University of Salahaddin in Arbil
College of Engineering
Department of architecture
Kurdistan Region/ Arbil, 05.02.2020

COURSE BOOK

Elective

(BUILDIN PHYSICS)
With
(BUILDING MATERIALS)

5th Year, Bachelor of Science

2 Hours in a Week

Group A + B

Lecturer

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COURSE OBJECTVES

This course analyzes the state and operation of the building envelope like walls, roofs, Floors and foundation, as well as the physical process of heat, moisture and fire protection. These physical transport processes determine the performance of the building. It's essential for sustainability, passive planning and energy - efficient buildings with high levels of comfort and lifetime.

Building Physics will help us to anticipate the performance and consequences of alternative designs as well as determining technical solutions before critical design and construction decisions can be made.

Building physics is a design discipline to make less energy-hungry buildings for the built environment more sustainable, in order to protect our surroundings and our health.

PROBLEM PRESENTATION & THE AIM OF BUILDING PHYSICS SUBJECT

The climate zone in which we study has a very dry and hot condition (46 - 50) C° in summer and very wet cold weather (2-(-6) in winter time. The sky is often clear without clouds with long and strong daylight. The temperature different between day and night, summer and winter is relatively very big.

As we know the buildings in the region make people to depend mainly on technical power resources. The coast will be higher and put the environment under pressure. Therefore it is very important to build with climatic design. For that purpose help us the fundamentals of **Building Physics**.

The main duty of this Study is to keep itself busy with **thermal comfortable** and **energy saving** in the buildings, which create and provide us a healthy inside atmosphere, especially which has a good connection with correct environmental building system in the Region. We want to know which Optimize procedures reduce the inside temperature of the buildings in the summer or to protect the inside warm temperature in the winter.

FORMS OF TEACHING METHODS

Different forms of teaching will be used in the class. **Power point presentations** help us to realize some of aims of this course. The following explains the methods:

- Teaching, asking and discussion in the class with Power point presentations for the head titles, definitions and conclusions.
- Students will be permanent asked to understand the subjects
- Worksheet in the class let the chance for practicing the most important exercises together. If necessary, we can meet in another time to get the best understand of the subject.
- Report preparation in English language to represent environmental effects on a specific existing building to compare the optimized house with unoptimized realized objects.
- Classroom discussion about the reports, solves, analysis and evaluate problems to get the best of the course. Try as much as possible to participate in classroom discussions, to solve the assignments given in the course.
- Your attendance and activities in the class is very important to fulfill our aims

GRADING

The students required to monthly exams besides quizzes and weekly assignments about project solution in our climate.

30% Monthly Examine and Quizzes
- 10% Quizzes
- 20% Examine

10% Classroom activities, participation and attendance
10% Reports about physical project solution
50% Final exam

Classroom activities, assignments resolve and attending class will be evaluated by the lecture over the semester and used to determine the final grad.

COURSE MATERIALS

1- Kadr, Salahden, 2010, **Climate optimization of residential family houses in Iraqish Kurdistan**, TU-Berlin, Dissertation. (German-English) **نامەی دکتۆرا**

2- Kadr, Salahden, 2013, **scientifically Building research for Kurdistan- Region**. First edition, Hawler-Kurdistan Region. Publisher Tafseer (Kurdish) **لێکۆڵینەوەی بیناسازی زانستی بۆ هەرێمی کوردستان**

3- Kadr, Salahden Ghareb, 2019, **Building Physics and Energy save**. First edition, Hawler-Kurdistan Region. Publisher Tefseer (**Kurdish**) **فیزیای بیناسازی و پاشەکەوتی وزە**

4- Hens, Hugo, 2012, **Building Physics**, 2nd Edition, Verlag Ernst & Sohn, Gemany. (English)

5- Lechner, Nobert, 2009, **Heating, cooling, lighting, Sustainable Design Methods for Architects**, Third Edition, John Wiley & Sons, Inc, Hoboken, New Jersey, USA. (English)

6- Kreith, Frank, 2010, **Principles of Heat Transfer***,* Cengage Learning; 7 Edition: Revised. (English)

7- Ernst Neufert, **Neufert**, Architects Data

8- Michail J crosbie, Donald Watson, **Time saver standards**, for Architectural Design

9- **Building and environment**, Copyright © 2014 Elsevier Ltd. All rights reserved

10- Hugo, hens, 2012, **Building Physics: Heat, Air and Moisture, Fundamentals and Engineering Methods with Examples and Exercises***,* Second Edition*,* Publisher: Wiley-VCH GmbH & Co. KGaA

USEFUL INTERNET LINKS

- **http://www.buildingphysics.com**
- **https://www.fabricfirst.com.au/services**

COURSE PROGRAM

ELECTIVE, BUILDING PHYSICS **Week**

1.0 CLIMATE

1.1 Basic concepts for Climate-Responsive Design
1.2 Definition of Environment
1.3 Outsite Climate and Weather
1.4 The meteorological condition
1.5 Climate in Kurdistan Region
1.5.1 Climate zones of the Region
1.5.2 Components of outsite Climate in the Region
1.5.2.1 Outsite air Temperature
1.5.2.2 Humidity and Air - Moisture
1.5.2.3 Relative air humidity φ (Phi) %
1.5.2.4 Precipitation and Wind
1.6 Indoor Climate
1.6.1 Room temperature, Feel temperature and Circumvallation temperature °C
1.6.2 Ideal Inside room climate
1.7 Inside factors of thermal comfort

2.0 ENERGY

2.1 Definition of energy
2.1.1 Heating energy
2.1.2 Cooling energy
2.2 Influence of energy on our life
2.3 Energy and Building
2.3.1 The main characteristics of the building to save energy
2.4 Energy house types in research
2.5 Thermal comfort and Energy in the buildings.....**1**

3.0 PRINCIPLES OF BUILDING PHYSICS

A BUILDING MATERIALS

A 1 Cement block stone
A 2 Brick masonry
A 3 Y-Ton or Thermo stone

3.1 HEAT & HEAT PROTECTION or HEAT SAVING

3.2 Fundamentals and purposes of the heat protection
3.3 Temperature (°C) (K)
3.3.1 Heat protection and energy save
3.3.2 Fundamentals of Building Physics (Heat protection)
3.3.2.1 Heat transfer, Heat flow (Φ)
3.3.2.2 Heat value, Thermal value (H)
3.3.2.3 Heat quantity or Heat storage capacity (Q)
3.3.2.4 Thermal conductivity (λ)