Field of study: Civil Engineering

Faculty: Faculty of Civil Engineering

Study mode & length of study: full-time, 2 years

Language of study: Slovak

Qualification awarded: Ing.

Building Services

Slovak University of Technology in Bratislava

Academic Year

- The academic year is divided into two semesters: winter and summer semester.
- Teaching period consists of 13 weeks in each semester.
- The examination period consists of 7 weeks in each semester.
- Holidays are 46 days (working days).

Specific Admission Requirements

The bachelors which are applying for directly linked study programs in master degree are to be accepted without any admission exam until three years since finished the bachelor study. That holds only for those, who did not attended given study program anytime before.

Other applicants must pass the admission exam. It consists of subjects which are essential for the state exam from that study program which is prcursor for the master degree study. The extent of the admission exam is consistent with the state exam. The acceptance condition successful passing the admission exam.

In case of study program building constructions and architecture is the acceptance conditioned by passing the talent admission exam. The talent admission exam consists of three parts: cloistered work from drawing and assessment of atelier work I and II.

The final list of accepted students for individual study programs will be worked out on the basis of results of the state exam or admission exam and the graduate degree average from the bachelor study. In case of study program building constructions and architecture, there will also be considered results of the talent admission exam.

Study Plan

	Code	Name of a course	Mode of completion	Credits
1st year – 1st semester	A group of compulsory courses:			
	I1-AT1_ZT	Design Studio 1 – Sanitary Engineering	Graded credit	2
	I1-PRTE	Fluid Dynamics	Exam	4
	I1-V	Heating	Exam	6
	I1-ZT1	Sanitary Engineering 1 (Water Supply, Sawerage)	Exam	6
	I1-TERM	Thermomechanics	Exam	4
	I1-VKCH1	Ventilation-Air Conditioning-Cooling 1	Exam	5
	A group of semi-compulsory courses (min. 1 cours):			
	I1-PRTH	Heat and Mass Transfer	Exam	3
	I1-VPB	Indoor Climate of Buildings	Exam	3

Information sheet

Heating

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-V
Course unit title: Heating

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
seminar	2 hours weekly (on-site method)

Credits allocated: 6

Recommended semester/trimester: Building Services – master (profilový, compulsory), 1. semester
Level of study: 2.
Prerequisites for registration: none

Assesment methods:

The student submits assignments, which are individually scored.
The student completes the course if he submits all assignments and will get 56% of total points.
The final grade from the subject will be determined in accordance with the rules determined by the STU study regulations.

Information sheet

Heating

Learning outcomes of the course unit:

The student is able to calculate the energy efficiency of buildings.
The student masters the principles of selection and design of central heating systems in buildings and their individual components in terms of reducing fuel consumption and energy savings.
The student will learn and can design classic hot-water and low-temperature heating systems and will learn alternatives for practical applications of heating technology in buildings.
The student will learn and know how to design heat sources – boiler rooms, heat pump engine rooms, heat transfer stations.

Course contents:

Environmental theory, indoor and outdoor environment, material and architectural environment.
Energy balance of buildings – the need for heat and energy for heating, hot water, ventilation and air conditioning, climatic factors.
Heat transfer systems – radiators, large radiant heating surfaces.
Heat sources – boiler classification and design requirements. Small heat sources – gas wall appliances open and closed designed for heating, methods of combustion air supply and flue gas exhaust. Combined heat sources and applications.
Medium heat sources – boilers for liquid and gaseous fuel. Types and requirements for design. Design solutions – low temperature and condensing boilers.
Design of heat sources using environmental energy – heat pumps.
Accessories for heat sources – security and safety devices, chemical water treatment and addition to the system.
Heating system accessories – circulation pumps, pipes, fittings and thermal insulation.
Design of heat sources using environmental energy – heat pumps.
Design of heat sources for biomass. Calculation and design of fuel economy.
Centralized heat supply systems. Heat exchangers. Heat transfer stations – pressure-dependent and independent connection, functional wiring diagrams. Layout and construction requirements.

Information sheet

Heating

Recommended or required reading:

Basic:

PETRÁŠ, D. – LULKOVIČOVÁ, O. – BAŠTA, J. – JELÍNEK, V. – KABÁT, V. Zdroje tepla a domové kotolne. Bratislava: Jaga, 2004.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – BAŠTA, J. – KABELE, K. Vykurovanie rodinných a bytových domov. Bratislava : Jaga, 2005. 246 p. ISBN 80-8076-012-8.
KURČOVÁ, M. – KOUDELKOVÁ, D. Vykurovanie. Cvičenia. Bratislava : Spektrum STU, 2020. 173 p. ISBN 978-80-227-5002-8.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – FÜRI, B. Nízkoteplotné vykurovanie a obnoviteľné zdroje energie. Bratislava : Jaga, 2001. 271 p. ISBN 80-88905-12-5.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – FÜRI, B. Obnoviteľné zdroje energie pre nízkoteplotné systémy. Bratislava : Jaga Group, 2009. ISBN 978-80-8076-075-5.
BAŠTA, J. Regulace vytápění. Praha : ČVUT, 2007. 99 p. ISBN 978-80-01-02582-6.
BAŠTA, J. Velkoplošné sálavé vytápění: Podlahové,stěnové a stropní vytápění a chlazení. Praha : Grada Publishing, 2010. 128 p. ISBN 978-80-247-3524-5.

Planned learning activities and teaching methods:	Lectures, exercises, projects. 150 h Contact teaching: lectures 26 h, exercises 26 h, presentation and defense 4 h. Contactless teaching: preparation for lectures and exercises 15 h, processing of protocols 30 h, project processing 30 h, study for exam 19 h.
Assesment methods and criteria:	Completion of the course: written exam evaluation from exercises: 16.8 to 30%, written exam: 0 to 70%, To successfully complete the course, it is necessary to achieve 56% of max. possible number of 100 points.

Information sheet

Ventilation-Air Conditioning & Cooling 1

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-VKCH1
Course unit title: Ventilation – Air Conditioning – Cooling 1

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
seminar	2 hours weekly (on-site method)

Credits allocated: 5

Recommended semester/trimester: Building Services – master (profilový, compulsory), 1. semester
Level of study: 2.
Prerequisites for registration: none

Assesment methods:

During the semester, assignments and drawings with max. achieved by 30 % of the total evaluation of the subject. The condition for admission to the exam is submitted all assignments with the achieved number of min. 16 %. The final grade of the course consists of the evaluation of exercises, active participation in lectures and the written and oral part of the exam. The final evaluation of the student with a mark is given by the current study regulations.

Information sheet

Ventilation-Air Conditioning & Cooling 1

Learning outcomes of the course unit:

The student will gain knowledge in the field of air conditioning (ventilation and air conditioning) and cooling of buildings. They will get acquainted with the properties of humid atmospheric air and with the possibilities of air conditioning, how to adjust this air to the required parameters of the indoor environment. They will learn to orientate in binding legal regulations and recommended technical norms in the field of air conditioning. They will understand the principle of operation of the air handling unit, its individual parts (chambers), or the interaction of several chambers on air quality. They will learn to determine the amount of pollutants in the interior and then calculate the yield of the air handling unit, as well as to design a specific assembly of the air handling unit in order to efficiently and economically treat the air during partial and year-round operation. He will gain knowledge in the field of construction of humid air diagrams (h-x diagrams), which are the basis for determining the energy balance of the ventilation system. They will understand the essence of the characteristics and classification of air conditioning systems, their advantages, disadvantages and possibilities of their use.
In the field of cooling, the student will gain knowledge of basic methods of air cooling for air conditioning purposes. They will get acquainted with the sources of cold and the types of refrigerants used in refrigeration circuits.
By acquiring the above knowledge, the student will gain a high degree of creativity and independence in the design of specific technical solutions, will be able to independently acquire new knowledge and actively expand their knowledge.

Course contents:

• Air conditioning as a scientific field. Microclimate of indoor spaces and its creation through air conditioning systems. Balance of pollutants in the ventilated space. Determination of air conditioning equipment yield using empirical methods
• Human habitat. Internal microclimate requirements in legislation. Determination of air conditioning equipment yield using analytical methods: Heat load of ventilated and air-conditioned rooms _Part 1 (heat gains from internal heat sources)

Information sheet

Ventilation-Air Conditioning & Cooling 1

- Determination of the yield of air-conditioning equipment using analytical methods: Heat load of ventilated and air-conditioned rooms _Part 2 (heat gains from external heat sources, total heat load)
- Psychrometry – Thermodynamics of humid air
- Basic heat and humidity isobaric treatment of humid air. Basic air treatment in the air handling unit for summer (warm) and winter (cold) operation
- Parts of ventilation and air conditioning equipment _Part 1 (fans)
- Parts of ventilation and air conditioning equipment _Part 2 (heaters, coolers)
- Parts of ventilation and air conditioning equipment _Part 3 (humidifiers, dehumidifiers)
- Parts of ventilation and air conditioning equipment _Part 4 (equipment for heat recovery from exhaust air)
- Parts of ventilation and air conditioning equipment _Part 5 (filters, control dampers)
- Central air handling unit – basic sets. Air conditioning engine room
- Decentralized air handling unit – unit air handling units
- Development and new trends in the field of air conditioning

Recommended or required reading:

Basic:

SZÉKYOVÁ, M. – FERSTL, K. – NOVÝ, R. Vetranie a klimatizácia. Bratislava : Jaga, 2004. 422 p. ISBN 80-8076-000-4.
FERSTL, K. Klimatizácia: Prednášky a cvičenia I. Bratislava : STU v Bratislave, 1994. 344 p. ISBN 80-227-0509-8.
DRKAL, F. – ZMRHAL, V. Větrání. Praha : ČVUT v Praze, 2013. 157 p. ISBN 978-80-01-05181-8.
CHYSKÝ, J. Vlhký vzduch. Praha : SNTL, 1977. 156 p.
GEBAUER, G. – RUBINOVÁ, O. – HORKÁ, H. Vzduchotechnika. Brno : ERA group , 2005. 262 p. ISBN 80-7366-027-X.

Study Plan

1st year – 2nd semester	A group of compulsory courses:			
	I1-SOP-TZ	Construction and Commercial Law	Graded credit	2
	I1-AT2-V	Design Studio 2 - Heating	Graded credit	2
	I1-HVS	Hydraulics of Heating Systems	Exam	5
	I1-PDP-TZ	Internships	Pass credit	1
	I1-MRTZB	Measurement and Control in Building Services	Exam	4
	I1-ZT2	Sanitary Engineering 2 (Gas Supply)	Exam	5
	I1-VKCH2	Ventilation-Air Conditioning-Cooling 2	Exam	5
	A group of semi-compulsory courses:			
	I1-PTZB	Fire-Fighting Equipment in Building	Exam	3
	I1-TTZB	Technology at Buildings Services	Exam	3
	I1-TOB	Thermal Protection of Buildings 2	Exam	3

Information sheet

Measurement and Control in Building Services

University:	Slovak University of Technology in Bratislava
Faculty:	Faculty of Civil Engineering
Course unit code:	I1-MRTZB
Course unit title:	Measurement and Control in Building Services

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
seminar	2 hours weekly (on-site method)

Credits allocated:	4
Recommended semester/trimester:	Building Services – master (compulsory), 2. semester
Level of study:	2.
Prerequisites for registration:	none

Assesment methods:

During the semester, assignments are continuously prepared and submitted according to the schedule specified in the assignment sheet. The maximum number that a student can get from the exercises is 30%. In order for a student to be admitted to the exam, he / she must obtain a min. 16%.
The course is completed by a written exam.
The final grade is determined after adding up the points for assignments and a paper with the following weights: completed assignments 30%, written exam 70%.
The final evaluation of the student with a mark is given by the current study rules of the STU.

Information sheet

Measurement and Control in Building Services

Learning outcomes of the course unit:

The subject is directly related to the subjects of the 1st year of the winter semester of engineering study BS: Heating, Ventilation-air conditioning-cooling 1 and Medical technology 1. The basis for the elaboration of the assignments is primarily knowledge and also assignments from the mentioned subjects. The content of the course is designed to provide and deepen the basic knowledge necessary to compile the concept of measuring and control circuits and to solve complex problems in ensuring the optimal operation of energy systems with the possibility of cost-effective control of the internal environment.

Student knowledge:

The student has an overview of selected parts in the field of measurement and control theory such as distribution and properties of controlled systems, basic types of controllers, control circuits. The student masters the basic principles of creating the concept of measuring and control circuits and their application in the field of heating, ventilation and air conditioning.

Student skills:

The student is able to conceptually design measuring and control circuits for the profession of Heating:

a) at the level of heat production – control circuits of heat transfer medium temperature at the outlet from the primary source circuit, pressure, pressure difference, tank levels, safety and emergency circuits of the source, measuring circuits of physical quantities for statistical and economic evaluations of operating efficiency, consumption measuring circuits energy

b) at the level of heat distribution – temperature control circuits of the heat transfer medium at the inlet to individual consumer circuits

(c) at the level of heat consumption as individual regulation of the air temperature in individual rooms or zones without or with auxiliary energy.

The student is able to conceptually design measuring and control circuits for the profession Ventilation and air conditioning at the level of central adjustment of air parameters in any set of ventilation or air conditioning unit as temperature

Information sheet

Measurement and Control in Building Services

Course contents:

Brief synopsis of the subject:

- Principles of the control technology, basic terms and definitions of measuring and control circuits.
- Controlled process plants, controllers and control loops.
- Measuring of physical variables for the need of the control.
- Control circuits of heat sources, the control of temperatureure,press,pressure difference flow and transformation to the control loop.
- Control of heating systems – conventional, large-area, solar.
- Valves for the control of heating systems and actuators for control valves.
- The hydraulic connection of valves.
- Control circuits for central air conditioning.
- Temperature control of the supply- and indoor-air, control of the air mixing.
- Indirect and direct control of the air humidity, special cases of the control of air humidity.
- Safety and protection loops in HVAC.
- Hydraulic connections of the control valves in HVAC.
- Control of the recuperative and regenerative heat recovery.
- Control of the indoor air quality.

Information sheet

Measurement and Control in Building Services

Recommended or required reading:

Basic:

KOUDELKOVÁ, D. Meranie a regulácia v TZB: 1. časť – Vykurovanie. Bratislava : Slovenská technická univerzita v Bratislave, 2014. 182 p. ISBN 978-80-227-4291-7.
LULKOVIČOVÁ, O. – PETRÁŠ, D. – BAŠTA, J. – JELÍNEK, V. – KABÁT, V. Zdroje tepla a domové kotolne. Bratislava : Jaga, 2004. 223 p. ISBN 80-8076-001-2.
CIHELKA, J. Solární tepelná technika. Praha : T.Malina, 1994. 203 p. ISBN 80-900759-5-9.
PETRÁŠ, D. – KOUDELKOVÁ, D. Teplovodné a elektrické podlahové vykurovanie. Bratislava : Jaga, 2004. 189 p. ISBN 80-88905-96-6.
SZÉKYOVÁ, M. – FERSTL, K. – NOVÝ, R. Vetranie a klimatizácia. Bratislava : Jaga, 2004. 422 p. ISBN 80-8076-000-4.

Recommended:

BAŠTA, J. Hydraulika a řízení otopných soustav . Praha: ČVUT v Prahe, 2003. 252 s. ISBN 80-01-02808-9.
Bašta, J. Regulace v technice prostředí staveb. Praha: ČVUT v Prahe, 2014. 194s. ISBN 97-8800-105455-0

Planned learning activities and teaching methods:

lectures, exercise
Contact teaching:
lectures – 24 h
exercise – 24 h
Contactless teaching:
preparation for the exercises – 26 h
study for exam – 26 h

Assesment methods and criteria:

Completion of the course: exam
The final grade consists of:
– evaluation of exercises: min. 16 %, max. 30 %,
– exam (written and oral): max.70 %
The final grade is given by the Study rules of the STU.
To obtain credits for the subject, the student has to reach at least 56 % of the maximum number of points (100 %)

Information sheet

Thermal Protection of Buildings 2

University:	Slovak University of Technology in Bratislava
Faculty:	Faculty of Civil Engineering
Course unit code:	I1-TOB
Course unit title:	Thermal Protection of Buildings 2

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
laboratory/construction practice	1 hour weekly (on-site method)

Credits allocated:	3
Recommended semester/trimester:	Building Constructions and Design – master (semi-compulsory), 2. semester Building Services – master (semi-compulsory), 2. semester
Level of study:	2.
Prerequisites for registration:	none

Assesment methods:

The student submits completely processed assignments from exercises.
Participation at lectures and exercises is mandatory.
A student successfully passes the exam if his overall success rate is at least 56 points.

Learning outcomes of the course unit:

Student has knowledge extension od desing and evaluation building components and building from view point of effective thermal protection. Design and evaluation of thermal performance properties of building components and buildings. Principles of design of building structures from view point required for indoor environment and limited thermal balance in winter and summer seasons. Design of net zero energy buildings. Criteria for evaluating the thermal protection of buildings in the design process. Principles of measuring and test methods of thermotechnical properties of building structures and buildings.

Information sheet

Thermal Protection of Buildings 2

Course contents:

- History of design parameters of thermal protection of buildings in various built periods, comparison of basic parameters
- Declared and design thermal values, conformity assessment
- Thermal bridges and heat flow. Thermal losses through non-homogeus structures
- Thermal performance of glass and glazing units
- Energy use for heating
- Methods for limiting thermal losses and utilization of heat gains
- Energy performace of buildings, energy certification, influence of thermal protection of buildings
- Overheating in summer period, dynamic characteristics
- Thermal stability of rooms in winter season, influence of various heating strategies
- Criteria and requirements for thermal performance of building components and buildings
- principles of measuring methods, testing methods for thermal performance properties of building components and building materials

Information sheet

Thermal Protection of Buildings 2

Recommended or required reading:

Basic:
CHMÚRNY, I. Tepelná ochrana budov. Bratislava: Jaga, 2003.
CHMÚRNY, I. – TOMAŠOVIČ, P. – HRAŠKA, J. Fyzika vnútorného prostredia budov. Vybrané kapitoly základov tepelnej ochrany budov, stavebnej akustiky, denného osvetlenia a insolácie budov. Bratislava: Nakladateľstvo STU, 2013. 394 p. ISBN 978-80-227-3917-7.
Recommended:
HENS, H. Building Physics – Heat, Air and Moisture. Ernst&Sohn, 2007, 270s. ISBN978-3-433-01841-5
STN 73 0540-2 a 3: 2012, STN EN ISO 13 790, STN EN ISO 13 789, STN EN ISO 13 370
Vyhláška č. 35/2020 Z. z. ktorou sa mení a dopĺňa vyhláška Ministerstva dopravy, výstavby a regionálneho rozvoja Slovenskej republiky č. 364/2012 Z. z., ktorou sa vykonáva zákon č. 555/2005 Z. z. o energetickej hospodárnosti budov a o zmene a doplnení niektorých zákonov v znení neskorších predpisov v znení vyhlášky č. 324/2016 Z. z.
Zákon č. 555/2005 Z. z. o energetickej hospodárnosti budov a o zmene a doplnení niektorých zákonov

Planned learning activities and teaching methods:

lectures, excercises
Contact teaching :
• lectures 26 h
• excercises 13 h
Contactless teaching :
• assignment processing 26 h
• study for exam 10 h

Assesment methods and criteria:

Completion of the course : exam.
The final grade of the course will consist of evaluation of the final exam (written examination) in accordance with the rules of the STU exam regulations according to the following percentage of individual assessment methods:
• exam (written examination) 100%
To obtain credits for the subject, the student has to reach at least 56% of the maximum number of points.

Study Plan

	Code	Name of a course	Mode of completion	Credits
2st year – 3rd semester	A group of compulsory courses:			
	I1-RSB	Building Control Systems	Exam	4
	I1-AT3-VZ	Design Studio 3 – Ventilation and Air Conditioning	Graded credit	2
	I1-EACB	Energy Audit and Certification of Buildings 1	Exam	5
	I1-EX-TZ	Excursion	Pass credit	1
	I1-OZE2	Renewable Energy Sources 2	Exam	5
	I1-SS-TZ	Special Seminar	Graded credit	2
	A group of semi-compulsory courses (min. 1 course):			
	I1-PRVZ	Industrial Air Conditioning	Exam	4
	I1-ZVHS	Sanitary and Water management buildings	Graded credit	4
	I1-OH-TZ	Solid Waste Management 2	Exam	4
	I1-TTS	Theory and Technology of Combustion	Exam	4
	A group of semi-compulsory courses (min. 1 course):			
	I1-TPIB	Environment Engineering of Intelligent Buildings	Exam	4
	I1-VYS	Heating Systems	Exam	4
	I1-ZTZA	Sanitary Facilities	Exam	4
	I1-VKCHS	Ventilation, Air-Conditioning and Cooling Systems	Exam	4

Information sheet

Building Control Systems

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-RSB
Course unit title: Building Control systems

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
seminar	2 hours weekly (on-site method)

Credits allocated: 4

Recommended semester/trimester: Building Services – master (profilový, compulsory), 3. semester
Level of study: 2.
Prerequisites for registration: none

Assesment methods:

During the semester, assignments are continuously submitted. The final grade is determined after adding up the points for assignments and a written exam with the following weights: completed assignments 30%, written exam 70%. In order to be admitted to the exam, it is necessary to obtain at least 16% of the completed assignments. The final evaluation of the student with a mark is given by the current study regulations.

Information sheet

Building Control Systems

Learning outcomes of the course unit:

The course deepens students' knowledge in the field of technical equipment of buildings, builds on the theoretical knowledge of the design of systems of technical equipment of buildings extended by knowledge about the operation of the building. The student expands the knowledge acquired in the subject Measurement and Control in Building Services.
The student will gain basic knowledge about the theory and principle of operation of the control circuit with a focus on the input and output functions of the control circuit.
The student will gain an overview of the possibilities of risky situations and master the principle of building security.
The student is able to assemble separate control and security circuits of individual technologies in the building, on the basis of which the functional and trouble-free operation of the building will be ensured. These circuits serve as inputs for the programmer to build a computer control system.
The student knows the work of the process station as a peripheral device of the control system, controls the methods of communication of remote data transmission for remote control of technology from the dispatching or autonomous station and can use and apply data obtained from the control system for facility management building.

Course contents:

- Buildings and their management.
- Building control systems. Origin, development, present, trends. Functions and goals of building management systems.
- Digital control.
- Technical equipment and system architecture of RSB. General autonomous functions.
- Input and output functions. Autonomous functions of energy management.
- Information processing functions. Communication systems and protocols.
- Risk management functions.
- Energy management. Facility management. Maintenance management.
- Vertical traffic management.

Information sheet

Building Control Systems

Recommended or required reading:

Basic:
SZÉKYOVÁ, M. – FERSTL, K. – NOVÝ, R. Vetranie a klimatizácia. Bratislava : Jaga, 2004. 422 p. ISBN 80-8076-000-4.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – BAŠTA, J. – KABELE, K. Vykurovanie rodinných a bytových domov. Bratislava : Jaga, 2005. 246 p. ISBN 80-8076-012-8.
VLACH, J. Řízení a vizualizace technologických procesů. Praha : BEN – technická literatura, 1999. 159 p. ISBN 80-86056-66-X.
VALEŠ, M. Inteligentní dům. Brno : ERA, 2008. 123 p. ISBN 978-80-7366-137-3.
SKŘIVAN, Z. Nebojte se zlodějů: Zabezpečovací technika v praxi. Praha : Grada, 1994. 201 p. ISBN 80-7169-096-1.
VESELÝ, V. – MURGAŠ, J. Riadenie technologických procesov: Vybrané kapitoly z prednášok a návody na cvičenia. Bratislava : STU v Bratislave, 1991. 236 p. ISBN 80-227-0450-4.
Recommended:
GARLÍK, B. Inteligentní budovy. Praha: BEN – technická literatura, 2012. 376 s. ISBN 978-80-7300-440-8.
KUDA, F. – BERÁNKOVÁ, E. Facility management v technické správě a údržbe budov. Praha: Professional Publising, 2013. 266 s. ISBN 97-8807-4311-14-7.
MERZ, H. – HANSEMANN, T. – HÜBNER, CH. Automatizované systémy budov. Praha: Grada, 2009. 264 s. ISBN 978-80-247-2367-9.

Planned learning activities and teaching methods:

lectures, seminars (4 credits, 100 h)

Contact teaching:
lectures – 26 h
exercises – 26 h

Contactless teaching:
assignment processing – 20 h
work with the control system in the laboratory – 2 h
study for exam – 26 h

Assesment methods and criteria:

Completion of the course: exam
The total mark from the subject will consist of:
– evaluation of exercises: min. 16%, max. 30%,
– exam (written): max. 70%
The grade will be determined according to the rules given by the STU study regulations. To obtain credits for the subject, at least 56% of the max. number of points (100%).

Information sheet

Energy Audit & Certification of Buildings 1

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-EACB
Course unit title: Energy Audit and certification of Buildings 1

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
seminar	2 hours weekly (on-site method)

Credits allocated: 5

Recommended semester/trimester: Building Services – master (profilový, compulsory), 3. semester
Level of study: 2.
Prerequisites for registration: none

Assesment methods:

During the semester, students hand in assignments. The final grade is determined after adding the points from the assignments using the following weights: finalized assignments 30 %, oral exam with a presentation of the assignments 70 %. To take part in the exam, at least 16 % must be obtained from the assignments. The final grade is determined in accordance with the study regulations.

Information sheet

Energy Audit & Certification of Buildings 1

Learning outcomes of the course unit:

The course contains a knowledge base regarding energy audit of buildings and energy certification of buildings, calculation methods of thermal balance and evaluation methods of the energy performance of heating, ventilation, air conditioning, cooling, and lighting systems in various types of buildings.
Student's knowledge:
The student understands functional and technological principles of creating an optimum indoor climate in intelligent buildings with respect to "3E" (energy, economics, and ecology).
Student's skills:
The student can evaluate the energy performance of various types of buildings as well as the economics of their operation, knows the methods for the evaluation of the energy performance of buildings and their technical systems, can elaborate energy audits, evaluations of the energy performance of buildings, and certification of buildings.
Student's competencies:
The student can formulate information about the procedure of task solving and communicate professional opinions.

Course contents:

- Legislation and broader relationships in the field of energy audit and certification of buildings.
- Procedure of energy audit and certification of buildings.
- Project identification, scanning, energy audit, energy monitoring, operation and maintenance.
- Requirements on building insulation and technical systems of buildings.
- Energy need for heating.
- Energy balance of buildings technical systems and calculation of energy use.
- Energy balance of solar systems.
- Proposal of energy efficiency measures.
- Calculation of profitability of energy efficiency measures. Cashflow.
- Report from energy audit, energy certificate and report to energy certificate.

Information sheet

Energy Audit & Certification of Buildings 1

Recommended or required reading:

Basic:
KRAJČÍK, M. – PETRÁŠ, D. – SKALÍKOVÁ, I. Energetické hodnotenie budov. Bratislava : Spektrum STU, 2019. 220 p. ISBN 978-80-227-4903-9.
DAHLSVEEN, T. – PETRÁŠ, D. – CHMÚRNY, I. – SMOLA, A. – LULKOVIČOVÁ, O. – FÜRI, B. – KONKOĽ, R. Energetický audit a certifikácia budov. Bratislava : Jaga Group, 2008. 163 p. ISBN 978-80-8076-063-2.
DAHLSVEEN, T. – PETRÁŠ, D. Energetický audit budov. Bratislava : Jaga, 2005. 335 p. ISBN 80-88905-85-0.
CHMÚRNY, I. Tepelná ochrana budov. Bratislava : Jaga, 2003. 214 p. ISBN 80-88905-27-3.
CHMÚRNY, I. Tepelná ochrana budov: Tepelnoizolačné vlastnosti stavebných konštrukcií. Bratislava: Spektrum STU, 2019. 121 p. ISBN 978-80-227-4954-1.

Planned learning activities and teaching methods:

lectures, exercises (5 credits, 125 h)

Direct education:
lectures – 26 h
exercises – 26 h

Indirect education:
work on assignments – 35 h
preparation for the exam – 38 h

Assesment methods and criteria:

Finalization of the course: exam
The final grade consists of:
– evaluation of the assignments: min. 16 %, max. 30 %,
– exam (oral): max. 70 %
The grade will be determined in accordance with the study regulations of the Slovak University of Technology in Bratislava. To obtain the credits at least 56 % out of the maximum of 100 % is needed.

Information sheet

Renewable Energy Sources 2

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-OZE2
Course unit title: Renewable Energy Sources 2

Mode of delivery, planned learning activities and teaching methods:

lecture	2 hours weekly (on-site method)
seminar	2 hours weekly (on-site method)

Credits allocated: 5

Recommended semester/trimester: Building Services – master (profilový, compulsory), 3. semester
Level of study: 1., 2.
Prerequisites for registration: none

Assesment methods:

The student submits protocols from individual assignments, which are individually scored.
The student completes the course if he / she submits all protocols on time and his / her success rate in the exercises will be 56%.
The final grade from the subject will be determined in accordance with the rules determined by the STU study regulations.

Information sheet

Renewable Energy Sources 2

Learning outcomes of the course unit:

The student will get acquainted with different types of renewable energy sources, learn the principles of selection and design of systems using renewable energy for TV preparation, support for heating, ventilation and air conditioning, and for pool water heating.
The student is theoretically prepared to design energy systems based on solar energy, geothermal water, environmental energy, biomass combustion for both seasonal and year-round use in buildings with almost zero energy consumption.
He is able to design energy systems and assess their suitability with max. utilization rate and thermo-economic evaluation.

Course contents:

Types and forms of energy based on RES. Conditions for the use of renewable energy sources. The sun and its model, principle and properties of solar radiation. Climatic data for the territory of Slovakia.
Solar energy systems (SES). SES components: collectors, storage tanks, pumps, security devices. Energy systems for the preparation of TV and heating of technological water for swimming pools, for heating with short-term and long-term heat accumulation. Economic and environmental assessment of SES.
Basic characteristic parameters of GTV sources, occurrence and conditions of use in Slovakia. Usable energy potential and usable amount of GTV and GE. Technological equipment and systems for the use of GE (direct and indirect use). Ways to assess GE utilization rates and proposals for measures to make better use of available energy potential. Use of GE for electricity generation.
Environmental energy, solar radiation, air, earth and water as natural sources of energy. Heat pumps. Low temperature energy systems with heat pumps.
Biomass – types and perspectives of use in Slovakia. Types of biomass and methods of its acquisition. Energy systems using biomass of plant and animal origin.

Information sheet

Renewable Energy Sources 2

Recommended or required reading:

Basic:

CIHELKA, J. Sluneční vytápěcí systémy. Praha : SNTL, 1984. 206 p.
VALÁŠEK, J. – HALAHYJA, M. Solárna energia a jej využitie. Bratislava : Alfa, 1983. 290 p.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – FÜRI, B. Nízkoteplotné vykurovanie a obnoviteľné zdroje energie. Bratislava : Jaga, 2001. 271 p. ISBN 80-88905-12-5.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – BAŠTA, J. – KABELE, K. Vykurovanie rodinných a bytových domov. Bratislava : Jaga, 2005. 246 p. ISBN 80-8076-012-8.
PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – FÜRI, B. Obnoviteľné zdroje energie pre nízkoteplotné systémy. Bratislava: JAGA GROUP, s.r.o., 2009. 221 p. ISBN 978-80-8076-075-5.
LULKOVIČOVÁ, O. – TAKÁCS, J. Netradičné zdroje energie: Prednášky. Bratislava : STU v Bratislave, 2003. 138 p. ISBN 80-227-1838-6.

Planned learning activities and teaching methods:

Lectures, exercises, projects.
Contact teaching:
lectures 26 h,
exercises 26 h,
presentation and defense 4 h.
Contactless teaching:
preparation for lectures and exercises 14 h,
processing of protocols 20 h,
project processing 20 h,
study for exam 15 h.

Assesment methods and criteria:

Completion of the course: written exam
evaluation from exercises: 16.8 to 30%,
written exam: 0 to 70%,
To successfully complete the course, it is necessary to achieve 56% of max. possible number of 100 points.

Study Plan

2st year – 4th semester	A group of compulsory courses:			
	I1-UO	Artificial Lighting	Exam	3
	I1-SIEPB	Building Energy and Environmental Simulation	Graded credit	3
	I1-ZABE	Energy Supply of Building	Exam	3
	I1-SSK	Final Exam	Exam	4
	I1-DP-TZ	Graduation Thesis	Exam	12
	A group of semi-compulsory courses:			
	I1-ENAB	Environmental Audit of Buildings	Graded credit	3
	I1-MVV	Research methods in Heating	Graded credit	3
	I1-MVZT	Research methods in Sanitary Engineering	Graded credit	3
	I1-MVVZ	Research methods in Ventilation and Air Conditioning	Graded credit	3
	A group of semi-compulsory courses (min. 1 course):			
	I1-PVS	Operation of Heating Systems	Graded credit	2
	I1-PZTZ	Operation of the Sanitary Facilities	Graded credit	2
	I1-PVTS	Operation of Ventilation and Air Conditioning Systems	Graded credit	2
	I1-TOO	Techniques of Air Protection	Graded credit	2

Information sheet

Artificial Lighting

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-UO
Course unit title: Artificial Ligthing

Mode of delivery, planned learning activities and teaching methods:

lecture 2 hours weekly (on-site method)

seminar 1 hour weekly (on-site method)

Credits allocated: 3

Recommended semester/trimester: Building Services – master (compulsory), 4. semester
Level of study: 2.
Prerequisites for registration: none

Assesment methods:

graduation exercises and handing award 40 points

Learning outcomes of the course unit:

Results of education
Subject applies the knowledge of light sources, lamps and lighting equipment within subject of buildings technical equipment.
Gained knowledge: Students will gain an overview of lighting techniques. Recognize the principles of lamps, lighting fixtures and their applications in lighting systems.
Gained skills: The specific measurements of lighting systems in order to verify their own proposals and proposed implementation measures and the rationalization of electricity savings illuminated. The course is based on knowledge acquired in mathematics and physics.
Gained competencies: The student will be characterized by a high degree of creativity and independence in proposing technical solutions, he/she can solve professional tasks in the field of lighting technology

Information sheet

Artificial Lighting

Recommended or required reading:

Basic:

HETSCHEL, H. Licht und Beleuchtung: Theorie und Praxis der Lichttechnik. Heidelberg : Dr. Alfred Hüthig Verlag, 1987. 377 p. ISBN 3-7785-1365-6.

DAHLSVEEN, T. – PETRÁŠ, D. – CHMÚRNY, I. – SMOLA, A. – LULKOVIČOVÁ, O. – FÜRI, B. – KONKOĽ, R. Energetický audit a certifikácia budov. Bratislava : Jaga Group, 2008. 163 p. ISBN 978-80-8076-063-2.

GAŠPAROVSKÝ, D. – SMOLA, A. Návrh umelého osvetlenia interiérov a exteriérov. Bratislava : Slovenský elektrotechnický zväz, 2011. 262 p. ISBN 978-80-8106-046-5.

Planned learning activities and teaching methods:

Planned learning activities:
Lectures Laboratory practice (3 credits, 75 h)
Education:
Contact Lectures – 26 h
Laboratory practice – 13 h
Contactless lectures
Reports preparing – 20 h
Study for exam – 16 h

Assesment methods and criteria:

Evaluation methods and criteria:
Completion of the course: Exam
The final grade from the subject will consist of:
Laboratory practice evaluation: min. 20%, max. 40%:
Exam (written and oral): max. 60%
The grade will be determined according to the rules given by the STU study regulations. At least 56% of the maximum number of points (100%) is required to obtain credits for the course

Information sheet

Energy Supply of Buildings

University: Slovak University of Technology in Bratislava
Faculty: Faculty of Civil Engineering
Course unit code: I1-ZABE
Course unit title: Energy Supply of Building

Mode of delivery, planned learning activities and teaching methods:

lecture 2 hours weekly (on-site method)

seminar 1 hour weekly (on-site method)

Credits allocated: 3

Recommended semester/trimester: Building Services – master (compulsory), 4. semester
Level of study: 2.
Prerequisites for registration: none

Assesment methods:

The student submits protocols from individual assignments, which are individually scored.
The student completes the course if he / she submits all protocols on time and his / her success rate in the exercises will be 56%.
The final grade from the subject will be determined in accordance with the rules determined by the STU study regulations.

Learning outcomes of the course unit:

The student masters the principles of economical way of supplying territorial units and buildings with energy.
The student has an overview of energy and energy supply of buildings, heat demand and energy demand for heating, TV preparation, ventilation and air conditioning.
The student has an overview of the systems of cold production and cold security of buildings in the transition period and in the summer months.
The student is able to conceptually design a system of centralized heat and cold supply for a residential district.
The student is able to calculate and design a source of heat and cold using renewable energy sources – solar energy, biomass, environmental energy – heat pumps and geothermal energy.

Information sheet

Energy Supply of Buildings

Course contents:

Forecasts of energy development until 2100. Overview of the occurrence of primary energy sources in the world. The main goals of the energy policy of the Slovak Republic.
Types and forms of energy, structure and growth of energy demand. Areas of importance of energy supply. Road supply. Settlement structure. Balance of heat and energy needs. Diagram of heat demand duration.
Heat sources for DH systems (district boilers, heating plants, heating plants). Heat transfer stations.
Thermal networks, types, distribution, use. Thermal insulation. Objects on heating networks and compensation of pipeline distribution network. Pressure diagram of a pipeline heating network.
Production, accumulation and distribution of cold in buildings.
The need for natural gas for individual consumption points. Total balances of natural gas needs. Types of gas networks, distribution, use and calculation.
Measuring and regulating stations of heat sources and regulating stations of residential districts.
Importance and categories of consumption, consumption density, sources of electricity. Distribution electrical networks radial, circular, grid.
Renewable energy sources and their application in district heating systems and in district heating systems.

Information sheet

Energy Supply of Buildings

Recommended or required reading:

Basic:

LULKOVIČOVÁ, O. Vykurovanie. Zdroje tepla. In VALÁŠEK, J. – FÜRI, B. – GAŠPAROVSKÝ, D. – KALÚS, D. – LULKOVIČOVÁ, O. – SZÉKYOVÁ, M. – HAVELSKÝ, V. – TAKÁCS, J. – NAGY, J. Technické zariadenia budov.Stavebno-technické zásady pre navrhovanie,posudzovanie a realizáciu vnútorných rozvodov a ich zariaďovacích predmetov: Stav – október 2008.

PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – FÜRI, B. Obnoviteľné zdroje energie pre nízkoteplotné systémy. Bratislava: JAGA GROUP, s.r.o., 2009. 221 p. ISBN 978-80-8076-075-5.

PETRÁŠ, D. – LULKOVIČOVÁ, O. – TAKÁCS, J. – BAŠTA, J. – KABELE, K. Vykurovanie rodinných a bytových domov. Bratislava : Jaga, 2005. 246 p. ISBN 80-8076-012-8.

LULKOVIČOVÁ, O. – PETRÁŠ, D. – BAŠTA, J. – JELÍNEK, V. – KABÁT, V. Zdroje tepla a domové kotolne. Bratislava : Jaga, 2004. 223 p. ISBN 80-8076-001-2.

SZÉKYOVÁ, M. – FERSTL, K. – NOVÝ, R. Vetranie a klimatizácia. Bratislava : Jaga, 2004. 422 p. ISBN 80-8076-000-4.

VALÁŠEK, J. – PERÁČKOVÁ, J. – BEŇO, S. – KABELE, K. – ŽABIČKA, Z. Zravotnotechnické zariadenia budov. Bratislava: Jaga, 2005. 350 p. ISBN 80-8076-013-6.

Planned learning activities and teaching methods:	Lectures, exercises, projects. Contact teaching: lectures 26 h, exercises 13 h, Contactless teaching: preparation for lectures and exercises 10 h, processing of protocols 10 h, project processing 10 h, study for exam 6 h.
Assesment methods and criteria:	Completion of the course: written exam evaluation from exercises: 16.8 to 30%, written exam: 0 to 70%, To successfully complete the course, it is necessary to achieve 56% of max. possible number of 100 points.

Profile of the Programme

- Acquisition of professional training in the field of design and management of building services, which is important for professional performance or qualifying for PhD. degree courses.

Occupational profiles of Graduates with Examples

- The alumnus will assert as a member of creative team, its leader or individual responsible worker in branch of designing of optimal solutions of installation, energetic and operation systems in buildings, in development of new technologies and facilities of technologies of the building environment, in branch of execution of the buildings, in technological departments within application of the facilities and coordination of the part of the building equipment, also in branch of protection of the environment within construction and operation of the buildings, in state administration and regional development, in education system etc.

Thank you

Prof. Ing. Dušan Petráš, PhD.