

MECH4360 Introduction to Intelligent Building Systems

Course Code: MECH 4360	Course Title: Introduction to Intelligent Building Systems
Required Course Or Elective Course: elective	Terms Offered (Credits): Fall or Spring (3 credits)
Faculty In Charge: Huihe Qiu	Pre/Co-Requisites: MECH 2310 and MECH 3610
Course Structure: 2 day per week, 3 hours	
Textbook/Required Material: (1) Lecture notes; (2) Gassmann O. and Meixner H., "Sensors in Intelligent Buildings" Wiley (reference only); (3) CIBSE Guide: Transportation Systems in Buildings (reference only); (4) Underwood C. P., "HVAC Control Systems, Modelling Analysis and Design" Routledge (reference only)	
Course Description: <ol style="list-style-type: none"> 1. This is an elective course for the BEng in Mechanical Engineering with Option in Energy. 2. Introduction to intelligent building and building automation, communication, safety and security systems. 3. Modeling and control of thermal comfort, illumination, mechanical transportation, electrical, fire safety subsystems. 4. System integration and optimization with the building envelope. 5. Code of practice in design, operational characteristics and performance specifications. 	
Course Topics: <ol style="list-style-type: none"> 1. Introduction to Intelligent Building Systems; 2. Basic concepts and terms: definition, evaluation and intelligent building index; 3. Mechanical Transport and Safety: Elevator technology, Safety devices and operating principles. Lift traffic analysis and grade of service, Local regulations on lifts and escalators; 4. A/D conversion; data acquisition and sampling theory; quantization and discretization; aliasing and leakage errors; 5. Thermal comfort and human sensation, intelligent control of HVAC systems, modeling of HVAC control system and simulation, predicted mean vote thermal control method; 6. Fire dynamics, modeling and safety: Fire spreading, combustion process; smoke, fire detection, alarm and suppression techniques; local fire safety regulations; 7. Intelligent sensors for safety and security in Buildings; 8. Design of Building Lighting: Fundamentals of illumination, lighting sources, lighting calculations, design practices, CADLink Building Services Software, LED lighting. 	
Course Objectives:	<ol style="list-style-type: none"> 1. To introduce the basic concepts and novel technologies in intelligent building systems; to provide a balance between both frontier technology updates and existing building services strategies, in both a quantitative and qualitative way. 2. To develop skills to design, model, analyze and evaluate intelligent building systems. 3. To develop creative thinking and to deal with complex multi-disciplinary building projects that involve the provision of effective and efficient solutions. 4. To provide students for practical training in the design of different

	intelligent building systems, such as lift planning and control, thermal comfort and control, energy saving design, fire safety and lighting design with professional software.				
Course Outcomes:	<ul style="list-style-type: none"> A. Be able to understand intelligent building design concepts, intelligent building index, key effects on thermal comfort and human sensation, building energy saving and green factors. B. Be able to design vertical transportation, HVAC, lighting and fire safety systems in commercial and residential buildings using standards and codes. C. Be able to model and perform simulation for evaluating and optimizing building performance. D. Be able to select proper sensors, actuators and controllers for the design of thermal comfort control and building automation. 				
Assessment Tools:	<table style="width: 100%; border: none;"> <tr> <td style="padding-left: 20px;">Regular homework problems</td> <td style="text-align: right;">20%</td> </tr> <tr> <td style="padding-left: 20px;">Mid-term and Final exams</td> <td style="text-align: right;">80%</td> </tr> </table>	Regular homework problems	20%	Mid-term and Final exams	80%
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