DEPARTMENT OF ARCHITECTURE
UNIVERSITY OF THE PUNJAB, LAHORE.

BACHELORS OF ARCHITECTURE (B. ARCH)
5 YEARS PROGRAM

COURSE OUTLINE

Course Title	**Environmental Control Systems I**
Course Code	**ARCH-241**
Credit Hours	**2**
Semester	**Fall**
Prerequisites	**NA**
Tutor	**As per Timetable**
Student Advising	**As per Timetable**
Contact	-

Teacher Signature **Chairman Signature**

Course introduction

This course incorporates tools needed by the students to learn to coalesce environmental control systems into the developmental process of form of architectural design. It is the 2nd course in the series of courses that aims to explain the task of building as a system in processing the environment around its users.

It further elaborates the fundamentals taught in ECS I and focuses on using passive systems to create comfortable thermal environment, fundamentals of lighting, Acoustics, Fire protection and other technical issues met in building design. The emphasis is given to the better quality of interaction between human sensory systems and related mechanical, building and environmental control subsystems.

Learning Objective:

In this course, Students will learn about basic envirnmental controls systems including solar geometiry sun path diagrame, altitute angle, azimuthengal, concept of heat, Climate And Weather, Elements of Climate, Microclimate, Climate Classification and indigenous Architecture

Outcome

Students will be able to:

- Define the concepts of Solar Geometry.
- Find the factors impacting thermal comfort in a given space.
- List environmental challenges and factors accountable for environmental degradation.
- Summarize the historical evolution of Passive solar architecture.
- Develop tools to analyze best possible building orientation.
- Model a sun path diagram to identify specific climate data on it.
- Develop an understanding of different climates and elements of climates and to study building design strategies in particular climatic zones.

Learning Methodology:

- Lectures as provided in the schedule of the semester activities
- Study of Archival Material and recommended books
- Guest Lectures as per requirement
- Presentation on allocated topics

Grade Evaluation Criteria

Following, is the criteria for the distribution of marks to evaluate final grade in a semester.

Marks Evaluation	**Marks in percentage**
Sessional (Assignments, Quizzes, Presentations)	30
Mid Term	30
Final examination	40
Total	**100**

Content	
Unit 1	Introduction to the subject and different terminologies used in various concepts under this subject
Unit 2	Pre-industrial, Industrial and Post-Industrial architecture Roots of passive solar architecture; passive solar movement
Unit 3	Solar Geometry (The Sun, Elliptical Orbit, Tilt of the Earth's Axis, Altitude angle, consequences of Altitude angle, Summer Solstice, Winter Solstice, Equinoxes) Importance of Building Orientation
Unit 4	Solar geometry (Determining Azimuth and Altitude angles, angle of declination, , Horizontal and Vertical sun path diagrams)
Unit 5	Student Presentation
Unit 6	Preparation of Sun path diagram and implementation of climatic data of any selected city on this diagram
Unit 7	Climate And Weather, Elements of Climate, Microclimate, Climate Classification
Unit 8	Climate and Indigenous Architecture
Unit 9	**Mid Term Exam**
Unit 10	Studying a particular climatic region and examples showing the features adopted in residential architecture in that specific climate.
Unit 11	Heat and temperature Physics of heat Theories of heat transfer Greenhouse effect (heat flow, time lag)
Unit 12	Thermal comfort Factors of comfort Clothing and comfort (thermal barriers, adjustable mechanisms)
Unit 13	**Student Presentation**
Unit 14	Thermal behavior of buildings
Unit 15	Passive Solar Architecture
Unit 16	Quiz
Unit 17	**Final Presentation**
Unit 18	Final Exam
Recommended Books/References	• Architecture and the Environment, Bioclimatic Building Design by Jones • Climatic Responsive Architecture: A design Handbook

	for Energy Efficient Buildings by Arvind Krishan • Environmental control system by Fuller Moore • Passive Solar Architecture; Heating, cooling, ventilation, daylighting and more using natural flows by David Bainbridge, Ken Haggard • Solar Geometry by Steven V. Szokolay • Heating, Cooling, Lighting-Sustainable design Methods for Architects by Norbert Lechner, 4th Edition, 2015,Published by John Wiley & Sons, Inc., Hoboken, New Jersey, • Introduction to Architectural Science- The basis of Sustainable Design by Steven V Szokolay, 2nd Edition 2008, Elsevier • Design - Tech: Building Science for Architects by Jason Alread& Thomas Leslie, 1st edition , 2007, Elsevier • The Architectural Expression of Environmental Control Systems by George Baird; Edition 2004, Taylor and Francis Group • Sun, Wind & Light. Architectural Design Strategies by G.Z.Brown, Mark DeKay,, 2nd Edition, 2001, John Wiley & Sons. • Sustainable Building Design by ChitrarekhaKabre • Introduction to Architectural Science and the basis of Sustainable Design by Szokolay, Steven V, 2014, London, UK