# General Informations:

**Curriculum:** Architecture Bsc, Architecture OTM

**Name of Course:** ENERGY SYSTEMS 1.

**Course Code:** MSE086AN

**Semester:** Semester 4

**Number of Credits:** 3

**Allotment of Hours per Week:** 1 Lecture, 1 Practical Lesson /Week

**Evaluation:** Examination grade

**Prerequisites:**

Course director: Dr. Nyers Árpád, adjunktus

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## General Course Description

Purpose of this course is to introduce students to the optimal, energy-efficient operation of building systems and their design. Internal partitioning and planning of the building from the point of view of building engineering systems, space requirements, breakthroughs, grouping of functions. Minimum required and optimum size of mechanical space. Utility connections. Modern equipment, systems utilizing renewable energy and rainwater.

## Learning Outcomes

Neptun: Instruction/Subjects/Subject Details/Syllabus

Goals, student learning outcome.

Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

## Subject content

Introduction. Traditional and modern buildings vs local climate conditions, weather. Ventilation systems: types of ventilation, dimensional basics, fans, air handling units, air ducts, air inlets, diffusers. Air conditioning systems: working principals of air conditioning systems, types of system layout. Sanitary systems: sanitary equipment, typical layout, pipeline materials and dimensions. Drainage: typical layout, pipeline materials and dimensions. Heating systems: dimensional basics, heat sources, heat distribution systems, heat emitters.

LECTURE:

1. Ventilation systems
2. Heating systems
3. Sanitary systems
4. Electricity system

PRACTICE:

1. Ventilation systems - calculation of the dimensions of the ducts
2. Heating systems - calculation of the heat losses of a building
3. Sanitary systems - calculation of the dimensions of the pipes
4. Electricity system

**Examination and evaluation system**

*In all cases. Annex 5 of the Statutes of the University of Pécs, the* ***Code of Studies and Examinations (CSE)******of the University of Pécs*** *shall prevail*

[*https://international.pte.hu/sites/international.pte.hu/files/doc/TVSZ%202022\_06\_23\_ENG.pdf*](https://international.pte.hu/sites/international.pte.hu/files/doc/TVSZ%202022_06_23_ENG.pdf)

**Attendance**

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description..

Method for monitoring attendance : attendance sheet

**Assessment**

**Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam**

|  |  |  |
| --- | --- | --- |
| **Type** | **Assessment** | **Ratio in the final grade** |
| *Test 1.* | *max 7.5 points* | *7.5 %* |
| *Test 2* | *max 7.5 points* | *7.5 %* |
| *1. assignment*  | *max 8 points* | *8 %* |
| *2. assignment* | *max 8 points* | *8 %* |
| *3. assignment* | *max 8 points* | *8 %* |

**Requirements for the end-of-semester signature**

mid-term assessment of 40%

***Re-takes for the end-of-semester signature*** *(PTE TVSz 50§(2))*

*The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: all the tests and the records to be submitted can be repeated/improved each at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.*

**Type of examination** :written

The exam is successful if the result is minimum 40%. (The minimum cannot exceed 40%.)

**Calculation of the grade (TVSz 47§ (3))**

The mid-term performance accounts for 39 %, the performance at the exam accounts for 61 % in the calculation of the final grade.

**Calculation of the final grade based on aggregate performance in percentage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Grade: | 5 | 4 | 3 | 2 | 1 |
|  | A, jeles | B, jó | C, közepes | D, elégséges | F, elégtelen |
| Performance in % | 85%-100% | 70%-84% | 55%-69% | 40%-54% | 0-39% |

## Readings and Reference Materials

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature))

Required:

[1.] Joseph B. Wujek, Frank R. Dagostino - Mechanical and Electrical Systems In Architecture, Engineering, and Construction

[2.] Standard EN-15251

[3.] Standard ISO/FDIS 13790:2006

[4.] Standard EN 12056-2:2000

Recommended:

[5.]Walter T. Grondzik, Alison G. Kwok, Benjamin Stein, John S. Reynolds – Mechanical and Electrical Equipment for Buildings

[6.]W. Larsen Angel, P.E., LEED AP-HVAC Design Sourcebook

[7.]Alan C. Twort, Don D. Ratnayaka, Malcolm J. Brandt- WATER SUPPLY

[8.]Robert McDowall - Fundamentals of HVAC Systems

## Methodology

The lectures based on ppt presentation and discussion about problems regarding the actual topic.

1.Independent work during the scheduled time according to the semester course announced in the detailed subject program

2. Independent homework

## Students with Special Needs

Students with a disability and needs to request special accommodations, please, notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

*Detailed requirements and schedule of the Course*

**Tasks and minimum requirements**

**Minimum requirements of the 1st assignment:**

Individual design of a small house or flat with floor plan.

Conceptional arrangements of the ventilation ducts.

Conceptional arrangement of the ventilation inlets and outlets.

Calculation of the dimension of the ventilation ducts.

**Minimum requirements of the 2st assignment:**

Calculation of the heat losses and heat gains of the same small house.

Selection of the radiators for every room.

Presentation in the floor plan.

**Minimum requirements of the 3st assignment:**

Calculation of the dimension of the waste water canalization.

Conceptional arrangement of the waste water pipes.

Presentation in the floor plan.

## Schedule

(Neptunban: Oktatás/Tárgyak/Tárgy adatok/Tárgytematika/Tantárgy tartalma rovat)

|  |
| --- |
| LECTURE  |
| week | **Topic** | **Compulsory reading; page number****(from … to …)** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
| 1. | Introduction to building engineering | [1.] Page 6-9 | … | … |
| 2. | Specialists in building engineering and their relationship with buildings. Sustainable Building Engineering. | [1.] Page 6-9 |  |  |
| 3. | Installation of ventilation ducts and equipment, controlled ventilation solutions. | [1.] Page 213-225 |  |  |
| 4. | Modular Air Handling Unit | [1.] Page 188-191 |  |  |
| 5. | Principles of space air diffusion | [1.] Page 253-262 |  |  |
| 6. | National holiday | [1.] Page 253-262 |  |  |
| 7. | Modern heating systems | [1.] Page 171-210 |  |  |
| 8. | Heat distribution systems | [1.] Page 315-335 |  |  |
| 9. | Spring break |  |  |  |
| 10. | Gas boilers, heat pumps, oil boilers | [1.] Page 173-183 |  |  |
| 11. | Radiators, floor heating, fan coils | [1.] Page 227-230 |  |  |
| 12. | Sewage drainage | [1.] Page 393-439 |  |  |
| 13. | Water supply Domestic hot water supply. | [1.] Page 441-499 |  |  |
| 14. | Rainwater drainage for buildings. Internal fire water supply. | [1.] Page 553 |  |  |
| 15. | Electricity systems |  |  |  |

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| PRACTICE, LABORATORY PRACTICE |
| week | **Topic** | **Compulsory reading; page number****(from … to …)** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
| 1. |  |  |  |  |
| 2. | Duct diameter calculation | EN-15251 |  |  |
| 3. | Duct diameter calculation | EN-15251 |  |  |
| 4. | 1. Assignment |  |  | 7. week |
| 5. | Duct diameter calculation | EN-15251 |  |  |
| 6. | National holiday |  |  |  |
| 7. | 1. Assignment submission, 1. Test Calculations of heat loss through walls | ISO/FDIS 13790:2006 |  |  |
| 8. | 2. Assignment |  |  | 11. week |
| 9. | Spring break |  |  |  |
| 10. | Calculations of heat loss through walls | ISO/FDIS 13790:2006 |  |  |
| 11. | 2. Assignment submission, 2. Test |  |  |  |
| 12. | Diameter calculation of the sewage system | BS EN12056-2:2000 |  |  |
| 13. | 3. Assignment |  |  | 15. week |
| 14. | Diameter calculation of the sewage system | BS EN12056-2:2000 |  |  |
| 15. | 3. Assignment submission |  |  |  |

 Dr. Nyers Árpád

 course director

Pécs,03.02.2023