ASIIN Seal & European Labels

Accreditation Report

Bachelor's Degree Programmes
Process Equipment and Control Engineering
Renewable Energy Engineering

Provided by
University of Shanghai for Science and Technology

Version: 28 June 2019

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
Ba Process Equipment and Control Engineering	过程装备与控制工程	ASIIN, EUR-ACE® Label	–	**02**, 01
Ba Renewable Energy Engineering	新能源科学与工程	ASIIN, EUR-ACE® Label	–	**02**, 01
Date of the contract: 17.10.2016 **Submission of the final version of the self-assessment report:** 17.12.2017 **Date of the onsite visit:** 31.01 – 01.02. 2018 **at:** Shanghai				
Peer panel: Prof. Dr.-Ing. Reinhard Moeller, University of Wuppertal; Dipl.-Ing. Bernd Muehe, MLc consulting, Peking; Prof. Dr.-Ing. Walter Schumacher, Technical University of Braunschweig; Jiaxiong Yang, Student at East China University of Science and Technology				
Representative of the ASIIN headquarter: Dr. Siegfried Hermes				
Responsible decision-making committee: Accreditation Commission for Degree Programmes				
Criteria used: European Standards and Guidelines as of 15.05.2015				

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes;
[2] TC: Technical Committee for the following subject areas: TC 01 – Mechanical Engineering/Process Engineering; TC 02 – Electrical Engineering/Information Technology)

ASIIN General Criteria, as of xx.xx.20xx

Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering and Information Technology as of 09.12.2011

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Ba Process Equipment and Control Engineering / B.Eng.	Bachelor of Engineering	n/a	6	Full time	n/a	8 Semesters	240 ECTS	Winter term 2003
Ba Renewable Energy Engineering/ B.Eng.	Bachelor of Engineering	n/a	6	Full time	n/a	8 Semesters	240 ECTS	Winter term 2011

For the Bachelor's degree programme Process Equipment and Control Engineering the institution has presented the following profile in the self-assessment report:

„Process Equipment and Control Engineering Program is integrated with several disciplines, e.g., Mechanical Engineering, Chemical Engineering, Material Science, Mechanics and Control Engineering. It focuses on the advanced equipment and control technologies required for the heat and mass transfer, chemical reactions and transportations during the products manufacturing process with chemical and physical methods. […] By systematic theoretical learning and practical training, outstanding engineers for research and development, production, operation, organization and management in the fields of chemical engineering, petrochemical engineering, energy industry, power engineering, environmental protection, light industry, food industry, pharmaceuticals industry and refrigeration air conditioning can be trained. "

For the Bachelor's degree programme Renewable Energy Engineering the institution has presented the following profile in the self-assessment report:

„Renewable Energy Engineering is an emerging program which takes the theories, methods, technologies and applications of new energy in the process of production, conversion and utilization of new energy as a direction for learning and employment. Renewable Energy Engineering Program focuses on training outstanding engineering technical personnel

[3] EQF = The European Qualifications Framework for lifelong learning

with good social adaptation capability, engineering practice and innovation capability and international vision who are acquainted with solid theoretical foundation and specialized knowledge in the related fields of solar energy, wind energy, nuclear energy and biomass energy, etc., and capable of design, development, manufacturing, installation, operation, and management of power systems and engineering equipment in relevant fields.“

C Peer Report for the ASIIN Seal[4]

1. The Degree Programme: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)

Evidence:

- Learning objectives as presented in the SAR; see annex to this report
- Audit discussions with programme coordinators

Preliminary assessment and analysis of the peers:

The School of Energy and Power Engineering has defined a number of learning objectives for both degree programmes. These learning objectives do illustrate the academic level of the Bachelor programmes fairly well. Regarding this, it seems to be reasonable that basic scientific and engineering, professional and transferable skills and competences are formulated in a more generic manner because they respond to fundamental and overarching demands of the engineering profession. However, engineering and professional competencies and capabilities forming the core of each programme should be sufficiently precise and accurate in order to provide a meaningful benchmark for the assessment of the respective curriculum. As to that, the School at least stated a few specific learning objectives for each degree programme.

The Subject-Specific Criteria (SSC) of the Technical Committees for Electrical Engineering and Information Technology on the one hand and Mechanical Engineering and Process Engineering on the other provide the basis for judging whether the intended learning outcomes defined by Higher Education Institutions are constituted comprehensibly. Thus far, the auditors agree that the areas of competence as set forth by the relevant SSC are largely addressed in the degree programmes under review as explained in this paragraph.

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

Furthermore, the USST applied for the EUR-ACE® (European Accredited Engineer) Label for both degree programmes. This label is a Europe-wide recognized quality certificate for engineering degree programmes. During the accreditation process, the reviewers verified whether the two engineering degree programmes comply with the criteria fixed in the EUR-ACE Framework Standards. Since the above-mentioned SSC are closely linked to the EUR-ACE Framework Standards, the analysis of the alignment of the programmes' learning outcomes with the relevant SSC encompasses the reflection of the EUR-ACE Framework Standards.

Regarding this, the engineering-specific competence areas of "Knowledge and Understanding" of Mathematical, Natural Science and Engineering fundamentals, of "Engineering Analysis", "Engineering Design" and "Engineering Practise" are generally covered by the learning objectives constituted for each programme. Nevertheless, there seem to be some shortcomings with a view to the explicit inclusion or omission of specific competence fields in either programme.

Thus, with regard to the Process Equipment and Control Engineering Bachelor's Programme, the School pointed out that graduates should "understand the production and operation processes of industrial products" and, furthermore, that they shall "master advanced equipment and control energy, and be able to innovatively design, process and optimize the related industrial products in the process industry". However, considering the curriculum, the peers found that there is a preponderant occupation with the equipment, methods and processes of Process Engineering leaving out much of what might arguably be seen as fundamental to Control Engineering, and advanced Control Engineering in particular (see further below, section 1.3).

In a similar vein, the programme coordinators state as one of the subject-specific core objectives of the Renewable Energy Engineering Bachelor's programme that students shall be able to "understand the design and development of new energy engineering, transfer and utilization of new energy and production and management processes of relevant enterprise". Moreover, according to the definition of intended learning objectives, the graduates will "be capable to innovatively design and improve the equipment, technical processes and products performance in the related fields of new energy". By comparison with the curriculum, the peers found central issues of Renewable Energy Engineering such as grid feed-in and grid stability to be missing essentially. Apart from the stated learning outcomes, in the peers' view the programme's name implies these topics too (see below, curriculum 1.3). Insofar, the School's definition of the intended learning outcomes is either outgrowing what is actually covered by the programme's curriculum (Process Equipment and Control Engineering Bachelor's programme) or leaving aside what can be taken as part of the programme under its actual title (Renewable Energy Engineering Bachelor's programme). As a

result, it is considered necessary to ensure that the name of each degree programme, its intended learning outcomes in the field of "Engineering and professional practice capability" as well as its content are better aligned with each other (see also below section 1.2 and 1.3).

As indicated above, the more general engineering, professional and transferable skills and competences, which are nearly identical for both degree programmes, are considered adequate for the most part. They suitably mirror personal and social competences engineers are expected to put into practice when working in a professional engineering environment, nationally and internationally. However, as the SAR does not indicate whether and where these programme learning objectives are accessible to the relevant stakeholders (applicants, students and teaching staff), the School should in a suitable manner publicly inform all relevant stakeholders. In doing this, the above-stated reservations should be taken note of.

Criterion 1.2 Name of the degree programme

Evidence:

- Formal information according to the SAR
- Relevant Diploma Supplement
- Audit discussions with the programme coordinators

Preliminary assessment and analysis of the peers:

The peers generally stress that the programme title needs to be in line with both the intended learning outcomes and competences of the programme and the curriculum set to achieve these learning outcomes. In view of this, the expert team questions whether advanced control theory topics are reflected in the programme learning outcomes and integrated in the curriculum of the Bachelor's programme Process Equipment and Control Engineering in a manner justifying its prominent position in the title of the programme (see below, section 1.3). In the case of the Renewable Energy Engineering Bachelor's programme, they doubt whether specific issues, which in their view are or should be at the centre of any Renewable Energy programme (grid feed-in and grid stability), are treated adequately in the curriculum of the programme. In either case, the title of the programme, its learning objectives and its curricula are no perfect match at present.

Criterion 1.3 Curriculum

Evidence:

- Relevant chapter of the SAR
- Curricula of the degree programmes; see Appendices D1 and D2 of the SAR
- Objective matrices according to the SAR
- Module descriptions of the degree programmes; see Appendices B1 and B2 of the SAR
- Students Innovative Projects List, see Appendix R of the SAR
- Student Awarding and Patent Sample List, see Appendix O of the SAR
- Audit discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:
Overall, the peers stated that the two Bachelor's degree programmes are convincingly adapting to the needs of the market and the industry. Graduates therefore will generally be well prepared for and fitting into the job market of the process industry and energy supply sector respectively.

In the following section, the assessment is primarily concerned with the question as to whether the respective curriculum meets the relevant learning outcomes and/or the professional expectations raised by the programme title.

Regarding the Bachelor's degree programme Process Equipment and Control Engineering, the peers observed that the programme's name explicitly addresses two areas in equal measure, namely "Process Equipment" and "Control Engineering". Consequently, the programme learning outcomes state that graduates not only "understand the production and operation of individual processes of industrial products" and are "able to install, debug, operate, manage and maintain process equipment", but also "master advanced equipment and control technology". Yet the focus of the programme are – from the auditors' point of view – mechanical engineering-related parts of process technology and process equipment with special applications in the petrochemical and steal industries. Historically, this seems to be the origin of the programme. Control theory issues have evolved within the curriculum to an only moderate degree and volume (basic knowledge and some applications in the measuring technology, data processing and computer technology). However, there are very few indicators of "advanced control theory" in the programme. Looking closely into the relevant module descriptions (modules *Process Control Theory*, *Introduction to Process Equipment and Control Engineering*, *Measurement and Control of Power Engineering*, *Control Technology and Application*), there could hardly be found anything addressing issues

like “state space description of dynamic systems”, “observer for state estimation and disturbance estimation”, “Introduction into nonlinear control” or other advanced control engineering topics. The special issue of “state space description of dynamic systems” may be inserted into the “time domain description” already, but cannot be identified in the module description anyway. Thus, the peers wonder whether the prominent placement of “Control Engineering” in the programme title and the programme learning outcomes suitably reflects the actual curriculum and prospective learning outcomes. Programme coordinators should either enlarge the curriculum with at least a minimum of advanced control theory items or adapt the programme’s name and its learning objectives in order to reflect the curriculum more adequately. If advanced control engineering issues are already included in the curriculum to a greater extent but not yet clearly visible in the module descriptions, the latter need to be adapted accordingly.

Considering the Bachelor’s programme Renewable Energy Engineering, the peers are surprised that some of the most intensively discussed issues in the electrical supply branch, particularly energy storage, grid feed-in and grid stability, are handled only marginally, if at all, in the curriculum. Indeed, the programme learning objectives do not explicitly indicate any of the above-mentioned items, which might be indicative of the auditors’ observation. The issue of energy storage is obviously omitted, while the production, transfer and utilization aspects of the energy supply system are named in the stated learning objectives. In this context, the programme coordinators point to the *Power-Saving Technology* module, thus blending the issues of *energy efficiency* and *energy storage*. On the other hand, the capability to “understand the design and development of new energy engineering, transfer and utilization of new energy, and production and management processes of relevant enterprise[s]” is considered as embracing those issues concurrently, and insofar does not aptly define the programme’s actual educational profile.

The programme coordinators reasonably demonstrated that the programme’s content specifically focuses on the Shanghai labour market in the energy supply sector. According to them, it therefore comprehensively encompasses components, facilities/plants and the relevant processes of the energy supply system (production, conversion, transfer and utilization). Energy storage thus appears to be an issue of lesser importance, at least on the level of pure wording. Grid feed-in and grid stability, on the contrary, have not only been left out from the programme learning objectives, but are largely absent from the curriculum too. Contrary to this, in the auditors’ view, the integration of renewable energy into the grid in connection with the stability of the power network are at the basis of dealing with renewable energy sources. Therefore, the peers see grid feed-in and grid stability as major issues of a Renewable Energy degree programme, not to be intermixed with grid

optimization – as the programme coordinators suggested by referring to the module *Thermodynamic Equipment and System Optimization* (which is an *elective* course anyway). In sum, here too the programme coordinators should respond appropriately to ensure that the name of the respective degree programme, its intended learning outcomes and qualifications as well as its content are better aligned with each other. Analogous to the Process Equipment and Control Engineering programme, this might result in adapting or modifying the programme's name and/or its qualification profile (intended learning outcomes) and/or the curriculum or all of them accordingly.

The "ability to integrate professional knowledge with computer, e. g., computer-aided design and simulation" is a common learning outcome for both degree programmes under review. Regarding the related modules *Information Technology*, *Introduction to Computer* and *Program Design and Practice*, the peers have the impression that these modules for the most part convey knowledge and skills at a basic level, in part barely achieving the Bachelor's level. In case of the module *Introduction to Computer* for instance, fundamental topics like Computer architecture, Operation principles, Network, Operating system are apparently missing. In the light of the overwhelming intrusion of the information technology into all fields of engineering, including Process Engineering, Control Engineering and Electrical Power Engineering, it appears to be recommendable deepening the students' knowledge of the fundamentals of IT and Communication Theory in order to better qualify them for the professional job demands in their respective disciplinary fields. In this context, programme coordinators might think, inter alia, about including learning units of advanced programming languages, databases etc.

In order to prepare Engineering graduates of both programmes with adaptable knowledge and competences to cope with the requirements of the already evolving Industry 4.0 technological innovation, the peers also conclude that students' competences in related fields, for instance cyber security, system security or asset management, should be strengthened in order to better achieve the intended learning outcomes.

Moreover, regarding the Renewable Energy Engineering Bachelor's programme, the assessment of the curriculum leads the peers to the conclusion that enlarging the students' competences in the field of Power Electronics might be positively contributing to acquiring the overall learning outcomes.

Both degree programmes contain a course *Metalworking practice*, scheduled for the fifth semester each. The peers praise the application-orientation of the course but at the same time criticize that, with a view to its fundamental intention, the course seems somewhat misplaced in the curriculum. Moreover, with respect to its obvious origin in the context of traditional Mechanical Engineering, the course does not serve the respective programme's

educational objectives in equal measure. In fact, the course appears to be at odds with the Renewable Energy Engineering Bachelor programme, at least to a certain degree and as far as the content and intended learning outcomes in the module description are concerned. Consequently, it is suggested considering whether the practical Engineering competences linked to the *Metalworking practice course* might be acquired *extra*-curricular and as early as possible in the respective degree programme (e.g. through integration into the admission requirements or a voluntary internship).

Criterion 1.4 Admission requirements

Evidence:

- Relevant chapter oft he SAR
- Programme-specific Diploma Supplement
- "Management Regulations of Full-time Students' Study Status under Credit System for University of Shanghai for Science and Technology", see Appendix F of the SAR
- Enrollment Statistics of School of Energy and Power Engineering (2012-2016), see Appendix S of the SAR
- Audit discussion with programme coordinators

Preliminary assessment and analysis of the peers:

The auditors discussed the admission rules and procedures with the university representatives. Reportedly, the admission and entry conditions are published on the programme websites. The auditors were informed that everybody who wants to study at a Chinese University has to participate in the National University Entrance Exam of the People's Republic of China. This requires applicants to (1) comply with the Constitution and Laws of the People's Republic of China, (2) have been graduated from an advanced secondary school or with equivalent education, and (3) be physically healthy. As regards the contents of the general entrance exam, the expert team learnt that this exam covers topics like languages (Chinese, English), Natural Sciences and Social Sciences. Given that on average 90% of the students complete their degree in the given timeframe of four years (and 98% in the maximum duration of six years), the auditors confirm that the entry requirements are obviously designed in a way to facilitate the achievement of the intended learning outcomes.

Peers were told that students apply for the University choosing the best ranked Universities first. Only if students are admitted to a University, they decide the subject they want to study. The University decides about the admission of students itself, thereby complying with so-called admission transparency rules. Applicants being admitted are coming from all

regions and nations of China. Provincial admission offices are responsible for supervising universities implementation of national admission policies and plans. The auditors conclude that the procedures for admission to the programmes are governed by strictly applied and transparent procedures and ensure that all applicants are treated equally.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:

The auditors consider the diverse aspects of the criterion *not yet fulfilled completely*. Taking into account the statement of the programme coordinators, they conclude that the title of both degree programmes, the projected learning outcomes for each programme and their curricula are still somewhat discordant.

Programme title, programme-specific learning outcomes and curriculum / both degree programmes

The auditors take note of the coordinators observation that some of the issues they felt missing in the relevant curriculum are already involved in existing modules of the programmes, at least to a certain degree. In the view of the latter, this applies, for instance, to topics of advanced control theory in the Process Equipment and Control Engineering programme or issues like grid feed-in and grid stability in the Renewable Energy Programme. At the same time, the coordinators apparently admit that regarding the Process Equipment programme "theories and methods of Control Engineering are not taught systematically". In addition, they seem to be well aware of the fact that "the knowledge of energy storage, grid feed-in and grid stability are not fully involved in the present curriculum" of the Renewable Energy Programme. The peers acknowledge that the HEI is planning to adjust the curriculum in the respective fields of knowledge and competence in both programmes, thus contributing to a better alignment of the degree programmes' title, learning outcomes and curricular content. They, nevertheless, propose a respective requirement, until the HEI evidences concrete steps to translate the announcement into practice (see below, chapter F, A 2.).

Learning outcomes on the programme level ("qualification profile") / both degree programmes

The auditors note positively that websites for the degree programmes do already exist in Chinese and in English as well, containing plenty of information about the respective degree programmes. Inter alia, the websites list the intended learning outcomes of each degree programme. Therefore, a requirement requesting the HEI to present the degree programmes' learning outcomes publicly can be dropped. However, it turned out to be impossible validating whether the mentioned learning outcomes have also been integrated into

the respective Diploma Supplement, because the Diploma Supplements – though being linked on the websites – could not be reached. Consequently, this part of the original requirement should still be maintained from the auditors point of view (see below, chapter F, modified A 1).

Fundamentals of IT and Information Technology / both degree pogrammes

The peers welcome that according to the programme coordinators relevant fundamentals of informatics (such as Computer architecture, Operation principles, Network, Operating system and databases) are already covered by existing modules (e.g. *Introduction to Computer* and *Information Technology*) though not adequately reflected in the respective module descriptions. Adapting the module descriptions in order to properly reflect the content of each module would then be a necessary condition. Since the module descriptions will have to be presented in a revised version anyway, the peers will check the relevant descriptions as well. In addition to that, they suggest a recommendation dealing with the fundamentals of IT and Information Technology in order to make sure that the topic will be addressed in the course of the re-accreditation of the degree programmes (see below, chapter F, E 2.).

Module descriptions / both degree programmes

Certain aspects of the module descriptions have not been found satisfying in the preliminary assessment of the expert team (e. g. the alignment of title, learning outcomes and content of certain modules). The auditors propose a requirement to this end (see below, chapter F, A 3.).

Issues related to Industry 4.0 in the curriculum / both degree programmes

The peers welcome that the HEI is planning to enlarge topics related to Industry 4.0 such as cyber security, system security and asset management in certain existing modules. This intention is supported by a corresponding recommendation (see below, chapter F, E 1.).

Schedule of the Metalworking practise course / both programmes

The auditors take note of the programme coordinators' indication that Metalworking Practice courses are part of the undergraduate engineering education in most Chinese universities and arranged by the universities, not the Schools or faculties. This notwithstanding, the peers would like point out that the course at present seems to be scheduled too late in the curriculum. Moreover, considering the Renewable Energy programme, its practical aim appears to be principally disputable. As argued in more detail in the preliminary assessment, the peers therefore favour considering an extracurricular approach in dealing with this practical course (see below, chapter F, E 3.).

Competences in the field of Power Electronics

The peers welcome that competences in the field of Power Electronics in the Renewable Energy programme are acquired to a certain extent in some already existing modules and, apart from that, relevant aspects of Power Electronics shall be included in additional modules. There is no need for further action in this respect.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Curricula of the degree programmes; see Appendices D1 and D2 of the SAR
- Module descriptions of the degree programmes; see Appendices B1 and B2 of the SAR
- Practise base contract list, see Appendix P of the SAR
- Associated Forms about Graduation Internship, see Appendix V of the SAR
- Rules for Managing Undergraduates' Practical Course Teaching Process for University of Shanghai for Science and Technology, see Appendix F of the SAR
- Management Regulations of Full-time Students' Study Status under Credit System for University of Shanghai for Science and Technology, see Appendix
- Assessment Form, see Appendix I of the SAR
- Audit discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:

The programmes under review are composed of modules, which constitute coherent and complete teaching and learning units. Content, sequence and volume of the modules are considered adequately contributing to the intended programme learning outcomes. Nevertheless, this general judgment is to a certain degree constrained by the already mentioned reservations concerning the formulation of the respective programme learning outcomes and the curricula of the degree programmes (see crit. 1.1 and 1.3).

It is positively noted that both degree programmes consist of a generally well-balanced amount of modules covering subject-related competence fields such as "Mathematics,

Physics and Chemistry", "Informatics", "Engineering Fundamentals", "Engineering Applications" as well as key qualifications in the fields of "Foreign Language" and "Practical Training". The peers also noticed that students of both degree programmes have the opportunity to define an individual focus of their studies by choosing five modules from as set catalogue of electives. It is particularly worth noting that the curriculum of both degree programmes includes an extensive share of engineering practice training, which is reasonably well integrated into the curriculum of the seventh and eighth semesters. The module *Innovation and Entrepreneurship Project Training* in the seventh term and the *Internship* in the eighth term do suitably combine to generate and foster the students' practical engineering competences. At the same time, the internship is considered to be a preparation work for the *Bachelor Thesis* and in this way, too, serves to achieve the overall programme learning objectives. According to the module description, an in-School advisor and a company-based adviser shall supervise the internship. Furthermore, students have to submit an internship notebook and a report about the internship in order to pass it successfully. In this context, it is considered supportive that the School of Energy and Power Engineering has already concluded contracts with a string of Shanghai-based companies in programme-related sectors establishing the terms and conditions for student internships.

The practical engineering training is also supported convincingly by the combination of theoretical and practical training units in the framework of the technical modules. Regarding this, it is worthwhile that the teaching quality assessment of practical courses, *inter alia*, covers the coordination and linkage between theory and practice (see "Teaching Quality Assessment Form of Undergraduates' Practical Course"). This seems to be an appropriate mechanism to direct changes in the curriculum on either side if problems should surface in the student evaluation of modules.

From the sample of translated relevant documents, the peers conclude that there are set rules ensuring that students can apply for the recognition of competences and credit points received at other universities. In the discussion students confirmed that they principally have the opportunity to study abroad, even when only a small minority of them has already done so or is planning to go abroad for a study period. According to the students, the recognition procedure for modules or credit points acquired at other universities has not yet raised any problems. Reportedly, summer schools with a fixed curriculum or a study semester or a study year abroad according to a learning agreement are the principal options for studying abroad. The audit team acknowledges this approach to student mobility and encourages the representatives of the School and the University to support and foster students planning to conduct a part of their studies at other (national or international) universities.

Criterion 2.2 Work load and credits

Evidence:

- Curricula of the degree programmes; see Appendices D1 and D2 of the SAR
- Module descriptions of the degree programmes; see Appendices B1 and B2 of the SAR
- Audit discussions with HEI management, teaching staff and students

Preliminary assessment and analysis of the peers:
USST uses a Credit point system for the calculation of student workload per teaching/learning unit (course/module) and per semester. In the first instance, a Chinese credit point system is in use according to which the completion of studying a theoretical module course of 16 contact hours corresponds to one Chinese credit point. As for practical training courses, the completion of studying 32 contact hours corresponds to one Chinese credit point. Accordingly, the Chinese credit point system does embrace the attendance time only.

The programme coordinators have converted this system into the ECTS, thereby including the students' self-study time for each module. In principle, the results look reasonable. Modules are attributed 3 to 6 ECTS points for the most part, and the workload per semester spans between 29 and 31 ECTS points. The peers consider this workload bearable principally, and the student's comments do not give any indications to the contrary. The coordinators hinted that a meeting with student representatives is mandated every year on a regular basis, where – among other issues – the workload distribution is subject to discussion. However, this process seems to be mostly summative and not systematically module-related. Therefore, the peers recommend establishing a mechanism ensuring a more systematic and punctual workload monitoring.

Although the conversion of Chinese credits into ECTS credits appears to be essentially reasonable, information about the ECTS and, in particular, its consideration of both students' attendance time and self-study time, is scarce. In the peers' view, the students have proven poorly informed about the difference between the two credit point systems and, especially, the specific features of the ECTS. The peers therefore suggest finding appropriate ways to make students more familiar with the ECTS and its core principles.

Criterion 2.3 Teaching methodology

Evidence:

- Respective chapter in the SAR
- Module descriptions of the degree programmes; see Appendices B1 and B2 of the SAR

- Measure to Evaluate Undergraduate Classroom Teaching in USST (USST Teaching Documents (2010), No. 16), see Appendix F of the SAR
- Work Specification for USST Undergraduate Teaching, see Appendix F of the SAR
- Staff Awarding sample List, see Appendix T of the SAR
- Students Innovative Projects List, see Appendix R of the SAR
- Teachers Evaluation School of Energy and Power Engineering, see Appendix M of the SAR
- Audit discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:
The module handbook provides a proper overview of the "type of teaching" that is applied. A number of different teaching methods is in use. The lecturers explained that fundamental courses are mostly taught in the form of large classes (about 100 students), while Engineering fundamental courses are usually taught in the form of medium classes (about 60 students) and some professional courses in even smaller classes (about 40 students). Most of the modules/courses include theoretical knowledge as well as experiments. The auditors understood that for the practical parts the students are subdivided into small groups of 3-4 students, which is appropriate for laboratory work from their point of view.

Programme coordinators, members of the teaching staff and the SAR all strongly insisted that teaching methods and the improvement of individual teaching competences are core issues of USST's commitment to the quality of teaching and learning. The auditors are impressed about the numerous teaching awards the teachers had received in both programmes as presented in Appendix T. The evaluation results regarding the teaching performance at the School of Energy and Power Engineering at USST confirm an overall excellent teaching record.

It is also considered conducive to achieving the intended learning outcomes that online learning tools are already in use and obviously well received by the students at the School of Energy and Power Engineering. Additionally, it is considered contributing to the quality development of the degree programmes that the students are encouraged to engage in the Schools research activities and that many of them are voluntarily pursuing extracurricular "Innovative Projects" (see "Students Innovative Project List" in Appendix R).

With a view to the intended learning outcomes in the competence field "Capability in international communication", it is generally laudable that English language courses have been included in the curriculum of both programmes (with a volume of altogether 8 credit points). However, students report about different levels of Technical English language skills depending on the individual student's English proficiency and correspondent assignment

to the respective language courses. This notwithstanding, it is promising that about 25 students have undertaken studies abroad in the last two years. With respect to the objective to equip students "with enough foreign language and intercultural background" and to enable them "to work and collaborate in foreign countries or multinational corporations", the peers nevertheless recommend taking further steps to ensure that students are comparably able to communicate in technical settings.

The auditors welcome the distinction of self-study and contact time for each module in the module descriptions. They are convinced that the available time gives students sufficient opportunity to carry out independent academic work.

Criterion 2.4 Support and assistance

Evidence:

- Respective chapter of the SAR
- Audit discussions with students

Preliminary assessment and analysis of the peers:
It is appreciable that a number of different advisory offices are in place. For administrative routine support of undergraduate students, the *Undergraduate Dean's Office* with its subordinate offices is the address to raise questions and receive first information. Furthermore, the *Student Office* is responsible for guiding and supporting students of every department and school. Each programme has full-time undergraduate counselors, who are responsible for the guidance and psychological counseling of students in the University. Therefore, most of the freshmen plan for their occupational development in the first year of their university life under the guidance of counselors. Every class has a *class instructor* who normally is a teacher with doctorate and responsible for providing students with professional advice and guidance. *Enterprise mentors*, who are managers or engineers from relevant enterprises, are employed by USST and endowed with the responsibility for guiding students' projects during their enterprise internship, and keeping communication with academic tutors of the school to collaborate in teaching.

The auditors recognize that the university undertakes enormous efforts to effectively advice and counsel students. The students also confirmed that information for the study programmes are available on the internet and that every student receives a complete set of information for the respective degree programme after admission and enrollment. Most modules maintain a course webpage where questions can also be posted. Even though the general webpage, as indicated in the SAR, was only available in Chinese, the peers are con-

vinced that sufficient information is available and that the subject-specific and general advisory methods are suitable to help students achieve the learning outcomes and complete their degree within the normal period of study.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:

The auditors consider this criterion as *essentially fulfilled*.

English language competences

They appreciate the coordinators announcement to take additional measures strengthening the students' English proficiency for professional purposes. The HEIs plans to this end should be underlined by a corresponding recommendation from the peers point of view (see below, chapter F, E 4.).

Student workload

It is appreciated that the School of Energy and Power Engineering is planning to establish a mechanism ensuring a more systematic and punctual workload monitoring. How this mechanism is put into practice and works actually, should be focussed in the course of the re-accreditation of the degree programmes (see below, chapter F, E 5.).

Information about the ECTS system

It is welcomed that the School is going to provide ample information about the ECTS and its core principles to the students. Thereby, they will be able to better understand and assess core aspects of their study conditions and thus contribute to the quality assurance of the degree programmes. No further action is needed in this regard.

3. Exams: System, concept and organization

Criterion 3 Exams: System, concept and organization

Evidence:

- Respective chapter of the SAR
- Module descriptions of the degree programmes; see Appendices B1 and B2 of the SAR
- Management Regulations of Full-time Students' Study Status under Credit System for University of Shanghai for Science and Technology, see Appendix F of the SAR

- 2015 – 2016 Student Score List of Process Equipment and Control Engineering resp. Renewable Energy Engineering, see Appendices N1 and N2 of the SAR
- Examinations Statistics according to the SAR
- Audit discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:
The peers take note that there are regulations in place defining the rules and conditions of assessment in undergraduate degree programmes at USST (see Appendices E and F). According to these rules and the remarks of programme coordinators and teaching staff members the methods of examination include written examination, oral examination, reports, presentations etc. The assessment methods are adequately described in the relevant module descriptions. According to the available information, final examinations are regularly conducted during two examination weeks at the end of each semester, with apparently six to seven final exams as a rule and – normally – at least a one-day pause between two consecutive exams. In combination with midterm examinations and forms of a continuous assessment (assignments, exercises), the formal examination burden seems considerably high. Otherwise, both the students and the lecturers praise this examination system as an instrument to effectively monitor the individual learning progress and prepare the final examination. While final exams take mostly the form of written examinations, midterm examinations seem to vary to a greater degree. In sum, the audit team concludes that the examination system as such and the examination forms in particular are generally aiming at supporting students to achieve the intended learning outcomes. Exemplary exam pass rates of ten core modules for the two programmes in 2016 illustrate a remarkably high study success. On the other hand, student score lists of examinations in both programmes for the study year 2015 to 2016 demonstrate often-familiar failure rates in difficult engineering subjects such as *Theoretical Mechanics* (28 %), *Engineering Thermodynamics* (37 %) or *Measurement and Control Technology* (38 %). It favourably sheds light on the quality assurance system of the School that according to the SAR the examination results are analysed in order to support students who fail to pass certain exams and to improve their learning outcomes.

Students are expected to conduct a 12-week *Bachelor Thesis* in the eighth semester under the guidance of university supervisors. As for off-campus Bachelor Theses, students are required to keep contact with their supervisors on campus, and report the thesis progress in writing at least once every week, so as to ensure that the progress is in sync with the Bachelor Thesis progress on-campus.

Rules, requirements, procedural guidelines and components of the *Bachelor Thesis* are meticulously defined (see “Management Regulations for USST Full-time Undergraduates’

Graduation Design/Thesis" in Appendix F). With their thesis work, students are required to prove that they are able to solve an engineering task of an adequate level of difficulty independently and within a given period of time. Besides the written work, the *Bachelor Thesis* encompasses an oral defence. From the peers' perspective, the rules and requirements for the *Bachelor Thesis* and their implementation are supportive in achieving each programme's learning objectives. Samples of Bachelor Theses provided for inspection during the onsite-visit confirmed this impression.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:

The peers consider the criterion concerning the assessment system of the degree programmes as *fulfilled completely*.

4. Resources

Criterion 4.1 Staff

Evidence:

- Respective chapter of the SAR
- Staff Handbook of each degree programme, see Appendices A 1 and A 2 of the SAR
- Staff Awarding Sample List, see Appendix T of the SAR
- Audit discussions with the HEI management, the programme coordinators and the teaching staff

Preliminary assessment and analysis of the peers:

The peer group takes note of the staff handbooks of both degree programmes and concludes that the number of the available teaching personnel as well as the composition of the teaching body is adequate and appropriately qualified to implement the relevant curricula effectively. The peers welcome the fact that many of the staff members had spent parts of their academic career abroad. It is positively noted that, according to indications of the HEI, many teachers of the two programmes have published teaching research papers, won several high-ranking teaching awards, and published a series of professional textbooks and monographs in recent years. The peers are convinced that this engagement will consolidate and further advance the quality of the degree programmes.

In this context, the recruitment process for the teaching staff of the school as explained to the expert team consists of important elements ensuring the professional and didactic

qualification of the applicants. Thus, graduation at elite Chinese universities, study experiences abroad, professional and didactical excellence as well as industrial experience figure as core qualifying factors. The peers welcome this recruitment policy as a sustainable basis of the teaching and research record at the School of Energy and Power Engineering.

Criterion 4.2 Staff development

Evidence:

- Respective chapter/section of the SAR
- Audit discussions with the programme coordinators and the teaching staff

Preliminary assessment and analysis of the peers:
The peers learnt from the SAR that the USST provides a three months preparatory educational training for newly appointed young staff. According to the SAR, the USST has also implemented the "Young Teacher Mentoring Pilot Scheme" allocating mentors to young staff who are joining the University without advanced professional technical positions. In addition, the University encourages young teachers to go for either one year to a company for practical experience or abroad for international teaching and research experience. It is well understood that the professional advancement of the teaching staff to a large degree depends on their teaching and research record as well as their international study experience. This again convincingly illustrates the weight laid on the development of both teaching and research at the USST. As indicated in criterion 4.1, the teaching staff of the School of Energy and Power Engineering has already received numerous awards for excellent teaching. The auditors welcome that opportunities for further development of subject-relevant knowledge and teaching skills are available in abundance.

Criterion 4.3 Funds and equipment

Evidence:

- Respective chapter of the SAR
- Information about Laboratory Center for School of Energy and Power Engineering, see Appendix H of the SAR
- Investment Equipment in recent four years for School of Energy and Power Engineering (2013 – 2016), see Appendix G of the SAR
- Onsite-inspection of infrastructure and laboratories of the School of Energy and Power Engineering
- Audit discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:
The peers acknowledge that the USST vigorously enhances the engineering disciplines and actively serves the national innovation drive strategy with demonstrable support from the Shanghai government. A series of national prizes and awards in engineering disciplines related to the programmes under review confirm the School's status as an outstanding provider of engineering education and research in China.

Numerous co-operations with Shanghai-based and international companies in the Engineering sector as well as with renowned research institutes and universities abroad, e.g. Western universities in the US, UK, Australia, Canada, and Germany, underline and contribute to this strategy. So do far-reaching student exchange programmes carried out in cooperation with universities in Germany, the US, France, Japan, and South Korea.

Following this, it comes to no surprise to the expert team finding the School of Energy and Power Engineering and, particularly, the degree programmes under review in a healthy financial state. The laboratory equipment the peers have had the opportunity to inspect during their onsite visit has manifestly illustrated this result. The funding for maintaining and refurbishing the laboratories in the period 2013 to 2016 confirms the efforts of the School to keeping state-of-the-art equipment.

In this connection, the peers also have taken note of the visible development of the library and the corresponding benefits for students and teachers alike.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:

The peers consider the criterion concerning the resources of the degree programmes as *fulfilled adequately*.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Module descriptions of the degree programmes; see Appendices B1 and B2 of the SAR
- Audit discussions with the programme coordinators and the teaching staff

Preliminary assessment and analysis of the peers:
The audit team generally concludes that the module descriptions adequately reflect the respective curriculum and contain meaningful information about the individual modules. In particular, the descriptions provide comprehensive information about the different types of learning and teaching, the methods of assessment used in each module, the workload calculation and credit point attribution. Most of them also clearly indicate which knowledge, skills and competences students are supposed to achieve in order to reach the intended qualification profile.

However, some of the signatory module descriptions of both degree programmes list content or learning objectives, which are obviously at odds with one another or incongruous with the respective module title. Thus, for instance, the description of the module *Introduction to Computer* (both degree programmes) does hardly cover anything about computer architecture, operation principles, network, operating system etc. – topics, one would have expected from its title –, but largely issues concerning the "handling" of usual apps like word processors and PowerPoint instead. In a similar vein, learning outcomes, contents and title of the modules *Introduction to Process Equipment and Control Engineering* as well as *Measurement and Control of Power Engineering* appear to be inconsistent, which partly applies to the module *Energy Management* too. The deficiency here might be one of pure wording and, in this case, the relevant module descriptions need to be adapted accordingly. In certain cases, the inconsistencies in the given examples point to programme-specific or disciplinary shortcomings, which are treated more extensively in section 1.3 of this report.

According to the indications of the SAR and the programme coordinators, the module descriptions are publicly available for the relevant stakeholders of the USST webpages.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Sample of the Diploma Supplement of each degree programme, see Appendices K1 and K2 of the SAR
- Sample of the Transcript of Records of each degree programme, see Appendices L1 and L2 of the SAR
- Sample of the Diploma of each degree programme, see Appendices J1 and J2 of the SAR

Preliminary assessment and analysis of the peers:
English language Diploma Supplements for both study programmes have been provided to the auditors. The peers confirm that the Diploma Supplements give interested parties the

opportunity to gain insight into the structure, content and level of the successfully completed degree; the provided Transcript of Records explains the individual performance of the graduate.

Section 4.5 in the Diploma Supplement provides statistical data in accordance with the ECTS User's Guide to assist in interpreting the individual degree.

Criterion 5.3 Relevant rules

Evidence:

- Official Documents about Learning Rules and Examination Regulations, see Appendix F of the SAR

Preliminary assessment and analysis of the peers:
The peers note that all aspects of admission, examinations, Progress, Probation and Disqualification, Grading Policy, Examinations are addressed in the relevant study and exam regulations and, reportedly, outlined on the USST webpages; the fee structure has been explained in the self-assessment report and during the audit. The University explained that all these regulations are fully implemented in Chinese laws.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:

The peers deem the criterion concerning the transparency of the programme-related information as *largely, but not completely fulfilled*.

Module descriptions

The auditors appreciate the programme coordinators' announcement that the module descriptions will be revised according to the peers' indications detailed in the preliminary assessment. They propose drafting a requirement dealing with this issue (see below, chapter F, A 3., and also above, chapter C, final assessment of the peers).

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Respective chapter of the SAR
- Assessment Form, see Appendix I of the SAR

- Teachers Evaluation School of Energy and Power Engineering, see Appendix M of the SAR
- Questionnaire Survey on USST Graduates and Employer, see Appendix U of the SAR
- Appendix V Associated Forms about Graduation Internship, see Appendix V of the SAR
- Audit discussions with the programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:
The auditors see that the USST and the School of Energy and Power Engineering has implemented a quality assurance system comprehensively covering all phases and actors of the teaching-and-learning process. Thus, the teaching process is subject to the scrutiny of student and graduate surveys. Student statistics such as admission and graduation rates as well as examination scores are analysed and results used to provide helpful suggestions to individual students and to remedy shortcomings and deficiencies of the degree programmes. Additionally, the peers received the impression that the School makes significant efforts to get also feedback from employers and cooperating companies regarding the demands of the industry and the technical development in the disciplinary fields. Principles of USST's recruitment strategy, as detailed in chapter 4.2, along with permanent incentives to improving the individual teaching capabilities are further elements of a common understanding of quality, which is supportive to achieving the overall quality goals.

Concerning the evaluation of teaching, a three-pillar-system appears to be in practice. The first level is a routine-based course evaluation by students. On the second, intermedium level are collegial supervision and (external) expert evaluation. Finally, the USST obviously established various discussion forums on the central level for discussing quality issues with students and teachers. Regarding this, students on the one hand reported that they do not get a feedback to the regular course evaluation and, consequently, are not being aware of the lecturer's handling of the evaluation results. On the other hand, they emphatically pointed out that they do have the chance to raise critical issues in the midterm evaluations as well as in the above-mentioned other discussion rounds, which ensures that their voice is not ignored.

The peers conclude that the quality cycles in place for the degree programmes of the School of Energy and Power Engineering are working well. They also received the impression that the results of the students' course evaluation are feeding into the quality development of the programmes. In the view of the expert team, however, a more effective feedback mechanism in the framework of the students' course evaluation of teaching would benefit

the value of this quality assurance instrument. Therefore, the audit team recommends establishing a systematic feedback loop within the course evaluation in order to allow students an insight into the follow-up process concerning the results of the evaluation.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:

The auditors consider the quality assurance system in place for the degree programmes under review to be appropriate. Consequently, the related criterion is deemed *fulfilled*.

However, the system could be further improved if the School manages to impart students with an awareness of their contribution to the quality development of the degree programmes. A more effective feedback loop within the course evaluation might be an adequate way to reach this goal. The peers recommend elaborating the quality assurance system accordingly (see above, chapter F, E 6.).

D Additional Documents

No additional documents needed.

E Comment of the Higher Education Institution (16.05.2018)

The institution provided a detailed statement, which the peers have taken into account when drafting their final assessment for each chapter of this report.

F Summary: Peer recommendations (05.06.2018)

Taking into account the additional information and the comments given by the HEI, the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Process Equipment and Control Engineering	With requirements for one year	EUR-ACE®	30.09.2023
Ba Renewable Energy Engineering	With requirements for one year	EUR-ACE®	30.09.2023

Requirements

For both programmes

A 1. (ASIIN 1.1) Include the programme-specific qualifications also into the Diploma Supplement.

A 2. (ASIIN 1.1, 1.2, 1.3) Ensure that the name of the respective degree programme, its intended learning outcomes in the field of "Engineering and professional practice capability" as well as its content are better aligned with each other.

A 3. (ASIIN 1.3, 5.1) Revise and, if necessary, adapt the module descriptions in order to ensure that the title, the learning outcomes and the content of the modules correspond to each other. Refer to those modules particularly indicated in the report (for instance Control Theory, Renewable Energy Management; Informatics).

Recommendations

For both programmes

E 1. (ASIIN 1.3) It is strongly recommended to strengthen the students' competences in subject-specific fields related to Industry 4.0, for instance cyber security, system security or asset management, in order to better achieve the intended learning outcomes.

E 2. (ASIIN 1.3) It is recommended to deepen the students' knowledge of the fundamentals of IT and Communication Theory in order to better qualify them for the professional job demands in their respective disciplinary fields.

E 3. (ASIIN 1.3) It is recommended considering whether the practical Engineering competences linked to the *Metalworking practice course* might be acquired *extra*-curricular (e.g. through integration into the admission requirements or a voluntary internship in an early study phase).

E 4. (ASIIN 2.1) It is recommended to strengthen the English language competences of students in order to enable them to communicate in technical settings (oral and in writing).

E 5. (ASIIN 2.2) It is recommended to monitor the workload of students in order to make sure that the ECTS credit point attribution is plausible.

E 6. (ASIIN 6) It is recommended to establish a systematic feedback loop within the course evaluation in order to allow students an insight into the follow-up process concerning the results of the evaluation.

G Comment of the Technical Committees

Technical Committee 01 – Mechanical Engineering / Process Technology (06.06.2018)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure. It fully agrees with the recommended resolution of the peers.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee judges that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 01.

The Technical Committee recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Process Equipment and Control Engineering	With requirements for one year	EUR-ACE®	30.09.2023
Ba Renewable Energy Engineering	With requirements for one year	EUR-ACE®	30.09.2023

Technical Committee 02 – Electrical Engineering / Information Technology (15.06.2018)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee agrees fully with the recommended resolution by the peers. It considers the requirements and recommendations reasonable and confirms the peers' proposed decision without modification.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee judges that the intended learning outcomes of the degree programmes do comply with the engineering specific part of its Subject-Specific Criteria.

The Technical Committee recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Process Equipment and Control Engineering	With requirements for one year	EUR-ACE®	30.09.2023
Ba Renewable Energy Engineering	With requirements for one year	EUR-ACE®	30.09.2023

H Decision of the Accreditation Commission (29.06.2018)

Assessment and analysis for the award of the ASIIN seal:

The Accreditation Commission discusses the procedure. It decides making some minor editorial modifications concerning recommendation 1 and 2. Apart from that, it fully agrees with the proposed resolution of the peers and the Technical Committees.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee judges that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committees 01 and 02.

The Accreditation Commission for Degree Programmes decides to award the following seals:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Process Equipment and Control Engineering	With requirements for one year	EUR-ACE®	30.09.2023
Ba Renewable Energy Engineering	With requirements for one year	EUR-ACE®	30.09.2023

Requirements

For both programmes

A 1. (ASIIN 1.1) Include the programme-specific qualifications also into the Diploma Supplement.

A 2. (ASIIN 1.1, 1.2, 1.3) Ensure that the name of the respective degree programme, its intended learning outcomes in the field of “Engineering and professional practice capability” as well as its content are better aligned with each other.

A 3. (ASIIN 1.3, 5.1) Revise and, if necessary, adapt the module descriptions in order to ensure that the title, the learning outcomes and the content of the modules correspond to each other. Refer to those modules particularly indicated in the report (for instance Control Theory, Renewable Energy Management; Informatics).

Recommendations

For both programmes

E 1. (ASIIN 1.3) It is recommended to strengthen the students' competences in digital technologies and asset management, in order to better achieve the intended learning outcomes.

E 2. (ASIIN 1.3) It is recommended to deepen the students' knowledge of the fundamentals of Information and Communication Technology in order to better qualify them for the professional job demands in their respective disciplinary fields.

E 3. (ASIIN 1.3) It is recommended considering whether the practical Engineering competences linked to the *Metalworking practice course* might be acquired *extra*-curricular (e.g. through integration into the admission requirements or a voluntary internship in an early study phase).

E 4. (ASIIN 2.1) It is recommended to strengthen the English language competences of students in order to enable them to communicate in technical settings (oral and in writing).

E 5. (ASIIN 2.2) It is recommended to monitor the workload of students in order to make sure that the ECTS credit point attribution is plausible.

E 6. (ASIIN 6) It is recommended to establish a systematic feedback loop within the course evaluation in order to allow students an insight into the follow-up process concerning the results of the evaluation.

I Fulfilment of Requirements (28.06.2019)

Analysis of the peers and the Technical Committees (June 2019)

Requirements

For both degree programmes

A 4. (ASIIN 1.1) Include the programme-specific qualifications also into the Diploma Supplement.

Initial Treatment	
Peers	fulfilled Justification: The programme-specific qualifications have been implemented into the respective Diploma Supplement as the peers could see.
TC 01	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

A 5. (ASIIN 1.1, 1.2, 1.3) Ensure that the name of the respective degree programme, its intended learning outcomes in the field of “Engineering and professional practice capability” as well as its content are better aligned with each other.

Initial Treatment	
Peers	fulfilled Justification: The peers acknowledge that the curriculums of both degree programmes have been adjusted and relevant modules improved in order to achieve a better alignment of the name of the respective degree programme, the intended learning outcomes in the field of “Engineering and professional practice capability”, and the contents. Relevant modules have been revised and, partly, modified or adapted according to the suggestions of the expert team. In some cases, module titles have been changed, in others module descriptions sharpened in terms of module objectives and content.

TC 01	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

A 6. (ASIIN 1.3, 5.1) Revise and, if necessary, adapt the module descriptions in order to ensure that the title, the learning outcomes and the content of the modules correspond to each other. Refer to those modules particularly indicated in the report (for instance Control Theory, Renewable Energy Management; Informatics).

Initial Treatment	
Peers	fulfilled Justification: Obviously, the module descriptions have been revised in the direction indicated in the formulation of the requirement.
TC 01	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

Decision of the Accreditation Commission (28.06.2019)

The Accreditation Commission decides to extend the award of the seals as follows:

Degree programme	**ASIIN-label**	**Subject-specific label**	**Accreditation until**
Ba Process Equipment and Control Engineering	All requirements fulfilled	EUR-ACE®	30.09.2023
Ba Renewable Energy Engineering	All requirements fulfilled	EUR-ACE®	30.09.2023

Appendix: Programme Learning Outcomes and Curricula

According to the SAR, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Process Equipment and Controll Engineering:

1) Basic scientific literacy and engineering capabilities

- Understanding and application of mathematics and natural sciences to solve practical engineering problems, it is the basics of professional capability;
- Ability to understand and get involved in general industry processes, and meet requirements of potential positions and technologies;
- Ability to understand the development trends of modern science and technology and corresponding application prospects.

2) Professional competences and capabilities

- Ability to acquire and apply professional knowledge;
- With strong professional practice skills and capabilities in career;
- Ability in further study, further education and scientific research.

3) Capability in international communication

- With sufficient professional knowledge in English and be able to communicate with foreign colleagues and further study abroad;
- With enough foreign language and intercultural background, and be able to work and collaborate in foreign country or multinational corporations.

4) Computer and information application capability

- Ability to work with computer software and network, and high-efficiency ability to acquire and utilize information (including literature);
- General methods of literature, information and data retrieval;
- Ability to integrate professional knowledge with computer, e.g., computer-aided design and simulation.

5) Engineering and professional practice capability

- Understand the production and operation processes of industrial products;
- Master advanced equipment and control technology, and be able to innovatively design, process and optimize the related industrial products in the process industry;
- Be able to install, debug, operate, manage and maintain process equipment according to the standards.

6) Team-work and management capabilities

- With healthy psychology and personal integrity;
- With good legal awareness and social responsibility;
- With team-work and certain management capabilities;

- Be competent for competitive environment and challenging work.

The following **curriculum** is presented:

Curriculum of Process Equipment and Control Engineering												
(Note: CP-Credit Point, S-Semester, L-Lecture, P-Practice, W-Week)		Type	CP	Hours	S1	S2	S3	S4	S5	S6	S7	S8
Competence fields	Module				CP	CP	CP	CP	CP	CP	CP	CP
Mathematics, Physics and Chemistry	Calculus(1)	L	6	96	6							
	Calculus(2)	L	6	96		6						
	Linear Algebra	L	2	32		2						
	Probability Theory and Mathematical Statistics	L	3	48			3					
	College Chemistry	L&P	6	96	6							
	College Physics (1)	L&P	5	80		5						
	College Physics (2)	L&P	5	80			5					
Informatics	Information Technology	L&P	2	32	2							
	Introduction to Computer	L	3	48		3						
	Program Design and Practice	L&P	3	48			3					
Engineering Fundamentals	Fundamentals of Engineering Drawing	L	4	64	4							
	Electrical Engineering and Electronics	L&P	6	96		6						
	Mechanics of Materials	L&P	6	96		6						
	Theoretical Mechanics	L	6	96			6					
	Fundamentals of Engineering Materials	L&P	4	64			4					
	Mechancial Engineering Drawing	L&P	6	96				6				
	Engineering Thermodynamics	L&P	6	96				6				
	Machine Design	L&P	6	96				6				
	Engineering Fluid Mechanics	L&P	6	96				6				
	Process Control Theory	L&P	6	96					6			
	Heat Transfer	L&P	6	96					6			
	Introduction to Process Equipment and Control Engineering	L	4	64					4			

(Note: CP-Credit Point, S-Semester, L-Lecture, P-Practice, W-Week)		Type	CP	Hours	S1	S2	S3	S4	S5	S6	S7	S8
Competence fields	Module				CP	CP	CP	CP	CP	CP	CP	CP
Engineering Applications	Safety Technology of Process Equipment	L	3	48			3					
	Computer Modeling Practice	L&P	3	48				3				
	Measurement and Control Technology of Power Engineering	L&P	6	96					6			
	Process Principle and Equipment	L&P	6	96					6			
	Seal Technology of Process Equipment	L	6	96						6		
	Design of Process Equipment	L&P	6	96						6		
	Process Fluid Machinery	L&P	6	96						6		
	Control Technology and Application of Process Equipment	L&P	3	48						3		
	Chemical Drawing	L	3	48						3		
	Fabrication and Examination of Process Equipment	L&P	6	96							6	
Electives	Chemical Reaction Engineering	L	3	48						6		
	Chemical Process Technique	L	3	48								
	Process System Identification and Simulation	L&P	3	48								
	Energy Management	L	3	48								
	Process Analysis and Integration	L	3	48							12	
	FEM Numerical Simulation	L&P	3	48								
	CFD Numerical Simulation	L&P	3	48								
	Complete Set Technology of Process Equipment	L	3	48								
	Water Treatment Engineering	L	3	48								
	Equipment Fault Diagnosis	L	3	48								
	Fundamental English	L&P	2	48	2							
	Intensive English	L&P	2	48		2						

(Note: CP-Credit Point, S-Semester, L-Lecture, P-Practice, W-Week)		Type	CP	Hours	S1	S2	S3	S4	S5	S6	S7	S8
Competence fields	Module				CP	CP	CP	CP	CP	CP	CP	CP
Foreign Language	Interactive Practical English	L&P	2	48			2					
	Reading and Writing in Technical English	L&P	2	48			2					
	Interactive Comprehensive English	L&P	2	48				2				
General Courses	Ideological,Moral Cultivation and Law Basis	L	1	32	1							
	Introduction to China's Modern and Contemporary History	L	1	32	1							
	Introduction to Basic Principles of Marxism	L	1	32	1							
	Introduction to Mao Zedong Thoughts and the Theoretical System of Socialism with Chinese Characteristics	L	2	48	2							
	Social Practice	P	1	32	1							
	Military Theories	L	1	32	1							
	Military Training	P	1	2W	1							
	Physical Education(1)	p	1	32	1							
	Physical Education(2)	p	1	32		1						
	Physical Education(3)	p	1	32			1					
	Physical Education(4)	P	1	32				1				
Practical Training	Metalworking Practice	P	3	3W					3			
	Comprehensive Experiment	P	4	4W							4	
	Professional Comprehensive Course Design	P	4	4W							4	
	Innovation and Entrepreneurship Project Training	L&P	4	4W							4	
	Internship	P	14	10W								14
Bachelor Thesis	Bachelor Thesis	L&P	16	12W								16
SUM=240	ECTS PER SEMESTER				29	31	29	30	31	30	30	30

According to the SAR, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Renewable Energy Engineering:

1] Basic scientific literacy and engineering capabilities

- Understanding and application of mathematics and natural sciences to solve practical engineering problems, it is the basics of professional capability;
  Ability to understand and get involved in general industry processes, and meet requirements of potential positions and technologies;
- Ability to understand the development trends of modern science and technology and corresponding application prospects.

2] Professional competences and capabilities

- Ability to acquire and apply professional knowledge;
- With strong professional practice skills and capabilities in career;
- Ability in further study, further education and scientific research.

3] Capability in international communication

- With sufficient professional knowledge in English and be able to communicate with foreign colleagues and further study abroad;
- With enough foreign language and intercultural background, and be able to work and collaborate in foreign country or multinational corporations.

4] Computer and information application capability

- Ability to work with computer software and network, and high-efficiency ability to acquire and utilize information (including literature);
- General methods of literature, information and data retrieval;
- Ability to integrate professional knowledge with computer, e.g., computer-aided design and simulation.

5] Engineering and professional practice capability

- Understand the design and development of new energy engineering, transfer and utilization of new energy, and production and management processes of relevant enterprise;
- Be capable to innovatively design and improve the equipment, technical processes and products performance in the related fields of new energy;
- Be able to install, debug, operate, manage and maintain new energy equipment according to the standards.

6] Team-work and management capabilities

- With healthy psychology and personal integrity;
- With good legal awareness and social responsibility;
- With team-work and certain management capabilities;
- Be competent for competitive environment and challenging work.

The following **curriculum** is presented:

Curriculum of Renewable Energy Engineering Program												
(Note: CP-Credit Point, S-Semester, L-Lecture, P-Practice, W-Week)		Type	CP	Hours	S1	S2	S3	S4	S5	S6	S7	S8
Competence fields	Module				CP	CP	CP	CP	CP	CP	CP	CP
Mathematics, Physics and Chemistry	Calculus (1)	L	6	96	6							
	Calculus (2)	L	6	96		6						
	Linear Algebra	L	2	32			2					
	Probability Theory and Mathematical Statistics	L	3	48				3				
	College Chemistry	L&P	6	96	6							
	College Physics (1)	L&P	5	80		5						
	College Physics (2)	L&P	5	80			5					
Informatics	Information Technology	L&P	2	32	2							
	Introduction to Computer	L	3	48		3						
	Program Design and Practice	L&P	3	48			3					
Engineering Fundamentals	Fundamentals of Engineering Drawing	L	4	64	4							
	Electrical Engineering and Electronics	L&P	6	96		6						
	Theoretical Mechanics	L	6	96		6						
	Mechanics of Materials	L	6	96			6					
	Mechanical Engineering Drawing	L	6	96			6					
	Fundamentals of Engineering Materials	L&P	4	64			4					
	Engineering Thermodynamics	L&P	6	96				6				
	Machine Design	L&P	6	96				6				
	Engineering Fluid Mechanics	L&P	6	96				6				
	Computer Modeling Practice	L&P	3	48				3				
	Fundamentals of New Energy Theory	L&P	6	96					6			
	Applied Physical Chemistry	L	6	96					6			
	Heat Transfer	L&P	6	96					6			

(Note: CP-Credit Point, S-Semester, L-Lecture, P-Practice, W-Week)		Type	CP	Hours	S1	S2	S3	S4	S5	S6	S7	S8
Competence fields	Module				CP	CP	CP	CP	CP	CP	CP	CP
Engineering Applications	Measurement and Control Technology of Power Engineering	L&P	4	64				4				
	Pumps and Fans	L&P	4	64					4			
	Thermal Engineering	L&P	4	64					4			
	Energy Management	L	4	64						4		
	Principles and Design of Heat Exchanger	L	4	64						4		
	Power-Saving Technology	L	4	64							4	
	Biomass Conversion and Utilization	L	4	64						4		
	Systems and Equipment of Nuclear Power Plant	L&P	4	64						4		
	Nuclear Reactor Engineering	L	4	64						4		
	Wind Power Generation Technology	L&P	3	48						3		
	Fundamentals of Solar Cell	L&P	4	64						4		
	Solar Power Generation and Thermal Utilization	L&P	3	48						3		
Electives	Principles of Steam Turbine	L	3	48							15	
	Thermodynamic Equipment and System Optimization	L	3	48								
	Principles and Equipment of Refrigeration	L&P	3	48								
	Manufacturing Technology of Thermal Power Machinery	L&P	3	48								
	Clean Combustion Technology	L	3	48								
	CFD Numerical Simulation	L&P	3	48								
	Energy and Environment	L	3	48								
	Thermal Power Plants	L	3	48								
	Gas Turbine Theory and Application	L	3	48								
	Combined-Cycle System	L	3	48								
	Fundamental English	L&P	2	48	2							

0 Appendix: Programme Learning Outcomes and Curricula

(Note: CP-Credit Point, S-Semester, L-Lecture, P-Practice, W-Week)		Type	CP	Hours	S1	S2	S3	S4	S5	S6	S7	S8
Competence fields	Module				CP	CP	CP	CP	CP	CP	CP	CP
Foreign Language	Intensive English	L&P	2	48		2						
	Interactive Practical English	L&P	2	48			2					
	Interactive Comprehensive English	L&P	2	48				2				
	Reading and Writing in Technical English	L&P	2	48			2					
General Courses	Ideological,Moral Cultivation and Law Basis	L	1	32	1							
	Introduction to China's Modern and Contemporary History	L	1	32	1							
	Introduction to Basic Principles of Marxism	L	1	32	1							
	Introduction to Mao Zedong Thoughts and the Theoretical System of Socialism with Chinese Characteristics	L	2	48	2							
	Social Practice	P	1	32	1							
	Military Theories	L	1	32	1							
	Military Training	P	1	2W	1							
	Physical Education(1)	P	1	32	1							
	Physical Education(2)	P	1	32		1						
	Physical Education(3)	P	1	32			1					
	Physical Education(4)	P	1	32				1				
Practical Training	Metalworking Practice	P	3	3W					3			
	Comprehensive Experiment	P	4	4W							4	
	Professional Comprehensive Course Design	P	4	4W							4	
	Innovation and Entrepreneurship Project Training	L&P	4	4W							4	
	Internship	P	14	10W								14
Bachelor Thesis	Bachelor Thesis	L&P	16	12W								16
SUM = 240	ECTS PER SEMESTER				29	29	31	31	29	30	31	30