

Subject Description Form

Subject Code	CSE464
Subject Title	Ergonomics and Human Factors
Credit Value	3
Level	4
Pre-requisite / Co-requisite / Exclusion	Pre-requisite : CSE377 or SN3617
Objectives	This subject aims to equip students with the ability to design and develop a better workplace, work environment and human-machine interface by applying the knowledge and principles of human and ergonomic factors, so as to achieve safety and health of persons at work and at the same time enhance the work efficiency.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. understand the importance of ergonomics in the improvement of productivity and well-being of the workers; b. apply the principles of anthropometric and biomechanical techniques in the evaluation of ergonomics hazards; c. devise work systems that allow individuals to accomplish their work without developing excessive fatigue; d. apply ergonomics principles to reduce or prevent work-related injuries and diseases; e. grasp basic knowledge on historical development of ergonomics and human factors.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. <u>Introduction</u> A brief history of ergonomics and human factors including their definitions. Introduction to common ergonomic hazards and illnesses. Introduction to the principles of ergonomics and the areas of applications. 2. <u>Anatomy and Physiology as Applied to Work</u> Anthropometry: anthropometric data, statistical concepts and anthropometric applications. Biomechanics: biomechanical classification of movements; physiological and operational categories of movement. Anthropometric and biomechanical techniques applied to ergonomic hazard analysis and control. 3. <u>Work Physiology and Shift Work</u> Physiological response. Energy and energy sources of the body. Categories of work. Physical work capacity. Fatigue and its evaluation. Classification of workload. Endurance in physical work and work-rest scheduling. 4. <u>Human Information Processing</u> Physiological mechanism in human information processing. Model of human information processing. Mental workload. Sensation and perception. Methods to improve ability of information processing. Attention. Signal detection. Behaviour-based safety. Behavioural accident prevention process. Human reliability methods. 5. <u>Interaction with the Environment</u> Human senses and the physiological mechanisms. Homeostasis.

	<p>Acclimatization. Hot and cold situations.</p> <p>6. <u>Work Scheduling</u> Body rhythms and individual differences. Sleep and sleep phases. Shift organization and patterns. Effects of shift work on workers. Guidelines for shift work. Criteria for selection of shift workers. Alternative work schedules.</p> <p>7. <u>Design of Repetitive and Manual Handling Tasks</u> Introduction to work-related musculoskeletal disorders. The back and neck problems. Cumulative trauma disorders (CTSs) in the upper extremities. Fundamental risk factors of CTDs. Prevention and treatment of CTDs. Anatomy and biomechanics of manual handling. Prevention of manual handling injuries in the workplace. Design of manual handling tasks. Postural stability and postural control. Design of carrying tasks.</p> <p>8. <u>Work-tool Design</u> Grip strength and endurance. Ergonomics guidelines for hand-tool design. Safety guidelines for tool use. The workplace characteristics and the worker's functions. Design guidelines for controls and displays.</p> <p>9. <u>Workstation Design and Office Ergonomics</u> Workstation design problems. Principles for workstation design. Ergonomic guidelines for seated workstations and standing tasks. Office health problems and solutions. Workstation design for office work, including display screen equipment user.</p>																																								
<p>Learning Methodology</p>	<p>The lecture will cover various ergonomic and human factors elements in the workplace and applications for achieving high efficiency and safety of work. Laboratory / field work will be incorporated where appropriate during the course of study. During the study, students are required to search for related literatures or articles to support what they have learnt. Continuous assessment may be in the form of essay, test and site visit report.</p>																																								
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1" data-bbox="507 1532 1385 1800"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% Weighting</th> <th colspan="5">Intended Learning Outcomes Assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>1. Group Project</td> <td>20</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Individual Report</td> <td>20</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>3. Final Examination</td> <td>60</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.</p> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p>	Specific assessment methods/tasks	% Weighting	Intended Learning Outcomes Assessed					a	b	c	d	e	1. Group Project	20	✓	✓	✓	✓	✓	2. Individual Report	20	✓	✓		✓	✓	3. Final Examination	60	✓	✓		✓	✓	Total	100					
Specific assessment methods/tasks	% Weighting			Intended Learning Outcomes Assessed																																					
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1. Group Project	20	✓	✓	✓	✓	✓																																			
2. Individual Report	20	✓	✓		✓	✓																																			
3. Final Examination	60	✓	✓		✓	✓																																			
Total	100																																								

	<p>Continuous assessment in the form of essay, test and site visit report to assess students' knowledge on Outcomes a, b, d and e.</p> <p>Written examination is to test the understanding / application of principles related to Outcomes a to e.</p>	
<p>Student Study Effort Expected</p>	<p>Class Contact:</p>	<p>Average hours per week</p>
	<ul style="list-style-type: none"> ▪ Lectures / Tutorials / Site Visit 	<p>3 Hrs.</p>
	<p>Other student study effort</p>	
	<ul style="list-style-type: none"> ▪ Coursework 	<p>2.5 Hrs.</p>
	<ul style="list-style-type: none"> ▪ Self Study 	<p>3.5 Hrs.</p>
	<p>Total student study effort</p>	<p>9 Hrs.</p>
<p>Reading List and References</p>	<p>Essential Textbooks:</p> <p>Kroemer, K. H. E., Kroemer, H. B. and Kroemer-Elbert, K. E. (2000). <i>Ergonomics: How to Design for Ease and Efficiency</i>. (Second Edition). Englewood Cliffs, N.J: Prentice Hall.</p> <p>Bridger R. S. (2003). <i>Introduction to Ergonomics</i>. (Second Edition). London: Taylor & Francis.</p> <p>Reference Textbooks:</p> <p>Tayyari F. and Smith J. L. (1997). <i>Occupational Ergonomics: Principles and Applications</i>. London: Chapman & Hall.</p> <p>Osborne D. J. (1995). <i>Ergonomics at Work</i>. (3rd Edition). Chichester: John Wiley & Sons.</p> <p>Karwowski W. and Marras W. S. (Editors). (2003). <i>Occupational Ergonomics: Design and Management of Work Systems</i>. Boca Raton: CRC Press.</p>	