

Introduction to Intelligent Building Systems

MECH 4360

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Course Description:

Introduction to intelligent building and building automation, communication, safety and security systems; modeling and control of noise, illumination, mechanical transportation, electrical, electronic, fire safety subsystems; system integration and optimization with the building envelope; code of practice in design, operational characteristics and performance specifications.

Text Book:

Reference Book:

1. CIBSE Guide (Transportation Systems in Buildings)
2. ASHRAE Handbook
3. NFP Code
4. Gassmann O. and Meixner H., "Sensors in Intelligent Buildings"
5. Underwood C. P., "HVAC Control Systems, Modelling Analysis and Design"
6. SFPE, "Fire Protection Engineering"
7. Marc Schiler, "Simplified Design of Building Lighting"
8. ASHRAE Standard 135-2016 (BACnet)
9. Asia Institute of Intelligent Buildings, "Intelligent Building Index Manual" Ver. 5
10. Albert So and Wai Lok Chan "Intelligent Building Systems"

Assessment:

• Final Examination:	45%
• Midterm:	35%
• Home Work	20%
Total:	100%

Course Outline:

1. **Introduction to Intelligent Building Systems:** Introduction, definition of Intelligent Building, how to evaluate Intelligent Building, Intelligent Building Index (1.0 Week)

2. **Mechanical Transport and Safety:** Elevator technology, basic structure of lifts and escalators. Safety devices and operating principles. Lift traffic analysis. Lift hoist and escalator drives. Local regulations on lifts and escalators. New development in elevator technology (2.5 weeks)

3. **Thermal Comfort and Intelligent Control Systems:** Human sensations and thermal comfort; Control components in heating and air-conditioning systems; Characteristics of sensors, controllers and actuators. Block diagram of typical systems, control schematics, elementary ladder diagrams, control stability and microprocessor applications. (3.5 week)

4. **Fire Detection and Protection:** Fire process; fire properties of materials; Smoke, production, measurement, toxicity; active protection system and components; local fire safety regulations (2.0 weeks)

5. **Design of Building Lighting:** Fundamentals of illumination, lighting sources, lighting calculations, daylight strategies, daylight calculation, design practices, CADLink Building Services Software. (1.0 Week Lecture + 1.0 Week Computer Lab)

6. **Safety and Security in Buildings:** Intelligent sensors in life safety and security systems. "Life safety" includes fire alarm, gas alarm, extinguishing and evacuation systems. "Security" refers to intruder alarm, access control and CCTV systems. (1.0 week)

7. **Energy Efficiency Labeling Scheme in Hong Kong:** Description and Analysis of Energy Efficiency Labels for Air Conditioners, Refrigerators and Dehumidifiers in Buildings (1 Week).