Bachelor of Science in Human Factors in Safety Programme – Courses at a Glance

Level 1 Courses

HFS103 PSYCHOLOGY FOR HUMAN FACTORS

It is important that HFS practitioners have a strong foundation in the study of human behaviour. This introductory course in psychology provides the theoretical foundations of human functioning in areas such as perception and consciousness, motivation and emotion, personality and individuality, social behaviour as well as altered states. It gives student an insightful understanding of the complexities of human relationships in personal, social, and vocational settings. In each topic covered, students are guided to its relevance to human factors studies, for example, how to design better user interfaces through a thorough appreciation of human perception and consciousness or how to design pleasurable consumer products through a better understanding of human emotion.

HFS105e COGNITION AND INFORMATION PROCESSING

Designing artefacts, products and systems that improve human performance requires a good understanding of human information processing capabilities and limitations. This course provides an essential introduction to several important areas in cognitive psychology. Students are firstly introduced to lower level cognitive processes such as sensation and perception, attention and memory. In the later part of the course, students will study higher level cognitive processes such as problem solving and decision making. The relevance of each topic to the design and evaluation of systems and human factors studies will be highlighted and discussed.

HFS107e SYSTEMS CONCEPTS AND TOOLS

Human factors involves a broader understanding of systems concepts in order to have a better understanding of integration of various parts and features of a system. Therefore, after going through this 18-hour course, the students would be able to look at the systems concepts and tools that are used for development of products and services to satisfy the needs of human being. This course aims to familiarize students with the fundamental concepts of systems design processes. The student will also learn the need for the development of the products and services and steps to do so. Students will also understand how to develop a root understanding of any problem.
**BME107 ANATOMY AND PHYSIOLOGY**

This course examines the organization of the human body at the macroscopic and microscopic levels. The various topics include the study of elementary cell biology and the integration of physiological components. The study of these components will involve an understanding of four major areas of physiological interest: organization of the body and its protective covering; skeletal movement and muscles; circulatory system and its components; and the respiratory system. This course also covers a summary of some of the common medical conditions related to the failings of these physiological systems.

**MTH103e CALCULUS AND STATISTICS**

MTH103e is a foundation course designed to equip you with mathematical skills that will help you with the higher level mathematics and subjects that require some mathematical background.

**SST101e PRINCIPLES OF PROJECT MANAGEMENT**

SST101e Principles of Project Management will provide both theoretical and practical insights on the management of projects. Students will be taught the characteristics of different industries, and how project management skills apply in them. These give undergraduates a solid foundation in the appreciation and application of project management. It prepares them for an in-depth understanding of project management in science and technology.

**SST102e HUMAN FACTORS AND SYSTEMS DESIGN**

Human factors is about understanding human strengths and limitations and designing systems that fit them. SST102 Human Factors and Systems Design gives students an overview of the underlying philosophy, aims and approaches of human centered systems design. Students are introduced to the human sensory and physiological systems and cognitive processes. They are exposed to basic principles of designing and evaluating workplaces and interfaces. Issues on accidents, human error and designing for safety are also covered in this course.

**Level 2 Courses**

**HFS201 WORKPLACE EVALUATION & DESIGN**

An important learning outcome of the HFS programme is to be able to demonstrate knowledge of work design and process improvement concepts and techniques. This course fulfils this objective by teaching students how to apply knowledge of anatomy, physiology and biomechanics in assessing and designing jobs and workplaces to fit the operators’ needs and requirements. Students will conduct a workstation analysis to help them better understand how various factors such as work postures and job requirements contribute to occupational risks.
Students will be taught how to redesign workstations to alleviate repetitive motion injuries. Principles of workstation design will be covered and these principles are applied not only to computer workstations but all other kinds of workstations. Manual materials handling guidelines are dealt with as well as designing for other types of population such the elderly, children and people with physical disabilities.

**HFS203 ENVIRONMENTAL HAZARDS AND TOXICOLOGY**

Human-environmental interaction forms an important component in a human factors programme. It is imperative for human factors and safety practitioners to appreciate how human performance is affected by physical environmental factors such as lighting, thermal, noise, and vibration. This course will cover these topics as well as how human performs in high and low altitude environments. Students are taught to recognize problems in the physical environment in relation to human responses and how to alleviate these problems.

**HFS206e OCCUPATIONAL BIOMECHANICS**

Occupational Biomechanics addresses the structures, functions, capabilities and limitations of the musculo-skeletal system. The biological basis addresses structural, surface and functional anatomy, and some of the physiological processes underlying muscle contraction and control. The mechanics basis covers mechanical units, statics and dynamics. The biomechanics content addresses the measurement of posture and movement, and the associated moments, compressions and tensions in the various structures. The application content covers working postures, manual materials handling and manipulation activities. Contemporary occupational biomechanics also includes a collection of computer based biomechanical models. The pathology / epidemiology component addresses such things as low back strain and other work related musculo-skeletal disorders. Finally, the physical ergonomics component introduces various laboratory and field measurement tools and preventive approaches such as workplace, equipment, tool and task design.

**HFS209e HUMAN FACTORS METHODOLOGY**

Students are exposed to a range of human factors methods for analysis of human interaction with devices, machines workstations and environment. This course provides students with the skills and tools to be able to address real world problems, seek best compromise for difficult problems, offer cost effective solutions and develop benchmark for best practices. In completing the course, students will be well versed with the range of human factors tools that they can employ in human factors practice. Human factors practitioners also need to be savvy in conducting research and investigations involving human subjects and making sense of data gathered. Practical problems associated with the design of experiments in human factors research will be taught.
HFSY215 BEHAVIOURAL BASED SAFETY

Behaviour based safety is now commonly employed as part of the safety management programme in many different industries. This course not only teaches students how to employ behavioural psychology to promote safety at the workplace but also the principles underlying behaviour based safety. Topics covered include how to combat human nature and interpersonal factors and the impact of stress at work. In the later part of the course, students are taught how to develop, implement and evaluate behaviour based safety programme. Topics will also include the importance of engaging employees to conduct team effort towards removing work hazards and to identify and reward positive behaviours.

HFSY217 EMERGENCY PREPAREDNESS AND RESPONSE PLANNING

The course equips students with knowledge on how to be prepared to deal with emergencies and manage disasters effectively at the workplace. The students will appreciate the different tactical and operational roles undertaken by various agencies within and outside the organization and how to implement an effective command and control capability. The course also covers post-emergency response and business continuity plan.

SST201 Sustainable Society through Innovative Technology

SST201 Sustainable Society through Innovative Technology introduces all students to how a green and clean environment can be preserved despite the pursuit of new and novel technological inventions and systems. In the second part, students learn how to use technological innovation to solve the different types of societal problems to create a sustainable ecosystem for all on earth.

Level 3 Courses

HFS301 COGNITIVE SYSTEMS ENGINEERING

As technology advances, humans are required to work within complex systems environment with multiple interacting factors. Often decisions have to be made within compressed time and errors in decision making could lead to dire consequences. This course deals human performance within complex socio-technical systems, such as power plants or traffic control stations. Students will better appreciate how interacting variables in complex systems affect decision making and work performance. The focus is on describing and applying various tools for analysing complex work environments as well as cognitive requirements of work to uncover the information required for making design decisions.
HFS303 SAFETY, RISK AND RESILIENCE ENGINEERING

System safety has progressed from its roots in accident investigation, through the creation of various prevention and mitigation strategies to a full partnership in the system design process along with quality and productivity. This 18-hour course provides students with a set of analysis and design tools to assure the ease of use, effectiveness (quality and reliability), efficiency, safety, security and satisfaction in the operation of small and large systems throughout its life cycle given various technological, human, operational and environmental “hazards.”

HFS351 SAFETY MANAGEMENT AND AUDIT

This course covers important topics in managing and auditing safety in the workplace. Students will be taught the importance of safety policy and culture at work and how best to implement and communicate these policies to the workforce. The different quality management standards are also explored. Students are finally taught the process of developing a safety audit system, how to plan and implement an audit and also how to prepare an audit report.

HFS353 INCIDENT AND ACCIDENT INVESTIGATION

In the workplace environments that exist today in modern industry, events occur that injure people, damage property, and create chaos. Added to these events, there are innumerable others that often seem innocuous but have the potential to create even more mayhem. This Course examines how we react to these events from legal, social, technical, and behavioural standpoints. The Course focuses its attention on the modern accepted standpoint that our prime response to these events should be to increase our knowledge of what caused the incident and from this to look at how we can protect ourselves and others in the future. This focus will integrate incident and injury investigation into an aspect of modern behavioural Safety Systems, and transform it from a responsive reaction into a proactive contribution. The course will work sequentially through the process of incident and injury investigation starting with how we prepare ourselves before the event. We will examine tools and methods we might use to collect and analyse data, and will explore how to draw conclusions and offer recommendations from this data, within the structure of a formal incident report. Finally we will move beyond the report into how to influence people to take action from the report and so change our future using our new knowledge. The aim of the course is to equip the student with the knowledge, skills, competence, and confidence to create and use an Incident and Injury Report within the normal range of events that occurs in today’s industrial companies.

HFS371 RISK ASSESSMENT AND MANAGEMENT

Students will be introduced to the tenets underlying risk assessment and management and are exposed to methods of assessing and managing risk at the workplace. In order to implement better risk management programmes, students are also taught decision-making processes and strategies and how these influence risk decisions. Social, economic, cultural and psychological factors affecting decision making will be discussed as well as novel decision making model
such as recognition-primed decision model proposed by Klein, will be discussed and applied to risk decision making. Students are also taught hazards identification methods and tools. How risks assessed, communicated and controlled will also be covered.

HFSY355 SAFETY STANDARDS, LEGISLATIONS AND BEST PRACTICES

The Course introduces the legal context within which health and safety practitioners operate. Students will be exposed to local safety guidelines, standards and legislations including Singapore’s Workplace Safety and Health Act, Work Injury Compensation Act and related statutes. Common Law negligence and its application; employer’s duty and occupier’s liability shall be discussed during the seminars to give students sufficient knowledge to understand how they are applied to workplace safety and health related situations. An introduction and comparison to occupational safety and health standards and the laws governing these areas outside of Singapore, namely, in Europe, England and the United States shall be discussed briefly.

HFSY357 ENVIRONMENTAL MANAGEMENT & SUSTAINABLE DEVELOPMENT

A set of international standards is required to bring a world-wide focus to the environment, encouraging a cleaner, safer, healthier world for us all. The existence of the standards allows organizations to focus environmental efforts against an internationally accepted criterion. This course covers environmental systems, environmental audit, environmental management principles, environmental labeling, environmental performance evaluation and life cycle assessment.

HFSY359 FATIGUE MANAGEMENT

Fatigue is mainly caused by lack of rest and sleep, and significantly impacts a worker’s ability to perform. This course helps students understand human circadian rhythm and sleep cycle, impacts of sleep debt and causes of sleep loss. The impact of fatigue on health and performance at work will also be covered. Students will also be equipped with knowledge on conducting physical and cognitive tests to evaluate performance impact from fatigue. Developing an effective fatigue management programme that assesses and manages risk factors (work shift cycles, roster design, rest breaks and occupational exposure levels) will be covered.

SST301e STRATEGIC MANAGEMENT OF TECHNOLOGY

SST301e Strategic Management of Technology introduces the concepts of Systems Thinking to students, and then through their subsequent progression how to infuse Systems Thinking Concepts into their analyses of strategic management case studies. The rest of the course covers the general management perspective on integrating technology and strategy, the design and implementation of technology strategy viewed from an evolutionary perspective, identification of key issues in the development of a company’s innovative capabilities to
implement a technology strategy, as well as the creation and implementation of a development strategy. The course concludes with a discussion on generating new ideas through case studies on how to increase a company's capacity for the management of technological innovation.

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