Course Code ESE-812	Credit Hours (Th-Pr) 3.0-0	**Energy Management in Buildings (Elective)**	Contact Hrs/Week (Th-Pr) 3-0	Total Contact Hrs (Th-Pr) 45-0

Course Outline:

Overview of the significance of energy use and energy processes in buildings; indoor environmental requirements and management; climate, solar radiation, the external influences, and the shape and orientation of buildings; lighting, daylighting and air-conditioning; end-use energy requirements and status of energy use; estimation of energy use in a building; heat gains and thermal performance of building envelope; energy audit and energy conservation; energy management options.

Eligibility Criteria: B.E (Chemical, Mechanical, Electrical, Environmental and Materials)

Recommended Books:

S. No.	Title	Author(s)	Assigned Code	Remarks
1.	Heating and Cooling of Buildings: Design for Efficiency	J. Krieder, and A. Rabl	KR	Text
2.	Energy Management in Buildings	Keith J. Moss	MK	Text
3.	Energy Management and Operating Costs in Buildings	Keith J. Moss	MK	Reference
4	Energy Design for Architects	Alexander Shaw	AS	Reference
5	Mechanical and Electrical Equipment for Buildings	S. M. Guinnes, and Reynolds	GR	Reference

Course Objectives:

To enable essential but practical understanding of the energy processes in buildings. The course covers the external and internal energy processes in the control of the built environment. It also examines emerging technologies for energy management.

Learning outcome:

Identification of primary sources of energy loss in buildings. Conservation measures undertaken to mitigate these losses. Design of efficient energy buildings will be the natural outcome of this course. Intelligent building design based on smart devices such as solar windows, coatings, optimal use of insulation and least cost HVAC load calculations are given due attention.

Topics Covered:

No.	Topics	Text Book	Contact Hours
1.	**Overview of the Significance of Energy Use and Energy Processes in Building** 1. Indoor Activities and Environmental Control 2. Internal and External Factors on Energy Use and the Attributes of the Factors 3. Characteristics of Energy Use and Its Management 4. Macro Aspect of Energy Use in Dwellings and Its Implications	KR &MK	4
2.	**Indoor Environmental Requirement and Management** 1. Thermal Comfort 2. Ventilation and Air Quality 3. Air-conditioning Requirement 4. Visual Perception, Illumination Requirement 5. Auditory Requirement	KR &MK	6
3.	**Climate, Solar Radiation and Their Influences** 1. The Sun-earth Relationship and the Energy Balance on the Earth's Surface	KR &MK	6

	2. Climate, Wind, Solar Radiation, and Temperature 3. Sun Shading and Solar Radiation on Surfaces 4. Energy Impact on the Shape and Orientation of Buildings		
4.	**End-use Energy Utilization and Requirements** 1. Lighting and Daylighting 2. End-use Energy Requirements 3. Status of Energy use in Buildings 4. Estimation of Energy Use in a Building	KR &MK	6
5.	**Heat Gain and Thermal Performance of Building Envelope** 1. Steady and Nonsteady Heat Transfer Through the Glazed Window and the Wall 2. Standards for Thermal Performance of Building Envelope 3. Evaluation of the Overall Thermal Transfer	KR &MK	4
6.	**Non-Steady Heat and Moisture Gain through Building Envelope** 1. Single and Multi-Dimensional Problems 2. Transfer Function and Finite-Difference Solution 3. Energy Balance Concept and its Implementation	KR &MK	4
7.	**Technologies for Low Energy Buildings** 1. Application of Radiant Barriers With other Building Materials 2. Solar-Generated Desiccant Dehumidification for Ventilation 3. Radiant Panel Cooling 4. Natural and Active Cooling with Adaptive Comfort 5. Daylighting Application	KR &MK	4
8	**Heat Gain Through Window** 1. Solar Radiation Transmission through Complex Fenestration System 2. Thermal Gain and Net Heat Gain 3. Methods of Control	KR &MK	4
9	**Dynamic Air-Conditioning Load** 1. Dynamic and Latent Heat Gain from External and Internal	KR &MK	4

	Source by Air 2. Cooling Coil Load and Air-Conditioning Load		
10	**Energy Prediction** 1. Prediction of Energy Use by Simple Indicators and by Building Energy Simulation 2. Application of Neural Network for Energy Prediction	KR &MK	3