

Virginia Evans  
Jenny Dooley  
Vishal Nawathe



# COMPUTER ENGINEERING



**CAREER  
PATHS**

SECOND  
EDITION



# COMPUTER ENGINEERING

Book

1

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**Express Publishing**

## Scope and Sequence

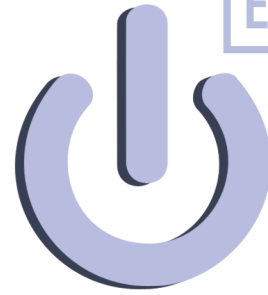
Unit	Topic	Reading context	Vocabulary	Function
1	The Computer Engineer	Webpage	computer engineer, computer science, design, develop, evaluate, hardware, investigate, mathematical analysis, software, test	Describing goals
2	Types of Computers	Webpage	computer, computer cluster, desktop, embedded computer, laptop, notebook, PC, server, tablet, workstation	Expressing a preference
3	I/O Devices 1	Textbook chapter	active matrix, bitmap, component, CRT, display, flat-panel, frame buffer, HD, LCD, monitor, pixel, screen	Expressing satisfaction
4	I/O Devices 2	Product description	button, click, electromechanical mouse, GUI, keyboard, LED, optical mouse, peripheral, pointer, QWERTY, scroll, scroll wheel	Making a prediction
5	Storage Devices	Article	capacity, CD, DVD, external hard drive, flash drive, flash memory, floppy disk, hard drive, magnetic tape, storage, Zip drive	Listing features
6	Inside the Computer	Troubleshooting guide	bay, case, CD/DVD drive, cover, fan, heat sink, motherboard, processor, port, power supply	Giving instructions
7	Networks	Webpage	antenna, broadband, CAT-5 cable, Internet, LAN, network, router, signal, wireless, WLAN	Making a recommendation
8	Operating Systems	Advice column	Apple®, customize, Linux®, Microsoft®, open source, operating system, OS X®, software compatibility, Windows®	Politely disagreeing
9	Basic Math	Chart	add, divide by, equals, hundred, less, minus, multiply by, over, plus, subtract, times	Making a realization
10	Analyzing Quantities	Textbook chapter	convert, decimal number, denominator, fraction, numerator, -out-of, percent, percentage, point, reduce	Giving a reminder
11	Measurements	Conversion chart	Celsius, centimeter, convert, degree, Fahrenheit, gram, Imperial, inch, kilogram, Metric, ounce, pound	Asking for clarification
12	Energy	Textbook chapter	chemical energy, conservation of energy, energy, friction, heat energy, kinetic energy, potential energy, release, transfer, work	Correcting an error
13	Electricity 1	Course description	alternating current, charge, conduct, direct current, electricity, electron, negative, polarity, positive	Confirming information
14	Electricity 2	Guide	ampere, conductor, current, electrical energy, electrical power, ohm, resistance, volt, voltage, watt, wattage	Describing a problem
15	Education	Webpage	bachelor's degree, calculus, computer architecture, electrical engineering, foundation, hardware design, mathematics, physics, programming, signal processing	Describing progress

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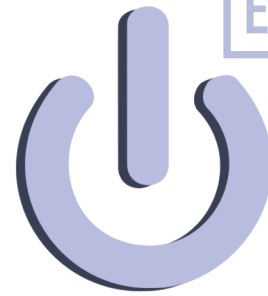
Unit	Topic	Reading context	Vocabulary	Function
1	Traits of a Computer Engineer	Job listing	critical thinking, curious, dedicated, detail-oriented, efficient, focus on, innovative, logical, mastery, pay close attention, talented, thorough	Describing skills and traits
2	The Scientific Method	Webpage	conclusion, control group, evaluation, experiment, experimental group, hypothesis, independent variable, observation, problem, prototype, result, scientific method, testable	Discussing possibility
3	Accounting	Textbook chapter	closed system, consumption, extensive quantity, final, generation, initial, input, intensive quantity, open system, output, system, Universal Accounting Equation	Expressing confusion
4	SI and IEC Units	Email	binary, byte, exponential, factor, IEC, kibi-, kilo-, mebi-, mega-, prefix, SI unit, tebi-, tera-	Emphasizing a point
5	Describing Change	Magazine article	correspond, decline, decrease, double, expand, fluctuate, increase, Moore's law, obsolescence, rise, stabilize, steady, trend	Expressing interest
6	Describing Performance	Guide	availability, bandwidth, bit/s, compact, compression ratio, data compression, data decompression, data transmission, rate, resource, response time, terminal	Asking for/ Making a recommendation
7	Concepts in Physics	Course description	conservation, constant, electromagnetism, equilibrium, gravity, law, magnetism, momentum, motion, thermodynamics, vibration, wave	Correcting oneself
8	Theory of Computation	Textbook chapter	abstract, automata theory, computability theory, computational complexity theory, efficiently, machine, process, solvable, space complexity, theory of computation, time complexity, Turing machine	Asking for help
9	Control Systems	Class handout	control system, derivative, error, integral, ladder logic, linear control, logic control, negative feedback, on/off control, oscillation, PID control, process variable, proportional control, set point	Offering help
10	Solid-state Electronics	Webpage	charge carrier, confined, crystalline, electromechanical, electron hole, gas-discharge tube, moving part, semiconductor, solid, solid-state, vacuum	Realizing an error
11	Design Processes	Employee manual	assemble, constraint, construct, criteria, detailed design, estimate, feasibility, identify, narrow down, preliminary design, sketch, study, verify	Clarifying information
12	Algorithms	Textbook chapter	algorithm, automated, calculation, decidable, decision problem, determine, effective method, elegance, finite, function, goodness, sequence, step-by-step	Asking for an opinion
13	Memory	Journal article	cache memory, DIMM, DRAM, memory, nonvolatile memory, primary memory, secondary memory, SIMM, SRAM, volatile memory	Agreeing with an opinion
14	Chips	Webpage	bond, chip, defect, die, discard, insulator, integrated circuit, on/off switch, pattern, silicon, transistor, ULSI, VLSI, wafer	Reporting on progress
15	Internet Security	Email	anti-virus, audit log, authenticate, deny, encrypt, firewall, log in, password, permit, security, software, SSL connection, virus	Making a recommendation

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## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Computer Languages 1	Textbook chapter	assembler, assembly language, binary digit, C, C#, C++, COBOL, compiled programming language, compiler, Interpreted programming language, Java, machine language, programmer, Python, Ruby, systems software, translate, Visual Basic	Expressing confusion
2	Computer Languages 2	Textbook chapter	address, basic block, bit, concept, conditional branch, data, data transfer instruction, instruction, instruction set, register, stored-program, word	Giving a reminder
3	Arithmetic for Computers 1	Textbook chapter	base 2, base 10, leading 0, leading 1, least significant bit, most significant bit, number base, sign bit, signed number, subscript, two's complement, unsigned number	Asking for clarification
4	Arithmetic for Computers 2	Textbook chapter	addition, bit-wise shift, borrow, carry-out, division, exception, ignore, interrupt, multiplication, operand, overflow, recognize, result, subtraction, value	Making a realization
5	Arithmetic for Computers 3	Webpage	accurate, approximation, double precision, exponent, floating point, guard digit, infinite, integer, normalized, round, scientific notation, significand, single precision, sticky bit, ULP, underflow	Confirming information
6	Assessing Performance 1	Report	clock cycle, clock rate, CPI, CPU time, execution time, metric, performance, system CPU time, throughput, user CPU time, wall-clock time	Describing mixed results
7	Assessing Performance 2	Webpage	Amdahl's law, application, arithmetic mean, benchmark, diminishing returns, MIPS, reproducibility, SPEC CPU benchmark, SPEC ratio, weighted arithmetic mean, weighting factor, workload	Asking for an explanation
8	Datapaths and Control	Textbook chapter	adder, ALU, arithmetic-logical, branch, control, data selector, datapath, destination, implementation, instruction class, memory-reference, multiplexer, PC, source	Explaining a process
9	Pipelining 1	Journal article	branch hazard, branch prediction, control hazard, concurrently, data hazard, forwarding, hazard, latency, load-use data hazard, pipeline stall, pipelining, stage, structural hazard, untaken branch	Describing possibility
10	Pipelining 2	Textbook chapter	branch delay slot, branch history table, branch prediction buffer, branch target buffer, bubble, correlating predictor, dynamic branch prediction, flush instructions, NOP, tournament branch predictor	Asking for an explanation
11	Memory Hierarchy 1	Message board	access time, block, hit, hit rate, hit time, memory hierarchy, miss penalty, miss rate, principle of locality, reference, spatial locality, temporal locality	Making comparisons
12	Memory Hierarchy 2	Encyclopedia entry	access, cache, cache miss, consistent, direct-mapped cache, fully associative cache, handle, parallel, queue, set-associative cache, split cache, tag, valid bit, write-back, write buffer, write-through	Asking for help
13	Virtual Memory	Textbook chapter	address space, address translation, LRU replacement scheme, page, page fault, page table, protection, physical address, reference bit, segmentation, share, swap space, TLB, virtual address, virtual memory	Explaining terms
14	Disk Storage	Journal article	controller time, cylinder, disk controller, hot swapping, magnetic hard disk, mirroring, protection group, rotational latency, RAID, seek, seek time, sector, standby spare, striping, track	Disagreeing with an opinion
15	Buses	Online encyclopedia article	asynchronous, backplane bus, bus, bus transaction, FireWire, handshaking protocol, parallel bus, processor-memory bus, read transaction, SCSI, serial bus, split transaction protocol, synchronous, USB, write transaction	Clarifying information

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## Get ready!

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

- 1 What basic subjects do computer engineers study?
- 2 What kind of work are computer engineers trained for?



computer engineer

Kempko Technical Institute >  
 Department of Computer Engineering >  
 Program Overview

## What will I learn in the Computer Engineering Program?

Start your career as a **computer engineer** at Kempko! Our program teaches everything you need to know about computer engineering. This growing field has many career opportunities.

- Begin with fundamental courses in engineering and **computer science**. Gain a strong understanding of **mathematical analysis** and theory.
- Learn to **develop** computer **software**. **Design** your own computer programs. Then other students will **test** them for functionality and usability.
- Also learn to **investigate** problems with **hardware**, **evaluate** causes and implement appropriate solutions. These skills will make you invaluable to potential employers.

mathematical analysis

## Reading

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

- 1 \_\_\_ Students must study computer science before they apply to the program.
- 2 \_\_\_ Computer engineering students test each other's software.
- 3 \_\_\_ According to the webpage, the school places students with potential employers.

## Vocabulary

3 Match the words (1-5) with the definitions (A-E).

- |               |                   |
|---------------|-------------------|
| 1 ___ test    | 4 ___ evaluate    |
| 2 ___ design  | 5 ___ investigate |
| 3 ___ develop |                   |

- A to plan the way that something will be created
- B to get more information about something
- C to carefully study and assess the qualities of something
- D to bring something from conception to action
- E to operate something to see if it works properly

4 Place the words or phrases from the word bank under the correct headings.

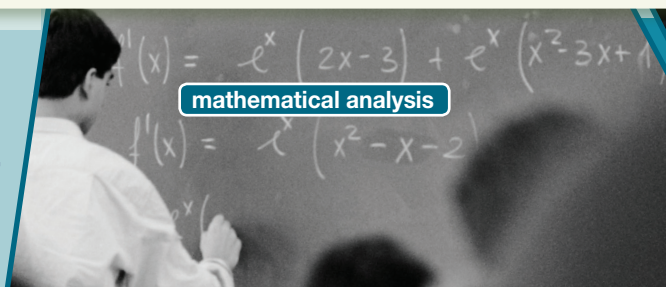
### WORD BANK

mathematical analysis   software  
 computer engineer  
 hardware   computer science

Parts of a computer	Computer Studies	People who work with computers



investigate



mathematical analysis

- 5 Listen to and read the webpage again. What parts of a computer do computer engineers work with?

## Listening

- 6 Listen to a conversation between an academic advisor and a student. Choose the correct answers.
- What is the purpose of the conversation?
    - A to review the requirements for computer engineering students
    - B to list different foci within the computer engineering major
    - C to discuss the woman's experience with the computer engineering program
    - D to determine if the man is interested in computer engineering
  - What has the man already completed?
    - A an application to major in computer science
    - B a few mathematical analysis courses
    - C an overview course on hardware and software
    - D an entrance exam for the computer engineering program

- 7 Listen again and complete the conversation.

**Advisor:** Okay, let's look at your next semester. Did you decide on a major?

**Student:** I'm not sure. My 1 \_\_\_\_\_ to go for something with good career potential.

**Advisor:** I see you already took some 2 \_\_\_\_\_ courses.

**Student:** I want to do a course 3 \_\_\_\_\_ solving problems.

**Advisor:** How about the computer engineering program? You will probably do well on the 4 \_\_\_\_\_.

**Student:** I don't know much about that. Do computer engineers focus on 5 \_\_\_\_\_?

**Advisor:** Both, actually. The program teaches 6 \_\_\_\_\_ and electrical engineering.

**Student:** Hmm. That sounds interesting. I'll look into it.

## Speaking

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

### USE LANGUAGE SUCH AS:

*My goal is to ...*  
*I see you already took ...*  
*I want to do ...*

**Student A:** You are an academic advisor. Talk to Student B about:

- his or her interest in computer engineering
- which courses he or she has already taken
- subjects that the program covers

**Student B:** You are a student. Talk to Student A about your interest in computer engineering.

## Writing

- 9 Use the conversation from Task 8 to fill out the email from an advisor to a student.

Dear Tim,

I think you would be a great fit for the computer engineering program. You have already taken \_\_\_\_\_.

That means you already know about \_\_\_\_\_.

In the program, you will take \_\_\_\_\_,

where you will learn about \_\_\_\_\_.

You will also learn about \_\_\_\_\_.

Let me know if I can answer any further questions.

Sincerely,

Gina Farrell  
 Academic Advisor  
 Kempko Technical Institute



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# COMPUTER ENGINEERING

*Career Paths: Computer Engineering 2nd Edition* is a new educational resource for computer 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: Computer Engineering 2nd Edition* addresses topics including working with numbers, computer accessories, computer hardware, writing software, and operating systems.

The series is organized into three levels of difficulty and offers a minimum of 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 detailed lesson plans, a full answer key and audio scripts.

The **audio CDs** (downloadable) contain all recorded material.



The **Digital** version of the book contains subject specific videos, instant feedback on all tasks and progress monitoring reports.



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