

Tijana Vesić Pavlović

NUTS AND BOLTS



English for Mechanical Engineering Students

STEEL
VELOCITY
ENGINE GEAR
ENGINEERING
FORCE ENERGY
ALLOY



TIJANA VESIĆ PAVLOVIĆ

NUTS AND BOLTS

The title 'NUTS AND BOLTS' is rendered in a large, bold, black serif font. The word 'AND' is smaller and positioned between 'NUTS' and 'BOLTS'. A 3D-rendered nut is placed over the 'S' in 'NUTS', and a 3D-rendered bolt is placed over the 'O' in 'BOLTS'. The letters have a slight drop shadow.

English for Mechanical Engineering Students

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FOREWORD

The English phrase *nuts and bolts* implies the essential or basic aspects of something, just as in engineering nuts and bolts are the basic elements which join components together. Accordingly, the book with this title is meant to offer an insight into the essential English needed for the mechanical engineering profession.

This book is principally intended for first-year students of the Faculty of Mechanical Engineering. The main aim is to introduce students to the basic terminology related to the field of mechanical engineering, as well as to provide practice in both grammar and vocabulary. Each unit consists of texts dealing with a specific mechanical engineering-related topic, accompanied by exercises. The texts have been compiled based on information acquired from a number of sources listed in the Bibliography. The units also contain a brief grammar revision or language focus, deemed relevant for the purpose of using the discourse of mechanical engineering. The book has originated from the author's nine-year experience working with mechanical engineering students, and the topics covered in the book have been selected bearing in mind their interests as well.

The relevant terminology included in the book covers various mechanical engineering branches, engineering materials, methods of joining materials, the internal combustion engine, the use of computers in engineering, energy sources, physics, mathematics, as well as more recent issues such as advanced driver assistance systems, autonomous vehicles, artificial intelligence and Industry 4.0. The textbook concludes with a short English-Serbian glossary encompassing the most important terms featured in the textbook.

The author would like to thank the reviewers, prof. Katarina Rasulić and prof. Ivana Trbojević Milošević for their constructive comments and suggestions. It is the author's hope that this small volume will be of great help to students in facilitating their use of the English language for academic and professional purposes, as well as in broadening their horizons regarding the new developments in mechanical engineering and technology in general.

*Belgrade,
June 2018*

Tijana Vesić Pavlović

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READING Studying Mechanical Engineering

The Faculty of Mechanical Engineering of the University of Belgrade was founded in 1948. Its mission throughout the years has been to provide high-quality, student-centred education. The studies at the faculty take place at three levels: bachelor, master and doctoral. Having completed three years of training, students obtain the diploma of Bachelor of Science (B.Sc.). At the next level, after a further two years of studies, they obtain the title of Master of Science (M.Sc.), and after another three years of studies the doctoral title (Ph.D.).

A variety of courses are available for students, both compulsory and elective. Compulsory courses at the bachelor level include various subjects, such as mathematics, physics, mechanics, strength of materials, programming, engineering graphics, engineering materials, machine elements, fluid mechanics and control engineering. Future mechanical engineers need to pass an exam in English and be able to apply the basic concepts of sociology and economics. At the end of bachelor studies, students are obliged to gain practical experience through mechanical engineering praxis and write a final course report (B.Sc. work).

When enrolling in master studies, students choose one module or specialisation area from a wide range of modules (e.g. motor vehicles, biomedical engineering, naval architecture, aeronautical engineering, internal combustion engines, control engineering). Having obtained the title of M.Sc. in mechanical engineering, they can pursue careers in their chosen field or continue with their education by enrolling in doctoral studies.

EXERCISES

I Answer the questions.

1. How many levels of studies are there at the Faculty of Mechanical Engineering?
2. How many years does the Bachelor level last?
3. Which courses are taught at the Bachelor level?
4. What is the level that follows after the Bachelor level?
5. What modules can you choose from at the second level of studies?

II Fill in the gaps with the correct words.

holds, completed, graduated, enrolled, obtained

1. I _____ from the University of Belgrade in 2013.
2. After Marija _____ her BSc, she _____ in master studies at the Faculty of Electrical Engineering.
3. Having _____ all courses, Sonja graduated from the Faculty of Organisational Sciences.
4. John _____ a degree in Aeronautical Engineering.

GRAMMAR FOCUS Use of Present Simple and Present Progressive

Present Simple is used:

- ◆ to express habitual action, i.e. something that happens regularly, on a daily basis – with adverbs such as *usually, always, commonly, frequently, normally, often, sometimes, rarely* or phrases containing the word *every* (such as *every day/week/month/year*).

The Earth revolves around the Sun.

He usually gets up at 7 o'clock.

He visits his aunt every week.

Present Progressive is used:

- ◆ to describe an action happening *now*, in the moment of speech;
I am teaching a class right now.
- ◆ to describe an action happening around the moment of speaking but not necessarily at that particular moment;
I am reading an interesting book on Newton these days.
- ◆ to express an action happening frequently that usually annoys the speaker.

You are always forgetting your homework!

UNIT 10

FERROUS AND NON-FERROUS METALS

Metals are traditionally the most used materials in engineering. Therefore, in this unit we will focus on different types of metals and their alloys and mention some of the advances in the field of alloy making.

Match the words with their definitions.

<i>ore</i>	a red-brown metal suitable for making pipes or wire
<i>steel</i>	a light silver-coloured metal
<i>aluminium</i>	a strong metal made from a mixture of iron and carbon
<i>copper</i>	a rock from which metal can be obtained

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READING Ferrous and Non-ferrous Metals. Iron and Steel.

Ferrous metals comprise iron, cobalt, nickel, manganese and their alloys. The most abundant of these are iron and steel, which are used in a wide range of applications. Iron ore is fairly available and easy to convert into a useful form. Iron is easily machined, welded, cast and forged. However, it also has certain shortcomings, such as its weight and susceptibility to corrosion. Steel is the most commonly used material in engineering. There are two main types of steel: carbon steels and alloy steels. Carbon steels consist of iron and carbon and have different grades, depending on the percentage of carbon (0.08 to 1.5). There are three main grades: mild, medium-carbon and high-carbon steels. Mild steel is actually low carbon steel, which is most

widely used since it is ductile and resistant to shock and impact. Medium and high carbon steels contain a larger percentage of carbon and are used for cutting tools and springs.

When speaking about metals, we usually mention their alloys. An alloy is obtained when alloying elements are added to the metal to change its mechanical or physical properties. Metals are heated, dissolved in each other and then solidified, which results in an alloy. Alloy steels consist of iron, carbon and one or more alloying elements. Commonly used alloying elements in steel include nickel, molybdenum, chromium, tungsten, vanadium and silicon. The properties attained by alloying include higher strength, toughness, high wear and corrosion resistance and high core strength. Particularly important is stainless steel, which is obtained when chromium is added to improve corrosion resistance.

Non-ferrous metals include copper, copper alloys, aluminium and its alloys, titanium, magnesium and lead. Non-ferrous metals are usually used when some particular features not possessed by iron and steel are required, such as reduced weight, higher strength, higher melting points, or resistance to chemical and atmospheric corrosion. Copper is an excellent heat and electricity conductor, used in electric wires, tubes and pipe work. Brass is a copper alloy, a combination of copper and zinc, used mainly within electrical fittings. Aluminium is very lightweight and easily machined and hence most often used in aircraft manufacturing.

EXERCISES

I Answer the questions.

1. What are the advantages of using iron as an engineering material? What are the disadvantages?
2. List the groups of carbon steels.
3. How are alloys obtained?
4. What are alloy steels? What benefits do they offer in engineering?