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Unit Title:	Environmental Science
Unit Number:	BUG/2/260
Unit Value:	1.0
Unit Level:	2
Unit Coordinator:	Darren James Room T513 Telephone 020 7815 7226 email: jamesdb@lsbu.ac.uk
Pre-requisites:	None

INTRODUCTION & AIMS OF THE UNIT

This unit focuses on building environmental performance and develops an understanding of how buildings perform in the areas of acoustics, heat and moisture transfer, lighting, thermal comfort, ventilation and air conditioning design. The underlying principles of each topic is covered, together with more advanced applications, enabling the student to demonstrate an understanding of building performance to other professionals within the industry.

The unit aims to provide the student with an adequate understanding of environmental science which will be relevant to the student's future career, and to provide a scientific framework for building performance decisions in the wider context.

LEARNING OUTCOMES

On completion of the unit the student will be able to:

1. Describe the behavior of sound in rooms
2. Describe the difference between noise and sound
3. Calculate the reverberation time of a room and assess its significance
4. Carry out calculations relating to airborne sound insulation
5. Describe the heat transfer mechanisms within buildings
6. Quantify fabric and ventilation heat losses in buildings
7. Evaluate the state of air and moisture mixtures using the psychrometric chart
8. Carry out simple air conditioning design calculations
9. Predict the risk of surface condensation in buildings
10. Assess the contribution made by daylight in buildings
11. Design a simple artificial lighting installation
12. Evaluate the natural and mechanical ventilation options in a building

OVERVIEW OF THE CONTENT

This section outlines the Lecture and practical programmes for the unit. Reading and preparation required before lectures is indicated and the objective of each lecture is outlined.

Lecture and Practical Programme:

Week Beginning	***Lecture***	***Topics***	***Experiment***
28/1/08	**I N T R O D U C T O R Y W E E K**		
4/2/08	Heat: fundamentals	Temperature scales, heat transfer, sensible and latent heat fabric and ventilation heat losses	No Laboratory
11/2/08	Heat: applications	Thermal transmission and the U value calculation, radiation and the greenhouse effect	Thermal Imaging Heat Loss
18/2/08	Heat: thermal comfort	Parameters affecting comfort, CIBSE and ASHRAE comfort recommendations, Fanger's work, PMV and PPD, Humphrey's work	Greenhouse Effect Thermal Comfort
25/2/08	***ECOBUILD Exhibition – Earls Court***		
3/3/08	Acoustics: fundamentals & room acoustics	Wave terminology, velocity, frequency and wavelength, sound levels, sound propagation, noise and hearing, noise assessment, weighting ,Sound absorption, reverberation time, Sabine and Stephens & Bates formulae, application	Noise Analysis
10/3/08	Acoustics: sound insulation	Sound transmission, Sound Reduction Index (SRI), mass law, isolation, D_{ntw}	Sound Insulation
7/4/08	Lighting: fundamentals & Lighting: applications	Electromagnetic spectrum, the eye, lighting measures, Inverse square and cosine rule, Lamp types and properties, colour specification, lighting design, the lumen method	Luminous flux (hoop photometer)
14/4/08	Lighting: Daylight	External light levels, daylight factor, components of DF, transmission factors, littlefair's average DF calculation	Daylight Factor
21/4/08	Ventilation	Need for ventilation, infiltration, natural and mechanical ventilation, wind and temperature driven ventilation, building regulations, infiltration testing	Blower Door demonstration
28/4/08	Psychrometrics and A/C design	Properties of air and moisture mixtures, enthalpy, VP, SVP, relative humidity, psychrometric chart, system design	Heat pump
5/5/08	Condensation	Mechanisms and health impacts, factors affecting moisture levels, calculation methods	Review
12/5/08	***No Lecture***		

Environmental Science Practical work:

The practical work is an essential component of this unit and is designed to underpin the principles covered in the lecture programme. It is essential that students attend all practical experiments in order to be able to complete their unit assessment. More details are provided in the assessment section of this Unit Guide. Each student will carry out a total of ten laboratory experiments / demonstrations as follows:

1. Heat: Heat loss: steady state conditions
2. Heat: The Greenhouse Effect
3. Heat: Thermal Comfort
4. Acoustics: Noise analysis
5. Acoustics: Sound Insulation
6. Lighting: luminous flux
7. Lighting: daylight factor
8. Ventilation: blower door demonstration
9. The heat pump

UNIT PROGRAMME AND TIMETABLE

Allocation of unit hours:

Contact hours:	45
Student Centred Learning:	105
Total:	**150**

The timetabled hours for which the students are directly supervised by a course tutor are known as the contact hours. The contact hours are separated into lecture periods and practical periods as follows:

Lectures:	22.5
Practical work:	22.5

Students are expected to spend a *considerable* amount of time studying whilst not being directly supervised by a course tutor. This is known as Student Centred Learning and is fundamental to the success of the student on this unit.

Student attendance will be monitored during lectures and practical work.

UNIT ASSESSMENT

The Environmental Science unit is assessed by two separate pieces of coursework:

1. A 3000-word Essay on one of a variety of given subject areas.
2. A calculation based piece of coursework containing questions that reflect the practical experiments carried out as part of this unit.

Each of the above elements contributes 50% towards the unit assessment. The pass mark for the unit, calculated as the average of the two components, is 40%. However, the minimum mark that must be achieved in each component is 35%.

Coursework 1: The Essay

The 3,000-word essay should not only explore the chosen topic, but also contain adequate discussion and analysis for work at this level. The majority of marks will be awarded for analysis and not for simply regurgitating facts obtainable in the standard texts. The work is to be properly referenced.

A list of essay topics is provided below:

- Buildings are now being built with a far greater use of glazing for a number of aesthetic as well as practical reasons. The greenhouse effect can then cause significant internal heat gains reducing the need for heating buildings. The most environmentally friendly building is therefore one with the maximum amount of glazing.

- Human thermal comfort is ultimately dependent upon six simple parameters that can be easily measured and assessed for any individual in any particular environment. This allows us to design buildings within which all occupants will be thermally comfortable.

- There is an increasing need for auditoriums to be for multi purpose use; this is increasingly problematic as the diverse sound requirements make it impossible to design for optimum sound quality for all types of music.

- Evaluating the sound insulation of a partition wall between two dwellings is a simple process.

- Over recent years lamp technology has improved significantly. This has the potential to reduce energy demands and therefore cost savings for the users. High efficiency lighting should therefore be compulsory in all new installations.

- In a modern building daylight can provide most of our lighting needs for the vast majority of the working day. It is therefore unnecessary to spend too much time in designing artificial lighting systems.

- Air conditioning systems are inherently energy consuming and cause all sorts of internal air pollution and health problems. They should therefore be avoided as far as possible.

- There will always be a need for mechanical ventilation in buildings.

- Condensation problems in most dwellings are always caused by the behaviour of the people who live in them and so a better understanding of the causes could eradicate the problems altogether.

The final date for hand-in of the essay will be the **8th April 2008**. All coursework must be handed in at the School Office. Late submissions of work will only achieve a maximum pass grade of 40% unless there is a justifiable reason for late submission and where the procedure for an extension of time has been followed.

Each essay should be properly bound and submitted with a front cover giving the following information:

Student name
Course enrolled on
Environmental Science: Unit BUG/2/260
The name of the unit coordinator: Darren James

The template that will be used to mark the essay is shown below

Student: _____

Mark: _____ %

Introduction (10%)

Identifies key issues						Does not identifies key issues
Identifies areas to be covered and those which are excluded						Areas to be covered not identified

Main Section (60%)

Essay relevant to topic						Essay has little relevance
Evidence of extensive (relevant) reading						Evidence of only limited reading
Demonstrates understanding of key issues						Significant misunderstandings and/or failure to demonstrate understanding of key issues
Logically developed argument						Essay rambles and lacks continuity
Adequate analysis and evaluation						Descriptive account of the topic
Clearly identifies conflicts of opinion						Ignores conflicts of opinion

Conclusions (10%)

Key points summarized						Lacks summary of key points
Clear and pertinent conclusions of opinion						No clear conclusions

Presentation (20%)

Complies to the word limit						Over/under length
Fluent/succinct writing						Clumsy repetitive writing
Grammatically correct						Some ungrammatical sentences
Correct spelling throughout						Much incorrect spelling
Effective use of figures/tables						Figures/tables add little to the essay
Correct referencing						Inadequate referencing

Coursework 2: The calculation based coursework

The calculation based coursework brief will be issued to each of the students at the start of the semester. The coursework contents have been designed to reflect the lectures and the practical work that students are required to complete as part of this unit.

Students are required to complete all of the practical experiments in order to be able to complete the coursework. Within each of the science practicals there are a number of Student Centred Learning Exercises for students to carry out. These are designed to assist the student in completing questions contained in the coursework.

The Student Centred Learning Exercises in all experiments involve the analysis of data obtained as part of the experiments carried out.

Students will be offered assistance in completing the Student Centred Learning Exercises for each of the practical experiments but no assistance will be given for the questions in the physics coursework.

The final date for hand-in of the calculation based coursework will be the **13th May 2008**. All coursework must be handed in at the School Office. Late submissions of work will only achieve a maximum pass grade of 40% unless there is a justifiable reason for late submission and where the procedure for an extension of time has been followed.

Each report should be submitted with a front cover giving the following information:

Student name
Course enrolled on
Environmental Science: Unit BUG/2/260
The name of the unit coordinator: Darren James

It is recommended that students use a word processor for the text and a spreadsheet for any data analysis or graph production where required. The use of computers to produce the coursework is not a requirement although poor presentation or ineligibility will result in a reduction in the marks.

INDICATIVE READING LIST

The following information relates to both the core reading and optional reading texts for this unit.

It is *essential* that the student reads core reading texts to fully understand the topics being covered in this unit. The Student is expected to spend time studying the topics of this unit whilst not being directly supervised by a course tutor. This is known as Student Centred Learning and has been described earlier.

The optional reading, as its name suggests, should be referred to as necessary. Most of these texts are specialised and are therefore appropriate for one or two of the topics covered in the unit but will cover these topics in more detail than the core texts.

Building Physics

Core reading:

McMullan R, Environmental Science in Building, Macmillan, 6th Edn, 2007

Smith B, Phillips G, Sweeney M, Environmental Science, Longman, 1992

Optional reading:

Pritchard D C, Lighting, 7th edition, Longman 1995

Burberry P, Environment & Services, 7th edition, Longman 1994

Smith B J, Peters R J, Owen S, Acoustics and noise control, Longman 1982 and 1996.

Sharland I, Woods practical guide to noise control, 6th imprn, Woods of Colchester, 1990

Parkin P, Humphreys H, Cowell J, Acoustics, noise and buildings, Faber 1979.

Watson K, Foundation science for beginners, 2nd edition, Macmillan, 1998

Awbi H B, Ventilation of Buildings, E & F N Spon, 1991.

Marcus T and Morris E, Buildings, Climate and Energy, Pitman, 1980.

Duncan T, Advanced Level Physics, 4th edition, J Murray, 1987

Markus T, Morris E, Buildings, Climate and Energy, Pitman

Chadderton D, Building Services Engineering, E & F N Spon

Building Research Establishment (BRE) Digest 369: Interstitial condensation and fabric degradation

CIBSE Code for interior lighting, CIBSE, 1994.

CIBSE, Guide Volume A, 1978.

Building Regulations Approved Document L1 : Conservation of fuel and power in dwellings

Building Regulations Approved Document L2 : Conservation of fuel and power in buildings other than dwellings

Building Regulations Approved Document F : Means of ventilation

Building Regulations Approved Document E : Resistance to the passage of sound