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Advanced Curriculum on Energy Efficient Buildings in Extreme Continental and Sunny Climate in Mongolia / CEBEC

Quality assurance and enhancement plan

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МОНГОЛ УЛСЫН ШИНЖЛЭХ УХААН
ТЕХНОЛОГИЙН ИХ СУРГУУЛЬ
БАРИЛГА, АРХИТЕКТУРЫН СУРГУУЛЬ

CONTENT

Project Name: **Advanced Curriculum on Energy Efficient Buildings in Extreme Continental and Sunny Climate in Mongolia / CEBEC**

Project reference number: 609842 -EPP-1-2019-1-SE-EPPKA2-CBHE-JP

Partners

P1. LU Lund University, Sweden

P2. TalTech, Tallinn University of Technology, Estonia

P3. MUST, Mongolian University of Science and Technology, Mongolia

P4. MULS, Mongolian University of Life Sciences, Mongolia

P5. GMIT, The German-Mongolian Institute for Resources and Technology, Mongolia

AIMS AND OBJECTIVES FOR CEBEC PROJECT

In order to introduce a sustainable, energy efficient solutions, two areas will have to be prioritized:

a) academic staff capacity development
b) development of energy efficiency content in the university curricula.

Main goals:

1. revision of existing modules/development of new module(s) to integrate a content on energy efficient buildings and renewable energy
2. training of lecturers and technical staff in energy efficient solutions and EEB
3. development of instructional media and laboratories to facilitate successful implementation of the modules and trainings
4. development of digital learning techniques and tools to facilitate successful implementation of the modules and trainings
5. arrange student/researcher/lecturer internship/short-medium term training at partner European universities
6. development of short-term training programs for industry partners
7. development of public relations campaign geared towards general public to promote the University's activities in EEB and the related technologies.

Intermediate goals:

1. to develop appropriate laboratory components and field experiment tools based on interactive learning and teaching;
2. to establish training courses for professional engineers and architects in the areas of applied energy for buildings;
3. to establish scientific preparation courses for professional engineers and architects, aiming at improving or establishing research on energy efficiency in buildings;
4. to promote technological and scientific co-operation between universities and companies on energy efficiency in buildings;

5. establish faculty/student exchange programs to support internationalization of the partner HEI's

The outcome of the project can be summarized to:

1. Modernization of higher education institutions (HEI) and system:
    a. New curricula for single courses on Energy Efficient Building and Renewable Energy (EEBRE). For all partners.
    b. Development of laboratory facilities for interactive teaching methods and hands on training for future technicians. For all partners.
2. Quality of HE:
    a. Increase the teaching quality. For all partners.
        - New modern literature shall be introduced as well as new PC-programs for energy calculations;
        - New Laboratory experiments shall be set up and modern equipment shall be purchased.
    b. Improve pedagogy and English skills among teachers.

WP 3. Quality Plan

The Quality assurance process contents

- Creation of effective operational groups

- Student and teacher surveys after finishing each course

- Auditors report.

A Quality Assurance Plan shall be elaborated by the Management Team and discussed to be accepted by all consortia partners. It will be monitored by the Management Team, which will decide upon measures to be taken if quality problems occur.

Annually quality reports including auditors report will be presented by the Management Team.

The strategy of quality and project control is based on the control of the scheduled activities and results. For this many meetings and periodical reports are planned in the lifetime of the project. It is scheduled that at every participating university a scientific local coordinator and work team involved, whose are responsible for coordination and control of the local activities and results. The local coordinators are the practical contact persons at their institutions, and they cooperate with the project coordinator in all questions and measures related to the project activities.

In case of deviation or delay of the planned outcomes the coordinator of the project will contact the local coordinators at universities involved and the treated deviation or delay causes will be directly consulted and dealed with. In case of difficulties which aren't soluble on level of the project syndicate the EU contact point will be informed and asked for help.

Lead Organization	Tallinn University of Technology
Participating Organization	Lund University Mongolian University of Science and Technology Mongolian University of Life Sciences The German-Mongolian Institute for Resources and Technology
Contact person	MUST 1.

(responsible for the coordination and control)	MULS 1. GIMIT 1.

Outcome 3.1 An elaborated quality assurance plan

A Quality Assurance plan (QAP) will be developed by the Management Team and discussed and accepted by all partners. The QAP will be monitored by the Management team, which will decide upon measures to be taken if quality problems occur.

Outcome 3.2 Annual reports from Management Team regarding QAP

The result of the quality work shall be reported at the end of every year based upon the Management teams' common reflections and which measures it had decided and on the summaries of the Student and teacher surveys after finishing each course.

QUALITY ASSURANCE PLAN

The focus of the Quality Assurance Plan (QAP) is to enhance the learning through the established programme of the Interdisciplinary Master Courses in Energy Efficient Building Design.

The following topics will be addressed:
- Renewable energy and small scale energy production for buildings.
- Renewable energy planning in Buildings
- Solar energy
- Retrofitting of Buildings
- Energy and the Environment
- Energy analyses and Modelling
- Energy audit, Energy regulations and Energy management
- Energy Systems
- Energy Economics and Market Development
- Paper reading and writing in English.

The goals directly support the university mission as well as general education need according to the local and international market. The Master of Engineering in Renewable Energy aims to enhance the technical and analytical competency of engineers who work in renewable energy and associated fields. The programme will also provide skills in the state of art research, problem solving, innovation and entrepreneurship.
Specific Objectives

Master of Engineering in Renewable Energy graduate will be able to:

- Analyze and evaluate environmental, social, and economic impacts relating to renewable energy.
- Evaluate constraints and commercial risks related to renewable energy.
- Investigate and analyses complex engineering systems using modelling techniques.
- Initiate, plan and design new renewable energy infrastructure.
- Evaluate and optimize renewable energy systems.
- Assess and apply innovative and sustainable solutions appropriate to engineering activities.
- Understand range of problems related to renewable energy and apply new and emerging technologies to solve these complex problems.
- Identify areas of unexplored questions and recognize different approaches to problems in different disciplines.
- Enhance innovativeness and entrepreneurial attitude.

Process used to develop the QAP.

The consortia of project partners were gathered. The partners in the project are Lund University, Sweden (LU); Tallinna University of Technology, Estonia (TalTech); Mongolian University of Science and Technology (MUST), Mongolia; Mongolian University of Life Sciences (MULS), Mongolia; The German-Mongolian Institute for Resources and Technology (GMIT), Mongolia.

The main goal of the project team is the improvement of Master or Bachelor programs on Energy Efficient Buildings and Renewable Energy and support existing programs with development of laboratory facilities for interactive teaching methods and hands on training.

The outcome of the project is the new curricula for masters' courses in EEBRE for the Mongolian partners with needed study materials and supporting laboratory experiments.

The activities in the project were divided in different work packages (WP) with a lead organization.

The quality plan started with the analysis of the need of higher education programs on energy efficient building technique in buildings. It is relevant to know the needs in the building sector of engineers and architects. For that purpose, the surveys among the relevant stakeholders and authorities (the syndicate of engineers, construction companies, and real estate owners) were carried out to help to quantify the need for trained specialists in the field and identify specific important areas of interest.

The summary of the needs analysis is presented in Appendixes (Appendix 1, Appendix 2).

The needs analysis was the input for the WP2 "Development of courses and experiment stations". The development includes structure, admission, courses and graduation requirements. Courses are developed to correspond to a full master or bachelor program for partner universities.

The courses are developed together with the EU partners.

The development includes the curricula for the new courses on EEBT and the Master program. Additionally, to the curricula the course material-text books and the laboratory instructions and experimental handbooks are developed in cooperation with the EU partners. All the materials, experiments and the needed equipment must be listed and approved by the EU partners.

The laboratories must be equipped with necessary tools and experiment's manuals that describes the procedure to be followed, the maintenance schedule and any related information about the equipment description and purposes. The review of the necessary tools and equipment existing and needed for successful executions of the courses is done according to the developed courses.

For the QAP the program realization is done under supervision of the professors from the EU universities.

The realization in the Partner countries will be supported by professors from EU–universities by:

- Guest lectures in Mongolia
- Experiences from the EU-universities
- Partner teachers training in EU-universities
- EU examples (handouts, individual and group tasks, lab measurements)
- Presentations from EU-partner universities for training of local teachers
- Student mobility

Quality Assurance Principles

General provisions

1.1 Quality assurance is aimed at satisfaction of the internal and external stakeholders of University with the quality of teaching, organisation of studies and performance.

1.2 Quality assurance is a continuous process, which is adjusted in accordance with the changes and requirements in Mongolia.

1.3 The Quality Assurance Principles must be drawn up in compliance with the Standards and Guidelines for Quality Assurance in the Higher Education Area in Mongolia and legislation regulating academic activities at University.

2. Quality assurance system

2.1 The key elements of the quality assurance system include overall academic quality management, study programme development, student admissions, teaching and learning, support processes of studies, the quality of which shall be ensured by assessing academic performance on regular basis and by implementation of the relevant improvement activities.

2.2 Overall quality management

2.2.1 Management of the teaching and learning process shall be carried out in compliance with management of other core processes (research and development, provision of services to the society) of the university.

2.2.2 The goals of teaching and learning and the performance indicators shall be based on the QUALITY ASSURANCE AND ACCREDITATION FOR HIGHER EDUCATION IN MONGOLIA prepared for the period of validity of the strategic plan, the analysis of the implementation of which shall be carried out once a year.

2.2.3 The legislation, forms and web environment related to teaching and learning shall be up to date.

2.3 Study programme development

2.3.1 The study programme committee shall be responsible for the quality of the content and organisation of degree level programme.

2.3.2 Study programme shall be prepared and developed by taking into account the needs of the labour market and the society, the requirements established in the Standard of Higher Education, other national and international guidelines, professional standards, recommendations of internal and external evaluators and stakeholder feedback.

2.3.3 Study programme shall be developed in cooperation with University structural units as well as other higher education institutions in order to enhance interdisciplinarity and internationalisation while taking into account economical use of the resources.

2.3.4 The goals and learning outcomes of the study programme and subject shall be clearly defined. The achievement of the learning outcomes shall be assessed on the basis of understandable and targeted assessment criteria, which shall be available in the programme information.

2.4 Student admissions

2.4.1 Student admissions shall be planned in compliance with the goals set out in the Education Policy and other documents and in accordance with the need of the society for graduates by keeping in mind University's capabilities.

2.4.2 In order to assure the quality of student admissions, the admissions shall be organised by employees who have completed the corresponding training.

2.5 Organisation of studies

2.5.1 The organisation of studies and subjects shall be aimed at acquisition of learning outcomes.

2.5.2 The organisation and content of work placement shall be up to date, shall support the goals of the study programme and achievement of the learning outcomes and shall be developed in collaboration with the employers.

2.5.3 The requirements set for graduation thesis shall be understandable and available and high-quality supervision of graduation thesis shall be ensured.

2.5.4 The research and teaching of academic staff shall be mutually supportive. Lecturers shall have the required qualifications and teacher competence. Highly qualified and outstanding professionals from outside University shall be involved in teaching. Opportunities shall be provided for continuing education, including teacher training.

2.5.5 Teaching shall be student-focused and shall be conducted at an up-to-date level by using diverse and appropriate methods of teaching. In addition to contact learning, modern digital technologies shall be applied in teaching and learning.

2.5.6 Academic fraud shall not be tolerated.

2.7 Assessment of Performance

2.7.1 A report on teaching and learning shall be compiled for each academic year, which shall include analysis of achievement of the goals set in Quality Plan. The results of continuing education shall be analysed in the continuing education reports prepared for each calendar year.

2.7.2 Achievement of the goals shall be assessed and further teaching and learning shall be planned by taking into account feedback from internal and external stakeholders and the results of internal and external evaluation. The results of feedback surveys and summaries of improvement activities shall be available for institutions.

2.7.3 The feedback system shall be implemented and developed based on the principles of integrity and functionality.

Responsibility and delegation of authority

Responsibility for the assurance and enhancement of learning and teaching quality rests with every member of staff involved in teaching delivery. Students, in partnership with teaching staff, are responsible for their learning and for providing constructive feedback on teaching and courses. Responsibility for the oversight of learning and teaching quality is distributed throughout the University, through Course Directors and Coordinators, Academic Heads, Faculty Deans and Associate Deans with responsibility for learning and teaching.

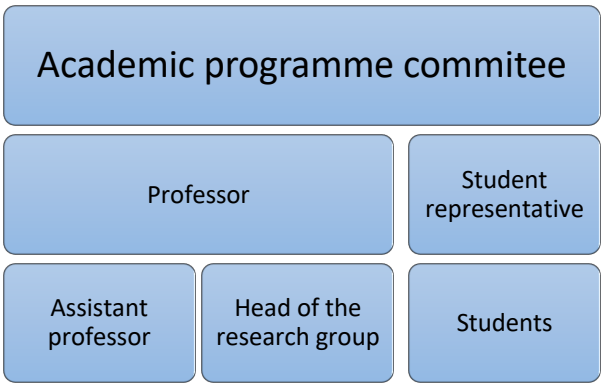
In all planning, the University identifies role-holders responsible and accountable for the implementation of specific tasks or processes.

Each academic manager works to clearly-defined operational goals, performance measures and reporting obligations. Academic Performance Review processes ensure accountability, based on the expectation that each member of staff carries out his or responsibilities consistent with the delegated authority of his or her position.

The Master Programme will be administered through the established Programme committee. This committee consists of X full-time staff persons.

The committee reports directly to the Management Team of the consortia about the assessment results of the programme.

Structure of the effective operational group reporting to the Management Team of consortia:



At every participating university a scientific local coordinator and work team involved, whose are responsible for coordination and control of the local activities and results. The local coordinators are the practical contact persons at their institutions, and they cooperate with the project coordinator in all questions and measures related to the project activities.

Students provide feedback on their learning experience through course and teaching evaluations and University surveys.

The result of the quality work shall be reported at the end of every year based upon the Management teams' common reflections and which measures it had decided and on the summaries of the Student and teacher surveys after finishing each course.

Courses and laboratory experiments

Courses are developed and improved to correspond to a full master program for MUST, MULS and GMIT to correspond to full time studying.

The course material-text books and the laboratory instructions and experimental handbooks are developed according to the curricula of the Master's program. All the materials are developed in cooperation with the EU partners. The task involved the selection of textbooks, preparation of power point presentations, lecture notes and the list of the laboratory work included in the courses.

New improved curricula for the study programs and list of the course materials are presented in Appendix 3.

In parallel to the course materials the plan of the laboratory exercises needed for the course is conducted. The next step is planning, and design of experimental stations needed to execute the experiments. Finally, the laboratory instructions and experimental handbooks are compiled.

Equipment

This activity includes Installation, Testing and Calibration of the purchased equipment. Exact quantity and specification of needed equipment will be prepared along with a business plan for each equipment or system proposed including location, personnel in charge, the possible courses that will use the equipment, the possible experiments, and if it has a service component to the industry.

The purchase of the equipment will be done according to the equipment procurement. The procurement is described in appendix (Appendix 4).

The laboratories must be equipped with necessary tools and experiment's manuals that describes the procedure to be followed, the maintenance schedule and any related information about the equipment description and purposes. The review of the necessary tools and equipment existing and needed for successful executions of the courses is done according to the developed courses.

The list of the needed equipment

Course	Equipment	

The list of the existing equipment to carry out the courses

Course	Equipment	

The list of the purchased equipment to carry out the courses

Course	Equipment	

INTRODUCTION

The purpose of the Quality Assurance Plan (QAP) is to guarantee the quality of development of Master Courses (MC) in Energy Efficient Buildings and Renewale Energy (EEBRE).

QAP is elaborated by the Management Team and accepted by all consortia partners. It will be monitored by the Management Team, which will decide upon measures to be taken if quality problems occur. Annually quality reports including auditors report will be presented by the Management Team.

The quality will be monitored at three levels

- Preparation;
- Development;
- Implementation.

PREPARATION

	Activity	Start date	End date	Lead	Description of activity	Specific measure	Status
1	**Analysis of the need and content of Higher Education programs on EEBRE**						
1.1	A list of needs of MC in EEBRE in the Partner countries	xx.xx. 2020	xx.xx. 2020	MUST	MUST will organize surveys to relevant organizations in order to analyze the future needs of specialists in EEBRE.	Surveys in Mongolia • xx: Companies • xx: Profession organizations (architects, civil engineers, HVAC engineers, real estate, etc.) • xx: University administration • *xx: Ministry ??* • *xx: Student organization ??*	Surveys have been conducted XX participants; report will be added to the report.
1.2	The possible structure and principle options of MC in	xx.xx. 2020	xx.xx 2020	MUST	MUST will organize surveys to relevant organizations in order to analyze the:	Surveys in different parties: • Professionals from the companies (architects, civil engineers, HVAC engineers, real estate, etc.) • University administration	Questionnaires of survey included questions about the courses and subjects what the need of

	Activity	Start date	End date	Lead	Description of activity	Specific measure	Status
	EEBRE in the Partner Universities				• possible structure of the courses: ○ additional contents to already existing ○ new and needed courses into existing or new MP ○ completely new MP • principle options of course customers: ○ craftsmen driven ○ engineering/science (+ architecture) driven ○ socio-economic/ ecologic driven?	• Ministry • Student organization	different fields is and what has to be included or added to the curricula of the new master course and what needs to be added to the existing one.
1.3	Review the existing programmes / courses so that it is not replicated	xx.xx. 2020	xx.xx. 2020	MUST	Partner Universities will organize surveys of existing programmes and courses in order to avoid replica.	Surveys in all universities	
1.4	A report with a proposals for development of Master programs and training courses on EEBRE	xx.xx. 2020	xx.xx 2020	MUST	After summarizing the surveys 1.1, 1.2, 1.3 and other contacts the future needs for trained specialists in the EEBRE and identify specific important areas of interest will be quantified. A summary report for all 3 universities.	A suggestion to new courses sent to the university administrations for decisions.	
2	**The possibilities to carry out of Higher Education programs on EEBRE**						

	Activity	Start date	End date	Lead	Description of activity	Specific measure	Status
2.1	Determining the requirements on competence for academic staff (position, degree, language skills)	xx.xx. 2020	xx.xx. 2020		National survey on requirements for academic staff.	Requirements on competence for academic staff What degree on what level?	
2.2	Analyzing the current competence of academic staff	xx.xx 2020	xx.xx. 2020		Analyze about: • current competence • current number of academic staff for courses of EEBRE.	Will be done after curricula	
2.3	Needs and availability of students	xx.xx 2020	xx.xx. 2020		Analyze about needs and availability of students for MC in EEBRE	Has to be done, each university has to give the number of planned students	
2.4	Possibilities for practice	xx.xx 2020	xx.xx. 2020		Universities will organize surveys in order to analyze the possibilities for practice: • in field (companies) • in university laboratory	Preliminary agreement with companies?	
2.5	Availability of literature	xx.xx 2020	xx.xx. 2020		Analyze about needs and availability of literature for MC in EEBRE	Will be done after curricula	
2.6	Availability of simulation software	xx.xx 2020	xx.xx. 2020		Analyze about needs and availability of simulation software for MC in EEBRE	Will be done after curricula	

DEVELOPMENT AND SURVEY OF COURSES IN EEBRE

	Activity	Start date	End date	Lead	Description of activity	Specific measure	Status
3.1	Correspondence to the markets needs				Comparison of MC to the summary report of the surveys		
3.2	Involvement of stakeholders into development process				Universities will organize regular meetings and seminars with local stakeholders from relevant organizations through the process of MC	seminars with 3 organizations outside university: • Companies • Profession organizations (architects, civil engineers, HVAC engineers, real estate, etc.)	
3.3	Acceptance in university				MC should be accepted by university government.	Accepted by university government	
3.4	Correspondence to the occupational qualifications system				MC should correspond to the occupational qualifications system	Corresponds to occupational qualification	Is there qualification system
3.5	Accreditation				MC should be accredited by a government organization, such as a ministry of education.	MP is accredited.	
3.6	Motivation to improve the MC				MC must be kept constantly up to date. The stuff has to be motivated to improve the MC materials according to the latest changes in the field.	List of partner universities; plan of study visits to other universities or labs; list of conferences of the subject and planned participation in near future.	

3.7	Research group				Aim to establish the research group involving students	Promote the program and possible further studies	
3.8	Audit				External audit by independent authority	Report to Management Team	

IMPLEMENTATION OF COURSES IN EEBRE

	Activity	Start date	End date	Lead	Description of activity	Specific measure	Status
	Involving students						
4.1	National promotion of the programs				MC on EEBRE is promoted in various info channels including radio, internet (Facebook, twitter etc.), newspapers; arrange seminars at the University and provide hand-outs.	count visitors of homepage likes in Facebook articles in newspapers seminars at the Universities	
4.2	International promotion of the M.Sc. program				Distributing flyers and advertisement in seminars, conferences and symposiums outside of Mongolia to involve international interest on MP	xx?? seminars, conferences, symposiums	
	The quality of the program in Higher Education programs on EEBRE						
5.1	Selection of the academic staff				Selection of academic staff based on the needed balance between positions, degrees and language skills	Qualified academic staff is selected based on selection criteria	
5.3	Selection of students				Determining general requirements for entrant students of MC in EEBRE	Motivated students are selected based on selection criteria	
5.4	Master courses evaluation				Every student must fill the questionnaire about courses, including questions concerning quality of the courses after every study quarter.	Questionnaire and report	

					The answers should be analyzed and if there are critical comments they should be analyzed and if needed measures should be taken.		
5.5	Master program evaluation				Every student must fill the questionnaire about the quality of the program after the graduation. The answers should be analyzed and if there are critical comments they should be analyzed and if needed measures should be taken.	Questionnaire and report	
5.6	Audit			LU	Audit by external committee	Report to Management Team	
	The quality of the M.Sc. thesis in Higher Education programs on EEBRE						
6.1	Quality of the topics of M.Sc. thesis				Students should have the freedom to choose for M.Sc. thesis either a research problem provided by the industry or by the University.	At least 50% of the topics should come from the industry.	
6.2	M.Sc. thesis supervisor				Students should have an opportunity to the external supervisor or/and supervisor on PhD level.	At least 50% of external supervisors should have be preferably representative of another University or representative of the local industry or/and supervisor on PhD level.	
6.3	Academic quality of M.Sc. thesis				Defense committee analyses if the quality of the research-based thesis is adequate for peer reviewed publication.	At least 50% of M.Sc. thesis should have a quality for peer reviewed conference paper or journal publication.	

6.4	M.Sc. thesis defense committee				Defense committee should have external member(s)	Defense committee should have one member from another university or at least one external member representing the local industry.	