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Description and Concept of Specific DHEMs of HEIs

Specific DHEM developed at VISER

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ABBREVIATIONS

VISER:	School of Electrical and Computer Engineering of Applied Studies in Belgrade
AR:	Applied Research
MT:	Master Thesis
ECTS:	European Credits Transfer System
DHEM	Dual Higher Education Model
HEI	Higher Education Institution

Objectives

The “Description and Concept of the Specific DHEMs of HEIs” is a deliverable within WP 4 entitled “Pilot testing of the flexible and generic DHEM” of the DualEdu project.

This document describes the concept of specific DHEM developed by VISER and represents a basis for presentation of specific DHEM to companies.

1. Introduction

School of Electrical and Computer Engineering of Applied Studies in Belgrade (hereinafter referred to as: VISER) provides students with three-year undergraduate studies (180 ECTS), as well as two-year master studies (120 ECTS) for further education.

Students may enroll in one of eight undergraduate study programmes: Audio and Video Technologies, Automation and Vehicle Control Systems, Environmental Engineering, Electronics and Telecommunications, Information Systems, New Energy Technologies, New Computer Technologies and Computer Engineering.

Students may enroll in one of three master study programmes: Electrical Engineering, Multimedia Engineering and Computer Engineering.

The School offers a wide range of courses, at all study programmes and both levels of studies, allowing thus everyone the possibility of creating a tailored educational matrix in alignment with their interests.

The studies are divided into two semesters in each academic year with equal workload in both semesters, in accordance with the Bologna process. By passing all exams in a given semester, students obtain a total of 30 ECTS.

Having analysed the educational practice in leading European countries, we have designed a unique Dual Higher Education Model to match the studies at VISER with the real market demands.

2. Implementation of the Dual Higher Education Model

Article 5 of the Law on Dual Higher Education Model (hereinafter referred to as: Law) defines that DHEM may be accredited as a separate study programme or as one of the modules within a study programme. In the process of accreditation of the existing study programme Electrical Engineering (master studies), the stage was set for the introduction of DHEM. It was thereby planned that students, over the course of their two-year studies, should go through practical forms of learning by being directly hired by an employer with whom VISER has an Agreement on Business and Technical Cooperation. Learning through apprenticeship in this study programme is realised in the following:

1. **Internship 1** in the second (summer) semester, in the first year of studies, 180 hours (6 ECTS),
2. **Internship 2** in the third (winter) semester, in the second year of studies, 180 hours (6 ECTS),
3. **Applied Research** in the fourth (summer) semester, in the second year of studies, 240 hours (8 ECTS) and
4. **Master Thesis** in the fourth (summer) semester, in the second year of studies, 480 hours (16 ECTS).

In this way, over the course of their studies, students obtain 120 ECTS, 36 ECTS of which are obtained in the process of work-based learning.

Master studies at VISER are adapted to work-related obligations of students. In this way, students have the conditions of organise practical forms of work-based learning.

Tables 1 and 2 show the list of courses studied at master studies, the number of lectures and practical classes, as well as the corresponding number of ECTS for each of them.

With the introduction of the Dual Higher Education Model, legislation allows for learning through apprenticeship to be realised in the scope of 450 hours of work (minimum) at the annual level. The recommended solution provides students with an opportunity to, during their two-year master studies, learn by working at the employer’s and being hired for a total of 1,080 hours (180+180+240+480).

Table 1. Course structure in the first year of studies

Course	Status (compulsory or elective)	Lectures (no.)	Practical classes (no.)	ECTS
FIRST YEAR				
1st semester				
Research methods	C	2	2	6
Students choose three of the electives offered				
Automotive Transmissions	E	3	3	8
Energy Sources in Power Systems	E	3	3	8
Measuring Information Systems	E	4	3	8
Design of Electrical Power Converters	E	3	3	8
Design of Electronic Devices	E	3	3	8
Gasoline Direct Injection Systems	E	3	3	8
2nd semester				
Students choose three of the electives offered				
Digital Systems Using Programmable Logic	E	3	3	8
Diagnostics of Diesel Injection Systems	E	4	3	8
Smart Grids	E	4	3	8
Signal Processing	E	4	3	8
Control of Power Quality	E	4	3	8
Process Control	E	4	3	8
Internship 1	C			6
Total ECTS per year				**60**

Table 2. Course structure in the second year of studies

Course	Status (compulsory or elective)	Lectures (no.)	Practical classes (no.)	ECTS
SECOND YEAR				
3rd semester				
Students choose three of the electives offered				
Communications Standards and Technologies	E	3	3	8
Automated System Design and Implementation	E	4	3	8
Computer-Aided Design of Electric Power Substations	E	4	3	8
Special Electrical Installations	E	4	3	8
Telecommunication Measurements	E	4	3	8
Hybrid and Electric Vehicles	E	4	3	8
Internship 2	C			6
4th semester				
Entrepreneurship and Incentives in the Field of Electrical and Computer Engineering	C	3	3	6
Applied Research	C			8
Master Thesis	C			16
Total ECTS per year				**60**

Table 3 shows the structure of students' work with the employers with whom VISER has signed Agreements on Business and Technical Cooperation.

Table. The structure of students' work with the employers

	2nd semester								3rd semester				4th semester							
Month	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX
Hours spent at the employer's		60	60	60					60	60	60		60	130	130	130	130 170*	140 100*		
Total		180							180					240+480=720						

* alternatively

The courses studied in the process of active learning in the second and third semester usually consist of 3 or 4 lectures and 3 practical classes; therefore, maximum monthly workload of students is structured as follows:

((4 lectures + 3 practical classes) x 3 courses) x 4 weeks = 84 classes.

Engagement of 60 hours of work-based learning in a time period of three months per semester and maximum possible active learning of 84 classes per month amounts to a total of 60+84=144 hours. Such engagement is within limits of acceptable monthly workload (average monthly workload at the employers' is 22x8 = 176 hours), which means that a student has enough time for his/her school obligations.

The courses studied in the process of active learning in the fourth semester consist of 3 lectures and 3 practical classes, which means that the monthly workload of a student is:

((3 lecturess + 3 practical classes) x 1 course) x 4 weeks = 24 classes.

Engagement of 130 hours of learning through apprenticeship in a time period of three months in the fourth semester, as well as active learning of 24 classes per month, amounts to a total of 130+24=154 hours. Such engagement is within limits of acceptable monthly workload, which means that a student has enough time for his/her school obligations. Activities in the Applied Research course most commonly start in February when students have no classes and can therefore realise their 60 hours of learning through work.

Classes are realised in a time period of no more than 15 weeks per semester. Work-based learning in a time period when there are no classes can be realised in a range of 100 to 170 hours per month, until the time the student has met all his/her obligations at the employer's, finished his/her work on Applied Research (hereinafter referred to as: AR) and completed his/her Master Thesis (hereinafter referred to as: MT).

For the purpose of realising Internship 1, a student, as agreed with the course teacher, may receive a request for the realisation of Internship 1 in an organisation which works in the field studied in the student's study programme and has an agreement on business and technical cooperation with VISER. After the completion of internship, the student submits a verified confirmation that he/she finalized the internship and takes the corresponding exam, but is also obliged to submit his/her internship journal. Each student who has taken part in some form of work-related engagement, submits a verified confirmation of the engagement with a description of the work done, in alignment with his/her study programme.

For the purpose of realising Internship 2, a student, as agreed with the course teacher, may receive a request for the realisation of Internship 2 at the company with which VISER has an agreement on business and technical cooperation. The agreement stipulates that the employer must designate a mentor from the organisation who monitors the work of the student and verifies the internship journal as successfully finalized, bearing in mind the objectives and outcomes of the course. When taking the exam Internship 2, the student evaluates, with the course teacher, whether the conditions have been met for the realisation of AR and MT with the internship employer and is guided towards choosing a mentor at VISER as well as a narrower field of expertise for the student's AR and MT. The student and teacher gauge whether the realisation of AR and MT would make an academic contribution at this level of studies (in terms of innovation, creativity, expert contribution, practical applicability for the employer). It is also evaluated to what extent the student is capable of realising his/her AR and MT (based on the student's ability to identify and methodologically structure their work by researching professional issues, based on the acquired theoretical and practical knowledge, theoretical and empirical research in the field related to the student's master study programme, and the ability to professionally interpret and present research results, as well as make the results practically applicable).

If an employer has no employee(s) who meet the legal conditions to be a mentor at the organisation (i.e. someone who has a master's degree in accordance with the Bologna process or a bachelor's degree in engineering in accordance with the old system), the employer may hire a person from another organisation who meets the conditions and has the necessary knowledge for a successful realisation of AR and MT in a field of expertise related to the study programme at VISER. The employer files a decision designating a mentor from the organisation for the realisation of AR and MT. VISER signs an agreement with the mentor designated by the employer, obligating thereby

him/her to send the reports on the realisation of AR and MT and participate in the defense of MT, confirming therein that the MT has been realised at the employer's, that it is applicable and that its content is appropriate.

Work on master thesis consists of student's practical research in which the student applies the knowledge gained in electrical engineering, computer engineering and multimedia engineering, as well as research methodology. Student's research is a project in which he/she solves a practical problem from a relevant field, approved by the corresponding organisation and the institution of higher education where the student studies. All accomplishments (for instance, patents and technical solutions, the recommended expert solution to a practical problem) remain in the ownership of the organisation where the MT was realised, while the mutual rights of students and employers are regulated by two-party agreements. All the recommended solutions in the MT are tested at the organisation, while all documentation remains at the employer's. The student, in his/her MT, presents research analysis and describes his/her methodological approrach, not disclosing any details which may be considered as a business secret. Mentor from the organisation confirms the validity of the analysis, while taking care of organisation's interests. The mentor from HEI makes sure that all research results are at a certain academic level and meet the criteria of VISER.

After his/her thesis topic has been approved, the student works on a research project approved by his/her teacher mentor. The student, in his/her AR, carries out research and writes a report on it in the form of a paper. After passing the exam in his/her AR course, the student writes a master thesis consisting of the following: Introduction, Theoretical Background, Experimental Section, Results and Discussion, Conclusion, Literature Overview and Appendix. All details about the form and the process of writing a thesis can be found on the webpage of the School (for example, what mandatory segments of a thesis are, how it should be done, how to do citations, what font to use, what covers to put, etc.). Before his/her thesis defense, the student files a signed confirmation of academic integrity in order to prevent any instances of plagiarism and disclosure of business secrets, with regard to the organisation where the research was realised. After finishing the thesis, the student, in coordination with his/her mentor, presents his/her thesis results in front of a defense commission at VISER. The commission normally consists of two teachers from VISER (mentor and head of the commission) as well as a mentor from the organisation where the thesis was realised. The commission evaluates the entire engagement of the student, based on the written material, his/her oral presentation and his/her responses to the commissions questions during the defense.

3. Legal Conditions for the Realisation of DHEM

Work-based learning is realised in its entirety with one, or more, employers, in compliance with the study programme and a plan for the realisation of work-based learning.

If work-based learning cannot be realised at the employer's in entirety, solely with the consent of VISER, one portion of that learning process can be realised at VISER or at the third party's premises (training centres, other legal entities who organise trainings, other employers, other higher education institutions and the like) with the material, technical and human resource conditions for the realisation of work-based learning.

The rights and obligations of VISER and employers, as well as VISER and third parties, are regulated by agreements.

Students enroll in dual education study programmes by applying for one of them, In accordance with the law on higher education.

The General Act of VISER defines the specific conditions for student enrollment in dual education study programmes, as well as transfer conditions for students who wish to transfer from a DHEM to other study models, and vice versa.

If more employers participate in the realisation of a DHEM, students apply for work-based learning at one of the offered, from a network of employers with whom VISER has an Agreement on Business and Technical Cooperation.

The distribution of students is managed via interviews during which the wishes of students are matched with the corresponding employers.

Study programme, and the plan of realisation of work-based learning, further determine more specific conditions for the distribution of students to various employers.

VISER offers its support, promotes and monitors career development of its students, in compliance with the General Act of VISER as well as the standards of career management and counselling set in the law regulating the national framework of qualifications.

VISER supports career development of its students in DHEMs in the following manner: it monitors the level of motivation and satisfaction of both students and employers during work-based learning, it encourages and supports students to plan and seat goals for career development, it helps students in the process of selecting their employers in cases when work-based learning is realised with several employers, so as to cater for their individual needs and work in their best interest.

Protection of students' rights is realised in the accordance with the law on higher education, the law regulating work safety and the law prohibiting work-related harassment, the law on social security benefits, the law on the protection of intellectual property and the law on dual education in higher education.

In the process of realising work-based learning, all forms of discrimination are prohibited, as stipulated in the law on the prohibition of discrimination.

The conditions each employer must meet for the purpose of organising work-based leaning are defined in the Law, Article 11.

3.1. Defining relations between employers and students

Relations between VISER, employers and students in various study programmes, or modules, are regulated by agreements.

Relations between VISER and employers are regulated by an agreement on DHEM, while relations between employers and students are regulated by an agreement on work-based learning.

3.1.1. Agreement on DHEM

The form, content, signing, publishing, termination and the consequences of terminating an Agreement on Dual Higher Education Model are defined in compliance with Articles 13-19 of the Law.

Agreement on Dual Higher Education Model is signed between VISER and an employer, in a written form, for a number of years which cannot be smaller than the number of years in a study programme.

Obligatory elements of such an agreement are:

1) name, location and identification number of the employer;
2) name and location of VISER;
3) information about the study programme;

4) obligation of the employer to organise work-based learning at their own expense;
5) obligation of VISER with regard to the realisation of work-based learning;
6) obligation of the employer with regard to the realisation of work-based learning;
7) plan and programme for the realisation of work-based learning;
8) place and time of the realisation of work-based learning;
9) maximum number of students from VISER to be hired at the employer's for work-based learning;
10) duration of the agreement;
11) protection of intellectual property rights of employers and students;
12) protection of personal information;
13) reasons for expiration of termination of the agreement;
14) manner of solving potential disputes;
15) date and signatures of both parties.

VISER seals an agreement on dual higher education model with one or more employers with the aim of providing conditions for the realisation of all contents of work-based learning defined in the study programme.

On selecting employers, VISER is obliged to work in the best interest of students.

Employer can make agreements on DHEMs with multiple higher education institutions.

After making agreements on DHEMs with one or more employers, VISER informs the ministry in charge of higher education and the Chamber of Commerce of Serbia about it in a time period of up to eight days after signing the agreement.

In accordance with Article 16 of the Law, VISER and the Chamber of Commerce of Serbia, in a time period of up to 15 days after signing an agreement on DHEM, publish on their official webpage the main information about study programmes and other information relevant for work-based learning.

Employer may terminate an agreement on DHEM if:

1) VISER has its work licence taken away or revoked in accordance with the law;
2) VISER stops meeting the conditions set for the study programme in which the employer realises work-based learning;
3) VISER does not meet its obligations set in the agreement on DHEM;
4) unanticipated technological, economic or organisational changes occur at the employer's, stopping, complicating or significantly altering thereby the realisation of professional activities.

VISER may terminate an agreement on DHEM if:

1) the employer does not meet the obligations set in the agreement on DHEM;
2) the employer violates the rights of students stipulated by law.

VISER is responsible for, without delay and no later than the following working day, informing the ministry in charge of higher education and the Chamber of Commerce of Serbia about the termination of an agreement and the reasons for the termination of the given agreement on DHEM.

If an agreement on DHEM is terminated due to one of the following reasons:

1) VISER has its work licence taken away or revoked in accordance with the law;
2) VISER stops meeting the conditions set for the study programme in which the employer realises work-based learning;
3) VISER does not meet its obligations set in the agreement on DHEM;

work-based learning is continued at another HEI determined by the Ministry.

If an agreement on DHEM is terminated due to unanticipated technological, economic or organisational changes that have occurred at the employer's, stopping, complicating or significantly altering thereby the realisation of professional activities, work-based learning is provided by VISER in cooperation with another employer with whom VISER has an agreement on DHEM.

If an agreement on DHEM is terminated due to the fact that the employer does not meet its obligations set in the agreement or has violated student rights stipulated by law, work-based learning is organised by HEI in cooperation with another employer with whom HEI has an agreement on DHEM.

3.1.2. Agreement on work-based learning

The form, content, signing, termination and the consequences of terminating an Agreement on Work-Based Learning are defined in accordance with Articles 20-25 of the Law.

Agreement on work-based learning is made by an employer and a student in a written form.

Agreement on work-based learning is made after all students are distributed to employers with whom they will realise work-based learning, no later than five days prior to the start of work-based learning at the employer's.

Employer is responsible for keeping a registry of all signed agreements on work-based learning, in accordance with the law.

Some of the mandatory elements of an agreement on work-based learning are:

1) employer's identification data;
2) student's name and last name, and his/her address;
3) information about VISER;
4) information about the study programme;

5) employer's commitment to organise and realise work-based learning for the student in accordance with the study programme;
6) confirmation from a health institution that the student meets all health-related conditions for work-based learning at the employer's, if such a confirmation is necessary, in accordance with the provisions on the protection of the youth stipulated by the law on work relations;
7) if a study programme is realised in a minority language, the employer is obliged to organise work-based learning in the language of that minority group;
8) location and time of the realisation of work-based learning;
9) obligation of the student to regularly attend work-based learning at the employer's;
10) obligations of the student with regard to the time spent at work, learning, work safety and health safety during the process of work-based learning;
11) material compensation of the student;
12) financial compensation of the student;
13) protection of employer's intellectual property right as well as student's intellectual property rights, for the results obtained in work-based learning;
14) protection of personal information;
15) confidentiality of employer's business secrets;
16) duration of the agreement;
17) reasons for expiration or termination of the agreement;
18) compensation in case of dismissal, unless the employer is not responsible for the dismissal;
19) manner of solving potential disputes;
20) date and signatures of both parties.

An integral part of an agreement on work-based learning is a plan of realisation of work-based learning.

Students may sign agreements on work-based learning with multiple employers with whom VISER has an agreement on DHEM, if it is necessary for the realisation of a study programme.

Conditions for termination of an agreement on behalf of a student or an employer, as well as the consequences of such termination, are defined in Articles 23-25 of the Law.

3.2. Registry of agreements

The Registry of agreements on DHEMs is kept by the Chamber of Commerce, as a designated task.

The type of data put in the Registry of agreements on DHEMs, as well as the procedure of adding input in the Registry are defined in Articles 26-27 of the Law.

3.3. Mentorship at the employer's

Mentor at the employer's must have the competence to realise work-based learning defined in the general act of HEI.

The manner of evaluating mentor's competence is determined in the general act of HEI.

Based on competence evaluation, HEI provides, if necessary, a guide for mentorship at the employer's or organises a training programme in compliance with the plan of realisation of the study programme with a DHEM.

3.4. Grading and exams in DHEM

Grading students in DHEM is defined in the general act of VISER.

Content and manner of realising final work are determined in accordance with the study programme and the plan of realisation of DHEM.

3.5. Material and financial compensation for students

Students participating in work-based learning are provided with the following:

1) tools and equipment for personal work safety;
2) compensation for the real cost of transportation to and from work, up to the cost of tickets for public transportation, if the employer has not provided another form of transportation to and from work;
3) compensation for meals in accordance with the general act of the employer;
4) insurance for any case of injury at work at the employer's, if such insurance exists for all employees who work for that employer.

Employer may provide a student with the compensation for accommodation and food at the student dormitories.

Students participating in work-based learning are entitled to financial compensation.

Compensation for work-based learning is paid once a month, no later than the end of the following month, for the previous month and for each hour spent at work, in a net value of at least 50% of a monthly salary of an employee working on the same or similar activities, in compliance with the law.

Compensation for work-based learning for students in undergraduate studies can be paid in different amounts, depending on the year of studies and student's level of knowledge, for each hour spent at work in a range of 30-70% of a monthly salary of an employee working on the same or similar activities, bearing in mind that the total compensation for work-based learning at a given level of studies must amount to 50% of a monthly salary of an employee paid for the same period.

If an employer simultaneously covers the cost of tuition, they can reduce the amount paid for work-based learning by the amount given for tuition.

3.6. Supervision and penalties

Supervision in the realisation of DHEM, as well as penalties, are regulated in Articles 33-35 of the Law.