普通高等学校土木工程专业创新系列规划教材

土木工程专业英语

主编　史　巍　王凯英
主审　周长东　孟宪强

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普通高等学校土木工程专业创新系列规划教材
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特别提示

教学实践表明，有效地利用数字化教学资源，对于学生学习能力以及问题意识的培养乃至怀疑精神的塑造具有重要意义。

通过对数字化教学资源的选取与利用，学生的学习从以教师主讲的单向指导的模式而成为一次建设性、发现性的学习，从被动学习而成为主动学习，由教师传播知识而到学生自己重新创造知识。这无疑是锻炼和提高学生的信息素养的大好机会，也是检验其学习能力、学习收获的最佳方式和途径之一。

本系列教材在相关编写人员的配合下，将逐步配备基本数字教学资源，其主要内容包括：

课程教学指导文件

(1)课程教学大纲；

(2)课程理论与实践教学时数；

(3)课程教学日历：授课内容、授课时间、作业布置；

(4)课程教学讲义、PowerPoint 电子教案。

课程教学延伸学习资源

(1)课程教学参考案例集：计算例题、设计例题、工程实例等；

(2)课程教学参考图片集：原理图、外观图、设计图等；

(3)课程教学试题库：思考题、练习题、模拟试卷及参考解答；

(4)课程实践教学(实习、实验、试验)指导文件；

(5)课程设计(大作业)教学指导文件，以及典型设计范例；

(6)专业培养方向毕业设计教学指导文件，以及典型设计范例；

(7)相关参考文献：产业政策、技术标准、专利文献、学术论文、研究报告等。

本书基本数字教学资源及读者信息反馈表请登录www.stmpress.cn下载，欢迎您对本书提出宝贵意见。

前　言

“土木工程专业英语”是土木工程专业本科生专业基础课程之一。开设此课程的目的是使学生在完成大学基础英语学习后，通过由专业课教师开设的专业英语课程，掌握一定的专业词汇，培养阅读和翻译与土木工程专业相关的英文文献和资料的能力，加深对专业知识的理解，使学生具备用英文表述国内外前沿专业知识的能力，同时提高国际交流合作的能力，实现综合素质的提高。

中国经济建设高速持续发展，土木工程行业对外交流日益增多，经济发展和社会进步对各类土木建筑人才需求与日俱增，对土木工程人才培养模式和质量也提出新的要求。本书正是为了适应当今时代对高层次、高素质应用型土木工程专业人才培养的需求而编写的。

本书以土木工程为主线，系统地介绍了土木工程所包含的相关学科的基本内容，涵盖土木工程、建筑结构、高层建筑、建筑材料、土力学、施工工程、桥梁工程、道路工程、隧道工程、工程管理与造价、质量控制、输电线路工程以及计算机在土木工程中的应用。素材选自英文原文文献，题材广泛，内容新颖、有代表性，适用范围广，力求反映国内外学科发展的最新水平。课程编排重点突出，难度适中，可适用于不同英语水平的学生，满足多层次的教学目的和要求。全书共 18 课，每课含正文、生词与短语、注释以及和正文内容紧密相关的阅读材料。各学校可根据专业侧重点的不同和课程学时的差异选择相关内容进行讲解，其余部分可供教师指导学生选学或作为课外阅读材料。相信本书对学生专业英语阅读和翻译能力的提高以及专业视野的拓展有很大帮助。

参与本书编写的人员为：东北电力大学，史巍、侯景鹏；北华大学，王凯英、廖明军；吉林建筑工程学院城建学院，赵莹；长春工程学院，李莹。

本书的具体编写分工如下：史巍（第 5 课、第 13 课、第 14 课），王凯英（第 2 课、第 6 课、第 12 课），侯景鹏（第 16 课、第 17 课），廖明军（第 1 课、第 9 课、第 15 课、第 18 课），赵莹（第 3 课、第 4 课、第 11 课），李莹（第 7 课、第 8 课、第 10 课）。全书由史巍、王凯英担任主编，侯景鹏、廖明军、赵莹、李莹担任副主编。

北方交通大学周长东教授和北华大学孟宪强副教授担任本书主审，详细审阅了编写大纲和全部书稿，并提出了宝贵意见，特此感谢。

在编写过程中，编者参考了大量英文专业书籍、论文、研究报告，以及国内众多已出版的土木工程专业英语教材的成功案例，特向这些资料的作者表示诚挚的谢意。另外，感谢各主、参编院校的大力支持和帮助。

由于编者水平有限，加之时间仓促，书中难免存在诸多疏漏和不足之处，恳请读者批评指正。

编　者

2014 年 6 月

目 录

Lesson 1

Text Civil Engineering

Civil engineering. Civil engineering. the oldest of the engineering specialties, is referring to the planning, design, construction, and management of the built environment. This environment includes all structures built according to scientific principles, from irrigation and drainage systems to rocket-launching facilities.

Civil engineers build roads, bridges, tunnels, dams, harbors, power plants, water and sewage systems, hospitals, schools, mass transit, and other public facilities essential to modern society and large population concentrations. They also build privately owned facilities such as airports, railroads, pipelines, skyscrapers, and other large structures designed for industrial, commercial, or residential use. In addition, civil engineers plan, design, and build complete cities and towns, and more recently have been planning and designing space platforms to house self-contained communities.

The word "civil" derives from the Latin for citizen. In 1782, an Englishman named John Smeaton used the term to differentiate his nonmilitary engineering work from that of the military engineers who predominated at the time. Since then, the term "civil engineering" has often been used to refer to engineers who build public facilities, although the field is much broader.

Scope. It is so broad, that civil engineering is subdivided into a number of technical specialties. Depending on the type of project, civil engineer specialists with many kinds of skills may be needed. When a project begins, the site is surveyed and mapped by civil engineers who locate utility placement—water, sewer, and power lines. Geotechnical specialists perform soil experiments to determine if the earth can bear the weight of the project. Environmental specialists study the project's impact on the local area: the potential for air and groundwater pollution, the project's impact on local animals and plant life, and how the project can be designed to meet government requirements aimed at protecting the environment. Transportation specialists determine what kinds of facilities are needed to ease the burden on local roads and other transportation networks that will result from the completed project. Meanwhile, structural specialists use preliminary data to make detailed designs, plans, and specifications for the project. Supervising and coordinating the work of these civil engineering specialists, from the beginning to the end of the project, are the tasks of the construction management specialists. Based on the information supplied by other specialists, construction management civil engineers estimate quantities and costs of materials and labor, schedule all work, order materials and equipments for the job, hire contractors and subcontractors, and perform other supervisory work to ensure the project is completed on time as specified.

Throughout any given project, civil engineers make extensive use of computers. Computers are used to design projects' various elements (computer-aided design, or CAD) and manage them. Computers are a necessity for modern civil engineers because they permit engineers to efficiently

handle large quantities of data needed in determining the best way to construct a project.

Structural engineering. In this specialty, civil engineers plan and design structures of all types, including bridges, dams, power plants, supports for equipment, special structures for offshore projects, the United States space program, transmission towers, giant astronomical and radio telescopes, and many other kinds of projects. By using computers, structural engineers determine the forces a structure must resist: its own weight, wind and hurricane forces, temperature changes that expand or contract construction materials, and earthquakes. They also determine the combination of appropriate materials: steel, concrete, plastic, stone, asphalt, brick, aluminum, or other construction materials.

Water resources engineering. Civil engineers in this specialty deal with all aspects of the physical control of water. Their projects help prevent flood, supply water for cities and irrigation, manage and control rivers and water runoff, and maintain beaches and other waterfront facilities. In addition, they design and maintain harbors, canals, and locks, build huge hydroelectric dams and smaller dams and water impoundments of all kinds, help design offshore structures, and determine if the locations of structures affect navigation.

Geotechnical engineering. Civil engineers who specialize in this field analyze the properties of soils and rocks that support structures and affect structural behavior. They evaluate and work to minimize the potential settlement of buildings and other structures that stem from the pressure of their weight on the earth. These engineers also evaluate and determine how to strengthen the stability of slopes and fills and how to protect structures against earthquakes and the effects of groundwater.

Environmental engineering. In this branch of engineering, civil engineers design, build, and supervise systems to provide safe drinking water and to prevent and control pollution of water supplies, both on the surface and underground. They also design, build, and supervise projects to control or eliminate pollution of the land and air. These engineers build water and wastewater treatment plants, and design air scrubbers and other devices to minimize or eliminate air pollution caused by industrial processes, incineration, or other smoke-producing activities. They also work to control toxic and hazardous wastes through the construction of special dump sites or the neutralizing of toxic and hazardous substances. In addition, civil engineers design and manage sanitary landfills to prevent pollution of surrounding land.

Transportation engineering. Civil engineers working in this specialty build facilities to ensure safe and efficient movement of both people and goods. They specialize in designing and maintaining all types of transportation facilities, highways and streets, mass transit systems, railroads and airfields, ports and harbors. Transportation engineers apply technological knowledge as well as consideration of the economic, political, and social factors in designing each project. They work closely with urban planners, since the quality of the community is directly related to the quality of the transportation system.

Pipeline engineering. In this branch of civil engineering, engineers build pipelines and related facilities which transport liquids, gases, or solids ranging from coal slurries (mixed coal and water) and semi liquid wastes, to water, oil, various types of highly combustible and noncombustible ga-

ses. engineers determine pipeline design, the economic and environmental impact of a project on regions it must traverse, the types of materials to be used—steel, concrete, plastic, or combinations of various materials, installation techniques, methods for testing pipeline strength, and controls for maintaining proper pressure and rates of flows of materials being transported. When hazardous materials are being carried, safety is a major consideration as well.

Construction engineering. Civil engineers in this field oversee the construction of a project from the beginning to the end. Sometimes called project engineers, they apply both technical and managerial skills, including knowledge of construction methods, planning, organizing, financing, and operating construction projects. They coordinate the activities of virtually everyone engaged in the work: the surveyors; workers who lay out and construct the temporary roads and ramps, excavate for the foundations, build the forms and pour the concrete; and workers who build the steel framework. These engineers also make regular progress reports to the owners of the structures.

Community and urban planning. Those engaged in this area of civil engineering may plan and develop communities within a city, or entire cities. Such planning involves far more than engineering consideration; environmental, social, and economic factors in the use and development of land and natural resources are also key elements. These civil engineers coordinate planning of public work along with private development. They evaluate the kinds of facilities needed, including streets and highways, public transportation systems, airports, port facilities, disposal systems, public buildings, parks, and recreational and other facilities to ensure social and economic as well as environmental well-being.

Photogrametry, surveying, and mapping. The civil engineers in this specialty precisely measure the earth's surface to obtain reliable information for locating and designing engineering projects. This practice often involves high technology methods such as satellite and aerial surveying, and computer processing of photo graphic imagery. Radio signals from satellites, scans by laser and sonic beams, are converted to maps to provide far more accurate measurements for boring tunnels, building highways and dams, plotting flood control and irrigation projects, locating subsurface geologic formations that may affect a construction project, and a host of other building uses.

Other specialties. Two additional civil engineering specialties that are not entirely within the scope of civil engineering, but are essential to the discipline, are engineering management and engineering teaching.

Engineering management. Many civil engineers choose careers that eventually lead to management. Others are able to start their careers in management positions. The civil engineer manager combines technical knowledge with an ability to organize and coordinate work power, materials, machinery, and money. These engineers may work in a municipal, county, state, or federal government; in the U. S. Army Corps of Engineers as military or civilian management engineers; or in semiautonomous regional or city authorities or similar organizations. They may also manage private engineering firms ranging in size from a few employees to hundreds.

Engineering teaching. The civil engineer who chooses a teaching career usually teaches both graduate and undergraduate students in technical specialties. Many teaching civil engineers engage in basic research that eventually leads to technical innovations in construction materials and meth-

ods. Many also serve as consultants on engineering projects, or on technical boards and commissions associated with major projects.

NEW WORDS AND PHRASES

1. predominate 居支配地位,统治,(数量上)占优势
2. geotechnical 岩土工程的
3. specification 载明,详述,技术要求,说明书,清单
4. supervise 监督,管理,控制
5. subcontractors 转包合同,转包工作(给第三者),承做(转包的工作)
6. hurricane 飓风,(感情等的)爆发
7. asphalt 沥青,铺沥青于
8. aluminum 【化】铝
9. runoff 雨量,流量,决赛,决定性竞选
10. lock 水闸,闸门
11. fill 充足,饱满,装填物,(一)袋,填土,填方
12. scrubber 洗涤器,涤气器,滤清器,板刷,擦布,擦洗者
13. incineration 烧尽,焚化,火葬
14. toxic 有毒(性)的,中毒的
15. combustible 易燃的,可燃的,易激动的
16. ramp 斜坡,斜面,滑行台
17. excavate 挖掘,发掘,在…上挖掘,挖出,变成空洞
18. precisely 精确的,刻板的,正好,恰恰,确实如此
19. aerial 空气的,大气的,航空的,架空的,生存在空中的
20. sonic 能发出声音的,声音的,音速的,利用音波的
21. plotting 测绘,标图,标航路
22. municipal 市政的,市立的,地方自治的,地方(性)
23. commission 委任,委托(事项),委员会
24. drainage system 排水系统

NOTES

1. They evaluate and work to minimize the potential settlement of buildings and other structures that stem from the pressure of their weight on the earth.

他们计算建筑和其他结构由于自重压力可能引起的沉降,并采取措施使之减少到最小。

2. They coordinate the activities of virtually everyone engaged in the work: the surveyors; workers who lay out and construct the temporary roads and ramps, excavate for the foundation, build the forms and pour the concrete; and workers who build the steel framework.

事实上,他们协调工程中每个人的活动:勘测员、为临时道路和斜坡定线和施工的工人、挖基础的工人、建模和浇筑混凝土的工人以及修建钢结构的工人。

3. Based on the information supplied by other specialists, construction management civil engineers estimate quantities and costs of materials and labor, schedule all work, order materials and

equipments for the job, hire contractors and subcontractors, and perform other supervisory work to ensure the project is completed on time as specified.

根据其他专家提供的信息，施工管理土木工程师要估计材料和劳动力的数量和成本，安排所有的工作，订购工作所需的材料和设备，雇承包商和转包人，以及做其他的监督管理工作以确保工程能依据说明按时完工。

4. Many teaching civil engineers engage in basic research that eventually leads to technical innovations in construction materials and methods.

许多从事教学的土木工程师参与以建筑材料和施工方法技术革新为最终目标的基础研究。

Reading Material (1) Careers in Civil Engineering

Engineering is a profession, which means that an engineer must have a specialized university education. Many government jurisdictions also have licensing procedures which require engineer graduates to pass an examination, similar to the examination for a lawyer, before they can actively start their careers.

In the university, mathematics, physics, and chemistry are heavily emphasized throughout the engineering curricula, but particularly in the first two or three years. Mathematics is very important in all branches of engineering, so it is greatly stressed. Today, mathematics includes courses in statistics, which deals with gathering, classifying, and using numerical data, or pieces of information. An important aspect of statistical mathematics is probability, which deals with what may happen when there are different factors, or variables, that can change the result of a problem. Before the construction of a bridge is undertaken, for example, a statistical study is made of the amount of traffic the bridge will be expected to handle. In the design of the bridge, variable such as water pressure on the foundation, impact, the effects of different wind forces and many other factors must be considered.

Because a great deal of calculation is involved in solving these problems, computer programming is now included in almost all engineering curricula. Computers, of course, can solve many problems involving calculations with greater speed and accuracy than a human being can do. But computers are useless unless they are given clear and accurate instructions and information, in other words, a good program.

In spite of the heavy emphasis on technical subjects in the engineering curricula, a current trend is to require students to take courses in the social science and the language arts. The relationship between engineering and society is getting closer; it is sufficient, therefore, to say again that the work performed by an engineer affects society in many different and important ways that he or she should be aware of. An engineer also needs a sufficient command of language to be able to prepare reports that are clear and, in many cases, persuasive. An engineer engaged in research will need to be able to write up his or her findings for scientific publications.

An engineering program in the last two years includes subjects within the students' field of specialization. For the student who is preparing to become a civil engineer, these specialized cour-

ses may concern such subjects as geodetic surveying, soil mechanics, or hydraulics.

Active recruiting for engineers often begins before the students' last year in the university. Many different corporation and government agencies have competed for the services of engineers in recent years. In the science-oriented society of today, people who have technical training are, of course, in demand. Young engineers may choose to go into environmental or sanitary engineering, for example, where environmental concerns have created many openings; or they may choose construction firms that specialized in highway work; or they may prefer to work with one of the government agencies that deal with water re ource. Indeed, the choice is large and varied.

When a young engineer has finally started actual practice, the theoretical knowledge acquired in the university must be applied. He or she will probably be assigned at the beginning to work with a team of engineers. Thus, on-the-job training can be acquired that will demonstrate his or her ability to translate theory into practice to the supervisors.

Civil engineers may work in research, design, construction supervision, maintenance, or even in sales or management. Each of these areas involves different duties, emphases and uses of engineers, and also the development and test of new structural materials.

Civil engineering projects are almost always unique; each has its own problems and design features. Therefore, careful study is given to each project even before design work begins. The study includes a survey both of topography and subsoil features of the proposed site. It also includes a consideration of possible alternatives, such as a concrete gravity dam or an earth-fill embankment dam. The economic factors involved in each of the possible alternatives must also be weighed.

Today, a study usually includes a consideration of environmental impact of the project. Many engineers, usually working as a team that includes surveyors, specialists in soil mechanics, and experts in design and construction, are involved in making these feasibility studies.

Among civil engineers, there are many top people who work in design. As we have seen, civil engineers work on many different kinds of structures, so it is normal practice for an engineer to specialize in just one kind. In designing buildings, engineers often work as consultants in architectural or construction firms. Dams, bridges, water supply systems, and other large projects ordinarily employ several engineers whose work is coordinated by a system engineer who is in charge of the powerhouse and its equipments. In other cases, civil engineers are assigned to work on a project in another field; in the space program, for instance, civil engineers are necessary in the design and construction of such structures as launching pads and rocket storage facilities.

Construction is a complicated process on almost all engineering projects. It involves scheduling the work and utilizing the equipments and the materials so that costs are kept as low as possible. Safety factor must also be taken into account, since construction can be very dangerous. Many civil engineers therefore specialize in the construction phase.

Reading Material (2) Civil Engineer

A civil engineer is a person who practices civil engineering, the application of planning, designing, constructing, maintaining, and operating infrastructures while protecting the public and environmental health, as well as improving existing infrastructures that have been neglected.

Originally, a civil engineer worked on public works projects and was contrasted with a military engineer, who worked on armaments and defenses. Over time, various branches of engineering have become recognized as distinct from civil engineering, including chemical engineering, mechanical engineering, and electrical engineering, while much of military engineering has been absorbed by civil engineering.

In some places, a civil engineer may perform land surveying; in others, surveying is limited to construction surveying, unless an additional qualification is obtained. On some U. S. military bases, the personnel responsible for buildings and grounds maintenance, such as grass mowing, are called civil engineers and are not required to meet any minimum educational requirements.

Specialization

Civil engineers usually practice in a particular specialty, such as construction engineering, geotechnical engineering, structural engineering, land development, transportation engineering, hydraulic engineering, and environmental engineering. Some civil engineers, particularly those working for government agencies, may practice across multiple specializations, particularly when involved in critical infrastructure development or maintenance.

Education and licensing

In most countries, a civil engineer will have graduated from a post-secondary school with a degree in civil engineering, which requires a strong background in mathematics and physical sciences; this degree is typically a bachelor's degree, though many civil engineers study further to obtain masters, and doctoral degrees. In many countries, civil engineers are subject to licensure. In jurisdictions with mandatory licensing, people who do not obtain a license may not call themselves "civil engineers".

Europe

Belgium. In Belgium, Civil Engineer (abbreviated Ir) (French: Ingénieur Civil, Dutch: Burgerlijk Ingenieur) is a legally protected title applicable to graduates of the five-year engineering course in one of the six universities and the Royal Military Academy. Their specialities can be all fields of engineering: civil, structural, electrical, mechanical, chemical, physics and even computer science[1]. This use of the title may cause confusion to English speakers as the Belgian "civil" engineer can have a speciality other than civil engineering. In fact, Belgians use the adjective "civil" as an opposition to military engineers.

The formation of the civil engineer has a strong mathematical and scientific base and is more theoretical in approach than the practical oriented industrial engineer educated in a five-year program at a polytechnic. Traditionally, students were required to pass an entrance exam on mathematics to start civil engineering studies. This exam was abolished by the Flemish Community in 2004, but is still organized in the French Community.

Scandinavia. In Scandinavian countries, a civil engineer [civilingenjör (Swedish), sivilingeniør (Norwegian), civilingeniør (Danish)] is a first professional degree, approximately equivalent to Master of Science in Engineering, and a protected title granted to students by selected institutes of technology. As in English the word has its origin in the distinction between civilian and military engineers, as in before the start of the 19th century only military engineers existed and the prefix "civil" was a way to separate those who had studied engineering in a regular university from their military counterparts. Today the degree spans over all fields within engineering, like civil engineering, computer science, electronics engineering, etc.

There is generally a slight difference between a master of science in engineering degree and the Scandinavian civil engineer degree, the latter's program having closer ties with the industry's demands. A civil engineer is the more well-known of the two; still, the area of expertise remains obfuscated for most of the public. A noteworthy difference is the mandatory courses in mathematics and physics, regardless of the equivalent master degree, e. g. computer science.

Although a college engineer [högskoleingenjör, diplomingenjör/mellaningenjör (Swedish), høgskoleingeniør (Norwegian), diplomingeniør (Danish)] is roughly equivalent to a bachelor of science in Scandinavia, and to become a civil engineer, one often has had to do up to one extra year of overlapping studies compared to attaining a bachelor of science/master of science combination. This is because the higher educational system is not fully adapted to the international standard graduation system, since it is treated as a professional degree. Today is starts to have a change due to the Bologna process.

A Scandinavian "civilingenjör" in international contexts will commonly call herself "master of science in engineering" and will occasionally wear an engineering class ring. At the Norwegian Institute of Technology (now the Norwegian University of Science and Technology), the tradition with a NTH Ring goes back to 1914, before the Canadian iron ring.

In Norway the title "Sivilingeniør" will no longer be issued after 2007, and has been replaced by "Master i teknologi". In the English translation of the diploma, the title will be "Master of Science", since "Master of Technology" is not an established title in the English-speaking world. The extra overlapping year of studies have also been abolished with this change to make Norwegian degrees more equal to their international counterparts.

Spain. In Spain, a civil engineering degree can be obtained after four years of study in the various branches of mathematics, physics, mechanics, etc. The earned degree is called Grado en Ingeniería Civil. Further studies at a graduate school include master's and doctoral degrees.

Before the current situation, that was, before the implementation of Bologna Process in 2010, a degree in civil engineering in Spain could be obtained after three to six years of study and was divided into two main degrees. In the first case, the earned degree was called Ingeniero Técnico de

Obras Públicas (ITOP), literally translated as "Public Works Engineer" obtained after three years of study and equivalent to a bachelor of civil engineering. In the second case, the academic degree was called Ingeniero de Caminos, Canales y Puertos (often shortened to Ingeniero de Caminos or ICCP), that literally mean "Highways, Canals and Harbors Engineer", though civil engineers in Spain practiced in the same fields as civil engineers did elsewhere. This degree was equivalent to a Master of civil engineering and was obtained after five or six years of study depending on the title granted by the school.

The first Spanish civil engineering school was the Escuela Especial de Ingenieros de Caminos y Canales (now called Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos), established in 1802 in Madrid, and followed by the Escuela Especial de Ayudantes de Obras Públicas (now called Escuela Universitaria de Ingeniería Técnica de Obras Públicas de la Universidad Politécnica de Madrid), which was founded in 1854 in Madrid. Both schools now belong to the Technical University of Madrid.

In Spain, a civil engineer has the technical and legal ability to design projects of any branch, so any Spanish civil engineer can oversee projects about structures, buildings (except residential structures which are reserved for architects), foundations, hydraulics, environment, transportation, urbanism, etc.

In Spain, mechanical and electrical engineering tasks are included under the industrial engineering degree.

United Kingdom. A chartered civil engineer (known as a certified or professional engineer in other countries) is a member of the Institution of Civil Engineers, and has also passed chartership exams. However, a non-chartered civil engineer may not be a member of the Institution of Civil Engineers or the Institution of Civil Engineering Surveyors. The description "Civil Engineer" is not restricted to members of any particular professional organization although "Chartered Civil Engineer" is.

Eastern Europe

In many Eastern European countries civil engineering does not exist as a distinct degree or profession but its various sub-professions are often studied in separate university faculties and performed as separate professions, whether they are taught in civilian universities or military engineering academies. Even many polytechnic tertiary schools give out separate degrees for each field of study. Typically study in geology, geodesy, structural engineering and urban engineering allows a person to obtain a degree in construction engineering. Mechanical engineering, automotive engineering, hydraulics and even sometimes metallurgy are fields in a degree of machinery engineering. Computer sciences, control engineering and electrical engineering are fields in a degree in electrical engineering, while security, safety, environmental engineering, transportation, hydrology and meteorology are in a category of their own, typically each with their own degrees, either in separate university faculties or at polytechnic schools.