

Liverpool John Moores University

Title: MEASUREMENT, TENDERING, ESTIMATING & TECHNOLOGY FOR BUILDING SERVICES ENGINEERING
Status: Definitive
Code: **4506BEFDS** (118442)
Version Start Date: 01-08-2011
Owning School/Faculty: Built Environment
Teaching School/Faculty: Built Environment

Team	Leader
Derek King	

Academic Level: FHEQ4 **Credit Value:** 36.00 **Total Delivered Hours:** 159.00
Total Learning Hours: 360 **Private Study:** 201

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	96.000
Tutorial	36.000
Workshop	24.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Formal examination	25.0	3.00
Report	Report	Report based on project work	50.0	
Test	ICA	In class assessment	25.0	3.00

Aims

This module aims to provide the student with a fundamental understanding of the principles and procedures of measurement of building projects in general and building services engineering in particular. The module will enable students to develop an awareness of the generic principles of tendering and estimating for the non-domestic construction sector and will also allow them to develop and

demonstrate a detailed knowledge of how these procedures apply to the commercial Building Services Engineering Industry.

The module is also intended to provide a detailed level of understanding of building engineering services for those working in the building services engineering sector, or who interface regularly with it, but are not intending to become specialist Building Services Engineers themselves. As such the module is intended to provide the students with a good understanding of the various systems, equipment and installations together with the processes, techniques and principles involved in the planning, design and installation of modern building engineering services.

Learning Outcomes

After completing the module the student should be able to:

- 1 Apply measurement techniques to complete measurement tasks for a range of standard and complex situations.
- 2 Prepare relevant preamble, preliminary items, and qualified & unqualified schedules of rates to given situations.
- 3 Apply standard method(s) of measurement to produce interim certificates and final accounts.
- 4 Identify the pre-tender information required for construction and building services engineering tenders.
- 5 Produce an estimate for a building services engineering project using appropriate principles and procedures.
- 6 Describe different tendering procedures and contractual arrangements commonly used in building services engineering projects.
- 7 Describe the principles and techniques required for the planning, design and installation of plant and equipment used for space heating, ventilation, air-conditioning, hot and cold water and fuel gas services installations in public sector, commercial & industrial buildings.
- 8 Describe the principles and techniques required for the planning, design and installation of plant and equipment used for electrical, data and communication installations within public sector, commercial & industrial buildings.
- 9 Describe the principles characteristics and legislative implications associated with the planning and installation of fire fighting and fire/smoke detection installations.

Learning Outcomes of Assessments

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

Exam	1	2	6
Report based on project work	3	4	5
In class assessment	7	8	9

Outline Syllabus

Overview of measurement during the various stages of a project: initial estimating

techniques, production of contract documentation, measurement of variations, sub-contract and supply chain packages, final account procedures.

Taking off of measurements and production of quantities: sections of a simple construction project, foundations and substructures, superstructure, including external and internal walls, flat and pitched roof construction and coverings, internal and external finishes, internal components such as doors, windows and staircases and floors, simple mechanical engineering services including plumbing and below ground drainage

Take-off procedures for simple construction elements: general overview of take-off procedures for standard simple construction elements and components including foundations and substructures, superstructure, including external and internal walls, flat and pitched roof construction and coverings, internal and external finishes, internal components such as doors, windows and staircases and floors.

Take-off measurements and produce quantities for complex Building Services Engineering systems: heating, ventilation and air conditioning installations, electrical power, lighting and distribution installations, data, fire & security engineering installations, public health and above ground drainage systems, fuel and specialist gas installations and building management and control installations.

Preamble clauses: producing required preliminary items/clauses for inclusion in a bill of quantities.

Bill format: the role and purpose of bills of quantities, different formats of bills of quantities, codes and other contract documentation and their use.

Measurement techniques: payments, final account work, different forms of procurement and different types of contractual arrangement.

Preparation of qualified and unqualified Schedule of Rates; Maximising the impact and values from SoR's

Payment: production of interim and final accounts

Examination of tendering information: consideration of the types of client, their objective and the constraints imposed; identification of the range of contract documentation required.

Building up an estimate: prime costs, labour and plant rates, materials costs, terms of supply, material handling costs, allowance for wastage and conversion, method statements and their effect on estimating, use of standard reference documents, use of company data, documentation, software or procedures, examination of rules within methods of measurement appropriate to Building Services Engineering.

Commercial and operational considerations : formulation of final estimate and tender price, inclusion of appropriate preliminaries, on-costs and overheads, inclusion of all Provisional Sums both defined and undefined, costs associated with the health and safety plan, commercial factors, risks and awareness of factors which might affect profit margin. Use of standard or company data, documentation, procedures or software.

Tender Preparation: examination of the decision to tender, contract risk management, procedures and strategies for tender preparation, types of contract commonly used for commercial building services engineering projects, types of commercial tendering procedures, procedures used to formulate select lists, procedures used in receiving and opening tenders, PFI and DBFO schemes and their operation.

Types of Client: Recognising the specific needs and requirement of clients from different sectors, identification of appropriate design guides, publications and

standards e.g. health care, education, sports etc

Thermal Comfort in Buildings: Need for heating, ventilation and air conditioning; analysis and interpretation of client and building operational requirements; energy efficiency; statutory and legal requirements. Thermal response of buildings and methods used for establishing heating and cooling loads.

Space heating in buildings: Design and installation considerations for the use of low, medium and high pressure hot water systems, steam, warm air, radiant tube systems. Implications of selecting different heating plant, fuels and energy sources.

Boiler and ancillary plant space requirements and services Legislative and environmental considerations. Control strategies.

Ventilation: natural and mechanical systems of ventilation, their application to a range of building types and situations. Ventilation plant and equipment, ductwork arrangements, high and low velocity systems. Fire and smoke venting.

Air conditioning: Alternative cooling strategies, justification for air conditioning, energy efficiency. Application, features, components, operating principles and control strategies for single and multi zone air conditioning systems. Application of refrigeration with air conditioning systems, features, components, operating principles and control strategies for refrigeration systems within air conditioning applications.

Public Health Engineering: Features and characteristics of cold water supplies, special

requirements for high-rise buildings, statutory requirements, materials and components, ,

Installation requirements of domestic hot water supply systems, hot water generators, unvented systems and safety requirements. Minimising risk of Legionnaires Disease, specific issues associated with hospital and other health care buildings.

Electrical, Data and Communication Systems: small power and lighting & emergency lighting circuits, electrical distribution, protection systems and containment. Statutory constraints and requirements. Provision for communication: data handling control and Building Management systems and ICT systems including networking over a range of buildings.

Fuel Gas Installations: General principles, operational features, installation requirements. Statutory constraints and requirements.

Fire fighting and fire/smoke detection installations: alarm and detection systems, the relationship of systems to escape routes, fixed fire fighting and sprinkler installations, statutory constraints and requirements.

Learning Activities

Lectures, tutorials, case studies.

References

Course Material	Book
Author	Langdon, D.

Publishing Year	2010
Title	Spon's Mechanical and Electrical Services Price Book
Subtitle	
Edition	
Publisher	Taylor & Francis
ISBN	9780415552639

Course Material	Book
Author	Murray, G.
Publishing Year	1998
Title	Measurement of Building Services
Subtitle	
Edition	
Publisher	Palgrave Macmillan
ISBN	0-333-67593-2

Course Material	Book
Author	Royal Institute of Charetered Surveyors
Publishing Year	1988
Title	Standard Method of Measurement 7 Measurement Code
Subtitle	
Edition	
Publisher	RICS
ISBN	0-85406-361-7

Course Material	Book
Author	Heating and Ventilating Contractors Association
Publishing Year	1990
Title	Guide to Estimating
Subtitle	
Edition	
Publisher	HVCA
ISBN	0-7506-5864-9

Course Material	Book
Author	Hall, F. Greeno, R.
Publishing Year	2009
Title	Building Services Handbook
Subtitle	
Edition	5th
Publisher	Butterworth-Heinemann
ISBN	9781856176262

Course Material	Book
Author	BSRIA
Publishing Year	2002
Title	Illustrated Guide To Mechanical Building Services

Subtitle	
Edition	
Publisher	BSRIA
ISBN	9780860226062

Course Material	Book
Author	BSRIA
Publishing Year	2005
Title	Illustrated Guide To Electrical Building Services
Subtitle	
Edition	
Publisher	BSRIA
ISBN	9780860226536

Notes

This module is intended for 'commercial' students from the buildings services sector (i.e. building services quantity surveyors etc.) and students from other construction disciplines who will benefit from a good grounding in modern building services installations.

The module takes the established principles and practices of Measurement, Tendering and Estimating within the construction sector and interprets them from the perspective of the commercial building services engineering industry. The module further provides an overview and understanding of the specialist mechanical and electrical building services for non-specialist building services engineering students.