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| **Date:** | Examination No.: | Version:2021-2022 | Start:01/09/2022 |
| **Module Name - Code** | **Environment and Sustainability** |
| **Module Language:** | English |
| **Responsible:** | **Dr. Hardi Khairullah Abdullah** |
| **Lecture (s):** | **Mr. Ahmed Nawzad** |
| **College:** | College of Engineering – Salahaddin University-Erbil |
| **Duration:** | 15 week – 1 semester |
| **Course outcomes:** | On the successful completion of this course, students will learn the following skills and information:* Knowledge about all climatic elements
* Learning about principles of heat transmission through building envelopes.
* Learning about passive solar energy consumption methods.
* Learning about natural lighting design principles
* Learning about natural air movement and natural ventilations in building design.
* Implementation of stack effect phenomenon on building design.
* Design climatic principles applications on buildings.
* Preparation of students for practical life projects applications concerning climatic principles and concepts.
* Learning about sustainability and green building principles and rating systems applied on buildings to minimize energy consumption or reduce it.
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| **Course Content:** | * Due to global warming crisis, it is wise for architects and architectural professionals to design buildings that respond to sever climatic changes depending upon advancement in technological issues in architectural design, construction technologies and building materials properties.
* It is important for students to understand about the effect of climatic elements on building performance; then to design their buildings to save energy as well as maintain indoor air and thermal comfort simultaneously.
* Climatic elements, thermal properties of building material, concepts of thermal energy, reduction through application of different natural phenomena; all these to be applied in building designs to maintain the above needs.
* Take benefit of renewable energies and working within sustainable design through application of most of sustainability or green building rating systems. The common objective is that buildings are designed to reduce the overall impact of the built environment on human health and the natural environment.

Students must be aware how to implement all above facts and phenomena in their futuristic designs to preserve the natural non-renewable energy resources for other generations and economize all projects with an optimum expenditure of energy consumption and maintaining human comfort climatically at the same time.The objectives of this course are:* + To familiarize students with all climatic elements.
	+ To understand the relationship between climatic elements and building envelope design.
	+ To deliver information about renewable energies.
	+ To understand the technological advancement in building technologies that maintains human comfort climatically within minimal use or net-zero energy or net-positive energy (production of energy more than needed).
	+ To analyze and apply the various passive solar energy systems on examples of building designs to initiate a variety of advanced concepts with innovative solutions.
	+ To manipulate building designs to all climatic elements such as thermal transmission, wind benefits from natural ventilation, configuration of openings design due to sun light need functionally, buildings protection

from rain water and dampness. |
| **Literature:** | **Main references:*** + Mitchells, Peter Burbery, Environment and Services
	+ Lechner , Norbert, Heating, Cooling, Lighting: Design Methods for Architects
	+ Brown, G.Z, Dekay ,Mark (2001): ”Sun ,Wind &Light “ John Willey & Sons , Canada.
	+ Passive and Active Environmental Controls
	+ Relative standards, guidelines, websites, and magazines.

**Useful References:**Gaur, R.C. (2008). Basic environmental engineering. New Age international publishers. |
| **Type of Teaching:** | 4 hrs. in lectures |
| **Pre-requisites:** | None |
| **Preparation Modules:** | None |
| **Frequency:** | Fall Semester  |
| **Requirements for credit points:** | For the award of credit points, it is necessary to pass the module set presentations and exams. It contains:The module has weekly works, assignments, pre final and final presentations for the required project set.**Student's attendance is required in all classes**. |
| **Credit point:** | 4 |
| **Grade Distribution:** | Assessment scheme:* 1. Assignments 15%
	2. Mid-term exam 10%
	3. Class attendance and activities (quizzes) 5%
	4. Project submission (Analyze and design) 10%
	5. Final exam 60%
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| **Work load:** | The workload is 110 hrs. It is the result of 60 hrs. attendance and 50 hrs. self-studies (Assignments, preparation for project set and applications). |