АНГЛИЙСКИЙ ЯЗЫК

ПРОМЫШЛЕННОЕ И ГРАЖДАНСКОЕ СТРОИТЕЛЬСТВО: ИСТОРИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ

Методические указания к практическим занятиям для студентов направления бакалавриата 08.03.01

ENGLISH

CIVIL AND INDUSTRIAL ENGINEERING: HISTORY AND DEVELOPMENT PROSPECTS

САНКТ-ПЕТЕРБУРГ
2019

Министерство науки и высшего образования Российской Федерации

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

Кафедра иностранных языков

АНГЛИЙСКИЙ ЯЗЫК

ПРОМЫШЛЕННОЕ И ГРАЖДАНСКОЕ СТРОИТЕЛЬСТВО: ИСТОРИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ

Методические указания к практическим занятиям для студентов направления бакалавриата 08.03.01

ENGLISH

CIVIL AND INDUSTRIAL ENGINEERING: HISTORY AND DEVELOPMENT PROSPECTS

САНКТ-ПЕТЕРБУРГ
2019

УДК 811.111:69 (073)

АНГЛИЙСКИЙ ЯЗЫК. Промышленное и гражданское строительство: История и перспективы развития: Методические указания к практическим занятиям / Санкт-Петербургский горный университет. Сост.: *Е.В. Картер*, *В.Н. Ионова*. СПб, 2019. 45 с.

Методические указания ставят своей целью формирование навыков чтения и перевода текстов по специальности, а также извлечения необходимой для речевой практики информации. Тематика текстов, система упражнений и тестовых заданий к ним позволяет научить студентов 2-го курса читать и анализировать прочитанное на иностранном (английском) языке, а также делать устные сообщения и принимать участие в беседе по темам по специальности.

Предназначены для использования на занятиях со студентами бакалавриата направления 08.03.01 «Строительство» по профилю «Промышленное и гражданское строительство» и согласованы с программой по иностранному языку для студентов неязыковых вузов.

Научный редактор доц. *И.С. Облова*

Рецензент доц. *Н.Э. Горохова* Санкт-Петербургский государственный университет)

Предисловие

Данные методические указания к практической работе предназначены для студентов 2 курса, обучающихся по направлению подготовки бакалавриата 08.03.01 «Строительство».

Изучение предложенного материала направлено на формирование и развитие навыков профессионально-ориентированного чтения и перевода на английском языке.

Методические указания состоят из пяти разделов, содержащих разное количество текстов. Предложенные аутентичные тексты содержат информацию по темам, изучаемым в рамках направления подготовки, а также представляющим интерес для студентов профильных направлений. Каждый текст сопровождается заданиями и упражнениями, цель которых – активизация познавательной деятельности учащихся, отработка и закрепление лексического и грамматического материала, формирование активного словарного запаса, развитие навыков аналитического чтения, письма, перевода и поиска информации, контроль понимания и перевода, развитие коммуникативных умений на английском языке, что позволяет мотивировать интерес студентов к будущей специальности.

Unit I. CIVIL ENGINEERING

Text 1. WHAT IS CIVIL ENGINEERING?

Task 1: Read the text and explain what civil engineering is.

Civil engineering is a discipline of professional engineering which mainly relates and deals with the configuration and design, building of those structures, and upkeep the sustainability of the physical as well as the naturally formed structures comprising the likes of roads, bridges, buildings, canals and dams. Civil engineering is conventionally categorized into a variety of sub-disc s only second to military engineering in terms being the olde ing discipline, and it is distinct to differentiate non-military engineering from military engineering. The scope of civil engineering takes place in wide range of the public sectors ranging from municipals to national governments, and in case of the private sector, it ranges from individual homeowners to multi-national companies.

Task 2: Give the definitions of the following terms: *configuration*, *design*, *sustainability*, *naturally formed structure*, *non-military engineering*, *military engineering*, *public sector*, *private sector.*

Text 2. EDUCATION AND LICENSURE

Task 1: Read the text and speak about education and licensure.

Civil Engineers normally have an academic degree in civil engineering. The time duration of the study is typically around three to five years, and after the completion of the degree, it is assigned as a Bachelors of Engineering (BE), or a four year certification in scientific studies in building and construction. The educational programs for the most part incorporate classes in Physics, Geometry, Arithmetic, Project Management, and other various design and particular subjects in civil engineering. Subsequent to taking essential courses in majority of sub-disciplines of civil engineering they move onto have some expertise in at least one sub-disciplines at highly specialized level. While a college degree (BEng/BSc) ordinarily gives fruitful understudies industry-accredited

capability, some scholarly establishments offer post-graduate degrees (MEng/MSc), which permit understudies to additionally have some expertise in their specific territory of interest.

In many nations, a four year certification known as Bachelor's degree in civil engineering in engineering symbolizes to the initial step towards professional accreditation, and an expert body affirms the degree program. In the wake of finishing a certified degree program, the specialist must fulfill a scope of prerequisites (counting work-experience and exam necessities) before being officially certified. Once certified, the specialist is assigned as an expert civil engineer (in the United States, Canada and South Africa), known as charted engineer (in most Commonwealth nations), a charted professional engineer (in Australia and New Zealand), or an European Engineer (in many nations of the European Union). There are universal understandings between applicable expert bodies to permit engineers to practice crosswise over national outskirts.

The advantages of accreditation shift contingent on area. For instance, in the United States and Canada, only the licensed proficient engineer may get ready, sign and seal, and submit building designs, plans and drawings to government for approval, or seal building work for clients ranging from public to private. This prerequisite is implemented under the province law, for example, the Engineers Act in Quebec.

No such enactment has been authorized in different nations including the United Kingdom. In Australia, state authorizing of architects is constrained to only Queensland. All of the certifying bodies keep up a code of morals which all individuals must withstand by.

The engineers should abide by the contract law in their authoritative relationships with different parties they engage with. In situations where an engineer's work falls flat, he might be liable to the law of tort of carelessness, and in outrageous cases, criminal charges. The engineer's work should likewise conform to various different guidelines and controls, for example, construction standards and natural protection law.

Task 2: Answer the questions.

1. What academic degree do civil engineers normally have?
2. What classes does the educational program incorporate?
3. What does college degree ordinary give?
4. What does Bachelor's degree in civil engineering symbolize?

5. What should the engineers abide by?

6. What should the engineer's work likewise conform to?

Task 3: Mark the sentences as TRUE or FALSE.

1. The time duration of the study is typically two years.

2. Some scholarly establishments offer post-graduate degrees.

3. In order to complete a certified degree program, the specialist must fulfill a scope of prerequisites.

4. Any proficient engineer may get ready, sign and submit building designs to government for approval.

5. In Australia, state authorizing of architects is not constrained to Queensland.

Task 4: Find a phrase match.

1. ... universal understanding between ...	A. ... their specific territory of interest
2. ... a four year certification in ...	B. ... applicable expert bodies
3. ... seal building work for clients ranging from ...	C. ... different parties
4. ... have some expertise in ...	D. ... public to private
5. ... might be liable to ...	E. ... scientific studies in building and construction
6. ... in their authoritative relationships with ...	F. ... the law of tort of carelessness

Unit II. BRANCHES OF CIVIL ENGINEERING

Text 1. CONSTRUCTION, GEOTECHNICAL AND STRUCTURAL ENGINEERING

Task 1: Read the text and speak about construction, geotechnical and structural engineering.

Usually, civil engineering is concerned with the general boundary of human constructed projects with the greater world. General civil engineers work often and closely with surveyors and highly professional civil engineers to design and construct dams, sewers, bridges, pavements and electric and communication supplies for which they use the knowledge

and principles or theories from various disciplines or branches of civil engineering. Some of the sub-disciplines or branches of civil engineering are listed below:

Construction engineering

Construction engineering includes the process of planning and its successful execution, transference of materials, site expansion on the basis of structural and geotechnical, environmental and hydraulic engineering. Owing to the fact that the construction organizations and firms normally have greater business risk in comparison to other different kinds of civil engineering firms possess, construction engineers regularly involve themselves in more business-like transactions, for instance, drafting and reviewing of contracts, assessing the logistical operations, and controlling the cost of supplies.

Structural engineering

Structural engineering is distinctly related with the field of structural design and structural assessment of different structures like buildings, bridges, big towers, tunnels, and flyovers. It is also concerned with the structural design and evaluation of off shore structures like the oil and gas fields in the sea, aero structure and other various structures. This comprise recognition of the loads which perform upon a structure and the forces and stresses which emerges inside that structure because of those pressure and then planning the design of the structure to efficiently support and withstand those loads. The loads can be the weight of the structures, , live loads, moving (wheel) load, wind load, earthquake load, load from temperature change or other different kind of load. It is a structural engineer's duty to design structures so they are safe for utilization and to positively realize the purpose they are premeditated for. Because of the property of some loading conditions, different sub-disciplines inside the structural engineering have been created, comprising of wind engineering and earthquake engineering as well.

Geotechnical engineering

Geotechnical engineering is mainly concerned with the study of layers of soils and rocks supporting the civil engineering systems. The extensive knowledge from the field of soil science, and hydraulics, material science and mechanic as well is utilized for execution of safe and cost effective configuration foundations, retentive walls, and other different

kinds of structures. The various endeavors for the protection of groundwater and with safety preserve landfills have procreated a totally new scope of research which is also known as geotechnical engineering.

The proper identification of various soil characteristics poses difficult hindrances to the geotechnical engineers. The boundary limitations are frequently well identified in other sub-disciplines of civil engineering, however, not quite like the steel or concrete, the material characteristics and the reaction of soil are complex to predict and manipulate mainly because of its variability and limitation on thorough research on it. Additionally, soil displays nonlinear (stress-based) strength and rigidity, which further creates complexity in proper studying of soil mechanics.

Task 2: Explain what is meant by *human constructed projects, communication supplies, site expansion, to assess the logistical operations, off-shore structures, earthquake load, safe and cost effective configuration foundations, retentive walls, nonlinear strength, rigidity***.**

Task 3: Answer the questions.

1. What is civil engineering concerned with?
2. Who do civil engineers often and closely work with?
3. What does construction engineering include?
4. Why do construction engineers regularly involve themselves in more business-like transactions?
5. What is structural engineering distinctly related with?
6. What kinds of loads are there?
7. Why have different sub-disciplines inside the structural engineering been created?
8. What is geotechnical engineering mainly concerned with?
9. What poses difficult hindrances to the geotechnical engineers?
10. Why are the material characteristics and the reaction of soil complex to predict and manipulate?

Text 2. SURVEYING

Task 1: Read the text and speak about surveying.

Surveying refers to the procedure by which a surveyor measures and calculates certain measurements and dimensions that happen on or close

to the surface of the Earth. The surveying gear, for example, levels and theodolites, are utilized for precise estimation of the angular deviation, flat, vertical and slant separations and distances. With advances of computerization, electronic separation estimation (EDM), add up to stations, GPS studying and laser scanning have to a huge degree replaced the conventional instruments. Information gathered by intricate process of survey measurement is changed over into a graphical representation of the globe's surface as a guide. This data are then utilized by structural specialists, civil engineers, and contractual workers and real estate agents to plan and configure from, expand on, and exchange, individually. Different components of a structure must be measured and situated in connection to each other and to site limits and adjoining structures. In spite of the fact that surveying is a particular distinct profession with partitioned capabilities and licensing courses of action, the civil engineers are prepared efficiently from the very basic level of reviewing and mapping, and in addition geographic data systems. Surveyors likewise lay out the courses of different transportation systems such as railroads, tramway tracks, interstates, streets, roads and pipelines too and additionally also position other framework, for instance, harbors, before development.

Land Surveying

In North America and in the United Kingdom and majority of the Commonwealth nations land surveying is thought to be a different and a very distinct specialized profession. Land surveyors are not thought to be architects or engineers, and have their own proficient affiliations and permitting prerequisites. The administrations of an authorized land surveyor are by and large required for limit boundary surveys (to set up the boundaries of a parcel utilizing its legitimate description) and subdivision plans (a plot or guide in light of a survey of a parcel of land, with limit lines drawn inside the bigger parcel to demonstrate the production of new boundary and streets), both of which are for the most part alluded to as Cadastral surveying.

Construction survey

Construction survey is for the most part performed by specific professionals. Not at all like land surveyors, the subsequent arrangement does not have legitimate status. Construction surveyors play out the accompanying errands:

1. Surveying of the existing states of the potential work site, comprising the geography, existing structures and infrastructure framework, and underground foundation when conceivable

2. “lay-out” or “setting-out”: putting reference focuses and markers that will direct the development of new structures, for example, streets or structures

3. Confirming the area of structures amid development

4. As-Built looking over: an overview directed toward the finish of the construction venture to check that the work approved was finished to the details set on arrangements.

Task 2: Answer the questions.

1. What does surveying refer to?

2. What is information gathered by intricate process of survey measurement changed over into?

3. Who are the data utilized by?

4. What courses do surveyors likewise lay out?

5. What is land surveying thought to be in North America and in the United Kingdom and majority of the Commonwealth nations?

6. What errands do construction surveyors play out?

Task 3: Match the synonyms.

1. gather	A. relate
2. separation	B. lawful
3. utilize	C. task
4. refer	D. collect
5. legitimate	E. effectively
6. errand	F. estimate
7. efficiently	G. use
8. calculate	H. disconnection

Task 4: Fill in the appropriate prepositions.

1. The surveying gear is utilized ___ precise estimation ___ the angular deviation.

2. Different components ___ a structure must be measured and situated ___ connection ___ each other.

3. The civil engineers are prepared efficiently ___ the very basic level ___ reviewing and mapping, and ___ addition geographic data systems.

4. The administrations ___ an authorized land surveyor are ___ and large required ___ limit boundary surveys.

5. Construction survey is ___ the most part performed ___ specific professionals.

Text 3. WATER RESOURCES ENGINEERING

Task: Read the text and fill in the gaps with the following words: *civil engineering, inside or out, concerned with, might be, various, different, assess and model, widely, assortment and management.*

Water resources engineering is basically subjected with the ____ of water. As a sub-discipline of civil engineering, it consequently comprises ____ subjects of hydrology, environmental science, resource management, meteorology and conservation as well. This field of civil engineering is ____ the elements like management and prediction of both the quality and the quantity of water existing underground and water existing above ground (rivers, and streams and lakes) resources. Water resource engineers intricately ____ minute to very big areas of the ground surface to forecast the quantity of water as it flows into, ____of a facility. Even though the original design plan of the facility ____ carried out by other engineers.

Hydraulic engineering is ____ related with the flow and delivery of fluids, primarily water. This area of ____is closely concerned with the design configuration of pipelines, water supply network, and drainage facilities (comprising bridges and dams, channels and storm sewers), and canals. The hydraulic engineers plan and design these facilities and structures with application of ____ perceptions of fluid pressure, fluid dynamics, and fluid statistics as well.

Text 4. EARTHQUAKE, COASTAL AND ENVIRONMENTAL ENGINEERING

Task 1: Read the text and speak about earthquake, coastal and environmental engineering.

Earthquake engineering

Earthquake engineering basically comprises of designing and construction of buildings and structures to resist the dangerous earthquake experiences. Earthquake engineering is a sub-categorization of structural

engineering. The basic goals of earthquake engineering are to comprehend the interface of buildings and structures on the wobbly ground; predict the effects of the probable earthquakes; and plan and design, build and upkeep those structures to perform at earthquake in compliance with building codes.

Environmental engineering

Environmental engineering refers to the modern term for sanitary engineering, even though sanitary engineering at first did not comprise many of the perilous waste management and ecological remediation functions which are currently covered in an extensive manner by environmental engineering. Environmental health engineering and Public health engineering are other terms which are used in place of environmental engineer.

Environmental engineering mainly engages with proper action of biological, thermal and chemical wastes, refinement of water and air, and additionally to remove the contamination in the contaminated sites after waste disposal or because of incidental contamination. Amongst various topics enclosed by environmental engineering, some of them are contaminant transport, water purification, and treatment of waste water, air pollution, management of solid waste and finally dangerous waste management. The environmental engineers manage and oversee activities pollution decrease, green engineering, and industrial environment. Environmental engineers also amass extensive information and asses on different environmental consequences of proposed activities.

Coastal engineering

Coastal engineering is basically apprehensive of the proper management of the coastal areas. In some authorities, the terms coastal protection and sea defense refer to the defense and protection against calamities flooding and erosion. However, the term coastal defense is the more conventional term, but the term coastal management has become more widespread since the field has stretched to methods that permit erosions to claim land.

Task 2: Answer the questions.

1. What does earthquake engineering basically comprise of?
2. What are the basic goals of earthquake engineering?
3. What modern term does environmental engineering refer to?
4. What does environmental engineering mainly engage with?

5. What are amongst various topics enclosed by environmental engineering?

6. What activities do environmental engineers manage and oversee?

Task 3: Mark the sentences as TRUE or FALSE

1. Earthquake engineering is a sub-categorization of construction engineering.

2. Sanitary engineering at first comprised many of the perilous waste management and ecological remediation functions.

3. Environmental health engineering and Public health engineering are other terms which are used in place of environmental engineer.

4. Environmental engineers also amass extensive information.

5. The term coastal management is the more conventional term.

Text 5. MUNICIPAL AND TRANSPORTATION ENGINEERING

Task 1: Read the text and speak about municipal and transportation engineering.

Municipal or urban engineering

Municipal engineering is mainly related with city framework. This includes determining, planning, building, and looking after avenues, walkways, water supply systems, sewers, road lighting, metropolitan strong waste administration and transfer, stockpiling stations for different mass materials utilized for support and open works (salt, sand, and so forth.), open stops and cycling framework. On account of underground utility systems, it might likewise incorporate the common bit (channels and get to loads) of the nearby appropriation systems of electrical and media communications administrations. It can likewise incorporate the improving of waste gathering and transport benefit systems. Some of these orders cover with other structural building strengths; however city designing spotlights on the coordination of these foundation systems and administrations, as they are regularly constructed all the while, and oversaw by the same metropolitan specialist. City specialists may likewise outline the site common works for expansive structures, mechanical plants or grounds (i.e. get to streets, parking garages, consumable water supply, treatment or pre-treatment of waste water, site seepage, and so forth.)

Transportation engineering

Transportation engineering is mainly concerned with moving individuals and products productively, securely, and in a way helpful for a lively and vibrant community. This includes determining, planning, building, and keeping up transportation foundation which incorporates lanes, trenches, roadways, rail frameworks, air terminals, ports, and mass travel transit. It incorporates zones, for example, transportation outline, transportation arranging, movement building, a few parts of urban engineering, queuing hypothesis, pavement engineering and designing, Intelligent Transportation System (ITS), and wholesome infrastructure management.

Task 2: Answer the questions.

1. What is municipal engineering mainly related with?
2. What might it likewise incorporate on account of underground utility systems?
3. What does city designing spotlight on?
4. What is transportation engineering mainly concerned with?
5. What does it include?

Task 3: Find a phrase match

1. ... looking after ...	A. … waste gathering and transport benefit systems
2. ... outline ...	B. ... a lively and vibrant community
3. ... keeping up ...	C. ... urban engineering
4. ... the improving of ...	D. ... avenues, walkways, water supply systems
5. ... a few parts of ...	E. ... transportation foundation
6. ... helpful for ...	F. ... the site common works for expansive structures

Text 6. FORENSIC AND CONTROL ENGINEERING

Task 1: Read the text and speak about forensic and control engineering.

Forensic Engineering

Forensic engineering refers to the examination of materials, items, structures or segments that come up short or don't work or capacity as planned, bringing on individual harm or harm to property. The outcomes of disappointment are managed by the law of item risk. The field addi-

tionally manages retracting procedures and systems prompting to mischance in operation of vehicles or hardware. The subject is connected most normally in common civil law cases, in spite of the fact that it might be useful in criminal law cases. For the most part the reason for a forensic designing examination is to find bring about or reasons for failures with a view to enhance execution or life of a segment, or to help a court in deciding the realities of a mischance. It can likewise include examination of licensed innovation claims, particularly licenses.

Control engineering

Control engineering (or control frameworks engineering) is the branch of structural designing subject that applies control theory to outline frameworks with anticipated practices. The practice utilizes sensors to gauge the yield execution of the gadget being controlled (frequently a vehicle) and those estimations can be utilized to offer criticism to the info actuators that can make rectifications toward craved execution. At the point when a gadget is intended to perform without the need of human contributions for accuracy it is known as automatic control, (for example, cruise control for managing an auto's speed). Its nature is multidisciplinary, thus control frameworks engineering exercises concentrate on usage of control frameworks for the most part determined by mathematical modeling of systems of assorted range.

Task 2: Answer the questions.

1. What does forensic engineering refer to?
2. What does the field additionally manage?
3. What is the reason for a forensic designing examination?
4. What is control engineering?
5. What does the practice utilize?
6. What is known as automatic control?

Task 3: Match the synonyms.

1. reason	A. check
2. property	B. aid
3. segment	C. damage
4. vehicle	D. work
5. examination	E. explanation
6. help	F. transport
7. harm	G. part
8. perform	H. belongings

Task 4: Fill in the appropriate prepositions.

1. The outcomes ____ disappointment are managed ____ the law ____ item risk.

2. The subject is connected most normally ____ common civil law cases.

3. The branch applies control theory ____ outline frameworks ____ anticipated practices.

4. That can make rectifications ____ craved execution.

5. Control frameworks engineering exercises concentrate ____ usage ____ control frameworks.

Text 7. MATERIAL SCIENCE AND ENGINEERING

Task: Translate the text in writing.

Materials science is a subject which is intricately related to civil engineering. Material science and engineering studies the basic properties of materials, and engages with the ceramics like concrete and mix asphalt concrete, very strong metals like aluminum and steel, and polymers comprising of the polymethylmethacrylate (PMMA) and carbon fibers as well.

Additionally, material engineering comprises the defense and deterrence. The process of alloying comprises two kinds of metals to create another metal with anticipated characteristics. It comprises of nanoscience and nanotechnology. The materials engineering is at the vanguard of academic research. It is also an essential part of forensic engineering and failure analysis as well.

Unit III. HISTORY OF CIVIL ENGINEERING

Text 1. INTRODUCTION

Task: Read the text and fill in the gaps with the following words: *problems, screw, confined, materials science, in nature, discipline and profession, mathematician, by artisan, scientific principles and physics.*

Civil engineering refers to the extensive application of both ____, as well as for the remedying lessening of the various ____ that frequently occur in society, additonally its background is in a very deliberate way connected to the advances in comprehension of mathematics and phsyics all through the history of this discipline. Owing to the fact that civil engineering is an extensive multifaceted ____, comprising assortment of other specialized sub-disciplines, its history is connected to the information of soils, geology, hydrology, structures, ____, geography, ecological environment, mechanics and other wide range of fields.

If we go through the history it is notable that majority of endeavours of architectal design and construction were carried out ____, in the ancient and medieval time period. These skilled stonemasons, carpenters and artisans slowly rose to the level of master builder. The knowledge and strategy regarding the constructions were ____ to the guild and community was seldom supplanted through advances. Thus, the infrastructures, roads and the buildings were repetitive ____ and augmentation in scale was also largely incremental.

The work of Archimedes in the 3rd century BC, comprising of Archimedes Principle, which is the underlying base for our understanding of buoyancy, and practical solutions like the Archimedes' ____ are some of the earliest examples of a proper scientific approach to mathematical and physical problem which could be utilized ib civil engineerig. Similarly, Brahmagupta, an Indian ____, utilized arithmetic in the 7th century AD, which was based on Hindu-Arabic numerals, for excavation (volume) computations.

Text 2. HISTORY OF CIVIL ENGINEERING PROFESSION

Task 1: Read the text and speak about the history of engineering profession.

The practice of civil engineering may have come into the practice between 4000 BC and 2000 BC in Indus Valley, ancient Egypt and Mesopotamia. Up until the modern times, there was no proper distinction between architects and engineers and their functions greatly overlapped. Construction of the pyramids of Egypt can be easily identified as some of

the first instances of creation of large structures. Some other notable civil engineering constructions from around the world are Qanat water management, the Parthenon by Iktinos in Ancient Greece (447-438 BC), the Appian Way by Roman engineers (c. 312 BC). Similar kinds of historic civil engineering constructions from the eastern world are the Great Wall of China by General Meng T'ien and the stupas constructed in ancient Sri Lanka.

The term Civil Engineering was coined in the late 18th century so as to comprise everything civilian in contrast to military engineering. John Smeaton who created the Eddystone Lighthouse was the first self-claimed civil engineer.

In 1818 the Institution of Civil Engineers was created in London, England. Two years later in 1820 the renowned engineer Thomas Telford became its first president. The establishment received a Royal Charter in 1828, thus civil engineering formally got recognized as a profession. Its charter defined civil engineering as, *"the art of directing the great sources of power in nature for the use and convenience of man, as the means of production and of traffic in states, both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks for internal intercourse and exchange, and in the construction of ports, harbors, moles, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce, and in the construction and application of machinery, and in the drainage of cities and towns."*

The first private college to teach Civil Engineering in the United States was Norwich University founded in 1819 by Captain Alden Partridge. The first degree in Civil Engineering in the United States was awarded by Rensselaer Polytechnic Institute in 1835. The first such degree to be awarded to a woman was granted by Cornell University to Nora Stanton Blatch in 1905.

Task 2: Answer the questions.

1. When may the practice of civil engineering have come into the practice?
2. In what way can construction of the pyramids of Egypt be easily identified?
3. What are some other notable civil engineering constructions from around the world?
4. What are similar kinds of historic civil engineering constructions from the eastern world?
5. When was the term Civil Engineering coined?
6. Who was the first self-claimed civil engineer?
7. When and where was the Institution of Civil Engineers created?
8. Who became its first president?
9. When did the establishment receive a Royal Charter?
10. How did its charter define civil engineering?
11. What was the first private college to teach Civil Engineering in the United States?

Task 3: Find a phrase match.

1. ... the first instances of …	A. … architects and engineers
2. ... comprise everything civilian in	B. ... directing the great sources of power
3. ... there was no proper distinction between ...	C. ... production
4. .. .the art of ...	D. ... contrast to military engineering
5. ... the means of ...	E. ... ports, harbors, moles, breakwaters and lighthouses
6. ... in the construction of ...	F. ... creation of large structures

Text 3. INTERESTING FACTS FROM THE HISTORY OF CIVIL ENGINEERING

Task 1: Read the text and speak about interesting facts from the history of civil engineering.

It is difficult to determine the history of emergence and beginning of civil engineering, however, that the history of civil engineering is a mir-

ror of the history of human beings on this earth. Man used the old shelter caves to protect themselves of weather and harsh environment, and used a tree trunk to cross the river, which being the demonstration of ancient age civil engineering.

Civil Engineering has been an aspect of life since the beginnings of human existence. The earliest practices of Civil engineering may have commenced between 4000 and 2000 BC in Ancient Egypt and Mesopotamia (Ancient Iraq) when humans started to abandon a nomadic existence, thus causing a need for the construction of shelter. During this time, transportation became increasingly important leading to the development of the wheel and sailing.

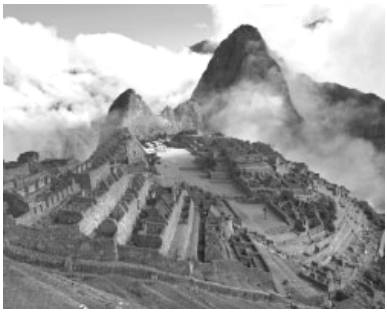
Until modern times there was no clear distinction between civil engineering and architecture, and the terms engineer and architect were mainly geographical variations referring to the same person, often used interchangeably.

Around 2550 BC, Imhotep, the first documented engineer, built a famous stepped pyramid for King Djoser located at Saqqara Necropolis. With simple tools and mathematics he created a monument that stands to this day. His greatest contribution to engineering was his discovery of the art of building with shaped stones. Those who followed him carried engineering to remarkable heights using skill and imagination.

Ancient historic civil engineering constructions include the Qanat water management system (the oldest older than 3000 years and longer than

71 km,) the Parthenon by Iktinos in Ancient Greece (447-438 BC), the Appian Way by Roman engineers (c. 312 BC), the Great Wall of China by General Meng T'ien under orders from Ch'in Emperor Shih Huang Ti (c. 220 BC) and the stupas constructed in ancient Sri Lanka like the Jetavanara-

maya and the extensive irrigation works in Anuradhapura. The Romans developed civil structures throughout their empire, including especially aqueducts, insulae, harbors, bridges, dams and roads.



Other remarkable historical structures are Sennacherib's Aqueduct at Jerwan built in 691 BC; Li Ping's irrigation projects in China (around 220 BC); Julius Caesar's Bridge over the Rhine River built in 55 BC, numerous bridges built by other Romans in and around Rome(e.g. the pons Fabricius); Pont du Gard (Roman Aqueduct, Nimes, France) built in 19 BC; the extensive system of highways the Romans built to facilitate trading and (more importantly) fast maneuvering of legions; extensive irrigation system constructed by the Hohokam Indians, Salt River, AZ around 600 AD; first dykes defending against high water in Friesland, the Netherlands around 1000 AD; El Camino Real - The Royal Road, Eastern Branch, TX and Western Branch, NM (1500s AD).

Machu Picchu, Peru, built in around 1450, at the height of the Inca Empire is considered an engineering marvel. It was built in the Andes Mountains assisted by some of history's most ingenious water resource engineers. The people of Machu Picchu built a mountain top city with running water, drainage systems, food production and stone structures so advanced that they endured for over 500 years.

A treatise on Architecture, Book called Vitruvius' De Archiectura, was published at 1AD in Rome and survived to give us a look at engineering education in ancient times. It was probably written around 15 BC by the Roman architect Vitruvius and dedicated to his patron, the emperor Caesar Augustus, as a guide for building projects.

Throughout ancient and medieval history most architectural design and construction was carried out by artisans, such as stonemasons and

carpenters, rising to the role of master builder. Knowledge was retained in guilds and seldom supplanted by advances. Structures, roads and infrastructure that existed were repetitive, and increases in scale were incremental.

One of the earliest examples of a scientific approach to physical and mathematical problems applicable to civil engineering is the work of Archimedes in the 3rd century BC, including Archimedes Principle, which underpins our understanding of buoyancy, and practical solutions such as Archimedes' screw. Brahmagupta, an Indian mathematician, used arithmetic in the 7th century AD, based on Hindu-Arabic numerals, for excavation (volume) computations.

Task 2: Answer the questions.

1. Why did man use the old shelter caves?
2. When and where may the earliest practices of Civil engineering have commenced?
3. Why were the terms *engineer and architect* often used interchangeably?
4. Who was the first documented engineer?
5. What do ancient historic civil engineering constructions include?
6. Why did the Romans build the extensive system of highways?
7. When was a treatise on Architecture, Book called Vitruvius' De Archiectura, published?
8. Who was most architectural design and construction carried out throughout ancient and medieval history by?
9. What is one of the earliest examples of a scientific approach to physical and mathematical problems applicable to civil engineering?

Task 3: Mark the sentences as TRUE or FALSE.

1. The history of civil engineering is a mirror of the history of human beings on this earth.
2. Between 4000 and 2000 BC, transportation was not important in Ancient Egypt and Mesopotamia.
3. The Romans developed civil structures throughout their empire.
4. Machu Picchu, Peru was built in around 1460.
5. The mountain top city built by the people of Machu Picchu endured for over 700years.
6. Knowledge was retained in guilds and seldom supplanted by advances.
7. Brahmagupta was a Chinese mathematician.

Task 4: Fill in the appropriate prepositions.

1. Civil Engineering has been an aspect ___ life since the beginnings ___ human existence.

2. Humans started to abandon a nomadic existence, thus causing a need ___ the construction ___ shelter.

3. Until modern times there was no clear distinction ___ civil engineering and architecture.

4. His greatest contribution ___engineering was his discovery ___ the art ___ building __ shaped stones.

5. It was built ___ the Andes Mountains assisted __ some __ history's most ingenious water resource engineers.

6. It was probably written ___ 15 BC ___ the Roman architect Vitruvius.

7. Brahmagupta used arithmetic ___ the 7th century AD, based ___ Hindu-Arabic numerals, ___ excavation (volume) computations.

Unit IV. INNOVATIONS IN CIVIL ENGINEERING

Text 1. THE LATEST INNOVATIONS IN CIVIL ENGINEERING

Task 1. Read the text and speak about the most amazing innovation in your opinion.

Innovations for Industry-AEC (Architecture Engineering Construction)

1. New Emergent Materials. These materials can be "grown" as opposed to "built". They possess properties that react to certain conditions that make them change. While some of these are still in very early development and others not yet in production, when they do become available, how will our industry change when a structure can grow itself with pre-programmed instructions for perfect engineering?

2. Generative Design- the ability of a computer to create an architectural or engineering design without human intervention. It "feeds" data from previous design projects and uses that to optimize and create its own.

3. Laser Scanning Point Clouds- A laser or a multiple photographs is used to create a 3D map of a structure or surface. This blows away traditional surveying.

4. 3D Printing- Additive Manufacturing that produces products by extruding material layer by layer. Entire buildings have been produced this way.

5. Robotic Prefabrication- Robots enable the production of a structure parts in pieces within controlled environment factories. Components are produced and assembled and then delivered on the site. This dramatically reduces labor and schedule.

Text 2. THE WATER CUBE

Task 1. Read and translate the text.

The Beijing National Aquatics Center, also officially known as the National Aquatics Center, and colloquially known as the Water Cube, is an aquatics center that was built alongside Beijing National Stadium in the Olympic Green for the swimming competitions of the 2008 Summer Olympics.

In July 2003, the Water Cube design was chosen from 10 proposals in an international architectural competition for the aquatic center project. The Water Cube was specially designed and built by a consortium made up of PTW Architects (an Australian architecture firm), Arup international engineering group, CSCEC (China State Construction Engineering Corporation), and CCDI (China Construction Design International) of Shanghai. The Water Cube's design was initiated by a team effort: the Chinese partners felt a square was more symbolic to Chinese culture and its relationship to the Bird's Nest stadium, while the Sydney based partners came up with the idea of covering the 'cube' with bubbles, symbolizing water. Con-

textually the cube symbolizes earth whilst the circle (represented by the stadium) represents heaven. Hence symbolically the water cube references Chinese symbolic architecture.

Comprising a steel space frame, it is the largest ETFE clad structure in the world with over 100.000 m² of ETFE pillows that are only 0.2 mm (1/125 of an inch) in total thickness. The ETFE cladding allows more light and heat penetration than traditional glass, resulting in a 30 % decrease in energy costs.

The outer wall is based on the Weaire-Phelan structure, a structure devised from the natural pattern of bubbles in soap lather. In the true Weaire-Phelan structure the edge of each cell is curved in order to maintain 109.5 degree angles at each vertex (satisfying Plateau's rules), but of course as a structural support system each beam was required to be straight so as to better resist axial compression. The complex Weaire-Phelan pattern was developed by slicing through bubbles in soap foam, resulting in more irregular, organic patterns than foam bubble structures proposed earlier by the scientist Kelvin. Using the Weaire-Phelan geometry, the Water Cube's exterior cladding is made of 4,000 ETFE bubbles, some as large as 9.14 meters (30.0 ft) across, with seven different sizes for the roof and 15 for the walls.

The structure had a capacity of 17.000 during the games that is being reduced to 7,000. It also has a total land surface of 65.000 square meters and will cover a total of 32.000 square meters (7.9 acres). Although called the Water Cube, the aquatic center is really a rectangular box (cuboid) 178 meters (584 ft) square and 31 meters (102 ft) high. The building's popularity has spawned many copycat structures throughout China. For example, there is one-to-one copy of the facade near the ferry terminal in Macau – the Casino Oceanus by Paul Steelman.

Task 2. Answer the questions.

1. Where is the Beijing National Aquatics Center situated?
2. What is the Beijing National Aquatics Center colloquially known?
3. Who was the Water Cube designed and built by?
4. Why does the Water Cube reference Chinese symbolic architecture?
5. What is the Weaire-Phelan structure?
6. How can you explain the building's popularity?

Task 3: Match the synonyms.

1. competition	A. informally
2. design	B. support
3. colloquially	C. contest
4. symbolic	D. let
5. comprise	E. offer
6. allow	F. figurative
7. maintain	G. contain
8. proposal	H. create

Text 3. 3D-PRINTER HOMES TO REDUCE HOMELESSNESS

Task 1. Read and translate the text.

Having a roof over your head is a basic human need, but there are 1.2 billion people in the world without adequate housing. This may change thanks to a revolutionary, low-cost use of 3D printers to construct houses. With 3D printing, materials are joined together or reinforced by using a computer-controlled device to create a three-dimensional object. Two companies have joined forces to try and ease homelessness around the world by building affordable homes using 3D printing. Tech company ICON has developed a method for printing a one-floor, 60-square-meter house out of cement in a day for just $10.000. This is a fraction of both the time and cost needed to build a similar construction using conventional methods.

ICON has teamed up with the non-profit, international housing organization New Story. Together, they will start building homes in developing countries. Their joint venture will see 100 new homes constructed in El Salvador next year. New Story's co-founder Alexandria Lafci acknowledged that the 100 homes were just a drop in the ocean. She said: "There are over 100 million people living in slum conditions, in what we call survival mode." She also saw possibilities for 3D-printed houses to become common in richer countries in years to come. However, she said that for the moment: "The tech is ready now to print very high-quality, safe homes in the places we're building."

Task 2. Find a match.

1. adequate	A. Having (or appearing to have) length, width, and depth
2. revolutionary	B. Build or put something together, like a house a building, road, etc
3. construct	C. Involving or causing a complete or dramatic change
4. . reinforced	D. Normal; ordinary; usual
5. three-dimensional	E. Satisfactory or acceptable in quality or quantity
6. fraction	F. Strengthened or supported an object or substance, especially with additional material
7. conventional	G. A small or tiny part, amount, or proportion of something.
8. venture	H. A tiny or unimportant amount compared to the real situation.
9. co-founder	I. A way or manner in which something occurs or is experienced, expressed, or done.
10. acknowledged	G. A dirty and overcrowded urban street or district very poor people live
11. a drop in the ocean	K. Someone who started a business or project with others.
12. slum	L. In the future.
13. mode	M. A business enterprise involving considerable risk.
14. in years to come	N. Accepted as being true.

Task 3. Answer the questions.

1. What do 1.2 billion people in the world not have?
2. What did the article say about the expense of using 3D printers?
3. How many companies are collaborating to lower homelessness?
4. How much will the 3D-printed houses cost?
5. What did the article say 3D printers could build houses at a fraction of?
6. What is the name of the non-profit organization in the article?
7. How many homes will the joint venture build in El Salvador next year?

8. What did co-founder say the homes were a drop in?
9. What conditions did the co-founder say 100 million people lived in?
10. Where might 3D-printed houses become common in the future?

Task 4. Mark the sentences as TRUE or FALSE

1. The article says 1.2 billion people have no proper place to live.
2. The article says 3D printing is very expensive.
3. Three companies have united to make homes for the homeless.
4. A company can make a home for $10,000 in just 24 hours.
5. A new project will build 1,000 homes in El Salvador next year.
6. A non-profit co-founder wants to build homes on the ocean.
7. 100 million people worldwide live in slum conditions.
8. People in rich countries may live in 3D-printed homes in the future.

Task 5. Work in pairs. Ask and answer the questions.

Homelessness Discussion

Card 1: Student A's Questions (Do not show these to student B)

1. What did you think when you read the headline?
2. What images are in your mind when you hear the word '3D'?
3. How important is having a roof over your head?
4. Why is there not enough adequate housing?
5. Why is there so much inequality in the world?
6. What do you know about 3D printers?
7. Would you like to print your own house?
8. How can countries tackle homelessness?
9. What do you think of a $10,000 house?

Card 2: Student B's Questions (Do not show these to student A)

1. Did you like reading this article? Why/not?
2. What do you think of when you hear the word "printer"?
3. What do you think about what you read?
4. How might 3D-printed homes be different from regular homes?
5. What's the difference between a house and a home?
6. What does 'Home is where the heart is' mean?
7. Is 100 3D-printed homes really a 'drop in the ocean'?
8. What must it be like to live in a slum?
9. How popular will 3D-printed homes be in richer countries?

Text 4. WORLD'S LARGEST BUILDING OPENS IN CHINA

Task 1. Read and translate the text.

China is building up a large collection of the biggest things in the world. The latest addition is the world's largest building. It is called the New Century Global Center and it opened this week in Chengdu, Sichuan province, in China's southwest. It is 500 meters long, 400 meters wide and 100 meters high. The area inside covers an amazing 1.76 million square meters. The building is so big that 20 Sydney Opera Houses could fit inside. It is almost three times the size of the Pentagon in Washington, D.C. It took thousands of workers just three years to build the enormous structure. The center is an important part of plans to make Chengdu a 21st-century city. It fits with the city's slogan, "Chengdu – Can Do". The inside of the center is almost like a small city in itself. There are around 400,000 square meters of shopping space, a 15-screen IMAX movie theater complex and an ice rink big enough to hold international competitions. There are also offices, hotels, a replica Mediterranean village and a water park. The building's owners hope it will attract business and tourists from across China and the world. It is all part of a wider plan to put Chengdu on the global map. Around 14 million people currently live in the city, but that is set to increase. The city is also a magnet for investment and is one of China's most important industrial regions. The area is also home to the world's largest giant panda nature reserve.

Task 2. Answer the following questions.

1. What is China building a collection of?
2. When did the building open?
3. What is the width of the building?
4. How many times bigger than the Pentagon is it?

5. What is the city's slogan?
6. How much shopping space is inside the building?
7. What is big enough for international competitions?
8. What is there a copy of inside the building?
9. What is the population of Chengdu?
10. What lives in Chengdu's nature reserve?

Task 3. Mark the sentences as TRUE or FALSE

1. The world's largest building is now an army headquarters in China.
2. The building is 100 meters high and 500 meters long.
3. 20 Sydney Opera Houses could fit inside the building.
4. It took 13 years to build.
5. There are 400.000 small stores in the building.
6. The building has a village that looks European.
7. 14 million people will use the building every week.
8. The city with the building is also famous for pandas.

Task 4. Match the synonyms.

1. collection	A. huge
2. addition	B. set
3. amazing	C. motto
4. enormous	D. copy
5. slogan	E. extra
6. theater	F. areas
7. competitions	G. cinema
8. replica	H. contests
9. attract	I. unbelievable
10. regions	G. win over

Task 5. Work in pairs. Ask and answer the questions.

Large Buildings Discussion

Card 1: Student A's Questions (Do not show these to student B)

1. What did you think when you read the headline?
2. What springs to mind when you hear the word 'largest'?
3. What do you think about what you read?
4. Is it good to have the world's largest building in your town?
5. What's the biggest building in your town like?
6. What would you like to have in your town that's the world's biggest?

7. Would you like to visit the New Century Global Center in Chengdu?
8. How big will buildings get in the future?
9. What kind of buildings do you like?
10. What should be in a 21st-century city?

Card 2: Student B's Questions (Do not show these to student A)

1. Did you like reading this article? Why/not?
2. Do you think some buildings are too big?
3. Is it possible to have a shopping mall that's too big?
4. What do you think of living inside a city in a building and not going out?
5. Why do you think a replica Mediterranean village is in the building?
6. Do you think Chengdu will become a famous tourist spot?
7. What is your city a magnet for?
8. What problems are there with enormous buildings?
9. What do you think is the world's most amazing building?
10. What questions would you like to ask the owner of the building?

Text 5. WORLD'S TALLEST BUILDING OPENS IN DUBAI

Task 1. Read and translate the text.

The world's tallest building officially opened in Dubai on January the 4th. The height of the 828-metre Burj Khalifa was kept a secret until the opening ceremony. It is twice the height of New York's Empire State Building. Another big surprise at the opening was the renaming of the tower. The building had always been called Burj Dubai. However, Dubai's ruler announced it would now be called Burj Khalifa after the ruler of Abu Dhabi, Dubai's neighbor. The oil-rich emirate of Abu Dhabi helped save Dubai from possible financial collapse. The chairman of the company that built the Burj, Mohamed Alabbar, said the building gives "hope and optimism". He add-

ed: “The world has gone through …difficult times… this is the beginning of a gradual move forward.” It is likely the Burj will remain as the world’s tallest building for a while to come. Since the 2008 global financial crisis, there seems to be little appetite for ambitious construction projects from property developers. The Burj’s owners, however, are confident the building will be a success. More than 90 per cent of the space has been sold. It cost $22 billion to build and has broken many records. The opening celebrations included the world’s highest fireworks, which lit up the sky above the world’s tallest fountain. The building houses the world’s highest mosque and swimming pool, located on floors 158 and 76. Burj Khalifa has 1,044 luxury apartments, 49 floors of offices and the 160-room Armani hotel. Around 12,000 people will live and work in the tower.

Task 2. Mark the sentences as TRUE or FALSE

1. Everyone knew the height of the world’s tallest building ages ago.
2. The Burj Khalifa is three times the height of the Empire State Building.
3. The building is named after Dubai’s ruler.
4. A property developer said the Burj is a symbol of good times to come.
5. Another project will soon beat the Burj as the world’s tallest building.
6. Between 90 and 100 per cent of space in the Burj has been sold.
7. The Burj contains the world’s tallest mosque.
8. There will be around 20,000 people living and working in the Burj.

Task 3. Match the synonyms.

1. officially	A. leader
2. twice	B. building
3. ruler	C. stay
4. collapse	D. illuminated
5. gradual	E. ruin
6. remain	F. formally
7. appetite	G. accommodates
8. construction	H. desire
9. lit up	I. two times
10. houses	J. slow

Task 4. Work in pairs. Ask and answer the questions.
Tall Buildings Discussion

Card 1: Student A's Questions (Do not show these to student B)

1. What did you think when you read the headline?
2. What springs to mind when you hear the word 'tower'?
3. Are you impressed by tall buildings?
4. Would you like to live on the top floor of the Burj Khalifa?
5. Do you think the people of Dubai would like the name change?
6. Are you good at keeping secrets?
7. Why do you think the name changed from Burj Dubai to Burj Khalifa?
8. Why does the new building provide "hope and optimism"?
9. What difficult times has the world been through?

Card 2: Student B's Questions (Do not show these to student A)

1. Did you like reading this article?
2. Why will the Burj Khalifa be the world's tallest building for a while?
3. Would you like to design buildings?
4. What was the last ambitious project you worked on?
5. What is the most important thing for the world's tallest building to have?
6. What are the pros and cons of living in the world's tallest building?
7. Which of the 165 floors would you like to live on?
8. Why do people build such tall big buildings?
9. Will there be a building that reaches space one day?

Unit V. INDUSTRIAL ENGINEERING

Text 1. WHAT IS INDUSTRIAL ENGINEERING?

Task 1. Read and translate the text.

Industrial engineering is a field, which concerns the design, improvement and installation of an integrated system of people, material, equipment, energy and technology. The American Institute of Industrial

Engineers (AIIE) further defines that it draws upon specialized knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained from such systems. Industrial engineering is thus concerned with bringing together and effective utilization of various resources to facilitate efficient production operation. Effective utilization of resources means that input to the production-operation system-such as people, material, information and equipment are used in right way so that they form an integrated combination to meet production/operation objectives. Efficient production/ operation systems are those systems which score high on norms of actual performance.

It is important to note that industrial engineering is concerned not merely with the system of material, equipment and processes but also with people who interact with this system. The impact of people on the operating system is both from within and from outside. People, who operate a machine, who plan the process or those, who handle material are within the operating system. Therefore, work-study, ergonomics, motivation, wage-incentive plan, time and motion study, etc, are integral part of industrial engineering. In addition to the people inside the purview of production/operation system, those people, who are outside also play an important role. For example, customers, outside the production/operation system, determine the demand of the product. Customer's demand is dependent on product design, quality, price-discount, etc. Therefore, industrial engineering also focuses on these aspects. With changed paradigm of quality during recent years, the focus of TQM is now on customer-delight. Industrial engineers are now expected to work on continuous improvement on product and process.

Task 2. Answer the questions.

1. What is industrial engineering?
2. How does the American Institute of Industrial Engineers (AIIE) further define this concept?
3. What are the tasks and aims of industrial engineering?
4. What is industrial engineering concerned with?
5. What is the focus of TQM now on?

Task 3: Find a phrase match

1. ... with the principles and methods of ...	A. ... effective utilization of various resources to facilitate efficient production operation
2. ... the impact of people on ...	B. ... which score high on norms of actual performance
3. ... installation of ...	C. ... the operating system
4. ... is thus concerned with ...	D. ... continuous improvement on product and process
5. ... are those systems ...	E. ... an integrated system of people, material, equipment, energy and technology
6. ... expected to work on ...	F. ... engineering analysis and design to specify, predict and evaluate the results

Text 2. HISTORY OF INDUSTRIAL ENGINEERING

Task 1. Read the text and speak about the historical development of industrial engineering.

Industrial engineering has developed in the past 250 years. Five different phases of industrial engineering have almost passed. These phases are:

Phase 1: Pre-Industrial Revolution Era (up to early 1800s)

Phase 2: Industrial Revolution (early 1800s to late 1800s)

Phase 3: Scientific Management Phase (1890 to 1940)

Phase 4: Operations Research and Quantitative Phase (late 1940s to early 1980s)

Phase 5: Automation and Computer Integrated Manufacturing Phase (since early 1980s)

The future trend is towards more automation, computer controlled manufacturing, information handling through computers, and integration of manufacturing systems.

Prior to industrial revolution in early 1800s, there was focus on hand operated manufacturing activity. India was a major player in global trade. There are evidences that India had trading relations with her neighboring

countries. However, there was no focused factory concept. Mostly, handicraft, agriculture products, etc, dominated the trade. Globally, the major developments were:

1774: James Watt developed the steam engine.

1776: Adam Smith wrote Wealth of Nations and advocated the concept of division of labor, skill development, specialization, etc.

For the first time, industrial engineering emerged as a profession during the industrial revolution. This was around year 1750. This was due to the need for technically qualified people, who were needed to plan, organize and control the manufacturing processes. After the industrial revolution, Taylor's contribution brought the era of scientific management. This was overall improvement in the planning, scheduling and control of the industrial process. Need for supervisors was being realized.

It was then the era of Frank B. Gilberth and his wife, Dr. Lillian Gilberth. Frank Gilberth focused on identification, analysis, measurement and setting standard for the fundamental motions, which were required to accomplish a job. His contributions were helpful in designing a job, deciding the time required to perform a job and improvement in ways to perform a job. Dr. Lillian Gilberth, who was the wife of Frank, worked on human relation aspect of engineering. Her period spanned almost a century from 1878 to 1972.

A major pioneering contribution came from Henry L. Gantt. He provided the concept of planning and scheduling the activities on a graphical chart. This type of chart is still widely used and is called as Gantt Chart. This is very helpful in reviewing the progress and updating the schedule of work. Factories emerged in textile, steam engine, metal cutting and fabrication, machine tools, etc. It was realized that the factories should be managed efficiently and processes should be effective to convert raw material into the finished goods. This became the root of the inception on industrial engineering.

In early 1800s, Charles Babbage systematically observed factory operations in England and USA. He wrote his experiences in a book "On the economy of Machinery and Manufacturing", in 1832. His observations, regarding skill, match with operations and his conceptual foundations on division of labor acted as the foundation blocks of some later developments in industrial engineering. It was around 1880 that a major

contribution by Frederick W. Taylor almost changed the approach towards industrial management. His focus was on improvement in work content, specialization and division of labor. His contributions are treated as the real beginning of industrial engineering by many authors.

Major building blocks of industrial engineering emerged in the period 1920-1940. In 1924, W.A. Shewhart developed the fundamental concept of statistical quality control. During this period, fundamental approaches on inventory control, incentive plans, material handling, conceptions of organization, theory and management, plant layout, etc, evolved. Ralph M. Barnes worked at Cornell University on motion study for his doctoral work.

During 1940s, conceptual foundation for value engineering, system analysis and operations research emerged. Mathematical and statistical tools were widely used. Optimization and system became the buzz after WW 2. Simultaneously, use of computers in industrial engineering started dominating the scene. Many research journals started coming out. After the advent of computerization of manufacturing activities, automation and application of flexible manufacturing system, the scene changed considerably. Many research works started appearing which dealt with cycle time reduction, flexibility, customer focus, stock less production etc. Manufacturing system is now being viewed on a much wider spectrum, which includes vendors and customers both.

Task 2. Answer the questions

1. What kind of manufacturing activity was there prior to industrial revolution in early 1800s?
2. What country was a major player in global trade?
3. What products dominated the trade?
4. What were the major developments?
5. When did industrial engineering emerge as a profession for the first time?
6. What do you know about the era of Frank B. Gilberth and his wife, Dr. Lillian Gilberth?
7. What do you know about the main contributions of the 19 th century?
8. When did the major building blocks of industrial engineering emerge?
9. What do you know about the main developments in the second half of the 20 th century?

Task 3: Fill in the appropriate prepositions.

1. ___ to industrial revolution ___ early 1800s, there was focus ___ hand operated manufacturing activity.
2. ___ the first time, industrial engineering emerged as a profession ___ the industrial revolution.
3. Gilberth. Frank Gilberth focused ___ identification, analysis, measurement and setting standard ___ the fundamental motions.
4. He provided the concept ___ planning and scheduling the activities ___a graphical chart.
5. His focus was ___ improvement ___work content, specialization and division ___ labor.
6. Ralph M. Barnes worked ___ Cornell University ___ motion study ___ his doctoral work.

GRAMMAR

Task 1: Put the verbs in the correct form (active voice).

1. The scope of civil engineering ... (take) place in wide range of the public sectors ranging from municipals to national governments.
2. Civil Engineers normally ... (have) an academic degree in civil engineering.
3. General civil engineers ... (work) often and closely with surveyors.
4. Construction engineering ... (include) the process of planning and its successful execution.
5. It ...(be) a structural engineer's duty to design structures.
6. The proper identification of various soil characteristics ... (pose) difficult hindrances to the geotechnical engineers.
7. Surveying ... (refer) to the procedure by which a surveyor ... (measure) and ... (calculate) certain measurements and dimensions that ... (happen) on or close to the surface of the Earth.
8. Earthquake engineering basically ... (comprise) of designing and construction of buildings and structures to resist the dangerous earthquake experiences.
9. The term coastal defense ... (be) the more conventional term.
10. Some of these orders ...(cover) with other structural building strengths.

11. Two years later in 1820 the renowned engineer Thomas Telford ... (become) its first president.

12. The first private college to teach Civil Engineering in the United States ... (be) Norwich University.

13. Civil Engineering ... (be) an aspect of life since the beginnings of human existence.

14. The world's production industries ... (generate) tremendous amounts of economic growth since the 1800s.

15. One such development ... (involve) converting waste plastic into small balls.

16. Affordable housing and overcrowding in cities ... (put) pressure on urban populations to make changes.

17. To combat these issues, civil engineers ... (design) floating houses – practical living spaces that sit upon water.

18. The antiquated rainwater harvesting techniques of the past ... (be) attempts to cope with severe climate conditions by storing the water as it fell,

19. This dramatically ... (reduce) labor and schedule.

20. For the first time, industrial engineering ... (emerge) as a profession during the industrial revolution.

Task 2: Put the verbs in the correct form (passive voice).

1. Civil engineering ... conventionally ... (categorize) into a variety of sub-disciplines.

2. This prerequisite ... (implement) under the province law.

3. No such enactment ... (authorize) in different nations including the United Kingdom.

4. Geotechnical engineering ... mainly ... (concern) with the study of layers of soils and rocks supporting the civil engineering systems.

5. This data ... then ... (utilize) by structural specialists, civil engineers, and contractual workers.

6. In North America and in the United Kingdom and majority of the Commonwealth nations land surveying ... (think) to be a different and a very distinct specialized profession.

7. The outcomes of disappointment ... (manage) by the law of item risk.

8. At the point when a gadget ... (intend) to perform without the need of human contributions for accuracy it ... (know) as automatic control.

9. The term Civil Engineering ... (coin) in the late 18th century.

10. In 1818 the Institution of Civil Engineers ... (create) in London, England.

11. A treatise on Architecture, Book called Vitruvius' De Archiectura, ... (publish) at 1AD.

12. It ... (call) the New Century Global Center.

13. Advanced civil engineers ... (need) now more than ever.

14. With overcrowding, resource demands ... (increase).

15. The homes ... (design) to resist floods by floating on top of water using a foundation of concrete and Styrofoam.

16. Harvesting rainwater is a climate adaptation strategy that ... (use) in many ancient and modern societies.

17. Components ... (produce) and ... (assemble) and then ... (deliver) on the site.

18. His contributions ... (treat) as the real beginning of industrial engineering by many authors.

19. Manufacturing system ... now ... (view) on a much wider spectrum.

20. Industrial engineering ... thus ... (concern) with bringing together and effective utilization of various resources to facilitate efficient production operation.

SUPPLEMENTARY READING

Innovations in Civil Engineering Aimed at Improving Sustainability

The world's production industries have generated tremendous amounts of economic growth since the 1800s, but the industrialization of cities has also led to significant challenges such as overcrowding and extreme pollution. Because urban environments are often home to many industrial facilities, people come to the city seeking employment, but large metropolitan hubs are running out of space to house their residents. With overcrowding, resource demands are increased, and as cities grow, urban environments may face more pressure in their attempts to provide large urban populations with sustainable supportive infrastructures like food, water, and safe roads. Advanced civil engineers are needed now more than ever to provide solutions to these critical issues; below are

several developing innovations currently being used around the world to improve socio-environmental sustainability.

Plastic Roads

As a response to massive local waste and plastic pollution within their country, India's government began experimenting with plastic roads during the early 2000s, with waste plastic being used as a construction material. An early report by India's Central Pollution Control Board discovered that even after four years of use, Jambulingam Street I Chennai – one of the first plastic roads – had not sustained much damage. The board cited that no potholes, rutting, raveling, or edge flaws were discovered during the elevation. The level of performance attracted the interests of local governments, who were looking to rid the Tamil Nadu region's urban environments of the discarded shopping bags, foam packaging, and other unrecyclable plastic products that litter the streets. As of 2015, any Indian city with a population of at least 500,000 is required to construct their roads using waste plastic as a core material, in efforts to promote greater pollution control and environmental sustainability for Indian communities.

Although the concept of using waste plastic in roads is still in its early stages, with very few plastic roads currently existing in the Western world, civil engineering researchers in countries like the United Kingdom and the United States are working to design new technologies to support the safe implementation of waste plastic in road construction. One such development involves converting waste plastic into small balls that, when combined with asphalt or other common road components, create a strong, permeable surface that hollow spaces that allow stormwater to seep through the road and more effectively recharge groundwater.

Transitioning to the use of plastic roads will lead to more manageable plastic waste and potentially, safer roads, but there are still some concerns regarding hazards that accompany plastic roads as they age. As these roads gradually deteriorate due to heat and light, they may dissolve into microplastics that give off harmful pollutants, affecting the functionality and biodiversity of soil and water resources. Creative civil engineers play a significant role in ensuring that the science behind using waste plastic for roads is accurate, and that future iterations of this concept are carried out with consideration for environmental health and safety.

Eco Floating Homes

Affordable housing and overcrowding in cities are putting pressure on urban populations to make changes. To combat these issues, civil engineers are designing floating houses – practical living spaces that sit upon water. The homes are designed to resist floods by floating on top of water using a foundation of concrete and Styrofoam, which makes them virtually unsinkable. This approach means that homes can be built in spaces that were previously off-limits, like rivers, lakes and other bodies of water. Civil engineering predict that modern home technology will lower the costs of flood damage in urban cities, while also providing compact inner-city populations with more diverse housing options.

The concept of floating buildings is not new, as they can found all over the world, especially in traditional Asian villages. Although with modern civil engineering knowledge, these structures – and the infrastructure needed to make them sustainable – are gradually becoming more reliable and easier to maintain. However, introducing this concept in urban environments with large populations will prove to be somewhat tricky, as structures being built within or on above-ground water sources could impact environments negatively by disturbing the natural state of the land beneath bodies of water (e.g. lake bottoms or the ocean floor). The effect of humans on the environment should not be underestimated either, so civil engineers will need to remain focused on creating systems that inhibit floating houses and their residents from disrupting local water ecosystems, while improving the viability of the technology for use in low-income areas.

Rainwater Harvesting

Harvesting rainwater is a climate adaptation strategy that has been used in many ancient and modern societies. The antiquated rainwater harvesting techniques of the past were attempts to cope with severe climate conditions by storing the water as it fell, allowing populations to drink the water or prevent oversaturation of the land during extreme precipitation. Modern rainwater harvesting is fundamentally the same in theory, but advancements in science and engineering have introduced sophisticated filtration and rain-capturing technologies that boost the efficiency of the process.

Dutch engineers and researchers have observed that effective large-scale implementation of rainwater harvesting infrastructure can reduce stormwater runoff by 20 to 50 percent, mitigating the strain that excess storm precipitation usually places on sewers and drainage systems. This is made possible by mounting rainwater catchment devices on the roofs of buildings, then routing the rainwater that is collected by the catchment through a treatment system and into a storage tank. To ensure the effectiveness of these rainwater-harvesting systems, the contents of each storage tank must be depleted before significant rainfall events occur. Therefore, civil engineers must obtain the knowledge and experience necessary to analyze the precipitation patterns and water usage rates of a region before installing any rainwater harvesting systems. With cost-effective approaches to the catchment, storage, and filtration technology used in rainwater harvesting currently being implemented and improved, large-scale rainwater collection is poised to become a widely used, economically viable solution to urban potable water shortages and stormwater management.

Large cities often come with many social benefits, but there will always be disadvantages to having large populations that are constricted to a finite amount of space. Ensuring that humans can live sustainably in highly populated urban environments requires creative solutions to infrastructural issues like road safety, housing crises, and food and water shortage. An advanced degree in civil engineering will provide an individual with an in-depth understanding of the environmental, structural, and infrastructural engineering knowledge required to work with the civil engineering innovations listed above.

ESSAY WRITING

Task 1. Study the following information.

When writing an essay:

1. *Analyze*

Analyze the question and make sure you understand what you have to do. Think of:

1) the general topic;

2) the specific aspect you have to write about;

3) whether you are asked to describe, compare, give the arguments or persuade.

2. *Brainstorm*

Make notes of as many points as you can which answer the question.

3. *Organize*

Put your notes into coherent shape. Make sure they all answer the question.

4. *Plan*

Prepare the paragraph plan. Think of a short introduction and a short conclusion.

5. *Check*

Reread your essay and answer the following questions:

1) have you given your opinions on the statement?

2) have you given both sides of the argument?

3) is each side of the argument in a separate paragraph?

4) is your style clear and neutral?

5) have you used linking phrases to make the connections in your argument clear?

6) are the grammar, spelling, punctuation and your use of linking expressions accurate?

Task 2. Write an essay on one of the following topics.

• *What are the most innovative, unique, and crazy civil engineering projects ever done from your point of view?*

• *Can the latest upcoming trends in civil engineering change the industry?*

• *What are the best innovations in civil engineering in your opinion?*

REFERENCES

1. http://www.thecivilengg.com/History.php

2. http://civilarc.com/civil-engineering/

3. https://breakingnewsenglish.com/1803/180315-3d-printer-homes.html

4. http://www.BreakingNewsEnglish.com/1307/130703-largest_building.html

5. http://www.independent.co.uk/news/world/asia/worlds-largest-building-the-new-century-globalcenter-officially-opens-in-china-8681615.html

6. http://edition.cnn.com/2013/07/01/travel/china-largest-building-chengdu/?hpt=hp_c4

7. http://www.BreakingNewsEnglish.com/1001/100105-worlds_tallest_building.html

8. https://www.quora.com/What-are-the-latest-innovations-in-civil-engineering

9. https://www.transtutors.com/homework-help/industrial-management/industrial-engineering/historical-development-of-industrial-engineering.aspx

CONTENTS

АНГЛИЙСКИЙ ЯЗЫК

ПРОМЫШЛЕННОЕ И ГРАЖДАНСКОЕ СТРОИТЕЛЬСТВО: ИСТОРИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ

Методические указания
к практическим занятиям студентов
направления 08.03.01

ENGLISH

CIVIL AND INDUSTRIAL ENGINEERING: HISTORY AND DEVELOPMENT PROSPECTS

Составители: *Е.В.Картер*, *В.Н.Ионова*

Печатается с оригинал-макета, подготовленного кафедрой
иностранных языков

Ответственный за выпуск *Е.В.Картер*

Лицензия ИД № 06517 от 09.01.02

Подписано к печати 00.00.2019. Формат 60×84/16.
Усл. печ. л. 00. Усл.кр.-отт 00. Уч.-изд.л. 00. Тираж 000 экз. Заказ 00. С 00.

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

АНГЛИЙСКИЙ ЯЗЫК

ПРОМЫШЛЕННОЕ И ГРАЖДАНСКОЕ СТРОИТЕЛЬСТВО: ИСТОРИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ

Методические указания к практическим занятиям для студентов направления бакалавриата 08.03.01

ENGLISH

CIVIL AND INDUSTRIAL ENGINEERING: HISTORY AND DEVELOPMENT PROSPECTS

Сост.: *Е.В. Картер, В.Н. Ионова*

Печатается с оригинал-макета, подготовленного кафедрой иностранных языков

Ответственный за выпуск *Е.В. Картер*

Лицензия ИД № 06517 от 09.01.2002

Подписано к печати 03.09.2019. Формат 60×84/16.
Усл. печ. л. 2,6. Усл.кр.-отт. 2,6. Уч.-изд.л. 2,5. Тираж 75 экз. Заказ 730. С 247.

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