CAREER PATHS

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MECHANICAL ENGINEERING

Express Publishing

Published by Express Publishing

Liberty House, Greenham Business Park, Newbury,
Berkshire RG19 6HW, United Kingdom
Tel.: (0044) 1635 817 363
Fax: (0044) 1635 817 463
email: inquiries@expresspublishing.co.uk
www.expresspublishing.co.uk

First published 2014

Made in EU

ISBN 978-1-4715-2895-8

Acknowledgements

Authors' Acknowledgements
We would like to thank all the staff at Express Publishing who have contributed their skills to producing this book. Thanks for their support and patience are due in particular to: Alex Newton (Editor in Chief); Sean Todd (senior editor); Steve Miller (editorial assistant); Richard White (senior production controller); the Express design team; Sweetspot (recording producers). We would also like to thank those institutions and teachers who piloted the manuscript, and whose comments and feedback were invaluable in the production of the book.

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MECHANICAL ENGINEERING

Book 1

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Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	The Mechanical Engineer	Article	assess, broad, design, hardware, improve, manufacture, mechanical engineer, power transmission, specialize in, test	Describing experience
2	Bearings	Poster	axial, ball bearing, bearing, inner race, journal bearing, outer race, radial, rolling contact bearing, sleeve, straight roller bearing, tapered roller bearing, thrust roller bearing	Making a polite request
3	Couplings	Textbook Excerpt	align, beam coupling, coupling, flexible, input shaft, offset, output shaft, rigid, sleeve-style coupling, transmit	Making a suggestion
4	Gears	Encyclopedia Entry	bevel gear, gear, helical gear, mesh, pinion, rack, spur gear, tooth, worm, worm gear	Stating a preference
5	Drives	Advice Column	belt drive, chain drive, groove, link, sheave, slippage, synchronous rotation, timing belt, v-belt, wedge angle	Making an estimate
6	Hand Tools	Email	ball peen hammer, box wrench, calipers, hacksaw, Phillips screwdriver, pliers, sledge hammer, slotted screwdriver, socket wrench, vice	Reacting to good news
7	Machine Tools	Webpage	band saw, broach, CNC mill, drill press, gear shaper, honing machine, lathe, lead screw, machine tool, mill	Talking about necessity
8	Numbers and Basic Math	Poster	add, divide by, equal, hundred, minus, multiply by, over, plus, subtract, times	Making an apology
9	Measurements 1	Conversion Chart	foot, gram, imperial, kilogram, length, meter, metric, ounce, pound, weight	Asking for clarification
10	Measurements 2	Email	Celsius, convert, cubic centimeter, Fahrenheit, fluid ounce, gallon, liter, milliliter, temperature, volume	Checking for certainty
11	SI Units	Poster	base unit, cubic meter, derived unit, force, joule, kelvin, mass, newton, pascal, SI	Expressing confusion
12	Large Numbers	Email	cubed, exponent, hundredth, rounding error, scientific notation, significant figure, squared, tenth, thousandth, to the nth power, trailing zero	Giving a warning
13	Analyzing Quantities	Textbook Excerpt	decimal number, fraction, improper fraction, mixed number, out of, percent, point, quantity, reduce, whole number	Making a prediction
14	Tables and Graphs	Note	bar graph, column, legend, line graph, pie chart, row, scatter plot, table, x-axis, y-axis	Discussing progress
15	Simple Machines	Textbook Excerpt	axle, fulcrum, inclined plane, lever, leverage, load, pulley, simple machine, wedge, wheel	Providing an example

Table of Contents

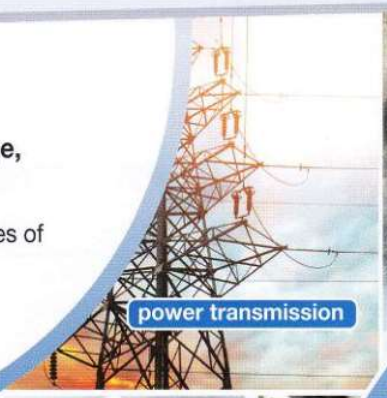
1 The Mechanical Engineer

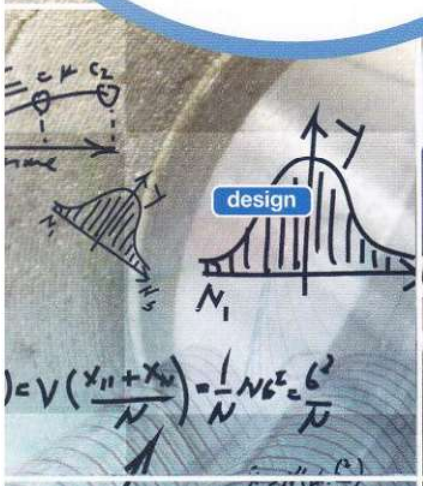
Get ready!

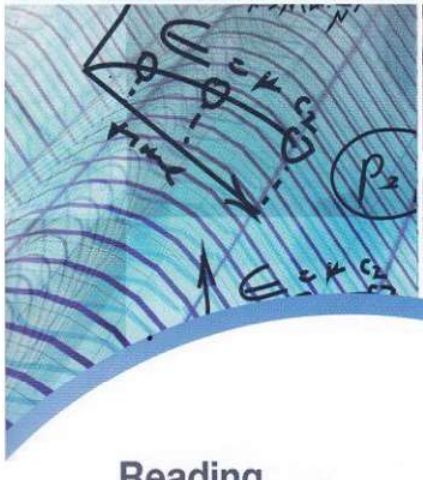
1 Before you read the passage, talk about these questions.

1 What are some responsibilities of a mechanical engineer?

2 What qualifications does a mechanical engineer need?







THE MECHANICAL ENGINEER

Do you want to become a **mechanical engineer**? Mechanical engineers **design** and build machines. They also **assess** the quality of existing machines. They adjust and **improve** the designs as needed. Sometimes mechanical engineers even invent new types of **hardware**. A qualified mechanical engineer has an engineering degree. Mechanical engineering is a very **broad** discipline. Most mechanical engineers **specialize in** a particular field. Areas of specialization include robotics, thermodynamics, and fluid mechanics.

Sub-fields of Engineering:

Students of mechanical engineering study physics and kinematics. Concepts like friction and **power transmission** are essential. Students learn how to **manufacture** machines and components. They also learn how to **test** machines effectively.

Reading

2 Read the article. Then, complete the table.

Type of Gear	Features
Responsibilities	1 _____ _____
Qualifications	2 _____ _____
3 _____ _____	physics, kinematics, manufacturing, machine testing

Vocabulary

3 Match the words or phrases (1-7) with the definitions (A-G).

1 __ test
2 __ broad
3 __ assess
4 __ hardware
5 __ manufacture
6 __ power transmission
7 __ mechanical engineer

A the transfer of energy from one place to another to perform work

B a person who studies, builds, and works with machines

C machinery or mechanical components

D to observe operations in order to determine functionality

E to build something in a factory

F involving a wide variety of topics or disciplines

G to study and evaluate something

4 Read the sentences and choose the correct words or phrases.

1 Mechanical engineers sometimes **specialize in/assess** a particular sub-field.
2 The design doesn't work, so the engineers need to **improve/manufacture** it.
3 The client asked the engineer to **test/design** a nearly silent engine.

5 Listen and read the article again. Why do mechanical engineers need college degrees?

Listening

6 Listen to a conversation between an engineer and an interviewer. Mark the following statements as true (T) or false (F).

1 __ The company is looking for someone to design new engines.
2 __ The man's experience includes assessing older engine models.
3 __ The woman offers the man the position.

7 Listen again and complete the conversation.

Engineer: Hi, I'm Ian Moore. I'm here for an **1** _____.
Interviewer: It's nice to meet you, Ian. Tell me about your work experience.
Engineer: Well, I **2** _____ _____ Osterbell Incorporated for twelve years.
Interviewer: What were your **3** _____ _____?
Engineer: I assessed old engine models. Then I made suggestions to **4** _____ them.
Interviewer: Did you **5** _____ any engines?
Engineer: Not on my own. I designed new parts for older models.
Interviewer: If we hire you, you'll design **6** _____ _____ as well.

Speaking

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

USE LANGUAGE SUCH AS:

Tell me about ...
I worked for ...
What were your ...?

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

- a job you are applying for
- your job experience
- your duties at your previous job

Student B: You are an interviewer. Talk to Student A about his or her job qualifications.

Writing

9 Use the article and the conversation from Task 8 to fill out the engineer's job application.

Vennotec Commercial & Industrial Vehicles

Job Application

- What position are you applying for?
  _____
  _____
- What is your educational background?
  _____
  _____
- What were your duties at your previous job?
  _____
  _____

2 Bearings

What kind of bearings do I need?

Rolling Contact

Rolling contact bearings use rollers to support loads. They have an **inner race** and an **outer race**. They accommodate different types of force and motion. Load-carrying capacity: LOW – MEDIUM

- **Ball bearings** use spherical rollers. They support **radial** and **axial** motion.
- **Straight roller bearings** use cylindrical rollers. They support radial motion.
- **Tapered roller bearings** use conical rollers. They support radial forces and moderate thrust forces.
- **Thrust roller bearings** use barrel-shaped rollers. They support thrust motion.

Journal

Journal bearings have no rolling parts. The shaft rotates inside a lubricated **sleeve** instead. Load-carrying capacity: HIGH

Get ready!

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

1 Why are bearings important?
2 What are some different types of bearings?

Reading

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

1 __ Rolling contact bearings have a lubricated sleeve.
2 __ A tapered roller bearing is a type of rolling contact bearing.
3 __ Journal bearings can carry a heavy load.

Vocabulary

3 Match the words or phrases (1-8) with the definitions (A-H).

1 __ ball bearing
2 __ thrust roller bearing
3 __ tapered roller bearing
4 __ straight roller bearing
5 __ axial
6 __ radial
7 __ journal bearing
8 __ rolling contact bearing

A a bearing that uses cone-shaped rollers
B a bearing that uses metal cylinders
C a bearing that uses a lubricated tube
D any bearing that uses rolling parts to support and direct motion
E a bearing that uses metal spheres
F a bearing that uses barrel-shaped rollers
G related to movement along an axis
H related to movement across an axis

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

1 **inner race / outer race**

A The _____ rotates with the shaft.

B The _____ remains stationary relative to the shaft.

2 **sleeve / bearing**

A The blockage stopped the shaft from moving through the _____.

B The engineer needs a different type of _____ for radial motion.

5 Listen and read the poster again. What type of bearing cannot accommodate radial motion?

Listening

6 Listen to a conversation between an engineer and an assistant. Choose the correct answers.

1 What is the conversation mostly about?

A replacing different bearings

B oiling an old bearing

C repairing a broken bearing

D installing a particular bearing

2 What will the woman probably do next?

A install a thrust-roller bearing

B repair the inner race of a ball bearing

C purchase bearings at the hardware store

D lubricate the sleeve of a journal bearing

7 Listen again and complete the conversation.

Engineer: Vicki, could you **1** _____ _____ _____ _____?

Assistant: Sure, Paul. What is it?

Engineer: Could you please go to the hardware store? I need a couple of **2** _____.

Assistant: Of course. What kind do you need?

Engineer: I need two **3** _____ _____ _____.

Assistant: Okay. Didn't you break a **4** _____ _____ earlier?

Engineer: That's right, I almost forgot. I also need an **5** _____ _____ for a ball bearing.

Assistant: Got it. I'll **6** _____ _____ right now.

Speaking

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

USE LANGUAGE SUCH AS:

Could you please ...?

What kind of ...?

I need ...

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

- an errand you need him or her to run
- what hardware you need
- when you will need the hardware

Student B: You are an assistant. Talk to Student A about what hardware to buy.

Writing

9 Use the poster and the conversation from Task 8 to fill out the expense report.

Mason-Reynolds

Expense Report

Date: _____

Purchase made by: _____

- What did you purchase?

_____

_____

- Why did you purchase it?

_____

_____

Total Cost: _____