Guidelines for teaching content harmonisation

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INternationaliSation of master Programs In Russia and China in Electrical engineering

ERASMUS + KA2- Cooperation for innovation and exchange of good practices – Capacity Building in the field of Higher Education

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Contents

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1. Bologna process

"United in diversity" is the European Union slogan. We are united by certain values that are shared by those within the profession, but as Europeans from different countries, we are all different too — in our qualifications, routes into education and in our idea of the skills and knowledge that we believe are essential to the profession. Social work education in Europe began in different countries from the early 20th century, but had a new impetus in the last two decades which saw the creation or re-opening of social work education in Eastern European countries. Many initiatives have been taken during the last two decades in social work education, and our intention here is to offer our impressionistic overview of the current situation of social work education in Europe[1].

Widely differing education and training systems in Europe have traditionally made it hard for Europeans to use qualifications from one country to apply for a job or a course in another. Increased compatibility between education systems makes it easier for students and job seekers to move within Europe.

At the same time, the Bologna reforms help to make European universities and colleges more competitive and attractive to the rest of the world.

The Bologna Process also supports the modernisation of education and training systems to make sure these meet the needs of a changing labour market. This is important as the proportion of jobs requiring high skills grows, and the demand for innovation and entrepreneurship increases.

The Bologna Process has been started in 1998 (Sorbonne Declaration [2]) by four countries (France, Germany, Italy, the UK). From 1999, when the Bologna Declaration [3] has been launched, more countries joined.

2010 has been a milestone for the Bologna Process: At the Vienna-Budapest Ministerial Conference [4], the European Higher Education Area has been launched. At the same time, it has been decided to continue the Bologna Process, at least until

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2020. More information on the history of the process can be found on the EHEA website [5].

The Bologna Process is a rather unique approach to reform and internationalise higher education systems and institutions and establish regional convergence. At its heart is the partnership between national governments. It is not a European Union initiative, but all EU Member States and the European Commission are involved in the Process. Bologna is a voluntary process: reforms are jointly agreed, but implementation is subject to national suzerainty.

Currently, the Bologna Process has 57 parties: 49 higher education systems in 48 countries (incl. Belgium Flemish and French Community), the European Commission, and seven Consultative Members. In principal, all countries that are signatories of the European cultural convention are eligible to join the Bologna Process. In addition, representatives of the European Quality Assurance Register for Higher Education (EQAR) [6] participate in Bologna meetings and events.

The active participation of "stakeholder organisations", which represent higher education community and society, is an important feature of the process: They are permanent consultative members (i.e. they attend all meetings but do not vote). Along with EUA, which represents the European universities, these are EURASHE [7] (representing professional higher education institutions), the European Students' Union (ESU) [8], Education International (EI) [9], the European Association for Quality Assurance in Higher Education [10] (ENQA, representing quality assurance agencies), and Business Europe [11] and UNESCO [12].

In its first phase, the Bologna Process focussed on 10 Action lines [13]. With time, these have been rephrased, and further developed. Major Bologna goals and instruments are:

1) A converged degree structure: three study cycles of Bachelor, Masters and Doctorates, laid down in the EHEA Qualifications Framework [14], which is largely

compliant with higher education qualifications in the EU Qualifications Framework for Lifelong Learning [15, 16]. In the Yerevan Communiqué [17], Ministers agreed to recognize short cycle degrees.

2) A joint credit system, usually the European credit transfer system (ECTS) [18] or a compliant system.

3) Mobility of students and staff.

4) Internationalisation of higher education systems and institutions, the international visibility of the EHEA, also named "Bologna in a global setting" or "international attractiveness".

5) A European Dimension of Quality Assurance – based on the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) [19] and the European Quality Assurance Register for Higher Education (EQAR) – so far the only institution created by the Bologna Process.

6) Social dimension, lifelong learning and widening access and participation.

7) Recognition of study periods, based on the credit system, and degrees, in line with the Lisbon Recognition Convention [20].

Ministers in charge of higher education usually meet every two to three years in Bologna Ministerial Conferences, sometimes referred to as Ministerial Meetings, in order to assess progress made and to set out new goals and actions. Since 2009, Leuven/Louvain [21], a Bologna Policy Forum has been organised back-to-back with the Ministerial Conferences, inviting Ministers from non-Bologna countries.

The Bologna Follow-up Group (BFUG) [22] gathers two to three times a year the representatives of Ministries and consultative members. It is in charge of the actual work and the steering of the process. It develops and decides on the rules and working methods, and sets up working groups, task forces and similar, comprising BFUG members, but on occasion also other parties, also through Bologna Conferences and seminars.

The Bologna Secretariat supports the Process. It is usually provided by and hosted in the country which hosts the next Ministerial Conference. There has been a discussion on establishing a standing Secretariat, and also on the internationalisation of the Secretariat's staff.

The Bologna Board meets usually twice a year, ahead of BFUG meetings, which to prepare is its main role. Since 2010, it is composed of the outgoing, present and incoming EHEA co-chairs (i.e. the EU Presidency country plus a non-EU Bologna country, in total six), the European Commission, and four consultative members (Council of Europe, EUA, ESU, EURASHE).

The most important outcomes of the Bologna Process are the Ministerial Communiqués [23]. In addition there are reports from working groups and also more binding documents such as the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). Monitoring progress and reporting has in the early years been done through a stocktaking report and reports from thematic working groups. Since the Ministerial meeting in Bucharest (2012), most of these have been replaced by a more holistic Bologna Implementation Report. In 2014, the BFUG has decided to make also working documents accessible to the public, in order to enhance transparency.

A lot of progress has been made in implementing the reforms, as shown by the regular reports [24]. In Yerevan in May 2015, the Education Ministers identified four key priorities for the future:

- enhancing the quality and relevance of learning and teaching;

- fostering the employability of graduates throughout their working lives;

- making our systems more inclusive;

- implementing agreed structural reforms.

In Bologna in 1999 the Ministers of Education of 29 countries agreed on a common vision of a European Higher Education Area[25]. They found that this vision was politically relevant for their own countries and translated it into the operational goals listed in the Bologna Declaration.

The key elements of the European Higher Education Area envisaged at that time were:

- European countries with different political, cultural and academic traditions would engage in cooperation to reach a shared objective;

- European students and graduates would be able to move easily from one country to another with full recognition of qualifications and periods of study, and access to the European labor market;

- European Higher Education Institutions (HEIs) would be able to cooperate and exchange students/staff on bases of trust and confidence and also of transparency and quality;

- European governments would fit their national higher education reforms into a broader European context;

- Higher Education (HE) in the European region would increase its international competitiveness, as well as enter into dialogue and improve cooperation with HE in other regions of the world.

In the past 15 years the Bologna Process, through voluntary convergence and an intergovernmental approach, has led to the construction of the main pillars of the European Higher Education Area:

a) A common framework, which includes the overarching Framework for Qualifications of the EHEA, a common credit system (ECTS), common principles for the development of student-centered learning, the European Standards and

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Guidelines for Quality Assurance, a common Register of QA Agencies, a common approach to recognition, and a common body of methodologies and sustainable achievements produced by European HEIs,

The most important topics concerning the European Higher Education Area and the Bologna Process [26] are:

1) Diploma supplement,

2) ECTS, including Learning outcomes,

3) Employability,

4) Implementation,

5) Internationalisation,

6) Lifelong learning,

7) Mobility,

8) Monitoring and stocktaking,

9) Qualification frameworks,

10) Quality assurance,

11) Recognition,

12) Research and innovation,

13) Social dimension,

14) Student centred learning,

15) Three-cycle system.

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1.1. THE BOLOGNA PROCESS IN RUSSIA

Russia has signed the Bologna declaration in 2003 and since that time the modernization of national education system has been taking place. The elaboration of federal educational standards on the base of competence approach aroused the problem of forming proper quality evaluation system of students" competences.

New educational standards suppose a greater choice of educational alternatives and independence of higher education institutions. But this freedom should comply with the demands of labor market and the whole society. The main criterion is the demand for graduates on the labor market[27].

 The implementing of new standards based on competence approach in Russia contributes the compatibility of different higher education systems, contents and structures of the educational programs, etc.

 The main goal is that Russia will become a country of knowledge with a strong intellectual cultural social and technical base in which higher education institutions would serve as leaders in the process of this development.

As it has already been stated the shift to new state educational standards has aroused the problem of proper quality evaluation in higher education area.

There are some reasons for the appearance of the independent quality assurance system. Though in Russia there already exists a Federal Service of Supervision in the sphere of education and science whose functions are to control and conduct accreditation procedures in higher education area, its approaches are based on the traditional view to higher education institutions. The other reason is the problem of educational standards: according to which Federal Service controls only the quality of the minimum of obligatory programs included in standards and all other programs which a HEI realizes are beyond the Federal Service"s monitoring. That"s why the outcomes of Federal Services" monitoring don"t meet demands of all groups of stakeholders interested in qualitative higher education and don"t comply the requirements of knowledge-based economy. Those facts explain the appearance of independence quality assurance system in Russia. Russian higher education

community has made a lot for the development of independent quality assurance system. Throughout the mechanisms of self- regulation in higher education community the independent quality assurance system evaluates a higher education institution more precisely taking into account demands of Russian modern society.

As a practical mechanism of independent quality assurance system's implementation the Agency for Higher Education Quality Assurance (AQA) has been established. AQA conducts audit procedures considering four main aspects:

- the HEIs' program contents and specifications;

- efficiency of the educational technologies used by the HEIs and the way the technologies influence the program quality;

- HEI management and administration, including the level and characteristics of the institutional management;

- the way the HEI organizes its operation, including the businesses where it is engaged.

Institutional audits are organized to serve the interests of students, the public, the employers, state bodies and other stakeholders. That is why the Agency is in contact with all the interested parties at all the audit process stages: when preparing the experts' visit, during the visit, when discussing the visit outcomes and when issuing recommendations in relation to the quality assurance in the program provision.

The information the Agency provides can be used by:

- the state bodies to ensure that the public is guaranteed to have constitutional access to educational services rendered at the appropriate level of quality

- which is ensured by the competences available at the institution that operates in a certain field of professional specialization;

- by the Russian citizens who want to have guarantees that they can get the knowledge, skills and professional competences in the field of study that can give them the competitive advantages after graduation; - by the higher education institutions (HEIs) to maintain and enhance quality of educational services rendered;

- by the employers who can use the data to make judgments about the quality of teaching in the HEIs and the correspondence between the intended learning outcomes indicated by the HEIs and the actual level of graduates" competences when making decision about employing people.

The Agency takes into consideration the diversity of interests the HEIs have and offers different types of academic audit. The audit types and procedures were developed in such a way that the best practices of such overseas accreditation bodies as ENQA, QAA, INQAAHE, APQN, EFQUEL were taken into account. That is why the HEIs taking their own interests into account have a right to demand:

- that external audit be made of the quality of the educational services rendered by the HEI;

- that assistance be rendered to the HEI in conducting self evaluation procedures as per the requirements set by the state regulatory bodies and recommendations of the leading foreign accreditation agencies;

- that the Agency specialists offer consultation services related to the issues of the HEI accreditation criteria optimization;

- that the internal institutional quality assurance system be assessed and all the main operational criteria be evaluated;

- that the indicators showing the level of the institutional sustainability be analyzed and assessed and that recommendations be made for enhancing the level of the HEI competitiveness on the educational services market;

- that the HEI action plan for the time period following the latest audit be set by the state accreditation bodies;

- that testing be made of the graduates" level of knowledge and professional competences level upon graduation.

Academic audit procedures conducted by the Agency are aimed at ensuring that the programs and other educational services rendered by the HEI can compete on the Russian and the international market. That is why the Agency uses the competences

check-based approach in use in the international academic community when assessing the graduates" quality of training.

The process of institutional audit requires a high degree of openness, transparency and trust in the partnership between the Agency and each HEI[28]. That is why the Agency guarantees that the audit process is open, unbiased and accurate and in its strategic planning and everyday operations is guided by the following general principles:

- the needs of all the interested parties are taken into consideration; they are involved into all the activities of the Agency;

- the Agency operational activity and methodology used is transparent which is the basis of trust and consensus in the relationships between all the interested parties; the public is informed of the Agency operations;

- all the Agency resources are effectively and efficiently used in order to achieve the stated goals;

- systematic, regular and timely actions are taken in regard to all the indicated procedures in order to get support of the decisions taken by the Agency and other interested parties;

- the Agency best practices and the best practices of other organizations are used;

- the information gathered by the Agency is easily assessable and understood and of use to all the interested parties.

 The AQA"s activities don"t contradict with the activities of Federal Service of Supervision but make a greater contribution in the development of accreditation and quality assurance approaches. The place and interrelation of both systems: federal and independent are depicted on picture.1.

The changes and seeming contradictions of Russian higher education system are stipulating that fact that Russian higher education system is becoming a part of global educational system. The facilities of higher education institutions should meet the requirements of modern economic environment.

1.2 THE BOLOGNA PROCESS GOES EAST

Over the past 15 years, the Bologna Process (BP) has evolved from being a pan-European project to a significant regional reform of higher education which exerts its influence beyond the borders of Europe. Initially other regions, such as North America, observed this re-organization of Europe's higher education structure with some scepticism, but more recently, the creation of a European Higher Education Area (EHEA) and a European Research Area (ERA) has increased the interest across the world, especially Asia. The Association of Southeast Asian Nations (ASEAN) and ASEAN+3 (China, Japan and the Republic of Korea) have been observing the development of the Bologna Process and viewing the Bologna Process, EHEA and ERA as a useful model for their regional higher education reforms. Japan and China have participated in all three Bologna Policy Forums since 2009. These countries also fear that the 'attractive' European higher education region will expand its links to ASEAN to the detriment of their position in ASEAN and in the international marketplace[29].

The Bologna Process has inspired the ASEAN ministers to set an ambitious plan in 2008 with an aim to achieve greater regional harmonization involving 6500 higher education institutions and 12 million post-secondary students (ICEF 2014)—about the same size as the EHEA. The region began a process of building a 'Common Space for Higher Education' contributing to the establishment of the ASEAN Economic Community. The European Union (EU) has been supporting the ASEAN regional integration process and education is one of the top priorities in the interregional EU-ASEAN dialogues. These developments raise important questions: Through which mechanisms do the Bologna ideas and policy instruments become a model for the regionalisation of ASEAN higher education? Why does ASEAN regional higher education matter to the EHEA and vice versa? What are the differences of the 'ASEAN common space for higher education' and the EHEA?

Most regional studies on ASEAN and the EU favour the theory of policy diffusion, which describes the EU-style institutions as a putative paradigm for

ASEAN regional integration. Some scholars in educational sociology also claim that regionalisation of higher education in Asia aspires to replicate the Bologna Process in the form of 'capacity building' for direct export of the European Bologna model. For example, since 2011 the EU has allocated a total budget of Euro 9 million to support the "Intra-ACP Academic Mobility Scheme", which sets up university consortia and facilitates student and staff mobility within Africa and in the Caribbean and Pacific regions. Similarly, in early 2014 the EU also launched a project called "the European Union Support to Higher Education in ASEAN Region (EU SHARE)" with a budget of Euro 9.6 million. This programme will support ASEAN to develop regional frameworks of quality assurance, qualifications framework and credit transfer. Through the incentive and professional socialisation, the EU will share its experience and expertise on the Bologna Process and the development of the EHEA.Non-state international organisations often play an important role in this mechanism, for example the European University Association (EUA) and the European Network of Quality Assurance in higher education (ENQA) are active promoters of the Bologna model in and outside Europe. The Bologna Policy Forum, Tuning (China, Japan, Russia, Latin America, USA, Africa) and the ASEM education forum are examples of such influential political dialogues[30].

2. Education System in China

2.1. Introduction into the system of higher education in China

Higher education (高等教育gaodeng jiaoyu)

Higher education is offered at institutions that call themselves 'university', 'college' or'school'. These include degree-awarding institutions (including several hundred research institutes), specialised institutions, professional universities, military institutions, medical schools and colleges (both regular and military), and executive training schools, which train staff for state-run companies and ministries.

Since 2008 official legislation made it possible for all independent colleges (独立学院, dulixueyuan) to issue their own diplomas and bachelor's degrees. Before that date the university they cooperated with would issue the diploma and the degree. The programmes of the independent colleges are considered to be equal to the ones offered in regular higher education in China. In 1991, the first recognised independent college was established. Currently there are about 292 recognised independent colleges as per 19/6/2013. This kind of education institutions cooperate with well known universities, private organizations or private investors and does not obtain any governmental funding.

Furthermore, the tuition fees for the students are higher than for students at regular higher education institutions. According to law, independent colleges must offer programmes at minimally the level of 4-year, professionally oriented undergraduate programmes, they are not allowed to offer zhuanke programmes. The programmes offered are very popular with the students: English, computer science, international economy and business, etc.

Admission to these independent colleges is through the national entrance examination for higher education, similar to regular higher education institutions. The scores required for admission are however lower than those required by the universities. Further information on the official legislation, including a list of independent colleges can be found at the website of the Chinese government. See under Addresses[31].

Institutions that operate directly under the supervision of the Ministry of Education are the most prestigious (such as Peking University and Tsinghua University). The concepts of 'college' (学院 xueyuan) and 'university' (大学 daxue) are sometimes used interchangeably, yet 'college' usually implies a less prestigious institution than a university. The Chinese word for 'university' (大学 daxue) is sometimes also translated as 'college'.

In 1992, the Chinese government introduced 'Project 211' (211工程211 gongcheng). The number '21' represents the 21st century, and the '1' stands for the 100 institutions selected for participation in the project. The aim of Project 211 is to improve the quality of education at 100 institutions to such an extent that they

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satisfy the highest international standards. As national examples, these institutions will then play a key role in China's social and economic development and receive financial support from the government for better facilities, equipment, and staff. A list of Project 211 institutions can be found further along in this document. The number of participating institutions fluctuates a great deal, partly due to the many recent mergers taking place in Chinese higher education. The list recently counted 112 institutions.

In 1998, the Chinese government introduced 'Project 985' (985 工程985 gongcheng) both as part of and as a follow-up to Project 211. The project awarded a number of prominent institutions participating in Project 211 additional financial support from the government, with the aim of generating first-class research institutes able to compete worldwide in terms of knowledge and technology. The 39 institutions on the Project 211 list marked with are also part of Project 985.

Of the approximately 1000 private (民办 minban) Chinese higher education institutions, 388 are currently recognised (as of 23 May 2011). These institutions are allowed to award diplomas independently, whereas students of non-recognised private institutions must take part in the national independent learning examination at the end of their course in order to obtain an officially recognised state diploma. So far, 79 of these 388 private institutions are authorised to award their own bachelor's degrees recognised by the Chinese Ministry of Education at the end of a 4-year programme.

An overview of private institutions can be found at the website of the Ministry of Education. See under Addresses. The Private Education Promotion Law of 28 December 2002 (which came into force on 1 September 2003) made it possible for foreign institutions to offer programmes in China through joint ventures with Chinese higher education institutions. The Ministry of Education publishes a list of recognised degree programmes offered through joint ventures with foreign partners. See under Addresses. This system has made it possible for Chinese students to obtain an foreign degree in their own country[32].

University education

In 1980, the Regulations of the People's Republic of China on Academic Degrees were passed by the Chinese government. These regulations distinguish between the three academic degrees of Bachelor, Master and Doctor. Students must complete entrance examinations for each level.

Bachelor

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A bachelor's degree (学士学位 xueshi xuewei) is awarded at the conclusion of a 4-year undergraduate programme (benke) at a higher education institution; the nominal length of programmes in Medicine, traditional Chinese Medicine, Architecture and some Engineering and Music programmes is 5 years. Students who graduate receive two documents: a diploma, and a certificate of degree conferment, signed by the Committee for the Evaluation of Academic Titles. In some cases no degree certificate is awarded, for example because the student failed the Chinese College English Test (CET) (possibly more than once), did not finish his/her final paper or did not obtain the required CGPA. Another possible reason is that there is no bachelor's degree associated with the programme. Since 1984, institutions have offered the possibility to complete a second bachelor's programme, which often takes 2 years. Students who already have a bachelor's degree are eligible to sit the entrance examination for these programmes

Master

A master's degree (硕士学位 shuoshi xuewei) takes 2 to 3 years to complete, half of which is devoted to coursework (on which students are examined) and the other half to writing the final paper. Admission is granted based on a bachelor's degree and an entrance examination. Candidates may not be older than 35 years of age. Students who only successfully pass the coursework section receive a Certificate of Graduation (biye zhengshu), but no certificate of degree conferment. Master's degrees can be awarded by either higher education institutions or research institutes. The Chinese-Foreign cooperation is also an important part of the Chinese education system, offering master's degrees of Chinese institutions in cooperation with a foreign institution. In general, the Master of Science, Master of Arts, Master of Engineering and Master of Economics are conferred. A separate category of master's degrees is the professional Masters; examples are Master of Law, Master of Education, Master of Clinical Medicine, Master of Stomatology, Master of Public Health, Master of Fine Arts, Master of Social Work, Master of Translation, Master of Physical Education, Master of Business

Administration, and Master of Accountancy.

Equivalent educational background (同等学力 tongdeng xueli) Through an alternative pathway in the framework of lifelong learning, it is also possible to apply for a master's degree, The student must possess a bachelor's degree and at least 3 years of relevant work experience, Furthermore the student needs to submit published research articles. The student needs to pass a national examination in foreign language and in research methods and examinations in curricular subjects to be determined by the university itself. The student then receives exemptions based

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on skills already obtained in the field of education, research, and specific professional knowledge[33].

Finally the student must write a Master thesis. After passing all the examinations and successfully completing the thesis, the student obtains a master's degree certificate and a transcript with the completed examination subjects. A certificate of graduation is not issued in these cases. In these cases, the letter T is placed before the reference number on the degree certificate. This procedure is – mutatis mutandis – also applicable for applying for a PhD degree.

PhD

Admission to a Doctorate (博士boshi) programme requires a master's degree, an entrance examination and recommendations from at least two professors or (senior) lecturers in the field. Candidates should not be older than 40 years of age when commencing the programme. Candidates without a master's degree may still gain admission via an entrance examination. Doctorate programmes take 3 to 5 years to complete, including 1 year containing only coursework, as well as a doctoral thesis. There is an entrance examination comprising political theory (Marxism), the relevant subject area and two foreign languages. Recently it has become possible to take a combined master's/PhD programme, in which students are neither awarded a separate master's degree nor required to sit an entrance examination to be admitted to the doctorate programme (硕博连读). At the end of the programme, the boshi degree is awarded with the accompanying diploma. Only outstanding students are eligible for this programme.

Higher professional education

As previously mentioned, there are also study programmes in Chinese higher education that do not culminate in an academic title. Such programmes usually take 2 to 3 years, and are offered by universities and other higher education institutions. These non-degree programmes, which are more practically-oriented than bachelor's degrees, are called zhuanke in Chinese. It is possible to continue on to a bachelor's degree after a zhuanke by completing an additional 2 to 3 years of study (after a 3 or 2-year zhuanke, respectively). This pathway is called 专升本 zhuanshengben in Chinese: upwards from a zhuanke programme to a benke programme[34].

2.2. Graduate system at the CIT and LUT universities

Electrical Engineering.Full-time academic postgraduate education plan

(Discipline code: 0808   granted degree: master of technologies)

1 Objective of education

High-level specialized talents should be educated in the field of electrical engineering, who should have solid knowledge of basic theory and wide range of professional knowledge, understand theoretical research on this discipline and have the knowledge of cutting edge technology for engineering, who should be capable of theoretical analysis, research through test and development application, who should be powerful in analyzing and resolving actual issues related to engineering, who should be suitable for electrical engineering and related fields in term of teaching, scientific research, design, development and management, who should be well grown spiritually, mentally and physically[35].

Particulars of requirements of academic postgraduates are as below:

(1) Well informed of important thoughts of Marxism-Leninism, Mao Ze Dong Thoughts, Deng Xiao Ping Theory and "Three represents", supporting basic line, policy and strategy of CPC, building up correct worldview, philosophy of life and values, loving the state, abiding by laws and regulations, strongly devoted to business and showing responsibility, good in moral quality and academic education, excellent in character and education, and proactively devoted to servicing the construction of socialist modernization.

(2) Having solid knowledge of basic theory and wide range of professional knowledge, well informed with tendency of academic development of electrical engineering first-level discipline, having advanced technology to solve electrical engineering specific issues, and knowledge of modern management

(3) Capability of scientific research will be systematically cultivated and trained, having awareness of innovation and pioneering, and capability of innovation, capable of performing discipline research on electrical engineering or independently undertaking specialized subject in the field of electrical engineering

(4) Good knowledge of a foreign language is mandatory, able to easily read scientific literature related to this discipline, skillful in listening, speaking, reading, writing and translation

(5) High level in basic quality: Excellence both in morality and learning is, having both ability and political integrity, paying attention to the interests of the whole, broad minded and enriched in innovation and creation, physically and mentally health, friendly in communicating and cooperating with others

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2 Direction of research

As supported by electrical engineering and automation, intelligent power grid information engineering, automation and electronic information engineering over 16 years, electrical engineering first-level discipline has developed and grown as key first-level discipline to be constructed in Jilin province. Electrical power system automation second-level discipline is key discipline in Jilin province, where three different directions of research have been developed[36].

2.1 Monitor and control of electrical energy quality of power distribution network

This research is based on electrical engineering second-level discipline electrical power system and automation, and profoundly integrated with computer science and technology, information and communication engineering, control science and engineering, where intelligent control technology, detection technology, information processing technology and computer technology are utilized to execute monitor and coordinated control of electrical power system. In the end, automated detection, autonomous decision and intelligent control will be realized to ensure safe, steady and reliable operation of electrical power system.

2.2 High efficiency of energy utilization and technology to save energy and reduce consumption

This research is based on modern control theory. As supported by computer, digital signal processor and microelectronic technology, intelligent control technology, detection technology, information processing technology and computer technology will be utilized to control power semi-conductor switches to execute electrical power conversion. This will provide all power loads and actuators among modern industry with highly efficient power supply and motor driven speed governors system with high quality and high performance[37].

2.3 Intelligent micro-grid and new energy power generation technology

This research mainly focuses on regenerative energy power generation industry which is one of national strategically new energies, where research on critical technology will be carried out in the aspects of control, operation, maintenance, testing, fault diagnosis and reliability of large-scale wind power generators at MW level, win-power and solar-power storage and intelligent micro-grid, and talents will be cultivated.

3 Education system and credit

In general, postgraduate for academic degree is 3-year education system

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Course is subject to credit system. Credit to be obtained by postgraduate should not be lower than 38 points.

4 Education mode

(1) Combination of tutorial system and academic group, where tutor guiding to postgraduate should be fully demonstrated

(2) Self-learning, discussion, and inspiration will be adopted with the focus on students' capability of self-learning and research.

5 Course learning

5.1 Course system

Course learning for postgraduate is based on credit system. It is mandatory that 1 point is obtained wen 16-hour theoretic course is completed. Particulars of courses are given in attachment.

5.2 Personal learning plan

Personal learning plan should be determined in consultation with tutor and submitted within 3 weeks of entry. Such plan should include: 14 points for fulfillment of degree course, out of which is 4 points for public basic courses and 10 pints for specialized basic courses, 7-9 points for non-degree courses, out of which is 2 points for specialized skills, 5-7 points for selective courses, and 7 points for compulsory courses, where it is 4 points for discipline practicing, 1 point for proposal, 1 point for middle-term thesis assessment and 1 point for comprehensive competence

5.3 Way of teaching and assessment

Degree courses will be taught by classroom teaching and discussion. Assessment will be conducted by shut-book examination. Final examination will contribute 80% of the score and usual performance will contribute 20%. Compulsory courses of non-degree courses will be taught in classroom and discussion. Assessment will be made by shut-book examination. Final examination will contribute 80% of the score and usual performance will contribute 20%. Selective courses of non-degree courses will be taught in classroom and discussion. Assessment will be made by report or open-book examination. Report or final examination will contribute 80% of the score and usual performance will contribute 20%.

6 Academic dissertation

Academic dissertation is important part of cultivating postgraduates. Dissertation can fully train the postgraduates to form prudent style of study, obtain basic

methods of scientific research, independently perform scientific research and comprehensively utilize learned knowledge to discover and resolve issues[38].

6.1 Topic choosing and research plan

To ensure the quality of academic thesis, the tutor should define the range of topics for each postgraduate as early as possible by guiding students to choose the topics through reading literatures, investigation and research, and establishing detailed research plan. When conditions permit, postgraduates should be encouraged to participate in scientific research program undertaken by the tutor. Topics to be chosen should show high start point, new point of view and perspective, and make certain sense in term of theory or application.

6.2 Proposal

Proposal should be executed in writing and recitation to cover the topics of thesis. However, postgraduate cultivation form should be downloaded and filled one week ahead of time.

Normally, the contents of postgraduate proposal should show sources of project and basis for project, read, analyze and summarize 40-70 relevant literatures from home and abroad over the last 15 years, and determine research program. Research program includes: statement of objective of research, contents of research, key points and innovative points, research procedure, technical routine and test programs. The basis for research work should explain required conditions, possible difficulties to be encountered during research, possible solutions and measures. In the end, work plan and time schedule should be defined for research work.

For proposal meeting, minimum 5 scholars with background for associate professors or better position or the persons holding doctor degree must attend this meeting. They will review and give comments. Postgraduates who fail for 1 or 2 times will be subject to corresponding procedures.

6.3 Review of academic dissertation

The college of postgraduate implements academic dissertation review and review random inspection system. Each year, the college of postgraduate will make random inspection of academic dissertations. The remainder of the papers will be subject to random inspection or reviewed according to procedures specified by college of postgraduate. All the academic dissertations organized for review by college of postgraduate are randomly selected papers subject to "double blind" review, that is, author of the thesis, its tutor and comments by evaluation expert will not be shown during such thesis review. Hence, two-way confidentiality is generated during thesis review between author of thesis, its tutor and evaluation expert. Papers to be

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reviewed by this college, when fallen in range of random inspection, should be submitted according to "double blind" criteria of college of postgraduate. The remainder of the academic dissertations will be reviewed in anonymous followed by procedures at college of postgraduate.

6.4 Dissertation defense

To ensure the quality of academic dissertations, postgraduates are required to submit initial draft before defensing the dissertations submitted for defense. In the meanwhile, pre-defense should be given by recitation. Pre-review of postgraduate thesis to be submitted for review will be internally organized by the discipline. The results of pre-defense should be reported to college for registration.

Academic dissertations must be systematically completed academic dissertations, and must be completed independently by the students. Wording and phrases in academic dissertations should be simple, concise, smooth, reliable data, clear graphs, and can precisely and accurately express research achievements. The conclusions should be true and practical.

One of following conditions must be satisfied before the applicant for master degree applies for master degree: (1) more than one thesis published in shared signature on public journal at home and abroad (student is first author, tutor is participant, or tutor is first-level author and student is level-2 author) (2) more than one thesis published in shared signature at important academic conferences at home and abroad (student is first author, tutor is participant, or tutor is first-level author and student is level-2 author).

Defense should be implemented according to "Bylaw of implementation of granting master degree of Changchun Institute of Technology" when students complete all cultivation processes and pass pre-review for the thesis[39].

3. Russian system of education

3.1 Introduction into Master's education in Russia

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Federal Law №273 on education (2012) provides the core legal framework for the Russian education system. The Federal Ministry of Education is the executive body responsible for the formulation and implementation of education policies at all levels. Under its purview is the Federal Education and Science Supervision Agency, which is tasked with the supervision and quality control of education institutions. Regional Ministries of Education are responsible for policy implementation at the local level.

University Admissions

Until recently, Russia's universities made independent admissions decisions, and did not necessarily factor in EGE performance. In 2009, however, the Russian government decided to make the use of the EGE in admissions mandatory. The impetus was twofold: to fight corruption in academic admissions, and to widen participation in higher education.

The introduction of the EGE sought to take admissions decisions away from the universities, and replace them with objective external criteria.

The EGE also facilitates broader access to higher education. Before the introduction of the EGE, applicants often had to travel to universities across the country to sit for institutional entrance exams – a costly and time-intensive process that has now greatly improved.

Tertiary Degree Structure

Prior to the introduction of the Bologna three-cycle degree structure in 2003, tertiary education in Russia consisted mainly of long single-cycle degree programs of five to six-year duration leading to the award of a "Diploma of Specialist," followed by a doctoral research degree called Kandidat Nauk (Candidate of Science). In 2007, the single-cycle Specialist program was replaced with a two-cycle degree system consisting of an undergraduate Bakalavr (Bachelor) degree, and a graduate Magistr (Master) degree in many fields of study. In these fields, Specialist degrees are being phased out, and the last waves of students studying under the old structure are currently reaching graduation. However, implementation of the two-cycle Bakalvr/Magistr system, has not been mandated across the board, and long Specialist degrees continue to be awarded in a number of fields, including the professions and technical disciplines. The three degrees still in common circulation are thus:

Bakalvr: Baklavr degrees in Russia are always four years in duration (240 ECTS credits). (In other European countries the length of Bachelor degrees varies between three and four years.) Bakalvr degrees are awarded in a wide variety of disciplines

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and require completion of a thesis (prepared over a time period of four months) and passing of a final state examination in addition to coursework. Admission is based on EGE results in disciplines related to the major of the program.

Magistr: Magistr degrees are research-oriented graduate degrees that are always two years in length (120 ECTS). Programs conclude with the defense of a thesis and state examination. Admission requires a Baklavr degree, but universities are free to set additional admission requirements, including entrance examinations and interviews. Bachelor graduates that completed a degree in a different field of study generally have to pass an entrance exam to demonstrate proficiency in the intended area of study. Holders of Specialist degrees are also eligible for admission.

Specialist Degrees: Specialist programs are at least five years in length and involve state requirements of approximately 8,200 hours of instruction, a thesis and state examination. Programs lead to the award of the "Diploma of Specialist" and are generally considered to be professionally rather than academically oriented, although the Specialist degree has the same legal standing as the Magistr degree and gives full access to doctoral programs.

Specialist degrees continue to be primarily awarded in professional and technical disciplines, which, in the case of Russia, include common professional disciplines like law, engineering or medical fields, as well as disciplines, such as astronomy, cinematography or computer security, for example.

European Credit Transfer and Accumulation System (ECTS) credits are used in Baklavr and Magistr programs, but, as of now, rarely in Specialist programs. The ECTS grading scale, as well as a new 0-100 grading scale, have been introduced in recent years, but are generally not used on state format academic transcripts, which continue to be issued using the standard 2 to 5 grading scale. Degree programs at both public and private universities conclude with a state examinations and the defense of a thesis in front of a State Attestation Commission.

Diploma Supplements existed in Russia prior to the Bologna reforms, and are still issued for all Russian tertiary degrees

3.2. Graduate system at partner universities from Russia in electrical engineering

Electrical engineering in Russia is governed by Federal State Educational Standards which includes several specializations:

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Master degree programs, direction of training 12.04.01 Instrument engineering and 140400 Electrical power engineering and electrical engineering by the higher educational institutions of professional education (higher educational institutions, universities), accredited on the territory of the Russian Federation.

Master Degree in Electrical power and electrical engineering is training for the following types of professional activity:

– design and engineering;
– production-technological activity;
– organizational and managerial activity;
– research;
– installation and adjustment;

The sphere of master's professional activity includes a set of technical means, methods and methods of human activity for the production, transmission, distribution, transformation, application of electrical energy, control of energy flows, the development and manufacture of elements, devices and systems that implement these processes.

Objects of masters' professional activity are:

– electric stations and substations;
– electric power systems and networks;
– systems of power supply for engineering and economic sectors;
– electric power, electrotechnical, electrophysical and technological installations of high voltage;
– devices of automatic control and relay protection in electric power industry;
– power plants, power plants and complexes based on non-traditional and renewable energy sources;
– electric machines, transformers, electromechanical systems and systems, including their control and regulation;
– electric and electronic apparatuses, complexes and systems of electromechanical and electronic devices, automatic devices and energy flow control systems;
– electric insulation of electrical devices, cable products and wires, electric capacitors, materials and electrical insulation systems for cables, electric capacitors;

- electric drive and automation of mechanisms and technological complexes in various branches of the economy;
- electrotechnological installations and processes, installations and devices of electric heating;
- various types of electric transport and means of ensuring the optimal functioning of transport systems;
- elements and systems of electrical equipment for cars and tractors;
- ship automated electrical power systems, converter devices, electric drives of power, technological and auxiliary installations, their automation systems, control and diagnostics;
- electric power systems, converter devices and electric drives of power, technological and auxiliary installations, their systems of automation, control and diagnostics on aircrafts;
- electric economy of industrial enterprises, all factory electrical equipment of low and high voltage, electrical installations, networks of enterprises, organizations and institutions;
- normative and technical documentation and standardization systems; methods and means of monitoring the quality of electricity, electrical products, electrical and electrical power systems, electrotechnological installations and systems.

The content of higher education in the direction of training is determined by the master's program developed and approved by the Organization. When developing a master's program, the Organization sets requirements for the results of its development in the form of universal, common professional and professional competences of graduates (hereinafter referred to as competence).

When implementing the Master's program, the Organization is entitled to apply e-learning, distance educational technologies.

E-learning, distance learning technologies used for training of disabled people (hereinafter disabled persons) should provide for the possibility of receiving and transmitting information in forms accessible to them.

Implementation of the master's program with the use of exclusively e-learning, distance educational technologies is not allowed.

The Master's program is implemented by the Organization both independently and through a network form.

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The term of receiving the Master's degree (regardless of the applied educational technologies): full-time education, including holidays, provided after the state final examination is 2 years; part-time it increases not less than 3 months and not more than half a year in comparison with getting full-time education; when training according to the individual curriculum of disabled people the term can be increased in accordance with their application for not more than six months in comparison with the period of education, established for the appropriate form of training.

The amount of the master's program is 120 credit units (hereinafter referred to as "CU") regardless of the form of training, the applied educational technologies, the implementation of the master's program using the network form, the implementation of the master's program according to the individual curriculum.

The amount of the Master's program, realized in one academic year, is not more than 70 CU. regardless of the form of education, the applied educational technologies, the implementation of the master's program using the network form, the implementation of the master's program according to the individual curriculum (with the exception of accelerated training), and with accelerated training - not more than 80 CU.

The Organization independently determines within the time limits and volumes specified in paragraphs 1.8 and 1.9 of FSES HE: the time period for obtaining a master's degree full-time or part-time, as well as the individual curriculum, including accelerated training; the volume of the master's program, which is realized in one academic year.

Areas of professional activity and (or) spheres of professional activities in which Master degree graduates (hereinafter - graduates) can carry out a professional activity:

Manufacture of electrical equipment, electronic and optical equipment (in the field of scientific research of transmission, processing, detection and measurement of signals, modeling of work and experimental research, creation and development of a variety of techniques and equipment that use energy and information transmission of various physical nature, and complexes of electronic and optical equipment for various purposes);

Open types of professional activity in industry (in the field of organization and management of scientific research and development, technical control of products);

The sphere of research and development of scientific and analytical instrumentation.

Graduates can carry out professional activity in other areas of professional activity and (or) spheres of professional activity, provided that the level of their education

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and the received competencies correspond to the qualification requirements of the employee.

4. Master programs in electrical engineering in UTBM, OVGU and UNIVAQ

UTBM

The University of Technology of Belfort-Montbéliard (UTBM) is a Grande Ecole university of engineering located in Belfort and Montbéliard, France. The University of Technology of Belfort-Montbéliard is part of the network of the three universities of technology[40].

The UTBM is authorized by the Ministry of Higher Education and Research of France to issue the following engineering degrees:

• specialty automation, electronics and industrial computing

• computer specialty

• mechanical specialty

• specialty production systems

• mechanical specialty, design and ergonomics

As well as

• electrical engineering specialty

• industrial logistics specialty

• specialty information systems

• specialty mechanical design

in training by apprenticeship and in partnership with the ITII of Franche-Comté.

UTBM has following Master Programs:

• Professional Master International Business Affairs (A2I)

• Research Master History of Economies and Industrial Societies in Europe

• Research Master Algorithmic, High Performance and Modeling

• Research Master Electrical Energy

• Master E-Thermal Engineering and Energy

• Sino-European Industrial Management Master (SEIM)

Within the framework of the INSPIRE project, it is planned to use a number of courses that are read at the university, the basis of which will be given by the directions for master's training Master E-Thermal Engineering and Energy and Master of Electrical Energy.

These directions are rather close in structure and composition of the projected master's program.

The goal of these two programs is to train high-level executives in the energy and electrical engineering field.

At the end of these master programs the student will have skills in:

• Design, modeling, optimization and management of thermal systems (systems industrial, habitat-related, cogeneration)

• Mastery of new technologies in energy and renewable energies and energy efficiency

• Mastery of tools and methods for digital engineering in thermal and fluid mechanics

• Energy business management

• Mastery of advanced fluid mechanics and advanced thermodynamics

• Ability to model a multiphysics system

• Taking into account legislative, economic and environmental constraints

• Project management and teamwork

• Organization workflow with an adaptation to an ever-changing environment

• To control the energy production systems, in particular of renewable origin or using the hydrogen-energy vector,

• Model multiphysics systems, in order to manage energy flows,

• Master electrical micro-grids and storage systems for electrical energy;

• Control the electrical or hybrid electric propulsion systems of land vehicles (rail or automobile);

• Design electric actuators, electrical drives and fuel cell systems.

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- Take into account the legislative, economic and environmental constraints.

- Manage projects and work as a team.

- Understand the issues of reliability, reliability, availability and life of electrical systems

- Describe the operation principles and constraints of an electric power system

- Describe and compare the various types of electricity markets and contracts

- Energy dissipation reduction of computing systems

- Describe the structure of a typical power system

- Design a basic protection scheme and configure a protection relay

- Perform frequency and voltage regulation with a synchronous generator

- Calculate the power, motor and embedded storage in an electrical vehicle

Students can choose disciplines for the modules from the following list:

1st year

- Electrical engineering

- Electric machine

- Analog electronic

- Thermodynamics for energy

- Industrial data

- Mechanics of solids and structures

- Mathematical tools for the energy engineer

- Programmable controllers

- Slave systems: continuous aspect

- Advanced identification and control of electrical energy systems

- Converters-machines combination: simulation, design, control

- Guided and wireless transmission systems: application to EMC

- Renewable energy: design and control

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- Supervision and management of production fleets

- Power system analysis and control

- Methodology of renovation of buildings

- Energy economics

- Systems Engineering-Project Management.

- Rapid Prototyping - Data Acquisition - Supervision

- Electric and hybrid transport systems

- Intelligent building management

- Tutored project 3rd year

- Development project

- Real-time control of energy converters

- Industrial project

- Research project

- Long-term professional internship

- Project Graduation

- Electric machine

- Power electronics 1

- Electronic design techniques and tools

- Design and dimensioning of industrial electrical installations

- Thermal building and materials for electrical energy

- Measurements and sensors

- Introduction to Matlab - Simulink

- Slave systems: continuous aspect

- Sampled systems and state representation

- Thermal transfers, fluid mechanics

- Power electronics 2

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- Electromagnetic Compatibility (EMC) - Theoretical and Practical Approach

- Hydrogen and fuel cells for energy systems

- Quality of electrical energy

- Power plants: fundamental principles

- Renewable energy: principle and technology

- New positive energy construction

- Energy storage

- Energy management: Iso50001, 50006 and 50015 standard

- Interdisciplinary research

- Virtual instrumentation

- Systems Engineering-Project Management

- Embedded Systems Technology

- Development project

- Industrial project

- Research project

- Long-term professional internship

- Project Graduation

2nd year

- Graph Theory and Applications

- Information system

- Operating System: Principles and Communication

- Fundamentals of object-oriented programming

- Algorithmic and programming

- Multicore and parallel computing

- Multimedia / Web programming

- Architecture of computer systems

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- Theoretical foundations of computer science

- Foundations in algebra and analysis

- Introduction to networks / Routing and switching essentials

- Multidimensional data analysis and datamining

- Advanced algorithms

- Business intelligence & data warehouse

- Multi-agent systems and distributed problem solving

- Processing and analysis of digital images

- Pattern Recognition

- Database Administration

- Mobile computing and short-range communications

- Java Enterprise Applications Architectures and Development Frameworks

- Broadband networks

- Security of computer systems

- Tutored project 3rd year

- Principles and techniques of telecommunications

- Development project

- Modeling and control of real-time systems

- Industrial project

- Research project

- Vision and virtual reality

- Long-term professional internship

- Project Graduation

- Optimization and operational research

- Information system

- Man / machine interface and perception

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- IT projects and source code management

- Artificial Intelligence: Fundamental Concepts and Dedicated Languages

- Analysis and signal processing

- Operating System: Principles and Communication

- Fundamentals of object-oriented programming

- Security of computer systems

- Numerical analysis and splines

- Statistics for the engineer

- Database design

- Process and quality of the software

- Software engineering

- Artificial intelligence for serious game

- Synthesis of images

- Interdisciplinary research - level

- Positioning systems: techniques and application

- Java Enterprise Applications Architectures and Development Frameworks

- Systems for embedded computing

- Mathematics for the image

- Distributed algorithms and protocols

- Interconnection of networks

- Mobile networks

- Embedded Systems Technology

- Development project

- Industrial project

- Research project

- Long-term professional internship

- Graduation project

OVGU

Master's Degree in Electrical Engineering and Information Technology at the Faculty of Electrical Engineering and Information Technology at Otto von Guericke University is a non-consecutive degree program, which is assigned to the profile type "more research-oriented". During the master programme the students acquire knowledge and skills in advanced electrical and information technologies[41]. The curriculum includes compulsory modules, elective modules and elective modules. The teachers determine independently within the framework of valid regulations the discipline-specific proportions of the different types of teaching of their modules. The following regulations must be observed:

The study comprises a total of 120 CP. Of this, 40 CP are for compulsory modules, 50 CP for compulsory elective and 30 CP for final master thesis.

They make it possible to pursue individual inclinations and interests within the chosen field of study as well as to take into account subject-specific requirements of students' later field of activity. The list of compulsory elective modules will be changed according to the development and availability of teachers and adapted to the curriculum of the faculty. At the request of the student to the examination board, further modules of all faculties of the Otto von Guericke University can be recognized as elective subject with the agreement of the student advisor.

Elective modules are all modules which the students choose from modules of Otto von Guericke University, in addition to the compulsory and elective modules required to complete their studies. Students can take an exam in the elective modules. The result of this test is not taken into account when determining the overall grade. Upon request, it will be included in the certificate.

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Technical compulsory modules

- Enrolment: All modules
- Electromagnetic Field Theory.
- Electronic Circuits.
- Digital Communication Systems.
- Digital Information Processing.
- Power Electronics.
- Power Network Planning and Operation.
- Systems and Control.

Non-technical compulsory modules

Enrolment: All modules

Technical elective modules

Enrolment: Choice of modules according to the regular curriculum. Technical elective modules can be chosen from the list given in the catalogue of elective modules, whereby it is recommended to put a focus on one of the subject areas

Automation Systems

- Distributed Control Systems
- Automotion Lab
- Non-linear Control
- Process Control

Structure and Behaviour Modelling - UML

Information and Communication Technology

- Introduction to RF Communication Systems.

- Image Coding.

- Medical Imaging – CT.

- Speech Recognition.

- FPGA and Microcontroller Programming.

- Theoretical Neuroscience II.

- Mobile and Satellite Communication Systems.

- Advanced Antenna Theory.

- Digital Information Processing Laboratory.

Microsystems

- CMOS Si Process.

- Sensors.

- Microsystems.

- Optoelectronic and Photovoltaic Devices.

- Ultrasonic Sensors for Imaging.

- Introduction into Medical Imaging.

- MEMS Technologies.

- Packaging for Microelectronics and Microsystems.

Power and Energy

- Modern Concepts of EMC and EMC Measurements.

- Advanced Power Electronics.

- Power Electronic Components and Systems.

- Renewable Energy Sources.

- Power System Economics and Special Topics.

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General

- Integrated Project.

UNIVAQ

Electrical Engineering is a branch of engineering that applies principles of engineering, basic and applied science, for modeling, analysis, design, and realization of electrical systems, plants, machines with a special focus on renewable energies. Master's Degree in at the Faculty University of L'Aquila is an academic degree with a strong professional orientation, according to International and National Directives on Engineering Professions.

Electrical engineering curriculum prepares students to work professionally in the field of design of electrical plants and industrial automation. Electrical engineering is one of the oldest and broadest engineering disciplines. Master program has a strong scientific component in an interdisciplinary learning context and is developed in a stimulating research environment. Students have a 3/6-months placement in companies in Italy and/or abroad for on-field working experiences and research activities. The study comprises a total of 120 ECTS-credits. The following content of disciplines must be observed:

Electric Systems for Mobility

- General aspects of traction system
- Traction motors and drives
- AC and DC railways
- Electric and hybrid vehicles

Electrical Automation

- Electrical motors & drives
- Motion control

- Sensors & transducers
- Simulation of drives
- Micro-controllers for automation

Electrical Drives

- Introduction to adjustable speed drives
- Steady state Electrical Machines models: DC Motors, Induction Motors,
- Synchronous Motors
- Stationary and rotating reference models
- DC Motor speed control and multi-quadrant operation. Separately excited DC
- Motors: armature voltage control, armature current control, field control
- Induction Motor speed control: variable voltage, constant voltage/frequency
- control, current control, flux weakening operation, vector control
- Synchronous Motor, Permanent Magnet Motor, Reluctance Motor speed
- vector control
- DC Converters: rectifier and chopper
- DC Motor Drives: single and multi-quadrant drives
- AC Converter: voltage source inverter. Six-step inverter and PWM inverter,
- modulation techniques, current control
- Speed control AC Motor Drives: voltage/frequency control and field-oriented control
- AC Motor operation with non-sinusoidal supply waveforms

Electrical Energy Systems

- Electrical energy fundamentals
- Environmental impact of electrical energy systems
- Renewable Energy Sources (RES)
- Thermal power plants

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- Hydroelectric plants

- Wind energy

- Solar energy

- Dispersed generation

- Open access electricity market

- Energy efficiency and energy management

- Power quality

Electrical Machines Design

- General considerations on the design of the electric machines. Specifications. Machine design criteria. Sizing equations. Construction of the electrical machines. Materials employed in the construction of the electrical machines. Magnetic analysis, losses and thermal analysis.

- Design of traditional electrical machines for standard applications: design of three-phase transformers and Induction motors.

- Design of electrical machines for electrical drives for industrial, automotive and aerospace applications: brushless PM motors, synchronous reluctance motors, switched-reluctance motors, PM linear synchronous motors, axial-flux PM brushless motors, fault-tolerant brushless motors.

- Computer-aided-design: innovative tools and techniques for the electrical machines design. Design optimization of electrical machines. Use of software for the electromagnetic field analysis.

- Laboratory of design optimization and Finite Element analysis of electrical machines.

- Visit to Electromechanical Company at the end of course

Electrical Power Systems

- Primary line constants definition and calculation

- Power flows formulation and calculation

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- Voltage control

- Neutral grounding connection of three-phase systems

- Short circuit current calculations

- Power system stability

- Overvoltages in power systems

Electromagnetic Compatibility

- Signal Spectra-the Relationship between the Time Domain and the Frequency Domain

- Multiconductor Transmission Lines and crosstalk

- Shielding

- Radiated Emissions and Susceptibility

- Conducted Emissions and Susceptibility

Measurements and Test of Electrical Machines and Systems

- Measurement techniques and instrumentation for inspections and testing on electrical installations

- Techniques and instrumentation for electrical power measurements on polyphase systems

- Testing of electrical machines

- Insulation measurements

- Power quality measurements

- Electrical energy measurements

Power Electronics

- AC voltage controller

- Line commutated converters

- Transformers for converters

- Chopper

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- Resonant pulse converters

- Inverter

- Power supplies

General

- Master dissertation.

5. Recommendations for teaching content harmonisation

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Globalization in economy, trade and information flows also penetrates the educational system across the world. As such, educational authorities in many countries intensify their internationalization policies, especially in the area of Higher Education. USA and the UK for years have been leading countries in terms of the attractiveness of their educational programs for both local and international students. While Germany and France have also dramatically increased their internationalization indicators, Russia and China have been taking active steps in this process as well. For instance, in 2010 Chinese Ministry of Education published their priorities in the area of export of educational services[42]. Among them are the following:

- To increase the number of international students in China
- To increase the number of governmental scholarship for international students to study in China
- To subsidies research activities carried out by students from developed countries
- To increase the number of degree programs offered in a foreign language in Chinese universities
- To increase the quality of education
- To implement the plans for education Chinese citizens abroad with the goal of increasing academic mobility

Similarly, the committee for strategic development and priority projects working under the supervision of the president of Russian Federation approved a Passport of a Priority project to develop the export potential for Russian education system. The goals are quite similar to those listed by the Ministry of Education of China and those that have been in place in our European partners[43].

These active movements in internationalizations across the countries is one indicator for the need to extend the slogan of the European Union "United in Diversity" to other non-EU partners. There is an urgent need to recognize that widely differing

education and training systems in Europe, Russia and China need to get modernize, become compatible and allow the graduates of all involved countries to freely move in the labor market and develop both regional and international economies. Thus, the first recommendation stems from the fact all partners involved strive towards reaching a shared objective to prepare educational programs and graduates who finish these programs and whose qualifications and expertise match the labor market needs in partner countries. This ambitious goals, among others calls for the need to really analyze the curricula of all partners involved, to find opportunities to enrich local teaching content and introduce improvements to it[44].

The second recommendations stems from the analysis of the provided descriptions of the Bologna process and the systems of education in Russian and Chinese universities. As of now, only a limited number of degree programs recognized by the Chinese Ministry of Education is able to offer joint ventures with foreign partners. Similarly, a handful of Russian universities are authorized to grant their own degrees, and arrange according to their internal regulations the requirements for academic mobility and recognition of credits received from foreign universities. The opportunity to learn from the more experienced European partners both in theory and practice, as well as to introduce the modules, competences and other subject-specific requirements - they all enrich the offerings in China and Russia, while allowing students to get educated in their home countries.

When it comes to more subject-specific recommendations, the strong experience of European partners' degree programs is considered. For instance, the strength of UTBM program in preparing highly qualified specialists in E-Thermal engineering and energy, the expertise of OVGU in Information and communication technology, as well as curriculum of UNIVAQ with its focus on Electrical drives and electrical machine design can contribute to enhancing the diversity, depth and strength of the joint program. All in all, it is essential that both faculty and students get acquainted with the curricula options of all partners involved in the project[45].

The descriptions of compulsory and elective modules, the large list of disciplines that students can choose to make up their core and selective modules to fulfill the degree requirements as well as experience in training by apprenticeship and in partnership with the ITII of France-Comte may significantly enhance the quality of education in partner universities and allow for a more flexible, diverse and global vision for preparing engineering for the 21st century.

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