2021

O1 INTELECTUAL OUTPUT
Output type: Studies / analysis –
Best practice guidelines / report

REVIEW

BEST PRACTICES
In Educating Sustainability
and Heritage

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Enhancing of Heritage Awareness and Sustainability of Built Environment in Architectural and Urban Design Higher Education

HERSUS

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REVIEW: Best Practices In Educating Sustainability and Heritage

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HERSUS

Content

Pedagogical and Educational Models

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Serbia (Belgrade)

×

Italy (Venice)

×

Cyprus (Nicosia)

×

Greece (Thessaloniki)

×

Spain (Seville)

SERBIA

Nataša Ćuković Ignjatović
Bojana Zeković

course 04

SAS EEZA 1.10. [Energetska rehabilitacija i sertifikacija postojećih zgrada – studija slučaja]

UNIVERSITY LEVEL COURSE DETAILS

Institution
X University of Belgrade

Type of Institution
X Higher Education Institution

District
X Belgrade, Serbia

Department
X Technology and Engineering Sciences

Faculty
X Faculty of Architecture

Study program to which this course belongs
X Specialist academic studies – Energy efficient and green architecture

A diagram that illustrates the position of the course in the structure of the study program:

Specialist academic studies – Energy efficient and green architecture		
SEMESTER 1		SEMESTER 2
SUSTAINABLE ARCHITECTURE / GREEN AND EE BUILDINGS DESIGN PRINCIPLES		GREEN BUILDING CERTIFICATION
	ELECTIVE COURSE 1	GREEN MATERIALS
ELEMENTS OF HEAT TRANSFER SCIENCE		WATER AND WASTE MANAGEMENT (REFORMED)
BUILDING PHYSICS	ELECTIVE COURSE 2	VERIFICATION TOOLS – MEASUREMENTS AND SIMULATIONS (NEW)
THERMAL-TECHNICAL SYSTEMS AND SUSTAINABLE ARCHITECTURE		FACILITY MANAGEMENT (NEW)
LIGHTING AND EE	ELECTIVE COURSE 2	DESIGN AND CERTIFICATION OF EE BUILDINGS – CASE STUDY
EE BUILDING CERTIFICATION – CALCULATION METHODS (REFORMED)		DESIGN, ENERGY, REHABILITATION AND CERTIFICATION OF EXISTING BUILDINGS – CASE STUDY
LAWS AND ECONOMIC ASPECTS OF EE BUILDINGS		THESIS PREPARATION
PROFESSIONAL PRACTICE (REFORMED)		THESIS WORK
30 ECTS		30 ECTS
		Total number of credits – 60 ECTS

Level
X Postgraduate

Year/Semester
X 1st year / 2nd semester

Course Type
X Studio design

Elective or Compulsory Course
X Elective

ECTS
X 6 ECTS

Lectures/week (hours)
X 1 (1 hour)

Studios/labs/week
X 1 (4 hours),
Individual research work: 1 hour

Academic/Teaching Personnel
X Associate Professor Dušan Ignjatović, PhD.
Teaching assistant Bojana Zeković, PhD.

Program of Study Content
X Design Project

COURSE CONTENT AND STRUCTURE

The course covers theoretical principles of the energy rehabilitation process – its fundamental principles, levels of refurbishment, possibilities and constraints. Analysis of the selected building for the case study covers its urban layout and architectural, constructive, technological and material features in order to determine constraints and potentials in the refurbishment process. As input for energy calculations/simulations, a detailed 3D model is required, where modeling principles are being practiced. Detail energy performance calculations in available software are done and the building's energy class is determined. Design of refurbishment scenarios with variant solutions analysis and calculations for verification.

THE COURSE PURPOSE AND OBJECTIVES IN GENERAL AS WELL AS IN RELATION TO SUSTAINABILITY AND CULTURAL HERITAGE

Mastering the methodology, theoretical basis and practical knowledge in the field of building energy rehabilitation and certification of existing buildings. Forming the criteria and algorithms of assessment and possible levels of the upgrade of existing buildings, together with calculation/simulation of energy performance and verification of refurbishment and design methodology. Inadequate refurbishment in a technical but as well architectural sense can degrade the quality of existing building stock, while supreme design quality and energy performance achieved through energy rehabilitation can upgrade the material value, cultural identity, comfort and sustainability in numerous ways.

KEY FEATURES

TO WHAT EXTENT DOES THE COURSE ADDRESS ASPECTS OF SUSTAINABILITY AND PROMOTE CULTURAL HERITAGE AS A BASE FOR SOCIAL, ECONOMIC AND ENVIRONMENTAL DEVELOPMENT

SOCIAL

low	medium	high

ECONOMIC

low	**medium**	high

ENVIRONMENTAL

low	medium	**high**

THE LEARNING OUTCOMES IN GENERAL (SKILLS, ABILITIES, KNOWLEDGE) WITH REGARD TO SUSTAINABILITY AND CULTURAL HERITAGE

Mastering the principles and methods for building refurbishment, together with calculation/simulation of building energy performance in the process of designing the best energy rehabilitation scenario. If existing building stock is regarded as one of key values of tangible heritage, consisting mainly out of buildings that do not fall under heritage protection regime and are in quite bad condition, it is clear that the quality of their rehabilitation, not only in energy performance characteristics, will generate new value both in economical and environmental but also in cultural terms.

THE EDUCATIONAL /TEACHING METHODOLOGY (GENERAL PRINCIPLES, PEDAGOGY AND MANAGEMENT STRATEGIES USED FOR CLASSROOM INSTRUCTION)

Design studio methodology, with lectures in the course's theoretical parts and student work (design, calculations, simulations, modelling) supervised by the teaching staff. Theoretical classes: Theoretical settings of the energy renewal process, basic principles, levels of renewal, possibilities and limitations, review of state of the art. Case studies - good practice examples.

TEACHING/LEARNING MATERIALS (DIDACTIC MATERIALS, RESOURCES, SOFTWARE, ETC.)

Literature: Giebeler G., Krause H., Fisch R., Musso F. 2005.: Refurbishment Manual, Birkhauser,
Douglas J. 2006.: Building adaptation, Butterworth-Heinemann,
Rulebook on energy efficiency. Belgrade: Official Gazette of RS, No. 61/2011
Rulebook on the conditions, content and manner of issuing building energy performance certificates. Belgrade: Official Gazette of RS, No. 69/2012 .
Rajčić A., Ignjatović D.: Design, energy rehabilitation ad certification of energy efficient buildings; excerpts from lectures and classes with an annex from the handbook
Software: KnaufTerm and KnaufTerm3D, e.

OBSTACLES, IMPEDIMENTS, PROBLEMS AND CHALLENGES REGARDING TEACHING SUSTAINABILITY OR/ AND CULTURAL HERITAGE IN THIS COURSE (IF ANY). PLEASE MENTION THEM BRIEFLY

X Yes, in sustainability

The course is very challenging for students with no skills in architectural design.

PRACTITIONERS/PROFESSIONALS/ EXPERTS INVOLVED IN THE EDUCATIONAL PROCESS? IF YES, PLEASE MENTION THEIR EXPERTISE AND THEIR ROLE IN THE COURSE

X Yes

Mechanical engineers (practitioners) with high level of expertise in energy modeling and performance simulaitons. They share their experience and provide an overview of state of the art in the area (tools, methods, good practice, and bad practice examples).

EXTERNAL PARTICIPANTS, VISITORS GUEST LECTURERS, ETC, INVOLVED IN THE EDUCATIONAL PROCESS? IF YES, PLEASE MENTION THEIR EXPERTISE AND THEIR ROLE TO THE PROGRAM OF STUDY

X No

RELATIONSHIP BETWEEN THE COURSE AND THE CURRENT LOCAL NEEDS/ REQUIREMENTS OF LABOUR MARKET IN THE FIELD OF ARCHITECTURAL AND URBAN DESIGN IN RELATION TO SUSTAINABILITY AND HERITAGE

Following several key legislative milestones in the process of building rehabilitation and certification, there is a large need for professionals in this field, especially in energy

performance calculations, simulations, verifications. Experience in energy rehabilitation projects, knowledge of legislation, and design documentation needed for obtaining building permits and applying for grants is valuable.

TO WHOM IT IS ADDRESSED (TARGET AUDIENCE)

The course is available to the students of Specialist studies Energy Efficient and Green Architecture interested in improving their design skills relevant for various upgrades, energy optimisation and decarbonisation of the existing building stock.
Specialist studies are addressed to graduate students with a masters degree (300 ECTS) in architecture, civil engineering and mechanical engineering.

Workload/weekly study hours

- ✕ 12 (1 hour lecture + 4 hours studio + 1 hour individual research + 6 hours study/design/analysis).

Language

- ✕ Serbian
  Although the study program is not formally accredited in English, most courses (including this studio) are available in English.

Evaluation Methods

- ✕ Project
- ✕ Project Presentation

Grading System

- ✕ Numerical

Employment influence evaluation (alumni feedback about employability)

- ✕ Employed in Private Sector
- ✕ Employed in Public Sector

RESULTS

Presentation of the studio work from the school year 2018/2019 can be previewed here: https://issuu.com/aleksandranikolic86/docs/rek_be_anijska_kosa_fin_3.5

Figure 1. Representation of the influence of the north wind on the objects of the subject area
https://issuu.com/aleksandranikolic86/docs/rek_be_anijska_kosa_fin_3.5

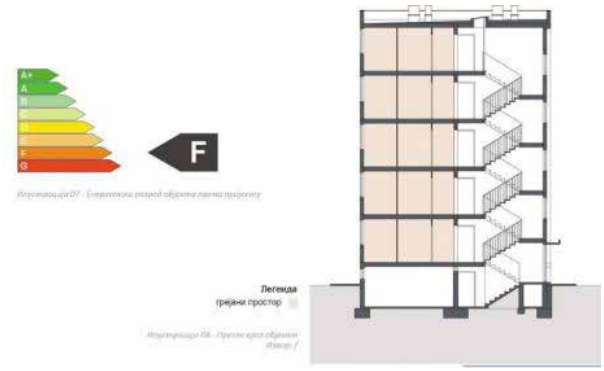
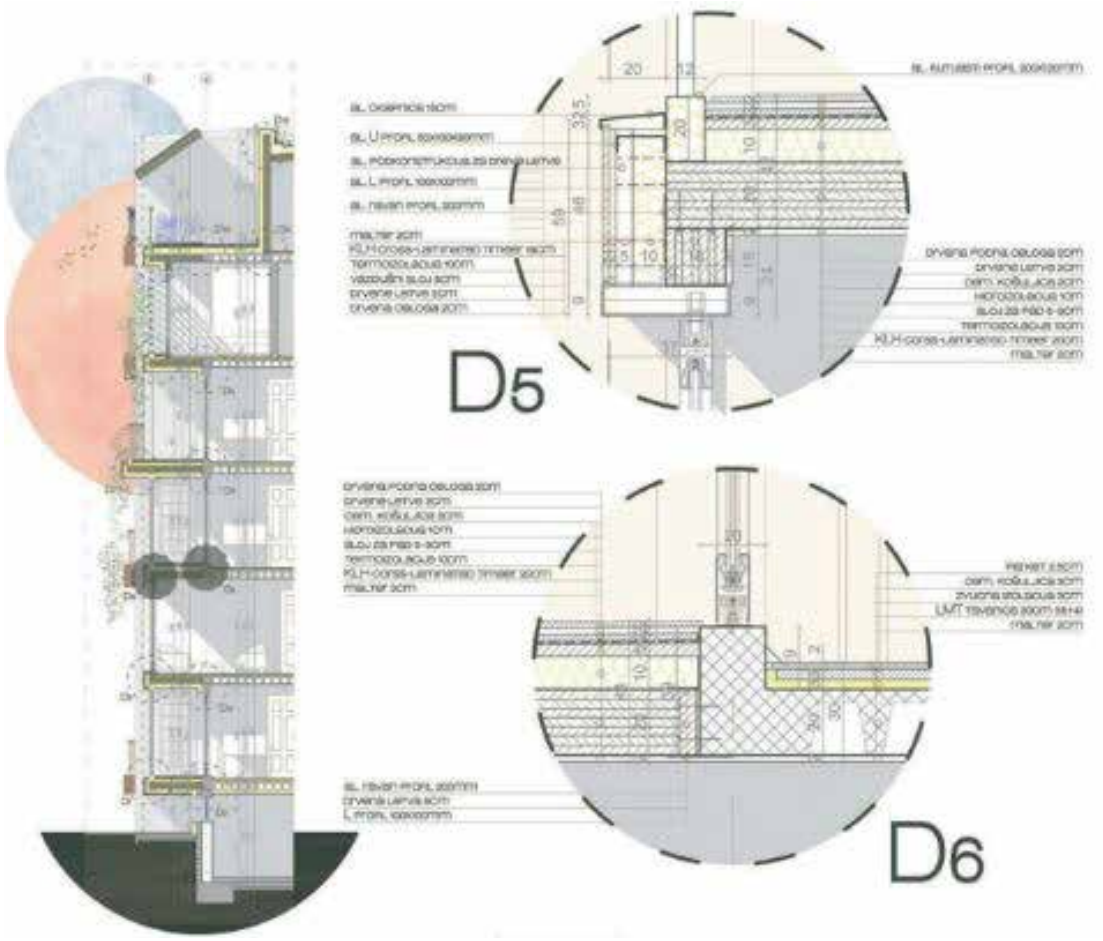


Figure 2. Section
https://issuu.com/aleksandranikolic86/docs/rek_be_anijska_kosa_fin_3.5

Figure 3. A proposal for the architectural improvement of the existing condition
https://issuu.com/aleksandranikolic86/docs/rek_be_anijska_kosa_fin_3.5



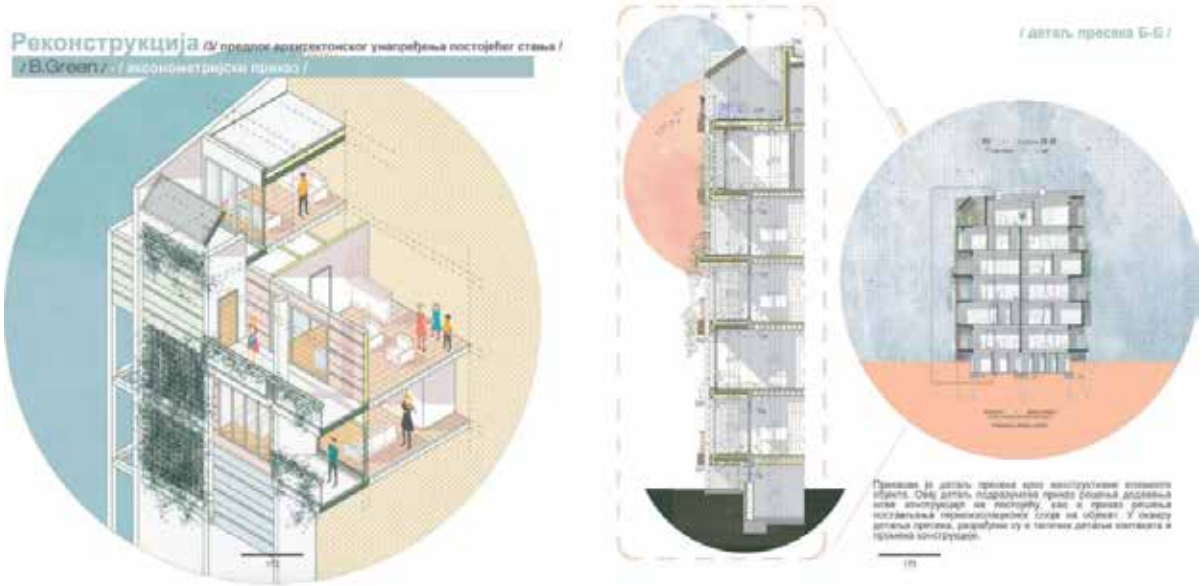


Figure 4. A proposal for the architectural improvement of the existing condition
https://issuu.com/aleksandranikolic86/docs/rek_be_anijska_kosa_fin_3.5