

Liverpool John Moores University

Title: HEATING, VENTILATION AND AIR CONDITIONING
Status: Definitive
Code: **5605BEFDL** (123942)
Version Start Date: 01-08-2016

Owning School/Faculty: Built Environment
Teaching School/Faculty: City of Liverpool College

Team	Leader
Alfred Leung	

Academic Level: FHEQ5 **Credit Value:** 20 **Total Delivered Hours:** 72

Total Learning Hours: 200 **Private Study:** 128

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	60
Tutorial	9

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Formal examination	60	3
Artefacts	AS2	Design Project	40	

Aims

The aim of this module is to further develop the student's understanding of the principles and applications of heating, ventilation and air conditioning installations. This is achieved by developing the students understanding and experience of the more specialised forms of space and process heating, ventilation and air conditioning which tend to be associated with the large and complex installations.

Learning Outcomes

After completing the module the student should be able to:

- 1 Determine energy requirements using data related to climate, building envelope, occupancy and use.
- 2 Produce and analyse designs for steam and high pressure hot water systems and select and specify appropriate heating plant and primary energy sources for heating and hot water generation for space and process heating.
- 3 Evaluate the use of district heating schemes.
- 4 Design and evaluate the use of electrical heating systems for commercial/industrial buildings.
- 5 Produce designs for fire and smoke management and process ventilation systems in buildings.
- 6 Design multi-zone air conditioning systems for complex buildings.
- 7 Investigate the engineering, economic and design factors relating to the use of high pressure/velocity air distribution systems.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

FORMAL EXAMINATION	3	4	6	7
DESIGN PROJECT	1	2	5	

Outline Syllabus

Energy Requirements: Seasonal climatic variations: use of weather data. Application and use of Degree Days.

Heat gain and loss data: operating profiles for occupancy movement, lighting, machinery/equipment, infiltration/ventilation etc.

Loadings: heating and cooling loads, diversity for central cooling plant, use of thermal analysis /simulation software.

Properties of steam: heat content of pressurised water, wet, dry and superheated steam

Design of steam systems: layouts, plant arrangements, types, operation and requirements for steam traps, relay points, pressure reducing valves. Design of steam systems. Steam for process work. Use and design of flash steam recovery systems. Use of steam to water heat exchangers. Plant and equipment sizing and selection.

High Pressure Hot Water: methods of pressurisation, Analysis of safe working temperatures/pressures. Anti-flash margins. Effect of pump location. Design of HPHW Systems: system design, installation and control arrangements. Expansion volumes, sizing and selection of plant including pressurisation plant, use of high temperature hot water, comparison with the use of low temperature hot water and steam systems. Conversion from high temperature hot water to low temperature hot water.

District heating schemes: Use and application of district heating, comparison with the use of individual plants. Alternative primary heat sources/fuels inc waste incineration,

CHP schemes, geothermal sources. Distribution methodologies, operating temperatures, design of distribution networks, distribution ducting. Plant for district heating schemes Consumer charging and energy metering Heating plant, appliances and equipment: arrangements for saturated and superheated steam and high temperature hot water systems. Steam super-heaters. Thermal efficiency of steam and high temperature hot water boiler plant. Boiler feed-water treatment, Blow-down rates, feed pumps.

Learning Activities

Lectures, tutorials, case studies, workshops, site visits.

Notes

This module is a key component for those students wishing to complete the programme following a 'mechanical' building services pathway. It provides those students who have a basic awareness of the principles and processes of heating, ventilation and air conditioning with a detailed understanding of the mechanisms involved in the thermal response of building and the ability to design and specify commercially viable systems. It also develops a detailed understanding of the principles and procedures associated with energy efficient within commercial buildings.