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Федеральное государственное бюджетное образовательное учреждение высшего образования
Санкт-Петербургский горный университет

Кафедра иностранных языков

ДЕЛОВОЙ ИНОСТРАННЫЙ ЯЗЫК

ХУДОЖЕСТВЕННАЯ ПРОЕКТИРОВКА ИЗДЕЛИЙ И КОМПЬЮТЕРНОЕ МОДЕЛИРОВАНИЕ ТЕХНОЛОГИЧЕСКИХ ПРОЦЕССОВ ИХ ПРОИЗВОДСТВ

Методические указания к практическим занятиям для студентов магистратуры направления 29.04.04

ENGLISH FOR SPECIFIC PURPOSES

PRODUCT DESIGN AND COMPUTER MODELLING OF TECHNOLOGICAL PRODUCTION PROCESSES

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ДЕЛОВОЙ ИНОСТРАННЫЙ ЯЗЫК. Художественная проектировка изделий и компьютерное моделирование технологических процессов их производств. Методические указания к практическим занятиям./ Санкт-Петербургский горный университет. Сост.: *Е.А. Варлакова, В.А. Спиридонова*. СПб, 2020. 35 с.

На материале аутентичных текстов, в которых освещаются различные способы художественной обработки материалов, необходимые для этого оборудование, инструменты и программное обеспечение, а также особенности профессий, связанных с этой сферой. Магистранты смогут овладеть необходимыми навыками для решения коммуникативных задач в профессиональной деятельности, а также подготовиться к зачету по дисциплине «Деловой иностранный язык».

Предназначены для студентов магистратуры, обучающихся по направлению подготовки 29.04.04 «Художественная проектировка изделий и компьютерное моделирование технологических процессов их производств» и согласованы с программой по деловому иностранному языку для студентов неязыковых вузов.

Научный редактор канд. филол. наук *С.А. Пушмина*

Рецензент канд. психол. наук, доц. *Н.Э. Горохова* (Санкт-Петербургский государственный экономический университет)

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Сост.: *Е.А. Варлакова, В.А. Спиридонова*

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Санкт-Петербургский горный университет
РИЦ Санкт-Петербургского горного университета
Адрес университета и РИЦ: 199106 Санкт-Петербург, 21-я линия, 2

ПРЕДИСЛОВИЕ

Данные методические указания предназначены для проведения практических занятий по английскому языку со студентами магистратуры по направлению подготовки 29.04.04 «Художественная проектировка изделий и компьютерное моделирование технологических процессов их производств». Методические указания составлены в соответствии с учебной программой по дисциплине «Деловой иностранный язык» для формирования иноязычной профессиональной компетенции будущих магистров. В методические указания включены аутентичные тексты, в которых описываются различные способы художественной обработки материалов, необходимые для этого оборудование, инструменты и ПО, а также особенности профессий, связанных с этой сферой.

Использование предложенного комплекса упражнений способствует формированию у будущих магистров навыков перевода с английского языка на русский публицистических и технических текстов, совершенствованию навыков говорения, просмотрового, ознакомительного, изучающего и поискового чтения, а также развитию умений реферировать аутентичные тексты на английском языке.

UNIT 1
MATERIALS PROCESSING TECHNOLOGY

Materials processing, the series of operations that transforms industrial materials from a raw-material state into finished parts or products. Industrial materials are defined as those used in the manufacture of "hard" goods, such as more or less durable machines and equipment produced for industry and consumers, as contrasted with disposable "soft" goods, such as chemicals, foodstuffs, pharmaceuticals, and apparel.

Task 1. Read the passage and answer the questions.

1. What are two main types of materials processing and when did they appear?

2. What are the main steps of metallic materials production?

Materials processing by hand is as old as civilization; mechanization began with the Industrial Revolution of the 18th century, and in the early 19th century the basic machines for forming, shaping, and cutting were developed, principally in England. Since then, materials-processing methods, techniques, and machinery have grown in variety and number.

The cycle of manufacturing processes that converts materials into parts and products starts immediately after the raw materials are either extracted from minerals or produced from basic chemicals or natural substances. Metallic raw materials are usually produced in two steps. First, the crude ore is processed to increase the concentration of the desired metal; this is called beneficiation. Typical beneficiation processes include crushing, roasting, magnetic separation, flotation, and leaching. Second, additional processes such as smelting and alloying are used to produce the metal that is to be fabricated into parts that are eventually assembled into a product.

Task 2. Paraphrase the passage above as much as possible.

1.1 Forming processes

Task 3. Translate the words into Russian: *a solid condition/state, casting, molding (a mold), milling, forging, an accurate pattern, pellet, an ingot, a billet, extrusion, to eliminate, to alter, removal process, metal plating process, a lubricant, a chemical solution.*

Task 4. Read the following text. Decide which answer 1, 2, 3 or 4 best fits each space.

Forming and shaping processes may be classified **(1)**… two broad types—those performed on the material in a liquid state and those performed on the material in a solid or plastic condition. The processing of materials in liquid form is commonly known **(2)**… casting when it involves metals, glass, and ceramics; it is called molding when applied to plastics and some other nonmetallic materials. Most casting and molding processes **(3)**… four major steps: a) making an accurate pattern of the part, b) making a mold from the pattern, c) introducing the liquid into the mold, and d) removing the hardened part from the mold. A finishing operation is sometimes needed.

Materials in their solid state are formed into desired shapes **(4)**… the application of a force or pressure. The material to be processed can be in a relatively hard and stable condition and in such forms as bar, sheet, pellet, or powder, or it can be in a soft, plastic, or puttylike **(5)**…. Solid materials can be shaped either hot or cold. Processing of metals in the solid state can be divided into two major stages: first, the raw material in the form of large ingots or billets is hot-worked, usually by rolling, forging, or extrusion, into smaller shapes and sizes; second, these shapes are processed into final parts and **(6)**… by one or more smaller scale hot or cold forming processes.

After the material is formed, it is usually **(7)**… altered. In materials processing, a "removal" process is one that eliminates portions of a piece or body of material to achieve a desired shape. **(8)**… removal processes are applied to most types of materials. They are most widely used on metallic materials. Material can be removed from a workpiece by either mechanical or non-mechanical means.

There are a number of metal-cutting processes. In almost all of them, machining involves the forcing of a cutting tool **(9)**… the material to be shaped. The tool, which is harder than the material to be cut, removes the unwanted material in the form of chips. Thus, the elements of machining are a cutting device, a means for holding and positioning the workpiece, and usually a lubricant (or cutting oil). There are four basic noncutting removal processes: a) in chemical milling the metal is removed by the etching reaction of chemical solutions on the metal; although usually **(10)**… to metals, it can also be used on plastics and glass, b) electrochemical machining uses the principle of metal plating in reverse, as the workpiece, **(11)**… being built up by the plating process, is eaten away in a controlled manner by the action of the electrical current, c) electrodischarge machining and grinding erodes or cuts the metal by high-energy sparks or electrical discharges, d) laser machining cuts metallic or refractory materials **(12)**… an intense beam of light from a laser.

	1.	**2.**	**3.**	**4.**
1.	by	through	into	in
2.	like	as	----	of
3.	have	include	consist of	involve
4.	by	in	through	with
5.	shape	substance	form	state
6.	goods	things	items	products
7.	further	later on	then	next
8.	despite	although	as	for
9.	anti	against	vs	with
10.	used	applied	referred	turned
11.	in place	rather	instead of	over
12.	with	against	through	and

1.2 Finishing processes

Task 1. Team racing. In each team write as many finishing methods as you know. The team that mentions more wins.

Task 2. Read and translate the following extract; insert articles into the gaps where necessary:

"Finishing" processes may be employed to modify (…) surfaces of (…) materials in order to protect (…) material against (…) deterioration by corrosion, oxidation, mechanical wear, or deformation; to provide (…) special surface characteristics such as reflectivity, electrical conductivity or insulation, or (…) bearing properties; or to give (…) material (…) special decorative effects. There are two broad groups of finishing processes, those in which (…) coating, usually of (…) different material, is applied to (…) surface and those in which (…) surface of (…) material is changed by (…) chemical action, heat, or mechanical force. (…) first group includes metallic coating, such as electroplating; organic finishing, such as painting; and porcelain enameling.

All above is taken from:
https://www.britannica.com/technology/Catalan-forge

Task 3. Match types of surface finishing processes with their Russian equivalents.

lapping	цинкование
honing	шлифование круглых отверстий
polishing	металлизация
buffing	барабанная очистка
power brushing	шлифование
tumbling	полировка
pickling	очистка механической щеткой
galvanizing	травление (оксидирование)
metal spraying	глянцовка
metallization	напыление

Task 4. Read the text and insert the missing words from the box into the gaps.

solutions components distortion roughened polishing coating dimensional applications defects thickness grinding molten peripheral descaling

1. Lapping is an abrading process that is used to produce geometrically true surface, imperfections, improve **(1)**… accuracy, or provide a very close fit between two contact surface. It is a low-efficiency process and is used only when specified accuracy and surface finish cannot be obtained by other methods.

2. The honing is **(2)**… or an abrading process mostly for finishing round holes by means of bonded abrasive stones, and it is called hones. Honing is, therefore one type of cutting operation and has been used to remove as much as 3 mm of stock but is normally confined to amounts less than 0,25 mm. Honing is generally used to correct some out of roundness, taper, tool marks, and axial **(3)**…. Material honed range from plastics, silver, aluminium, brass, and cast iron to hard steel and cemented carbides.

3. Polishing is a surface finishing operation performed by a polished wheel for the purpose of removing applicable metal to take out scratches, tool marks, pits and other **(4)**… from rough surface. In polishing, usually the accuracy of the size and shape of the finished surface is not important, but sometimes tolerance of 0,025 mm or less can be obtained in machine polishing.

4. Buffing is used to much higher, lustrous, reflective finish that cannot be obtained by **(5)**…. It consists of applying a very fine abrasive with a high speed rotating wheel. The buffing wheels are made of felts pressed, and glued layers of duck or other cloth. The abrasive is mixed with the binder, and is applied either on the buffing wheel or on the work. The buffing wheel rotates with a high **(6)**… speed up to 40m/sec. The abrasive consists of iron oxide, chromium oxide and emery. The binder is a paste consisting of wax mixed with grease, paraffin, and kerosene, or turpentine and other liquids.

5. Power brushing. High-speed revolving brushing can be used to remove burns, fins, sharp edges or minute surface defects from manufactured **(7)**…. Tough fiver wheels, wire-bristle, and Tampico are

utilized to produce power brushes. These materials are flexible and can conform to irregular surfaces.

6. Tumbling is the least expensive process for removing rust and scale from metal parts. Tumbling in dry abrasives is effective for removing rust and scale from small parts of simple shape. The parts of complex shape, with deep recess, and other irregularities cannot be descaled uniformly by tumbling. It requires several hours of the tumbling if the method is used. For addition of **(8)**… compounds instead of deburring compounds will often decrease the tumbling time by 75%.

7. Pickling refers to the removal of surface oxide and scale from metals by acid **(9)**…. Common pickling solutions contain sulphuric or hydraulic acids and water, and sometimes inhibitors which have been developed to reduce the harmful action of the acids fumes on plant equipment. Nitric and hydrofluoric acids can be used for some **(10)**…. In pickling, the parts must be perfectly cleaned before they are immersed in an acid solution. After pickling, the parts must be rinsed and completely neutralized by an alkaline rinse, otherwise, any trace of acid will corrode the material and harm paint or other subsequent **(11)**…. In some application, such as on aluminium, pickling is called oxidizing.

8. Galvanizing. A protective coating may be applied on metal pieces by dipping them into certain molten metals namely zinc, tin, or an alloy of lead and tin. Dipping is an economical way of putting on a heavy and enduring coating. To obtain an even coating on small objects, the objects are centrifuged, after being taken from the **(12)**… bath, until the coating is hard. Zinc dipping, or hot galvanizing, is widely used in steel as effective protection against corrosion. The parts are first cleaned and fixed in a solution of zinc chloride and hydrochloric acid.

9. Metal spraying is basically intended to confer some physical property on a surface. The appearance of poor surfaces on castings can be improved by metal spraying. Sprayed metal can be decorative, like aluminium or bronze or cast iron. The process uses compressed air to atomize fully the molten metal or oxides and projects them against a prepared surface where they are embedded, assuring good mechanical adhesions. The surface must be **(13)**… first and be free of dirt, oil and grease.

10. Metallisation is an interesting application of the oxy-acetylene flame. This technique essentially consists of laying deposits

which vary both in nature and in **(14)**…, on to the widest variety of parts. The principle is as follows: the material to be deposited is melted in a flame and subsequently pulverized and sprayed in fine droplets on to the part to be coated.

https://engr-info.com/types-of-surface-finishing-processes/

Task 5. Prepare a presentation about any method of surface finishing process.

UNIT 2
PRODUCT DESIGN

Task 1. Discuss in groups. What kind of product design methods do you know?

2.1 Machine milling

Task 2. Say these words correctly. Use the proper word stress: *process, feature, symmetric, dimensional, typically, completely, components, prototypes, designed, fasteners, manufactured, precision, specified.*

Part 1

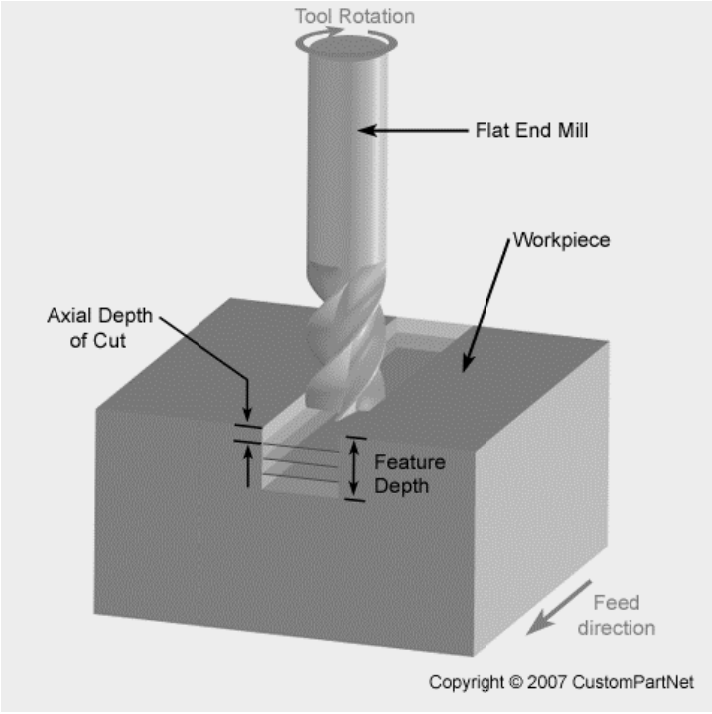
Task 3. Read and translate the text. Pay attention to the words in bold.

Milling is the most common form of machining, a material removal process, which can create a variety of features on a part by cutting away the unwanted material. The milling process requires a milling machine, **workpiece**, **fixture**, and cutter. The workpiece is a piece of pre-shaped material that is secured to the fixture, which itself is attached to a platform inside the milling machine. The cutter is a cutting tool with sharp teeth that is also **secured** in the milling machine and rotates at high speeds. By feeding the workpiece into the rotating cutter, material is cut away from this workpiece in the form of small **chips** to create the desired shape.

Milling is typically used to produce parts that are not **axially** symmetric and have many features, such as holes, **slots**, pockets, and

even three dimensional surface contours. Parts that are fabricated completely through milling often include components that are used in limited quantities, perhaps for prototypes, such as custom designed fasteners or brackets. Another **application** of milling is the fabrication of tooling for other processes. For example, three-dimensional molds are typically milled. Milling is also commonly used as a secondary process to add or refine features on parts that were manufactured using a different process. Due to the high tolerances and surface finishes that milling can offer, it is ideal for adding precision features to a part whose basic shape has already been formed.

In milling, the speed and motion of the cutting tool is specified through several parameters. These parameters are selected for each operation based upon the workpiece material, tool material, tool size, and more.



Task 4 Match the words in bold from the article with their meanings:

1._____. a piece of equipment which is fixed firmly in place;

2._____. the act of putting something to use;

3._____. a long, narrow aperture or slit in a machine for something to be inserted;

4._____ . a piece of raw material that is in the process of manufacture;

5._____. fixed or attached firmly so that it cannot be moved or lost;

6._____ . in the direction or line of the axis;

7._____ . a small piece of something removed in the course of chopping, cutting, or breaking a hard material such as wood or stone.

From Webster's Dictionary

Task 5. Say if the following statements are True or False:

1. A workpiece is a ready-made piece of material.
2. Milling is a removal process.
3. Milling is used to produce axially symmetric parts.
4. The cutter is a fixed tool in a milling machine.

Part 2

Task 6. Match the words and phrases with their Russian equivalents:

arbor	суппорт
saddle	устанавливать
spindle	зажим
knee	хобот станка
to enable	зажимная втулка
vise	консоль
to mount	шпиндель
overarm	позволить
collet	дерево

Task 7. Read the text and insert the missing verbs from the box into the gaps. Put the verbs in the correct form.

~~find~~ support (x2) remain include allow refer orient call move attach enable mount perform secure provide fix drive

Milling machines can be **(0)…found…** in a variety of sizes and designs, yet they still possess the same main components that **(1)**… the workpiece to be moved in three directions relative to the tool. These components **(2)** … the following:

Base and column. The base of a milling machine is simply the platform that sits on the ground and **(3)** … the machine. A large column **(4)** … to the base and connects to the other components.

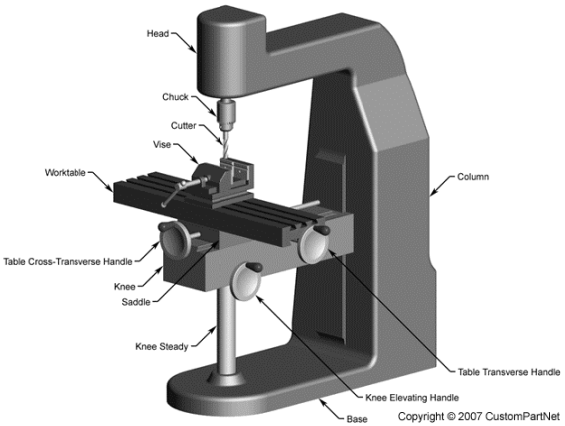
Table. The workpiece that will be milled is mounted onto a platform called the table, which typically has "T" shaped slots along its surface. The workpiece may **(5)** … in a fixture called a vise, which is secured into the T-slots, or the workpiece can be clamped directly into these slots. The table provides the horizontal motion of the workpiece in the X-direction by sliding along a platform beneath it, **(6)** … the saddle.

Saddle. The saddle is the platform that supports the table and **(7)** … its longitudinal motion. The saddle is also able **(8)** … and provides the horizontal motion of the workpiece in the Y-direction by sliding transversely along another platform called the knee.

Knee. The knee is the platform that **(9)** … the saddle and the table. In most milling machines, sometimes called column and knee milling machines, the knee **(10)** … the vertical motion (Z direction) of the workpiece. The knee can move vertically along the column, thus moving the workpiece vertically while the cutter **(11)** … stationary above it. However, in a fixed bed machine, the knee **(12)** … while the cutter moves vertically in order to cut the workpiece. The above components of the milling machine can be oriented either vertically or horizontally, creating two very distinct forms of milling machine. A horizontal milling machine uses a cutter that **(13)** … on a horizontal shaft, called an arbor, above the workpiece. For this reason, horizontal milling is sometimes **(14)** ... to as arbor milling. The arbor is supported on one side by an overarm, which is connected to the column, and on the other side by the spindle. The

spindle **(15)** … by a motor and therefore rotates the arbor. During milling, the cutter rotates along a horizontal axis and the side of the cutter removes material from the workpiece. A vertical milling machine, on the other hand, **(16)** … the cutter vertically. The cutter is secured inside a piece called a collet, which is then attached to the vertically oriented spindle. The spindle is located inside the milling head, which is attached to the column. The milling operations **(17)** … on a vertical milling machine remove material by using both the bottom and sides of the cutter.

https://www.custompartnet.com/wu/milling



Task 8. Fill in the table. Form a missing noun, verb or adjective from the following words where possible.

Noun	Verb	Adjective
variety		
rotation	rotate	
	relate	relative
		possessive
attachment		
	remove	removed
	orient	

2.2 Shell mold casting

Task 1. Group work. Name as many metal alloys as you can.

Task 2. Translate these phrases into Russian: *a sand resin mixture, multiple shell molds, molten metal, sand casting, the desired part, production rates, the disposable molds, high accuracy.*

Part 1

Task 3. Complete the passage using the verbs in brackets in an appropriate form – active or passive.

Shell mold casting **0** (be)…is… a metal casting process similar to sand casting, in that molten metal **1**(pour) … into an expendable mold. However, in shell mold casting, the mold is a thin-walled shell created from applying a sand-resin mixture around a pattern. The pattern, a metal piece in the shape of the desired part, **2** (reuse) … to form multiple shell molds. A reusable pattern **3** (allow) … for higher production rates, while the disposable molds enable complex geometries **4** (cast) …. Shell mold casting **5** (require) … the use of a metal pattern, oven, sand-resin mixture, dump box, and molten metal.

Shell mold casting **6** (allow) … the use of both ferrous and non-ferrous metals, most commonly using cast iron, carbon steel, alloy steel, stainless steel, aluminum alloys, and copper alloys. Typical parts **7** (be) … small-to-medium in size and **8** (require) … high accuracy, such as gear housings, cylinder heads, connecting rods, and lever arms.

Task 4. Find the English equivalents for the following Russian words and phrases. Then explain where these objects are used.

A) головка блока цилиндров (для двигателя внутреннего сгорания);
B) рычаг;
C) шатун (в поршне);
D) корпус коробки передач.

Part 2

Task 5. Match the name of the step of the shell mold casting with its description.

1. Mold assembly
Cooling
Casting removal
Pattern creation
Pouring
Mold creating

The shell mold casting process consists of the following steps:

A. A two-piece metal pattern is created in the shape of the desired part, typically from iron or steel. Other materials are sometimes used, such as aluminum for low volume production or graphite for casting reactive materials.

B. First, each pattern half is heated to 175-370°C (350-700°F) and coated with a lubricant to facilitate removal. Next, the heated pattern is clamped to a dump box, which contains a mixture of sand and a resin binder. The dump box is inverted, allowing this sand-resin mixture to coat the pattern. The heated pattern partially cures the mixture, which now forms a shell around the pattern. Each pattern half and surrounding shell is cured to completion in an oven and then the shell is ejected from the pattern.

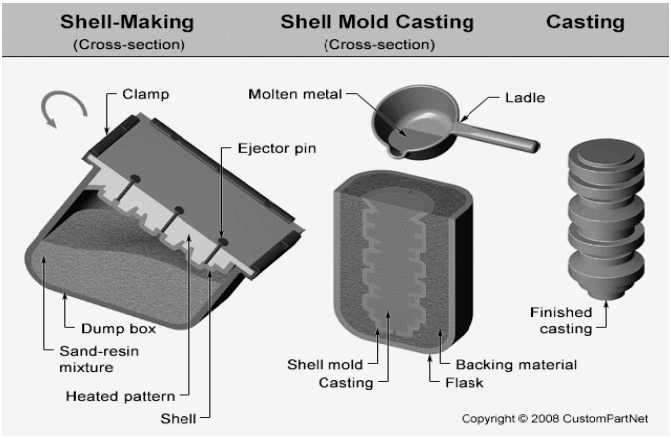
C. The two shell halves are joined together and securely clamped to form the complete shell mold. If any cores are required, they are inserted prior to closing the mold. The shell mold is then placed into a flask and supported by a backing material.

D. The mold is securely clamped together while the molten metal is poured from a ladle into the gating system and fills the mold cavity.

E. After the mold has been filled, the molten metal is allowed to cool and solidify into the shape of the final casting.

F. After the molten metal has cooled, the mold can be broken and the casting removed. Trimming and cleaning processes are required to remove any excess metal from the feed system and any sand from the mold.

https://www.custompartnet.com/wu/shell-mold-casting



Task 6. Use English-English dictionary and give a definition to "ferrous" and "non-ferrous" metals. Then choose one of them and make a small report about its properties and usage.

2.3 Hollow casting

Task 1. Translate the words and phrases into Russian: *a solid lump, hollow blades, slush casting, a core, ornamental products, moulding, tension.*

Task2. Underline materials with low-melting point:

tungsten	zinc	aluminium
tin	lead	cadmium
bismuth	iron	copper

Task 3. Read the text and answer the questions:

1. To produce which products is the method of hollow casting used for?

2. Which method can be considered as a forefather of hollow casting?

3. Who invented a hollow casting method?

Introduction: Hollow casting is a method to suppress displacement of the core during casting when making hollow blades by applying the lost wax method using a core. A wax pattern is made which comprises a core and a layer of wax covering the core. Then at least one pin of the same material as the blade is inserted into the wax layer such that this pin engages the core and part of the pin projects from the outer surface of the wax layer, after which, with the portion of the pin which projects from the outer surface of the wax layer being held in a casting mold, the wax is removed, followed by casting.

History: Slush casting is a variant of permanent molding casting to create a hollow casting, hollow metal casting or hollow cast. In the process the material is poured into the mold and allowed to cool until a shell of material forms in the mold. The remaining liquid is then poured out to leave a hollow form. The resulting casting has good surface detail but the wall thickness can vary. The process is usually used to cast ornamental products, such as candlesticks, lamp bases, and statuary, from low-melting-point materials. A similar technique is used to make hollow chocolate figures for Easter and Christmas.

The method of hollow metal casting was developed by William Britain in 1893 for the production of lead toy soldiers. It uses less material than solid casting, and results in a lighter and less expensive product. Hollow cast figures generally have a small hole where the excess liquid was poured out. Hollow casting is also used extensively for vitreous china products, such as sinks, urinals, and toilets.

Hollow Casting Process: Casting in a mold by lining the walls of the mold with layers of sculpture material rather than filling up the mold. Cast metal sculptures are made hollow chiefly to ensure that no part is much thicker than any other; such differences in thickness would create tensions in the metal as it shrinks in cooling.

The master pattern will be made from a solid lump of material; this material can be more or less anything, provided it is capable of holding a finish, workable, and non-porous. To prepare it for moulding it should have taper applied to all vertical surfaces. This is to allow the pattern to be drawn out of the mould easily. If there was a hollow or dent in a vertical side then this would be an undercut and so prevent removal of the pattern. This is why taper is applied. By drawing out the end view

of the part to see what difference having tapered sides will have on the final model.

Hollow Casting Application: Casting hollow toys and Christmas decorations.

http://www.industrialmetalcastings.com/casting_hollow_casting.html

Task 4. Correct wrong information in the following statements:

1. The resulting casting has good surface detail and the wall thickness is constant.
2. The method of hollow metal casting was developed in 1983.
3. Differences in thickness would create tensions in the metal as it stretches in cooling.
4. The master pattern is usually made from a hollow lump of material.
5. There should be a hollow or dent to let the pattern to be drawn out of the mould easily.

Task 5. Match the verbs from column A to their synonyms from column B. Translate them.

A	B
to suppress	to infuse
to insert	to delete
to comprise	to paste
to remove	to contract
to pour	to restrain
to shrink	to contain

Task 6. Writing. There is the oldest and the most well-known UK company named after William Britain. What is it famous for? Use the internet and write a brief history of the company.

UNIT 3
PRODUCT AND MACHINE DESIGN SOFTWARE

Task 1. Read the text and answer the following questions:

1. What is industrial design software?

2. What is product and machine design software?

3. How many types of 3D modeling are used in industrial design? What are they? Which of them have you already worked with?

Industrial design software helps engineers create, analyze, visualize, and communicate design intent and aesthetics before building a physical prototype. Many of the everyday products we use have been designed through industrial design software, from tablets to headphones to cars.

Product and machine design is a subcategory of computer-aided design software specifically targeted towards designers and engineers across a number of disciplines, including manufacturing, product design, automotive, and aerospace. These tools allow users to generate precision 3D models of parts, components, and assemblies to aid in engineering, manufacturing, and design processes.

Types of 3D modeling used in industrial design include polygonal modeling, surface modeling, solid modeling and parametric modeling.

Polygonal modeling software is used in industrial design for concept modeling and is useful for quick ideation.

Surface modeling software is used widely across industrial design and lets designers create and adjust freeform 3D surfaces with high precision.

Solid modeling software is used to create 3D models, assemblies, and drawings.

With parametric modeling, you can change parameters in the software, altering the shape of the design based on those values.

knowledge.autodesk.com

Task 2. In pairs, find English equivalents for the following phrases in the text above: *полигональное моделирование, моделирование поверхностей, моделирование трёхмерных объектов, параметрическое моделирование, формирование идей, выразить проектный замысел, программное обеспечение для производственных разработок, произвольные формы, подгонять, точность, чертежи, агрегаты / готовые изделия, изменять, значения.*

Task 3. Read and analyze the information about "Top 6 Product and Machine Design Software" given below. Fill in the table.

name of the software	*target user*	*unique features*

Top 6 Product and Machine Design Software

1. Autodesk® Inventor® software provides engineers and designers professional grade design and engineering solution for 3D mechanical design, simulation, visualization, and documentation. Engineers can integrate 2D and 3D data into a single design environment, creating a virtual representation of the final product that enables them to validate the form, fit, and function of the product before it is ever built. Autodesk Inventor includes powerful parametric, direct edit and freeform modeling tools as well as multi-CAD translation capabilities and industry standard DWG™ drawings.

2. Fusion 360 is for product designers, mechanical engineers, electrical engineers, and machinists. It unifies design, engineering, PCB design, and manufacturing into a single platform. Fusion 360 is a fully integrated CAD, CAM, PCB, and CAE software that includes generative design, 2.5, 3, 4, & 5 axis machining, and advanced simulation.

3. Onshape is the only product development platform that unites CAD, data management, collaboration tools and real-time analytics, plus an API with more than 50 engineering applications. With 1 in 8 sessions occurring on mobile devices, Onshape is the world's first anywhere, anytime CAD system.

4. AutoCAD® Mechanical design software is built for manufacturing. Part of the Digital Prototyping solution, it includes all the functionality of AutoCAD, plus libraries of standards-based parts and tools to help automate common mechanical CAD tasks and accelerate the mechanical design process.

5. Solid Edge is a portfolio of affordable, easy-to-use software tools that address all aspects of the product development process; for example 3D Design, CAM, Simulation, Electrical Design, 3D Printing, and Technical Publications.

6. Ansys is the global leader in engineering simulation. It plays a critical role in the creation of space crafts, airplanes, cars, computers, mobile devices, and wearable technologies. It assists in solving the most complex design challenges and engineer products limited only by imagination.

www.g2.com

Task 4. Choose the meaning in which each of the following abbreviation is used in the text above.

1) DWG	a) Distillers' Wet Grain b) Drafix Drawing File c) Device Working Group d) Drawing Database
2) CAD	a) Cash Against Documents b) Canadian Dollar c) Capital Adequacy Directive d) Computer-aided Design
3) PCB	a) Program Control Block b) Pensions Compensation Board c) Printed Circuit Board d) Polychlorinated Biphenyl

4) CAM	a) Cybernetic Antropomorphous Machine b) Current Account Mortgage c) Computer-aided Manufacturing d) Checkout and Maintenance
5) CAE	a) Cambridge Advanced English b) Common Application Environment c) Communication-and-electronics d) Computer-aided Engineering
6) API	a) Accountants for the Public Interest b) Application Programming Interface c) American Petroleum Institute d) Associate in Personal Insurance

3.1 Sheet metal software

Task 1. Read and translate the paragraph about sheet metal software.

Sheet metal design software considers the fabrication methods needed for manufacturing. As you create flanges and add bends, the sheet metal design software will accurately represent the flat pattern required. The flat pattern can be used to document and manufacture associatively as the design changes.

Task 2. You are going to watch the video "Basic Sheet Metal Parts in Fusion 360's Sheet Metal Workspace". Before watching try to answer the following questions:

1. Can you name any basic sheet metal parts?
2. What do you remember about Fusion 360?
3. How many millimeters are there in one inch?

Task 3. Look at some vocabulary units that you are going to hear in the video. Translate them into Russian: *to toggle, unit, to switch, to select, to detach, to convert, to hit, shortcut, to drag, width, to lock, to type out, height, to set, sketch, to exit, profile, thickness, edge, flip, override, modify, to right-click, specify, intersection, relief, benefit.*

Task 4. ►Watch the video once without any subtitles at https://www.youtube.com/watch?v=uPF1-IBj4ds and order the steps of the design process as they were presented in the video.

1-	a) I'll select flange in the toolbar and then select the rectangle that we just created
2-	b) next we want to create the three flanges…I'll select the top, the left and the bottom edges
3-	c) I'll also open up the corner conditions and the 2 bend intersection
4-	d) you'll want to make sure your document settings are set to millimeters
5-	e) you'll also be prompted to select the stationery face from which all the flanges are folded
6-	f) now let's start to create a simple sheet metal part with a few flanges
7-	g) you can toggle open the library folder to see all the different preset sheet metal rules

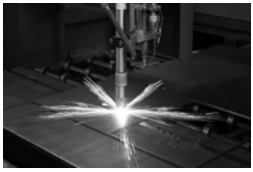
Task 5. ► Watch the video again with subtitles. Check your answers in task 4. Revise your translation of the vocabulary units in task 3. Have your translation changed once you heard the words I the given context?

Task 6. If necessary watch the video again. Answer the following questions:

1. How do sheet metal components differ from regular components in the model workspace?
2. What key should you hit to lock the dimension in place?
3. What is one main benefit of 3D modeling your sheet metal design?

3.2 Manufacturing Methods for Sheet Metal Designs

Task 1. Match the method with the correct definition and picture. Translate the definitions.

method	definition	picture
A. Laser	**a)** The **…….** process uses electrically conductive gas to transfer energy from a torch to the material being cut. It was developed for metals that could not be flame cut, such as stainless steel, aluminum and copper.	**1.** 
B. Plasma	**b)** Pressurized **……** mixed with abrasives can cut through stainless steel, Inconel, titanium, aluminium, tool steel, ceramics, granite, and armor plate, with a clean edge finish.	**2.** 
C. Water jet	**c)** A gas **…….**, such as a CO2, is transmitted through a beam, guided by mirrors, and directed at the material at an extremely high level of precision.	**3.** 

Task 2. Read the text below and answer the questions:

1. What are the three types of software that are required on most of the new CNC plasma systems?

2. What are the primary functions of each?

Software Packages on an Industrial CNC Plasma System

CAM *(computer-assisted manufacturing)* software on plasma cutting machines is known as the "post processing" or "nesting" software that processes CAD *(computer-aided design)* data and develops a machine code road map for the CNC *(computer numerical control)* control that tells it what speed, when to move, what direction, when to activate the plasma and the height control, and how to cut multiple parts on the plate for best plate utilization.

CNC software is integrated into the control on plasma cutting machines and is generally proprietary to a specific brand of controller. Its primary function is to receive and interpret the "machine code" from the CAM (or post processor or nesting software) and convert it into properly timed electrical signals that drive the X-axis, Y-axis and Z-axis motors for machine motion and activate and deactivate the plasma, the torch height control, the marking process and any other peripheral device. It also accepts input for cut speed, cut height, pierce height, amperage, voltage to produce the best quality cut possible.

by J. Colt
www.fabricatingandmetalworking.com

Task 3. Fill in the table with the missing noun, adjective or verb form of the word from the text where possible.

Noun	Adjective	Verb
plasma		
		integrate
	multiple	
		activate
utilization		
	cutting	
		accept

Task 4. Read the text about Software Packages on an Industrial CNC Plasma System again. Translate it into Russian.

UNIT 4
CAREER PERSPECTIVES

Task 1. Match the industrial product design related jobs with their descriptions.

1. Architects	**a.** use software to convert the designs of engineers and architects into technical drawings
2. Art Directors	**b.** create visual concepts, using computer software or by hand, to communicate ideas that inspire, inform, and captivate consumers
3. Drafters	**c.** devise efficient systems that integrate workers, machines, materials, information, and energy to make a product or provide a service
4. Graphic Designers	**d.** create the overall design of a project and manage the work of others who develop artwork and layouts
5. Industrial Engineers	**e.** develop the applications that allow people to do specific tasks on a computer or another device. Others develop the underlying systems that run the devices or that control networks.
6. Software Developers	**f.** plan and design houses, factories, office buildings, and other structures

collegegrad.com

Task 2. Translate the descriptions above into Russian.

4.1 Industrial design career

Task 1. You are going to watch the video "Commercial and Industrial Designers Career". Before watching, translate the following words and phrases into Russian:

blend, improve, take into account, usability, in mind, ensure, be on track, testing facilities, observe, entry-level position, apply for.

Task 2. ► Follow the link to watch the video https://www.youtube.com/watch?time_continue=90&v=1wS2I0dCdc4&feature=emb_logo

Mark the sentences True or False. Correct the False ones:

1. With a blend of skills in music, agriculture and engineering commercial and industrial designers develop and improve concepts for everyday products.
2. The designers take into account the function, appearance, production costs and usability of products when developing new ideas.
3. They make their design with their own project requirements in mind.
4. Engineers and other experts help industrial designers ensure their designs can actually be made.
5. They may travel to testing facilities and to the four corners of the earth to ensure their designs are on track.
6. They visit manufacturing facilities to take part in production.
7. A master's degree in industrial design, architecture, or engineering is usually required for entry-level positions.
8. An electronic portfolio of design projects is needed to apply for jobs.

Task 3. Read about "Important Qualities for Industrial Designers". First, range them individually from the most important to the least. Then work in pairs, compare your list with your partner's. Finally, work in small groups. Ask your group mates what qualities they value the most. Why? Present your group list in the class, explain your choice.

Analytical skills. Industrial designers use logic or reasoning skills to study consumers and recognize the need for new products.

Artistic ability. Industrial designers sketch their initial design ideas, which are used later to create prototypes. As such, designers must be able to express their design through illustration.

Computer skills. Industrial designers use computer-aided design software to develop their designs and create prototypes.

Creativity. Industrial designers must be innovative in their designs and the ways in which they integrate existing technologies into their new product.

Interpersonal skills. Industrial designers must develop cooperative working relationships with clients and colleagues who specialize in related disciplines.

Mechanical skills. Industrial designers must understand how products are engineered, at least for the types of products that they design.

Problem-solving skills. Industrial designers determine the need, size, and cost of a product; anticipate production issues; develop alternatives; evaluate options; and implement solutions.

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Task 4. Which of the skills are you good at? Choose one and think of a plan or a strategy of mastering it. Prepare a master class for your group mates to put it into practice.

4.2 Senior Software Engineer

Task 1. Read the position overview. In pairs, discuss the possible responsibilities.

In this role, you will be working as part of a closely-knit product engineering team that develops key components that help products integrate with Autodesk's Identity and Authorization solution.

Task 2. Now read Part 1. How many did you get right?

Part 1. Responsibilities:

- enhance and maintain the Identity Desktop SDK components across Windows, Linux and Mac platforms;
- enhance and maintain the Identity Desktop SDK components across Windows, Linux and Mac platforms;
- research, design and implement the next gen Identity Desktop SDK to support forward looking features of the Autodesk Identity and Access Management Systems;
- write unit and integration tests and fix bugs to maintain the quality of the deliverable product.

Task 3. Read Parts 2 and 3. Fill in the gaps (1-10) with the correct preposition. Use the dictionary to help you.

Part 2 Minimum Qualifications:

- bachelor's degree or higher **1. …** Computer Science, Engineering or related field;
- expertise **2. ….** object-oriented design and implementation;
- strong experience **3. …** building resilient and fault tolerant code and high quality desktop applications using QT and C++;
- strong understanding **4. …** desktop security concepts;
- exposure **5. …** native network and crypto libraries across Windows, Mac and Linux platforms;
- proficient **6. …** Inter Process communication (IPC), multi-threaded application development;

Part 3 Preferred Qualifications:

- experience **7. …** building products or services with large enterprise or global customers and the desire for continuous learning and growth;
- enthusiastic and creative with the ability **8. …** inspire, influence and encourage others, in both relationships with internal customers and peers;
- capability **9. …** work collaboratively with a large group of engineers/product managers external **10. …** the team to help them integrate the components in their products.

autodesk.taleo.net

Task 4. Read parts 1, 2 and 3 once again. Match the English verbs with their Russian contextual equivalents:

1.enhance	a. воодушевлять
2. maintain	b. изучать
3. research	c. реализовывать
4. design	d. объединять в целое
5. implement	e. улучшать
6. support	f. поддерживать к.-л.
7. inspire	g. влиять
8. influence	h. обеспечивать
9. integrate	i. поддерживать ч.-л.
10. encourage	j. разрабатывать

Task 5. Look at the phrases and collocations from the texts above (Parts 1, 2, and 3). Analyze the variants of their translation provided by 3 on-line translators: 1) translate.yandex.ru**, 2)** translate.google.com**, and 3)** translate.ru (PromptOne)**. Choose the variant for each phrase. Bearing in mind the context, improve the translation. Use topical dictionaries to help you.**

	1	2	3
forward looking features	прогнозные характеристики	перспективные функции	перспективные особенности
deliverable product	конечный продукт	поставляемый продукт	подлежащий доставке продукт
related field	смежной области	родственное поле	смежная область
strong experience	сильное переживание	большой опыт	
strong understanding	глубокое понимание	сильное понимание	глубокое понимание
object-oriented design	объектно-ориентированный дизайн		
multi-threaded application	многопоточное применение	многопоточное приложение	многопоточное применение

Task 6. ► Watch the video "Interview tips from Google Software Engineers" https://www.youtube.com/watch?v=XOtrOSatBoY **Answer the following questions:**

1. How many speakers were there in the video?

2. How many key questions have been discussed in the video?

3. What is the general structure of this kind of interviews?

4. What is the best strategy for answering questions on such interviews?

Task 7. Look at the gapped sentences below and try to predict what words can be there. Now watch the video again ► and fill in the gaps with the detailed information. Translate the sentences into Russian.

1. The main focus of this interview is …… ……
2. So you should be ready for a ….-to-….-minute interactive question.
3. Even though the first …… you come up with might not be the best, they will guide you through and give you enough …..
4. You definitely need to …… …….
5. First ask …… questions, second, ….. … assumptions.
6. Third, you need to explain your …. clearly before ….. into coding.
7. A lot of people come into it with the ……. that for every problem you are given, you must find algorithmically optimal solution.
8. Make sure your …. are going to be strong for the interview.
9. When coding on the whiteboard, you don't have any helpful …. to guide you through to finish the …..
10. Google like to hire …. people, but don't …… yourself.

Task 8. Have you ever been on an interview? If yes, what other tips can you share with your group mates?

Task 9. ► Watch the video "Product Design Interview – Questions to ask" https://www.youtube.com/watch?v=7RuE5H-144E. Haven't you missed anything? Write down a short bullet-point summery of the information provided by the speaker. Use it to get ready for an imaginary or real forthcoming interview of yours. Role-play it with your group mates. Use the studied vocabulary from the units above.

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CONTENTS