A Study on the Development of IEET Accreditation in Mainland China

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Abstract. With the growing importance of professional accreditation in engineering education, the demand for IEET (Institute of Engineering Education Taiwan) professional accreditation services in mainland China is on the rise. Regrettably, no literature currently compiles and analyzes IEET's accreditation services in the mainland. For the first time, this study compiles IEET accreditation data in mainland China and analyzes the valuable information behind it from multiple perspectives. As of the end of 2022, 77 universities in mainland China have received IEET accreditation, encompassing 244 accredited majors. We conduct a detailed analysis of IEET accreditation in mainland China from seven perspectives, including educational levels, the nature of the institutions, the number of accredited majors in a single institution, accredited institutions and majors under different accreditation specifications, and accredited institutions and majors in different provinces and years. This research can serve as an auxiliary data source for education authorities to guide university specialization construction and provide a decision-making basis for universities involved in IEET accreditation.

Keywords: Professional Accreditation; Engineering Education Accreditation; IEET

1 Introduction

The Institute of Engineering Education Taiwan (IEET) was established in 2003. It is an unofficial, non-profit organization in Taiwan composed of education-related organizations and individuals. The main business of IEET is to plan and implement computer and IT-related education accreditation (CAC), engineering education accreditation (EAC), architecture education accreditation (AAC), design education accreditation (DAC), and technology education accreditation (TAC) that meet international standards. Its primary focus for accreditation is in Taiwan. As of the end of 2022, 84 institutions and 593 departments in Taiwan have participated in and passed the IEET accreditation, with 1536 accredited majors [1]. In October 2015, IEET initiated accreditation services outside Taiwan, with the Medical Electronics Instrumentation and Maintenance specialty of Shanghai Health Medical College becoming the first mainland Chinese university specialty to receive its overseas accreditation.

In mainland China, the China Engineering Education Accreditation Association (CEEAA) [2] is a national social organization composed of organizations and individuals related to engineering education. Authorized by the Ministry of Education, it is the implementing organization for engineering education accreditation work. Theoretically, the CEEAA should act as the service organization through which mainland universities apply for professional

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accreditation. However, given the vast number of universities and majors, the pace of the Ministry of Education's engineering education accreditation process does not meet the extensive accreditation needs of mainland universities. Statistical data shows that as of August 2021, China has 2738 universities, 827 graduate institutions, and 265 adult higher education institutions. In 2019, 2020, and 2022, the number of university majors accredited by CEEAA in a single year was 460, 402, and 422, respectively, which indicates that CEEAA is already overburdened. When the Ministry of Education's engineering education accreditation falls short of meeting the universities' needs, some turn to IEET professional accreditation services.

Regrettably, no literature currently compiles and analyzes the accreditation services of IEET in the mainland. This paper aims to compile the IEET accreditation data in the mainland and analyze the valuable information behind the data from multiple perspectives, providing an auxiliary data source for education authorities to guide university specialization construction and offering a decision-making basis for universities participating in IEET accreditation.

2 Related work

The inception of professional accreditation in mainland China trails behind the esteemed educational powerhouses of Europe and America, signaling a nuanced divergence in global engineering standards. International accreditation is governed by two predominant systems, manifesting their influence across the global engineering domain. The first is the Washington Accord [3], a meticulously structured framework managed by the International Engineering Alliance. The second is the European engineering education professional accreditation system, a sophisticated assembly instituted by The European Network for Engineering Accreditation [4]. These two systems, established in 1989 and 2000, represent the continuing quest for technical excellence, presenting diverse yet converging approaches toward a consistent international norm.

Taiwan's IEET engineering accreditation institution was established in 2003. It formulated its EAC standards by referring to the Washington Accord and the European Engineering Education Professional accreditation standards, later promoting CAC, TAC, AAC, and DAC. EAC aligns with the Washington Accord of the International Engineering Education Agreement, CAC aligns with the Seoul Accord of the International Computer Education Agreement, TAC aligns with the Sydney Accord [5] of the International Engineering Technology Education Agreement, AAC aligns with the Canberra Accord of the International Architecture Education Agreement, and DAC has no corresponding international agreement. This differs from the mainland, where professional accreditation mainly refers to engineering education accreditation.

Liang et al. [6] described the importance of the Capstone Course in IEET accreditation. Liu et al. [7] presented the development of IEET in Myanmar. Qu et al. [8] proposed a talent training program for computer science and technology majors based on IEET accreditation. Li et al. [9] investigated the importance of the IEET's seven assessment criteria in students' coursework by collecting data from a sample of students at a Chinese university. Jonathan et al. [10] compared multiple international accreditation systems. Unfortunately, no scholar has studied the service of IEET in mainland China.

3 Research methodology

The research methodology adopted for this report consists of initial data processing, the addition of valuable fields, and data analysis.

Initial data processing refers to processing the IEET Annual Report (2022). The annual report is published in PDF format, and the list of accredited universities in the report does not indicate the location of the universities, and the universities and majors are ordered according to the stroke order of traditional Chinese characters. Initial data processing involves selecting universities and majors from the mainland, forming the initial data table, **tableA={id, universities, majors}**.

Adding applicable fields is because the list of accredited universities and majors in the annual report only includes the names of the universities and majors. According to the needs of the analysis, this stage needs to supplement the fields of the provinces where the universities are located, the nature of the universities (public or private), the level of education, the year of accreditation, and the type of accreditation standard. Our team retrieved the necessary field information from the IEET official website and the official websites of the universities that participated in the accreditation, forming **tableB={id, universities, majors, provinces, nature, levels, years, type}**.

We will analyze the IEET accreditation data from seven perspectives based on tableB, providing insights for management and university decision-making.

4 Data analysis

As of 2022, 77 universities in mainland China have received IEET accreditation, which closely approaches the 84 institutions in Taiwan Province with the same credential. While the mainland has accredited 244 majors under IEET, this number is far behind Taiwan Province's 1536 accredited majors. We will analyze the IEET accreditation in mainland China from several perspectives.

(1) Educational level

The 77 institutions accredited by IEET comprise 38 undergraduate colleges and 39 specialized institutions. Among them, nine are key provincial universities, including Fuzhou University, South China Normal University, and South China Agricultural University; Fujian Normal University, Huaqiao University, Guangdong University of Technology, Guangzhou University, Jimei University, Fujian Agriculture and Forestry University, Guangdong Ocean University, Guangdong Polytechnic Normal University, and Minnan Normal University.

(2) Nature of the institutions

Among the 77 IEET-accredited colleges and universities, except for eight private universities like Beijing Institute of Technology(Zhuhai), University of Electronic Science and Technology(Zhongshan Institute), Guangdong Baiyun University, Guangdong University of Science and Technology, Guangzhou Nanfang College, Guangzhou City Construction College, Guangzhou City University of Technology and Chongqing Vocational College of Transportation, the remaining institutions are public universities.

(3) Number of Accredited Majors in a single institution

Table 1. Number of Accredited Majors in a single institution.

Number of Accredited Majors (x)	*Institutions*
15>x>10	*Heilongjiang Polytechnic, Heilongjiang Agricultural Engineering Vocational College, and two other institutions.*
10≥x≥5	*Beijing Institute of Technology(Zhuhai), Foshan University of Science and Technology, and eleven other institutions.*
4≥x≥2	*University of Electronic Science and Technology(Zhongshan Institute), Fujian Normal University, and thirty-two other institutions.*
x =1	*Beijing Normal University(Zhuhai), Dongguan Vocational Technical College, and twenty-four other institutions.*

As illustrated in **Table 1**, most institutions have a limited number of accredited majors, with 77.92% (60/77) of them having no more than five. This trend may be associated with the high fees involved in IEET accreditation.

(4) Number of Accredited institutions in a single Major

Table 2. Number of Accredited institutions in a single Major.

Number of Accredited institutions (y)	Majors
y≥10	*Computer Science and Technology(15), Electronic Information Engineering(13), mechanical engineering and automation(13), Environmental Engineering(10), software engineering(10)*
10>y>5	*electronics information engineering technique(8), mechatronics technology(7), architectural engineering technology(7), bridge and tunnel engineering(6), food science and engineering(6), civil engineering(6)*
4≥y≥2	*optical engineering, Computer network technology, and 32 other majors.*
y =1	*material chemistry, urban rail transit, and 50 other majors.*

Table 2 reveals that 86 majors have fewer than five accredited institutions, signifying that each participating institution has chosen different majors for IEET accreditation.

(5) Accredited institutions and majors passed by different accreditation specifications

IEET holds EAC, CAC, TAC, AAC, and DAC accreditation specifications. As shown in **Fig 1**, EAC and TAC-AD are the most chosen accreditation specifications of institutions and majors. In combination with the nature of the institutions, undergraduate universities, and majors mainly chose EAC and CAC. Vocational colleges and majors, as they can only choose TAC, are limited to TAC-AD and GTAC-AD.

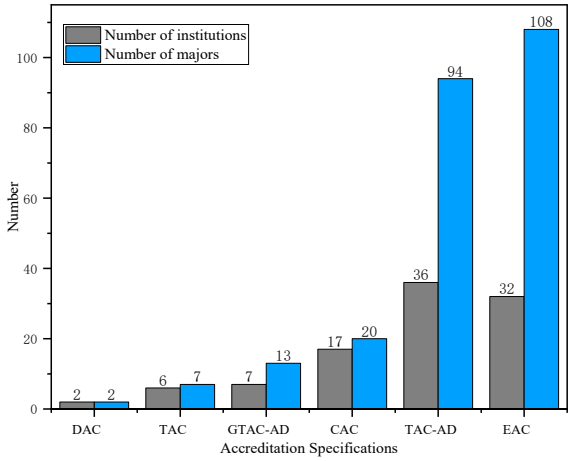

Fig. 1. Institutions and majors accredited under different accreditation specifications

(6) Accredited institutions and majors passed by different provinces.

As shown in **Fig 2**, Guangdong, Fujian, and Heilongjiang provinces have the most institutions and majors participating in and passing IEET accreditation. The three provinces have 92, 77, and 56 accredited majors, respectively, accounting for 92.21% of all accredited majors in the mainland. They have 67 accredited institutions, accounting for 87.01% of all accredited institutions in the mainland. Jiangsu, Zhejiang, Hebei, Liaoning, Shanghai, Sichuan, and Chongqing have a few institutions and majors that have participated in and passed IEET accreditation.

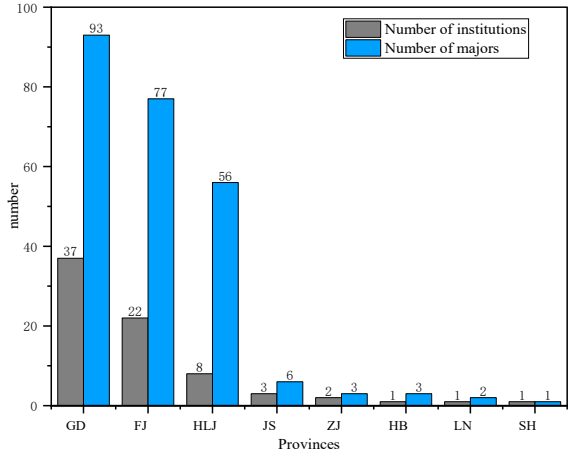

Fig. 2. Institutions and majors accredited in different provinces

(7) Accredited institutions and majors passed by different years

As shown in **Fig 3**, IEET started providing accreditation services on the mainland in 2015 (announced in 2016), accrediting 244 majors from 77 institutions. In 2018, 2019, and 2021, 35,

37, and 34 institutions were accredited, respectively, with 51, 74, and 70 majors accredited. It can be seen from the figure that the accreditation mainly took place in these three years.

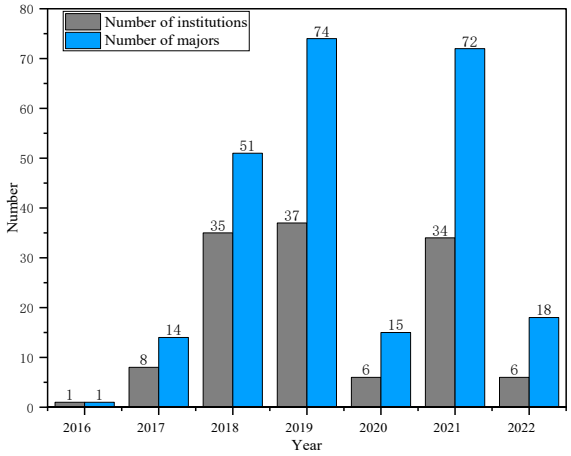

Fig. 3. Institutions and majors accredited in different years

5 Conclusion

In our comprehensive study of IEET accreditation in mainland China, the data indicates that while there is a growing interest and participation in the accreditation process, there remains a significant gap when compared to Taiwan Province, both in terms of the number of universities and the number of accredited majors. Institutions participating in the IEET accreditation represent a tiny proportion of the many universities in Mainland China. A pattern emerges from the shadows, suggesting that these institutions choose to enter the area of IEET accreditation with only a few majors. While there is evident enthusiasm among certain institutions in mainland China for IEET accreditation, the limited spread across various majors and institutions suggests room for expansive growth.

One of the significant challenges observed is the high cost associated with the IEET accreditation process, potentially acting as a barrier for many institutions. Strategies are urgently needed to ensure broader and more inclusive participation to make the accreditation process more accessible and affordable.

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