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المعهد الهندسي لخدمات التكنولوجيا والبرمجيات



Engineering office for Technology and Software Services

## HVAC Systems Design – Heating, Ventilation & Air Conditioning Engineering



Course Code: 2042-MECH

Main Branch: United building – E Shams –Front NBE  
, El Siouf \_Alexandria

Tel: 01102060500-01144470856



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## Introduction

This specialized training course equips engineers and HVAC professionals with the practical and theoretical knowledge required to design, analyze, and optimize Heating, Ventilation, and Air Conditioning (HVAC) systems for various building applications. The course emphasizes energy efficiency, indoor air quality, and the use of industry-standard software.

## Description

Designing efficient HVAC systems is critical for occupant comfort and energy management in modern buildings. This course delivers in-depth training on HVAC system components, thermal load calculations, ductwork design, and the integration of HVAC systems into architectural plans using professional tools like **HAP (Hourly Analysis Program)** and **Revit MEP**.

## Objectives

By the end of the course, participants will:

- Understand the fundamentals of HVAC systems and their components
- Perform accurate cooling and heating load calculations
- Design air distribution systems and ductwork
- Select appropriate HVAC equipment
- Utilize HAP and Revit MEP for simulation and design
- Incorporate Indoor Air Quality (IAQ) and sustainability in designs

## Course Duration

- **Total Duration:** 6 Weeks

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- **Sessions:** 18 (3 sessions per week)
- **Each Session:** 2 Hours
- **Total Hours:** 36 Hours

### Detailed Course Outline (Week-by-Week)

#### Week 1: HVAC Systems Overview

- HVAC system types and classifications
- Components: compressors, coils, chillers, air handling units (AHUs), VAVs
- Applications in residential, commercial, and industrial settings

#### Week 2: Load Calculations

- Cooling and heating load calculations using **Manual J and Manual D**
- Weather data, occupancy, envelope, and internal loads
- Heat gain/loss from windows, walls, ventilation, equipment

#### Week 3: Duct Design & Air Distribution

- Principles of airflow and duct sizing
- Friction loss and velocity method
- Duct layout strategies and diffuser/grille selection
- Static pressure calculations

#### Week 4: HVAC Equipment Selection and System Design

- HVAC system configurations (Split, VRF, Chilled Water)
- Equipment sizing and selection
- Fan coil units, air-cooled vs. water-cooled systems

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- Zoning and energy efficiency considerations

### **Week 5: Indoor Air Quality (IAQ) and Controls**

- Filtration, ventilation rates (ASHRAE 62.1), CO<sub>2</sub> monitoring
- Humidity control and air exchange
- Controls, sensors, and thermostats
- Smart HVAC systems and automation

### **Week 6: Software Application – HAP & Revit MEP**

- Introduction to **Carrier HAP** for load calculations and energy simulation
- Basics of **Revit MEP** for HVAC modeling
- Importing architectural plans and placing HVAC components
- Generating HVAC design documentation and schedules

### **Practical Projects**

- **Project 1:** Full HVAC system design for a commercial building
- **Project 2:** Load calculation using HAP and 3D modeling in Revit MEP
- Duct design exercises and equipment selection worksheets

### **What You Will Learn**

- Complete workflow of HVAC design: from thermal analysis to equipment layout
- Duct design principles and airflow calculations
- Software-based modeling using HAP and Revit MEP
- Design for energy efficiency and environmental compliance

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- Application of global standards: ASHRAE, SMACNA, and ISO

## Target Audience

- Mechanical and HVAC Engineers
- Building Energy and Sustainability Engineers
- MEP Designers and Consultants
- HVAC Technicians seeking advanced design skills

## Materials Provided

- Course slides and design reference manuals
- HAP and Revit MEP software guides
- Load calculation sheets and design templates
- Access to case studies and simulation examples

## Instruction Methods

- Instructor-led lectures with industry expert
- Hands-on software labs and live design walkthroughs
- Case study analysis and real-world scenarios
- Q&A sessions and project mentoring

## Course Format

- Hybrid Delivery (Live Online + Optional On-Site Workshops)

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- Project-based Learning + Simulation Assignments
- Final Design Project & Presentation

### ✓ Learning Outcomes

By completing this course, participants will:

- Design efficient HVAC systems tailored to building needs
- Use modern software to automate and document HVAC design
- Perform accurate energy load estimations
- Select and size HVAC components effectively
- Understand how to ensure indoor air quality and thermal comfort

### 🏆 Certification

A **Certificate of Completion** in "HVAC Systems Design & Simulation" will be awarded to participants who complete all sessions and submit the final design project.

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