FARMINGDALE STATE COLLEGE

DEPARTMENT: PSYCHOLOGY PREPARED BY: PSYCHOLOGY DEPT.
DATE: FALL 2017

COURSE TITLE: Ergonomics and Biomechanics

COURSE CODE: PSY 405

CREDITS: 3

CONTACT HOURS: 45

CATALOG DESCRIPTION:

This course will examine the scientific knowledge related to human ergonomics, anthropometry, and biomechanics. The measurement of human work, physiological characteristics and movement will be presented. The application of such knowledge to the design of devices, systems, and environments for use by people will be discussed. The contribution of ergonomics and biomechanics to the improvement of safety, productivity, and quality of work will be presented. Prerequisite(s): PSY 328. Credits: 3 (3,0)

PREREQUISITES: PSY328 (Introduction to Human Factors), 2 general education biology courses with approval of chairperson

REQUIRED FOR: Applied Psychology Program, Human Factors Concentration

ELECTIVE FOR: All curricula with upper level social science electives.

Ergonomics and Biomechanics

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Behavioral Objectives

1. The student will acquire knowledge of current theories of ergonomics, anthropometry, and biomechanics.

2. The student will understand the effects of ergonomics, anthropometry, and biomechanics factors on human performance. In addition, the student will understand the effects of environmental factors on human performance.

3. The student will understand good design practices to support human performance in the areas of ergonomics, anthropometry, and biomechanics.

4. The student will obtain a sufficient understanding of ergonomics, anthropometry, and biomechanics characteristics and effects to apply.

5. The student will understand the limitations of our knowledge of ergonomics, anthropometry, and biomechanics factors and will be familiar with the major issues being debated by researchers in the field.

COURSE OUTLINE

The following is an overview of the topics to be covered in this course. Each unit will include relevant theory, current research, and its application.

Unit 1: The Anatomical and Mechanical Structure of the Human Body
In this unit, the areas of human ergonomics, anthropometry, and biomechanics and their importance to system design and operation will be introduced.
Unit 2. Physiological Systems
In this unit, the basic physiological systems that are important to ergonomic design considerations will be presented. These systems include: nervous system, respiratory system, circulatory system, metabolic system. Methods to determine energy requirements for work tasks and the assessment of energy expenditures during performance will be discussed. The concept of physiological stress will be presented and research regarding its effects on performance will be reviewed.

Unit 3: Human Senses
In this unit, human sensory systems will be presented. The research on the characteristics of these senses, including, vision sense, hearing sense, olfactory sense, gustation sense, cutaneous senses, and vestibular sense will be reviewed. The characteristics of these senses that are important to engineering design of products and systems will be discussed.

Unit 4: How the Body Interacts With the Environment
In this unit, the performance of the human body in response to various types of environmental situations will be presented. Environmental considerations include the thermo-regulation of the human body to various temperatures, working in polluted air, working strenuously at high altitude, working in high-vibration environments, working in weightlessness, and working under high acceleration. In each area, the research related to the effects of the environmental characteristic on performance will be reviewed and efforts to design countermeasures will be discussed.

Unit 5: Body Rhythms, Work Schedules, and Alcohol Effects
In this unit the theories and research associated with circadian rhythm, sleep-wake cycles, and their impact of performance will be presented. Specifically, the effects of prolonged hours of work and sleep deprivation will be discussed and their implications for shift work will be considered. Research of the effects of alcohol on performance will be presented.

Unit 6: Designing to Fit Body Posture
Design requirements for work places differ depending on whether workers are expected to be standing or sitting, the posture they are expected to use, and the forces and torques that must be used to accomplish the tasks. In this unit general design principles based on body position, orientation, and force requirements will be presented. Ergonomic problems and issues associated with various work orientations will be discussed. In addition, the design of interfaces for hand and foot operation will be presented.
Unit 7: Computer Workstation
As computer workstations become more common place, the health and ergonomic issues of prolonged interaction with computers are becoming well known. In this unit, the difficulties of human-computer interaction, such as repetitive motion disorders and back strain, will be presented. Theories of "healthy" sitting will be discussed as will principles for good office workstation design.

Unit 8: Handling Loads
Many adults suffer from back and skeletal problems associated with handling loads. In this unit, the strains associated with load handling will be presented. Research on assessing body capabilities related to material handling and on the ergonomic design of objects to support handling will be discussed. Also presented will be current practices with regard to personnel selection and training for load handling.

Unit 9: Selection, Design, and Arrangement of Controls and Displays
The are many ergonomic and biomechanics considerations in the selection, design, and arrangement of controls and displays. These considerations include decisions for display location based in the characteristics of vision and the positioning of controls based on reach envelopes. These factors will be presented and the research on design principles of control and displays will be discussed. Also discussed will be the research addressing the design and location of labels and warning.

Unit 10: Designing for Special Populations
In this unit, the design considerations for addressing the needs of special populations such as children, aging, and disabled persons, will be presented. The analyses and design processes that will help products and systems better address the requirements of such populations will be discussed.