

INTERNATIONAL MODULE SYLLABUS

W506 - ERGONOMICS ESSENTIALS (including Manual Handling and DSE)

Aim: This module provides a broad based introduction to ergonomic principles and their application in the design of work, equipment and the workplace. Consideration is given to musculo-skeletal disorders, manual handling, ergonomic aspects of the environment as well as to the social and legal aspects. Study of this module is beneficial to persons wishing to qualify for the Certificate of Competence in this subject.

Learning On successful completion of this module the student should be able to:

Outcomes:

- understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace
- understand ergonomic risk assessments and appropriate control measures
- understand the causes of upper limb disorders and how to reduce them
- appreciate workplace layout and equipment design
- appreciate environmental aspects of good ergonomic design

| Content: | Topic | Time Allocation |
|----------|--|-----------------|
| | 1 Overview of Ergonomics | 20% |
| | 2 Ergonomics Methods & Techniques | 20% |
| | 3 Musculo-skeletal Disorders | 20% |
| | 4 Workplace, Job and Product Design | 20% |
| | 5 Relevant physical factors of the work environment | 10% |
| | 6 Legal and Social Aspects | 10% |

Note: Reference is made to standards and good practice documentation. This may not be the most up-to-date relevant publications and is intended as guidance for candidates only.

1 Overview of Ergonomics (20%)

Introduction to ergonomics and its scope in relation to work. Outline of the disciplines of anatomy, physiology and psychology, with respect to ergonomics building blocks such as anthropometry and biomechanics.

1.1 General Principles

- Aims, objectives and benefits of ergonomics
- Definition and scope of ergonomics and systems of work
- The role of the ergonomist
- Fitting the job to the person and the person to the job
- Human characteristics, capabilities and limitations
- Human error
- Teamwork and ageing
- Interfaces between job, person and environment
- Human computer interaction

1.2 Biological Ergonomics

- Body systems - musculo-skeletal and nervous
- Anatomy, static and dynamic anthropometry
- Biomechanics
- Applying work physiology - body metabolism, work capacity & fatigue
- Static and dynamic postures

1.3 *Psychology*

- Perception of risk
- Motivation and behaviour
- Memory
- Signal Detection Theory and vigilance
- 'Work 'Stress' - causes, preventative and protective measures
- Work organisation - shift working and overtime

1.4 *Developing an Ergonomics strategy at Work*

- Culture of an organisation - commitment and decision-making
- 'Macro-ergonomics' and participatory ergonomic teams
- Ergonomics at the design stage
- Developing ergonomics, professional ergonomists and competence

2 **Ergonomics Methods and Techniques (20%)**

Observational experimental methods are identified which can be used for investigation, so that work, equipment and planned systems can be improved for human use.

2.1 *Work Design*

- Task analysis and allocation of functions
- User trials
- Problem solving - scientific method

2.2 *Ergonomics Risk Assessment*

- Definitions of hazard and risk
- Priorities
- Risk evaluation quantity and quality of risk
- Assessment systems
- Overall ergonomics approach
- Control measures monitoring and feedback

2.3 *Measurements and Information Gathering*

- Ergonomics standards
- Observational techniques
- Rating scales, questionnaires and check lists
- Use of models and simulation

3 **Musculo-Skeletal Disorder (20%)**

The disorders resulting from manual handling and repetitive work must be covered and the causes explained. The methods of assessment and the techniques used to prevent or reduce these disorders must also be covered.

3.1 *Manual Handling*

- The nature and causes of manual handling disorders
- Risk Assessment
- Job design and training
- Principles of handling and preventative and protective measures

3.2 *Work Related Upper Limb Disorders (WRULD)*

- The nature and causes of WRULD/ 'Repetitive Strain Injuries'/Cumulative Disorders
- Risk assessment
- Principles of control, preventive and protective measures

4 **Workplace, Job and Product Design (20%)**

Key features in the design of workplaces, jobs and their results - products and services - are outlined, so that more effective and healthier work can be achieved. Existing data and routes to further sources of information are emphasised.

4.1 *Workplace Layout and Equipment Design*

- Principles of workstation and system design

- Space and workstation design principles
- Risks to health:
 - Musculoskeletal problems
 - Visual fatigue
 - Mental stress
 - Requirements for eye tests
- Design considerations for Visual Display Unit (VDU) Stations:
 - Ergonomic factors
 - Work stations
 - Design of work and practice
 - Carrying out assessments of risk at VDU workstations

4.2 *Controls, Displays and Information*

- Visual, auditory and other displays
- Quantitative and qualitative information
- Compatibility and population stereotypes
- Warnings, signs and labels
- Sources and selection of data
- Principles of software ergonomics

5 **Relevant Physical Factors of the Work Environment (10%)**

Physical factors of the working environment must include the way the eye, ear and clothed body respond qualitatively to light, sound heat etc., so that human performance can be predicted and improved. This part of the syllabus should be regarded as an overview and thus technical and quantitative detail should be minimised.

5.1 *Lighting*

- Visual acuity and colour vision
- Lighting levels, contrast and glare
- Reflections and flicker fusion

5.2 *Noise*

- Noise induced hearing loss
- Distraction, annoyance and emergency signals

5.3 *Thermal Environment*

- Body temperature regulation and acclimatisation
- Subjective assessments - thermal comfort and discomfort

5.4 *Other considerations*

- Smell, taste and tactile senses
- Vibration - effects and subjective assessment

5.5 *Clothing and Protective Equipment*

- Objective and subjective effects
- Risk perception, and wearability
- Design, style and fit

6 **Standards and Social Aspects (10%)**

Consideration should be given to sources of standards covering ergonomics, social aspects and training, instruction and supervision requirements

6.1 *Standards*

- ISO standards
- Sources of other standards

6.2 *Selection and Training*

- Training Needs Analysis
- Testing and interview techniques

6.3 *Instruction and Supervision*

- Health information, legal requirements

- Supervision and records
- Measuring health and illness

Overall Assessment Method

The overall assessment for this module consists of an “open book” written examination and satisfactory results from the formative practical assessment.

Written Examination

40 short answer questions to be answered in 120 minutes. The questions require candidates to write short answers which will require no more than the box provided but may include multiple answers. Some questions may require calculations.

Formative Practical Assessment

All candidates must participate in the practical studies and demonstrate the required skills.

The studies should be designed by the course tutor(s) to test the basic skill and knowledge of each of the candidates in the techniques in making ergonomic risk assessments and the performance of control measures

The exercise must, therefore, involve two separate studies of workplace situations which may be presented as a series of photographs for the candidate to evaluate and report on their findings.

Full details of the practical requirements and the individual candidate reporting forms etc. are available in document JF.2.

Relevant Documentation

- i ISO 11228-1:2003 Ergonomics -- Manual handling -- Part 1: Lifting and carrying
- ii ISO 11228 –2:2007 Ergonomics -- Manual handling -- Part 2: Pushing and pulling
- iii ISO 11228-3:2007 Ergonomics -- Manual handling -- Part 3: Handling of low loads at high frequency
- iv ISO/TS 20646-1:2004 Ergonomic procedures for the improvement of local muscular workloads -- Part 1: Guidelines for reducing local muscular workloads
- v ISO 6385: 2004 Ergonomic principles in the design of work systems
- vi ISO/TR 16982:2002 Ergonomics of human-system interaction -- Usability methods supporting human-centred design

Recommended Support Reading

- i Ergonomics for Beginners (2003), Dul & Weerdmeester (Taylor & Francis)
- ii Workplace Ergonomics: A practical guide McKeown and Twiss (2001) (IOSH services)
- iii Introduction to Ergonomics R.S.Bridger (2003) Taylor and Francis
- iv Evaluation of Human Work: Wilson & Corlett (2005) (Taylor & Francis)
- v Ergonomics Work and Health, Pheasant (1991) (Macmillan)
- vi The Ergonomics of Workspaces & Machines, Corlett & Clark (1995) (Taylor & Francis)
- vii Bodyspace: Anthropometry Ergonomics and Design, Pheasant & Haslegrave (2006) (Taylor & Francis)
- viii HSG 48: Reducing error and influencing behaviour (1999)
- ix Fitting the task to the human – a text book of Occupational Ergonomics, Kroemer & Grandjean (1997) Taylor & Francis
- x Human Error, Reason (1990) Cambridge University Press