

土木工程专业研究生系列教材

土木工程科技英语

Technical English in Civil Engineering

夏冬桃 鲁修红 主 编

Master of Civil Engineering

中国建筑工业出版社

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本书基于“兴趣是最好的老师”的理念, 内容包括: 科技论文写作、纽约环保摩天楼、中国超大桥梁、德国高速公路、京沪高速铁路、英法海底隧道、芝加哥地底城、香港海上机场、抗灾建筑与防震工程、上海中心大厦 BIM 技术应用、FIDIC (国际咨询工程师联合会) 合同条件共 11 个土木工程前沿专题以及“一带一路”国际合作高峰论坛开幕式主旨演讲报告、实验室安全工作手册等内容。本书内容涵盖土木工程各专业领域: 结构体系与性能设计、结构试验与数值模拟、智能建造与防灾减灾、智能交通和智能材料、绿色建筑和 BIM 技术、学术论文写作以及国际项目合作等方面内容的交叉融合创新, 使读者深入了解安全、实用、经济、耐久、节能和环保等土木工程的科学规律, 并掌握相关科技知识, 深刻理解新理论、新技术、新材料和新工艺与土木工程发展的关系。

本书以任务驱动教学法为编写指导思想, 采用新颖的编写方式, 每个单元按照引导活动、阅读活动、听力活动、口语活动和写作活动开展编写, 读者通过阅读书中内容、词语词组记忆、视频听力活动、课堂讨论以及课后文献阅读和写作活动, 加强科技英语“听、说、读、写”综合能力的提高。根据不同课时要求, 教师可做适当调整, 有选择地使用教材。

本书可作为建筑与土木工程相关专业的研究生以及优秀本科生学习科技英语的教材, 也可作为土木工程前沿科技的双语教学的参考教材, 还可供从事土木工程设计、施工、管理以及研究的专业人员学习科技英语参考使用。

本书配备教学课件, 有需要的读者可通过发送邮件(邮件主题请注明《土木工程科技英语》)至 jiangongkejian@163.com 索取。

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前言

2018年6月24日,土木工程专业正式纳入我国工程教育专业认证体系及《华盛顿协议》名单,此举将有助于土木工程专业技术人员跨境流动和执业,支撑“一带一路”国家战略的实施。2019年4月25日至27日,第二届“一带一路”国际合作高峰论坛在北京举行,这是一次具有标志性意义的国际盛会。共建“一带一路”为世界各国发展提供了新机遇,也为中国开放发展开辟了新天地。21世纪的新材料、新结构、新技术、新工艺以及新设备日新月异。节能技术、信息控制技术、生态技术等与土木工程结合日益紧密,土木工程正成为许多新技术的复合载体。土木工程所采用的结构体系与性能设计、结构试验与数值模拟、智能建造与防灾减灾、智能交通和智能材料、节能环保以及BIM技术的应用正成为代表一个国家土木工程技术发展水平的重要标志。

不断地提升“听、说、读、写”的英语综合能力将有助于土木工程专业人员的职业发展。“授人以鱼,不如授人以渔”。本书编者根据国内外土木工程科技前沿发展现状,精心选择和设计教学单元,有助于提高学生的学习热情,举一反三、熟能生巧,力求使学生逐步掌握土木工程一般词汇和常用术语、结构计算分析、设计施工的一般表达方式,提高英文科技文献的阅读和写作能力以及口语交流能力,对土木工程领域的科学和工程问题进行有效分析和表达,以满足日益增长的国际项目合作与科技交流的时代要求,为海外项目建设和城市发展贡献应有的力量。

本部教材具有三个特色:

1. 前沿性与实用性兼容并举

通过引入:世界上最节约环保的大厦、21世纪之初的中国超大桥和跨海大桥、全球最安全的高速公路、京沪高速铁路、世界第二长的海底隧道以及海底段世界最长的铁路隧道、无限大工程——地底城规划、全球最繁忙的海上机场、防震工程未来科技创想、中国具有里程碑意义的BIM技术项目共9个土木工程前沿专题的情景视听和各项任务驱动学习,以及科技论文写作技巧、实验室安全工作手册、FIDIC(国际咨询工程师联合会)合同条件解读等实用专题,使读者了解土木工程师在公众健康、公共安全、社会文化、法律法规、生态环境以及可持续发展等方面应承担的责任和义务;深入了解安全、实用、经济、耐久、节能和环保等土木工程的科学规律,并掌握相关科技知识;深刻理解新理论、新技术、新材料和新工艺与土木工程发展的关系。知识前沿,信息量大,实用性强。

2. 积极调动读者的融合思维能力,充分发挥语言学习的联想作用

全球最伟大的土木工程项目是如何展开的?每项工程背后的精彩以及挑战性体现在哪些方面?作为设计师、工程师、项目经理以及科技人员,如何克服各种挑战打造现代最高、最长、最快和最复杂的土木工程?大量丰富而生动的工程案例包括纽约环保大厦、中国超大桥梁、德国高速公路、京沪高速铁路、英法海底隧道、芝加哥地底城、香港海

上机场、上海中心大厦等全球最伟大的工程，为读者提供体验、实践和感悟问题的情境，将科技知识融入公共英语学习的语境，将设计与施工、试验与分析、机遇与挑战、思考与创新紧密联系，有助于读者不断提升“听、说、读、写”的英语综合应用能力。

3. 专业知识、语言学习与文化修养融于一体

英法海底隧道、芝加哥地底城、京沪高速铁路、抗震建筑——地震工程内容源于美国 Discovery 频道（全球最具影响力的科学探索频道）的科技新知节目：伟大工程、无限大工程、建筑奇观、工程大突破；香港海上机场、纽约环保大厦、中国超大桥梁、德国高速公路源于美国 National Geographic 频道的最新科学与尖端科技节目：工程典范、伟大工程、伟大建筑巡礼等。课文根据原视频节目整理编辑而成，并分成 n 小节，汇编主要的专业词汇表、精彩片段赏析、相关的研究方向等便于读者学习。学生在阅读课文、学习视频与查阅科技文献的同时，将专业英语与西方文化结合起来，在丰富专业语言知识的同时，扩大文化交流和生态保护的视野。

本教材以任务驱动教学法为编写的指导思想，更利于读者专业英语“听、说、读、写”综合能力的提高。教材中每一个单元都可以通过 6 个阶段来展开教学：引导活动→阅读活动→听力活动→口语活动→阅读活动→写作活动。引导活动主要以提问的方式引导学生进入这一单元的主题。听力活动包括：播放小视频、关键词速记、复述视频内容、重复播放精彩小视频等方式。口语活动是听力活动的自然延伸和拓展，要求学生积极参与精彩片段的赏析、专业词汇的理解记忆以及问题讨论和小组展示活动（Presentation），教师做必要的引入和指导。阅读活动和写作活动由教师布置课外任务（作业），学生围绕任务查阅科技文献后撰写科技短文。

感谢湖北工业大学土木建筑与环境学院的资助，感谢国际化示范学院的经费资助。

限于编者的水平，书中的不足之处在所难免，还需要在今后的教学和研究的工作实践中不断加以改进和完善，敬请专家和读者多多批评指正。

编者 湖北工业大学 夏冬桃

2019 年 7 月

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Unit 1

Academic Paper Writing

1.1 General Description

1. Basic Types of Academic Papers

Generally speaking, an academic paper is a formal piece of writing in which academics present their views and research findings on a chosen topic, they can be divided into basic subject papers and applied technical papers. In the same academic subjects, they can be divided into basic theory or application papers.

Academic paper contains four types and they are **academic report**, **research paper**, **course paper**, and **thesis/dissertation**.

Whatever a paper may be classified according to different criteria, the task of the writer may, in most cases, be the same: to do research on a particular topic, gather information on it, critically examine the issue (s), and report the finding of the research.

2. Structure of an Academic Paper

A publishable academic paper in English is supposed to include Title, Abstract, Keywords or Indexing Terms, Introduction, Literature Review, Research Methodologies and Procedures, Results and Findings, Discussion, Conclusion, References and Appendixes.

Writing for academic purpose in English concerns how writers meet the requirements of international academic communities. Table 1 – 1 below are the major parts of an academic paper and their respective functions.

The components of an academic paper and functions

Table 1-1

Items	Main Functions
Title	Summarizing the main text of the paper; Attracting readers
Abstract	Explaining the background, topic, approach, conclusion and significance; Summarizing the paper; Orienting readers to the paper
Keywords or Indexing Terms	Highlighting the focus using noun terms
Introduction	Introducing the research background; Making a research orientation; Stating the research purpose
Literature Review	Reviewing the previous research
Research Methodologies and Procedures	Specifying the methods and procedures used in the study; Explaining the theoretical framework or models and the research design; Clarifying data collection and treatment, experimental apparatus and procedures
Results and Findings	Summarizing the main results and findings; Interpreting or commenting on the most important results with important figures (shown in graphs, tables and diagrams)

continued

Items	Main Functions
Discussion	Expounding the interrelations between the observed facts and their underlying causes; Analyzing the data; Comparing the results with previous studies and the original hypothesis; Developing the hypothesis and speculations; Highlighting the viewpoints; Mentioning the limitations of the study
Conclusion	Summarizing the main points of the study; Presenting the conclusion; Providing implications and suggestions for future work
References	Showing respect for previous work; Facilitating the literature search

Example 1-1

Typical framework of a journal paper drafted as a manuscript.

Title, Authors and affiliations, Keywords, Abstract

1. Introduction, 2. Methods, 3. Results and discussion, 4. Conclusion 5. References

The above items are basic elements of a journal paper. Different journals may require different orders of arrangement and/or subsection names of these elements, whereas the content maintains similar. In other words, the authors should always prepare texts corresponding to each item listed above, regardless of actual format requested by a journal. With all the items ready, the authors would proceed to check journal's requirements and organize those prepared items in the journal's standard format.

1.2 Title, Author/Affiliation and Keywords

The importance of choosing a title is self-evident, the writer should observe the value, the scientific, the innovative and the feasibility principles in choosing a title for an academic paper.

General functions contain "Summarizing the main text, attracting the readers' attention and stimulate their interest, facilitating the retrieval and layout".

Title searches are frequently used by potential readers, to find publications in which they have an interest, therefore, title and key words are crucial.

Linguistic features contain "Using a phrase instead of a sentence, using more nouns, noun phrases and gerunds". Writing requirements contain "be concise, accurate and clear, be brief, be specific, be unified, be standard avoid questions".

Example 1-2

Title: Multicrack detection on semirigidly connected beams utilizing dynamic data.

Keywords:

Connections; Beams; Data analysis; Cracking

1.3 Abstract: Category and Structure

1. Topic Sentence

We may regard the sentence answering the question of "what" in an abstract as the topic sentence. The topic sentence always goes straightforward to the subject or the problem and indicates the primary objectives of the paper.

Useful patterns of topic sentence

The purpose of this paper is. . .	The primary object of this fundamental research will be to reveal the cause of. . .
The primary goal of this research is. . .	
The intention of this paper is to survey. . .	The main objective of our investigation has been to obtain some knowledge of. . .
The overall objective of this study is. . .	
In this paper, we aim at. . .	With recent research, the writer intends to outline the framework of. . .
Our goal has been to provide. . .	
The chief aim of the present work is to investigate the features of. . .	The writer attempted the set of experiments with a view to demonstrating certain phenomena. . .
The writers are now initiating some experimental investigation to establish. . .	The experiment being made by our research group is aimed at obtaining the result of. . .
The work presented in this paper focuses on several aspects of the following. . .	Experiments, were made in order to measure the amount of. . .
The problem we have outlined deals largely with the study of. . .	The emphasis of this study lies in. . .

2. Supporting sentences

The topic sentence is usually followed by a few supporting sentences which further specify the subject to be presented. Research methods, experiments, procedures, investigations, calculations, analyses and other significant information will be provided in this part. These supporting sentences, therefore, can be taken as the main body of an abstract.

Useful patterns of supporting sentences

The method used in our study is known as. . .	The experiment consisted of three steps, which are described in. . .
	Included in the experiment were. . .
The technique we applied is referred to as. . .	We have carried out several sets of experiment to test the validity of. . .
The procedure they allowed can be briefly described as. . .	They undertook many experiments to support the hypothesis which. . .
The approach adopted extensively is called. . .	Recent experiments in this area suggested that. . .
Detailed information has been acquired by the writers using. . .	A number of experiments were performed to check. . .
The research has recorded valuable data using the newly developed method. . .	Examples with actual experiment demonstrate. . .
This is a working theory which is based on the idea that. . .	This formula is verified by. . .

3. Concluding sentences

As the ending part of an abstract, concluding sentences usually summarize the research results.

Useful patterns of concluding sentences

In conclusion, we state that. . .	As a result of our experiments, we concluded that. . .
In summing up, it may be stated that. . .	
The results of the experiment indicate that. . .	This fruitful work gives explanation of. . .
The studies we have performed showed that. . .	The writer's pioneering work has contributed to our present understanding of. . .
The pioneering studies that the writers attempted have indicated that. . .	The research work has brought about a discovery of. . .
We carried out several studies which have demonstrated that. . .	These findings of the research have led the writer to the conclusion that. . .
The research we have done suggests that. . .	Our work involving studies of. . . proves to be effective. . .
The investigation came out by. . ., which has revealed that. . .	The writer has come to the conclusion that. . .
All our preliminary results throw light on the nature of. . .	Finally, a summary is given of. . .
It is concluded that. . .	

Example 1-3 Abstract

The problem of crack detection has been studied by many researchers, and many methods of approaching the problem have been developed. To quantify the crack extent, most methods follow the model updating approach. This approach treats the crack location and extent as model parameters, which are then identified by minimizing the discrepancy between the modeled and the meas-

ured dynamic responses. Most methods following this approach focus on the detection of a single crack or multicracks in situations in which the number of cracks is known. **The main objective of this paper is to address (topic sentence)** the crack detection problem in a general situation in which the number of cracks is not known in advance. **The crack detection methodology proposed in this paper consists of two phases (supporting sentence)**. In the first phase, different classes of models are employed to model the beam with different numbers of cracks, and the Bayesian model class selection method is then employed to identify the most plausible class of models based on the set of measured dynamic data in order to identify the number of cracks on the beam. In the second phase, the posterior (updated) probability density function of the crack locations and the corresponding extents are calculated using the Bayesian statistical framework. As a result, the uncertainties that may have been introduced by measurement noise and modeling error can be explicitly dealt with. **The methodology proposed herein has been verified (supporting sentence)** by and demonstrated through a comprehensive series of numerical case studies, in which noisy data were generated by a Bernoulli – Euler beam with semirigid connections. **The results of these studies show that (concluding sentence)** the proposed methodology can correctly identify the number of cracks even when the crack extent is small. The effects of measurement noise, modeling error and the complexity of the class of identification model on the crack detection results have also been studied and are discussed in this paper.

1.4 Abstract: Writing Techniques

1. “Five Steps” for Abstract Writing

When a paper is finished, the "Five Steps" in writing an abstract can be used.

Step One: Reading your introduction—to define the context, the topic, and the purpose of the study.

Step Two: Identifying the content of the study—to outline the approach and the procedures of the study.

Step Three: Listing results, findings, conclusion, and significance—to summarize the most important ones and give suggestions of further study.

Step Four: Drafting the abstract—to use your own words or useful ready-made sentence patterns. Eliminate tables, figures, etc. Write in concise English.

Step Five: Checking the draft of the abstract—to study it again with a view to shortening it further to a minimum length. Make sure your abstract is comprehensive representative and readable.

2. “5A Strategy” for Abstract Writing

Unlike the above "Five Steps" for abstract writing, the following "5A Strategy" will be more helpful in writing an abstract when a paper is unfinished.