

FACULTY OF **ENGINEERING**

DEGREE COURSE: **CIVIL AND ENVIRONMENTAL
ENGINEERING BS**

SUBJECT: THERMAL SCIENCE AND HVAC DESIGN PRINCIPLES

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OBJECTIVES

The purpose of the course is:

1. to provide the basic principles of thermodynamics and heat transfer mechanisms,
2. provide an introduction to acoustic and illuminating engineering together with building thermophysics basics and HVAC design principles.

CONTENTS

THERMODYNAMICS

Thermodynamic properties.

Thermodynamic diagrams.

Pure substances.

Ideal gas law.

First and second law of thermodynamics.

Brayton cycle, Rankine cycle, Vapour compression cycle.

Thermodynamics of moist air.

HEAT TRANSFER

Mechanisms of Heat Transfer.

Heat Conduction.

External Forced Convection.

Internal Forced Convection.

Natural Convection.

Radiation Heat Transfer.

Heat Exchangers.

ACOUSTIC ENGINEERING

Acoustics basic principles.

Acoustic phenomenon in the closed environment.

Acoustic properties of construction materials.

ILLUMINATING ENGINEERING

Definitions. Sources classification.

Natural and artificial illumination.

HVAC

Building heating model.
Human thermal comfort.
Heating and cooling load calculation.
Air conditioning systems.

LEARNING OUTCOMES

The student should know:

- basic principles of thermodynamics
- heat transfer mechanisms
- acoustic and illuminating engineering in building design
- the basic rules for optimal air-conditioning and thermal comfort in buildings.

ASSESSMENT

Written exam: multiple choice and open questions

RECOMMENDED TEXTBOOKS

- Yunus A. Çengel, Introduction to Thermodynamics and Heat Transfer, 2nd edition, Mc Graw Hill

