, approach, approach, attack, iteration, iterative, problem identification, problem solving, procedure, solution, synthesis	Stating problems
3	Statistics	Textbook excerpt	event, independent, intersection, median, mutually exclusive, outcome, population, probability, range, sample, sample space, statistics, union	Expressing certainty
4	Diagrams	Article	blueprint, combination diagram, complex, detail, dimension, floor plan, ladder diagram, legend, one-line diagram, pictorial diagram, represent, schematic diagram	Expressing confusion
5	Insulating Materials	Textbook excerpt	fiberglass, glass, insulating materials, laminate, neoprene, paper, porcelain, PVC, resin, rubber, varnish, vinyl, wood	Asking for an opinion
6	Conductive Materials	Handbook excerpt	aluminum, brass, bronze, concrete, copper, graphite, iron, mercury, plasma, salt, silver, steel	Expressing concern
7	Electrical Components	Supply catalog	active component, capacitor, connector, crystal, diode, fuse, passive component, resistor, resonator, switch, terminal, transistor	Introducing a problem
8	Alternating and Direct Current	Textbook excerpt	alternate, alternating current (AC), constant, direct current (DC), inverter, polarity, rectifier, reverse, ripple, steady, transformer	Giving a reason
9	Circuits	Chapter	branch circuit, closed circuit, configuration, continuous, leg, node, open circuit, overcurrent, parallel circuit, series circuit, series-parallel circuit, short	Asking for an explanation
10	Signals	Article	analog, analog-to-digital converter, binary form, digital, digital-to-analog converter, format, information, manipulate, response, sensor, signal, transmit	Making an assumption
11	Signal Processing	Employee handbook	analog signal processing (ASP), autocorrelation, bandwidth, compress, convolution, digital signal processing (DSP), extract, feedback signal, filtering, recovery, reduction, reformat, mixed-signal processing (MSP)	Disagreeing
12	Waveforms	Web tutorial	alternating waveform, amplitude, duty cycle, period, pulse, rectangular waveform, sawtooth waveform, sine wave, square waveform, trigger, unidirectional waveform, waveform	Asking for a reason
13	Power Supply	Email	feedback path, filter, filter capacitor, input circuit, isolated, linear supply, output circuit, regulation, supervision, switch mode supply, transient suppressor, voltage selector	Agreeing
14	Electric Motors	Textbook excerpt	AC motor, asynchronous motor, commutator, DC motor, pole, pole, rotor, salient pole, shaded-pole motor, stator, synchronous motor, torque, universal motor, windings	Making a comparison
15	Batteries	Webpage	anode, battery, cathode, cell, electrolyte, non-rechargeable, portable, potential, rechargeable, replace, standard, throwaway	Asking for clarification

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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Circuit Simulation	Article	algorithm, characteristic, circuit simulation, computer simulation, display, export, netlist, parameter, printed circuit board, representation, simulate, SPICE, virtual test instrument	Asking for suggestions
2	Grounding	Brochure	advanced driven rod, charge, discharge, driven rod, electrode, electrolytic ground rod, ground potential rise, grounding, grounding plate, soil resistivity, sphere of influence, step potential, touch potential, ufer ground	Asking about knowledge
3	Surge Suppression	Work order	basic insulation level (BIL), circuit breaker, clamping voltage, distribution-class, intermediate-class, lightning arrester, lightning strike, maximum continuous operating voltage (MCOV), metal oxide varistor, overvoltage, power strip, station-class, surge capacitor, surge suppressor	Assigning responsibilities
4	Electromagnetics	Textbook excerpt	aggressor, ambient field, cabling, electromagnetic compatibility, electromagnetic fields, electromagnetic wave, electromagnetics, infrared, photon, radiate, reactive field, stray, victim, visible light	Troubleshooting a problem
5	Power Engineering	Webpage	distribution, electrical cooperative, generation, generator, industrial, interconnection, off-grid, on-grid, power engineering, power grid, rural, transmission, urban, utility	Discussing plans
6	Control Systems Engineering	Pamphlet	adjust, automation, control system, control theory, controller, dynamic system, feedback, MIMO, monitor, open-loop controller, PID controller, SISO, stability	Asking for an opinion
7	Microelectronics Engineering	Speaker profiles	equivalent, integrated circuit, MEMS, microactuator, microelectronics, microfabrication, microlithography, microsensor, nanotechnology, research and development, semiconductor, transducer	Giving an opinion
8	Electronics Engineering	Job advertisement	commercial, compliance, consulting, consumer electronics, contract, government, innovation, integration, laboratory, power electronics, product development, reliability, specification, technology	Asking about experience
9	Biomedical Engineering	Prospectus excerpt	biomedical engineering, bioMEMS, biomonitor, biosensor, biosignal, CT, diagnostic, implant, inject, medical imaging, MRI, pacemaker, therapy, X-ray	Responding to good news
10	Telecommunications Engineering	Webpage	broadband, coaxial cable, fiber optics, infrastructure, multidisciplinary, multiplex, network, project management, switching system, telecommunication, wired, wireless	Making an admission
11	Computer Engineering	Course description	computer engineering, computer program, embedded, firmware, hardware, microcontroller, microprocessor, operating system, personal computer, robotics, software, supercomputer	Making a decision
12	Project Management	Employee handbook excerpt	budget, cost control, document, effective, efficiently, finances, interpersonal communication, leadership, management, meeting, negotiate, presentation, quality assurance, schedule, time management	Asking for suggestions
13	Renewable Energy	Article	clean energy, electric car, emissions, fossil fuel, geothermal, hydropower, incorporate, non-renewable, photovoltaic, pollution, renewable, solar, wind turbine, smart grid	Expressing interest
14	Sustainability	Newsletter	ecological footprint, efficient, energy consumption, environment, environmental impact, evaluate, green, improvement, light pollution, metering, optimize, recycle, sustainable, waste management	Talking about possibilities
15	Ethics	Code of conduct	bribery, code of conduct, competence, conflict of interest, disclose, discriminate, endanger, ethical, ethics, honest, interest, morals, personal, professional, responsibility, welfare	Expressing surprise

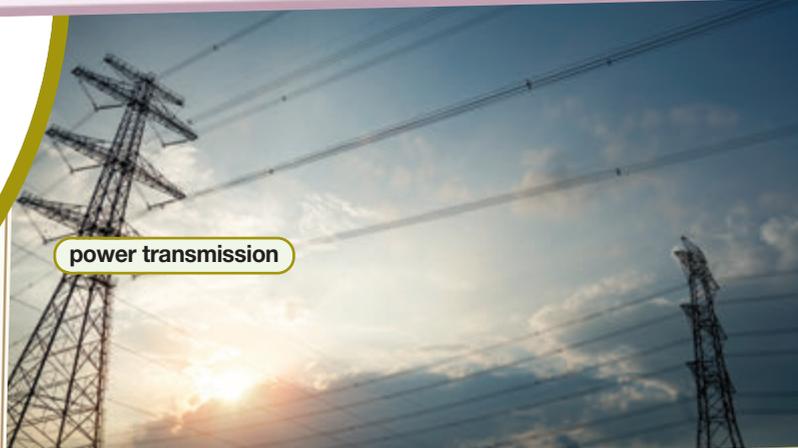
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Get ready!

1 Before you read the passage, talk about these questions.

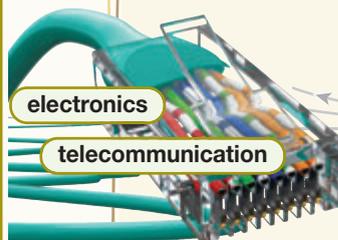
- 1 What subjects do electrical engineers study at university or in college?
- 2 What are some job duties an electrical engineer performs?



power transmission

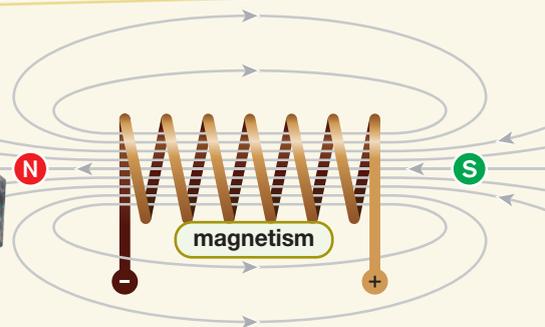
By Laurence K. Heard

Electrical engineers understand the principles of **electricity** and **magnetism**. As college undergraduates, they learn the rules that govern these fields. As engineers, they apply those rules to their work.



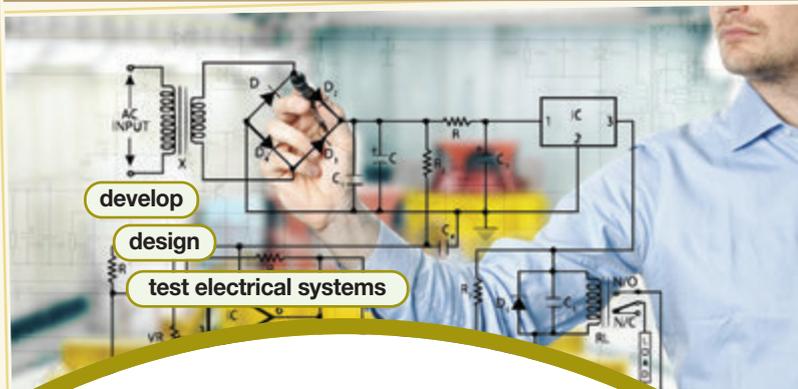
electronics

telecommunication



magnetism

Electrical engineers **develop**, **design**, and **test** electrical systems and **components**. More experienced engineers may **supervise** teams working on projects. Electrical engineering is extremely important. People need electricity in their homes and businesses. They depend on electrical engineers' skills for **power transmission**. Carmakers hire electrical engineers to create **motor control** systems. Other **control systems** help manage devices such as elevators and furnaces. **Signal processing** is used in **electronics** and **telecommunication** systems.



develop

design

test electrical systems

Vocabulary

3 Match the words or phrases (1-6) with the definitions (A-F).

- | | |
|---------------------|-------------------------|
| 1 __ electronics | 4 __ magnetism |
| 2 __ motor control | 5 __ signal processing |
| 3 __ control system | 6 __ power transmission |

- A a branch of study involving electrical currents
 B a device, or system of devices, that control and regulate electric motors
 C the large-scale transfer of electricity by power plants or substations
 D a device that manages the operation of other components or systems
 E a field of electrical engineering that involves the analysis of signals
 F the study of attraction between electric charges or currents

Reading

2 Read the occupational handbook excerpt. Then, mark the following statements as true (T) or false (F).

- 1 __ Electrical engineers do not need a college education.
- 2 __ Auto manufacturers rely on electrical engineers.
- 3 __ Signal processing is used for elevators.

4 Read the sentence pairs. Choose which word best fits each blank.

1 electricity / telecommunication

- A _____ went out during the hurricane.
- B Current _____ systems use radios, satellites, and the Internet.

2 designed / supervised

- A Engineers at the company _____ a number of efficient appliances.
- B Ted _____ a team of five technicians.

3 test / develop

- A Sally wanted to _____ the devices in different conditions.
- B The engineer's goal is to _____ a new kind of sensor.

5 Listen and read the occupational handbook excerpt again. What are some subfields of electrical engineering?

Listening

6 Listen to a conversation between an interviewer and a job candidate. Choose the correct answers.

- 1 Which branch of electrical engineering did the woman study?
 - A signal processing
 - C control systems
 - B telecommunication systems
 - D receivers
- 2 What does the woman think her strengths are?
 - A receiving and processing signals
 - B supervising and studying projects
 - C developing and designing products
 - D controlling and improving processes

7 Listen again and complete the conversation.

Interviewer: You graduated from State University?
Candidate: Yes. I received my Bachelor's of Science. I also did graduate work there.
Interviewer: You studied electrical engineering, mainly 1 _____. Why's that?
Candidate: I want to help improve 2 _____ for receivers.
Interviewer: How long have you worked as an 3 _____?
Candidate: Four years. I have some experience with 4 _____ as well as telecommunication systems.
Interviewer: Good. Would you be willing to 5 _____ projects?
Candidate: Yes, although I feel that my strengths are in product 6 _____.

Speaking

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

USE LANGUAGE SUCH AS:

I want to ...
How long have you ...?
I have some experience with ...

Student A: You are an interviewer. Talk to Student B about:

- his or her education
- his or her work experience
- his or her work interests

Student B: You are a job candidate. Talk to Student A about your education, work experience, and interests.

Writing

9 Use the conversation from Task 8 to fill out the job application.



Job application

Name: _____
 Position Desired: _____
 Education: _____
 College: _____
 Degree Earned: _____
 Work Experience: _____

Glossary

- add** [V-T-U2] To **add** a quantity to another quantity is to increase it by that amount.
- ammeter** [N-COUNT-U11] An **ammeter** is an instrument used to measure current. The instrument must be connected in a series with the circuit.
- amount of substance** [PHRASE-U6] An **amount of substance** is the measure of basic elements, such as atoms and electrons, within a chemical substance. The mole is the unit used to measure chemical substance.
- ampere (A)** [N-COUNT-U5] The **ampere (A)** is the SI unit of electric current.
- angular frequency** [PHRASE-U10] **Angular frequency** is the measure of the number of cycles per period, measured in radians per second.
- arc flash hood** [N-COUNT-U14] An **arc flash hood** is the part of an arc flash suit that goes over the head to protect electrical workers. It includes a face shield.
- arc flash suit** [N-COUNT-U14] An **arc flash suit** is a protective clothing worn to reduce the risk of injury or death from an electrical explosion. It includes pants, a jacket, and a hood with a protective face shield.
- atom** [N-COUNT-U12] An **atom** is a unit of matter consisting of protons, neutrons and electrons.
- base quantity** [N-COUNT-U6] A **base quantity** is a fundamental unit based on the measurement of physical objects. Base quantities are defined by an International System (SI), and are based on Universal properties.
- base unit** [N-COUNT-U5] A **base unit** is one of the seven units of measurement from which all other SI units are derived.
- basic** [ADJ-U13] If something is **basic**, it is concerned with primary scientific principles.
- burn** [N-COUNT-U15] A **burn** is an injury caused by fire, electricity, or extreme heat.
- candela (cd)** [N-COUNT-U5] The **candela (cd)** is the SI unit of power emitted from a light source.
- capacitance** [N-UNCOUNT-U8] **Capacitance** is the ability to hold a certain amount of electric charge.
- centimeter** [N-COUNT-U10] A **centimeter** is a unit of length equal to one hundredth of a meter.
- charge** [N-UNCOUNT-U8] **Charge** is a quantity of electricity equal to the electric current multiplied by the time it flows for.
- chemical effect** [N-COUNT-U13] A **chemical effect** is when the flow of electrons can result in the decomposition of fluids or metals.
- circuit** [N-COUNT-U11] A **circuit** is the entire path that an electrical current flows along.
- comes to** [V-T-U2] If something **comes to** a number or an amount, it is precisely the same as that number or amount.
- conductor** [N-COUNT-U12] A **conductor** is a material that allows the flow of electric charge.
- connect** [V-T-U11] To **connect** something is to join it to an electrical supply.
- control system** [N-COUNT-U1] A **control system** is a device, or a system of devices, that manages the operation of other components or systems.
- coulomb** [N-COUNT-U7] A **coulomb** is a unit that measures electrical charge.
- coveralls** [N-PLURAL-U14] **Coveralls** are a one-piece garment, usually secured by buttons or a zipper, used to protect a worker's clothes from damage.
- cubed** [ADJ-U3] If a number or symbol is **cubed**, it is equal to itself multiplied by itself twice, or to the third power.
- current** [N-UNCOUNT-U8] **Current** is the rate of flow of an electric charge.
- decibel** [N-COUNT-U10] A **decibel** is a unit of sound intensity.
- decimal number** [N-COUNT-U4] A **decimal number** is any number that has digits after the decimal point.
- decomposition** [N-UNCOUNT-U13] **Decomposition** is the process of breaking into smaller parts or rotting.
- de-energize** [V-T-U15] To **de-energize** something is to disconnect it from an electrical power source.
- derived quantity** [N-COUNT-U6] A **derived quantity** is a unit of measurement determined by equations that use the seven base quantities.
- derived unit** [N-COUNT-U5] A **derived unit** is an SI unit of measurement that is derived from a base unit.
- design** [V-T-U1] To **design** something is to plan and construct an item for use.

The logo for 'Career Paths' is located in the top left corner. It features the words 'CAREER' and 'PATHS' stacked vertically in a bold, italicized, sans-serif font. The text is white with a dark outline, set against a dark purple background that has a vertical gradient and is bordered by yellow lines.A stylized purple lightning bolt icon is positioned above the word 'ELECTRICAL'.

ELECTRICAL

ENGINEERING

Career Paths: Electrical Engineering is a new educational resource for electrical engineering professionals who want to improve their English communication in a work environment. Incorporating career-specific vocabulary and contexts, each unit offers step-by-step instruction that immerses students in the four key language components: reading, listening, speaking, and writing. **Career Paths: Electrical Engineering** addresses topics including electricity, conductors, tools, troubleshooting problems, and career options.

The series is organized into three levels of difficulty and offers over 400 vocabulary terms and phrases. Every unit includes a test of reading comprehension, vocabulary, and listening skills, and leads students through written and oral production.

Included Features:

- A variety of realistic reading passages
- Career-specific dialogues
- 45 reading and listening comprehension checks
- Over 400 vocabulary terms and phrases
- Guided speaking and writing exercises
- Complete glossary of terms and phrases

The **Teacher's Guide** contains teacher's notes, a full answer key and audio scripts.

The **audio CDs** contain all recorded material.

Denise Paulsen, PE, graduated from the Georgia Institute of Technology with a Bachelors degree in Electrical Engineering. She specializes in the design and manufacture of silicon devices and has received several awards for research and development in the electrical engineering field.



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