School of Civil and Environmental Engineering

Term 3, 2020

CVEN4405 HUMAN FACTORS IN CIVIL AND TRANSPORT ENGINEERING

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week	
Class	Wednesday, 11:00am – 1:00pm	Online
	Wednesday, 2:00pm – 3:00pm	Online
Workshops	Thursday, 2:00pm – 4:00pm	Online
	Thursday, 4:00pm – 6:00pm	Online
	Please ensure you attend your assigned workshop time.	
Course Coordinator and Lecturer	Prof. Michael Regan email: m.regan@unsw.edu.au office: Civil Engineering, Room 112	
Teaching Fellow	Dr. Prasannah Prabhakharan email: p.prabhakharan@unsw.edu.au office: Civil Engineering, Room 111B	
Demonstrator	Mitchell Cunningham email: mitchell.cunningham@unsw.edu.au	

INFORMATION ABOUT THE COURSE

Human Factors is the scientific discipline concerned with the understanding of interactions between humans and other elements of a system. The Human Factors profession applies theory, principles, data and methods to the design process to optimise human well-being and overall system performance. This course, which also encompasses the field of engineering psychology, will equip students with fundamental knowledge and skills necessary for human-centred design across many Civil Engineering disciplines, with a primary focus on the road and traffic management system - to optimise its performance and make it safe, efficient and satisfying to use. Students will also gain an appreciation of human considerations that are critical in the successful design, operation and evaluation of connected, automated and intelligent transport systems (including connected and automated vehicles), now and into the future.

HANDBOOK DESCRIPTION

See link to virtual handbook

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN4405

OBJECTIVES

List the objectives of the course.

Link the objectives with the program outcome attributes and the assessment strategies for this course. In other words, how do the assessment strategies assist in achieving these objectives, and how do the objectives contribute to achievement of program outcome attributes?

List of programme attributes:

- An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context
- Capacity for analytical and critical thinking and for creative problem solving
- Ability to engage independent and reflective learning
- Information literacy
- Skills for collaborative and multi-disciplinary work
- A respect for ethical practice and social responsibility
- Skills for effective communication

TEACHING STRATEGIES

The teaching strategies that will be used and their rationale. Give some suggested approaches to learning in the course.

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
Lectures	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Laboratory Work	• Hands-on work, to set studies in context

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

EXPECTED LEARNING OUTCOMES

Expected learning outcomes, their association with the teaching strategies and with the suggested approaches to learning. Include an alignment of the assessment tasks to the course and program learning outcomes. Student-centred and self-directed learning (expectations of the students, where relevant)

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

Course Learning Outcome (CLOs)		EA Stage 1 Competencies
1.	**CLO1:** Explain the Fundamental Principles of Human Factors that can be used by Civil and Transport Engineers to Facilitate User-Centred Design	*PE1.1, PE1.3, PE1.5*
2.	**CLO2:** Apply HF principles, methods and data to the design of the road and traffic management system	*PE1.3, PE1.2, PE1.4, PE1.5, PE2.3*
3.	**CLO3:** Plan for the Integration of HF into the Design Cycle of the Road and Traffic Management System	*PE1.3, PE1.6, PE2.3, PE2.4*

COURSE PROGRAM

A table of lectures and workshops or practical class topics for each week, indicating the name of lecturer involved (where multiple lecturers teaching in course), online activities, such as discussion forums, and relevant readings from textbook and other reference material identified for the course.

Date	Topic	Lecture Content	Demonstration Content
14/09/2020 (Week 1)	**Lecture 1a:** Introduction to the Course	Definition, History and Scope of Human Factors	Week 1 Workshop: Intro to Course and Synergies Task
	Lecture 1b: Human Performance Limitations 1	Human Information Processing; Nervous System; Vision; Hearing	
	Lecture 2: Human Performance Limitations 2	Perception; Attention	
21/09/2020 (Week 2)	**Lecture 1a:** Human Performance Limitations 3	Memory; Decision Making	Week 2 Workshop: Human Performance Limitations in Action
	Lecture 1b: Human Performance Limitations 4	Response Execution and Responding; Physiology; Biomechanics; Anthropometry; Feedback	
	Lecture 2: Human Performance Limitations 5	Reaction Time; Human Error	
28/09/2020 (Week 3)	**Lecture 1a:** AT1 - Early Session Assignment: 1 Essay Question (1000 words)		Week 3 Workshop: Anthropometric Exercise
	Lecture 1b: Vulnerabilities in Human Performance 1	Fatigue; Drowsiness; Emotion; Arousal; Stress & Strain	
	Lecture 2: Vulnerabilities in Human Performance 2	Individual Difference; Alcohol; Other Drugs; Inattention and Distraction	
06/10/2020	**Lecture 1a:** Human Factors in Traffic Engineering 1	Introduction and the Driving Task	Week 4 Workshop: Design Considerations

(Week 4)	**Lecture 1b:** Human Factors in Traffic Engineering 2 (Guest Lecturer)	Road Trauma; Crash Types; Road Users; Contributing Factors	
	Lecture 2: Human Performance Limitations and Traffic Engineering 1	Vision and Driving	
12/10/2020 (Week 5)	**Lecture 1a:** Human Performance Limitations and Traffic Engineering 2	Perception; Expectancy	Week 5 Workshop: Self Explaining Roads
	Lecture 1b: Human Performance Limitations and Traffic Engineering 3	Memory; Decision Making	
	Lecture 2: Human Performance Limitations and Traffic Engineering 4	Self-Explaining Roads; Reaction Time	
19/10/2020 (Week 6)	***Flexibility week for all courses (non-teaching)***		
26/10/2020 (Week 7)	**Lecture 1a and 1b**: AT2 - Mid Session Exam		Week 7 Workshop: Behavioural Adaptation Hackathon
	Lecture 2: Human Information Needs	Delineation; Behavioural Adaption	
02/11/2020 (Week 8)	**Lecture 1a:** Human Performance Vulnerabilities and Traffic Engineering	Driver Distraction; Driver Fatigue	Week 8 Workshop: Advertising Billboard Assessment
	Lecture 1b: Human Factors Research 1	Data Collection Methods	
	Lecture 2: Human Factors Research 2	Evaluation Methods	
09/11/2020 (Week 9)	**Lecture 1a:** Integration of HF into Project Lifecycle of the Road and Traffic Management System	Stages in Project Lifecycle; Human Factors Integration	Week 9 Workshop: Experimental Design
	Lecture 1b Paving the Way for Human Factors Integration: Case Study (Guest Lecturer)	Design Lifecycle; Human Factors Activities; Real World Challenges	
	Lecture 2: The Safe System Approach to Road Transport (Guest Lecturer)	Safe System Principles; Elements of Safe Road Environment; Road Transport Considerations	
16/11/2020 (Week 10)	**Lecture 1a:** Automated and Connected Transport Systems 1	Automated Vehicles; Connected Vehicles; Implications of Road and Traffic Engineering	Week 10 Workshop: Group Presentations
	Lecture 1b: Automated and Connected Transport Systems 2	Changing Role of the Driver; Technical Challenges	
	Lecture 2: Automated and Connected Transport Systems 3	Human Factors and Implications for Road and Traffic Engineering	

N.B The minimum attendance requirement is 80% of all classes, including lectures and workshops. You may fail the course if more than 20% absences are recorded.

ASSESSMENT

Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are set out below. As noted in 'Assessment Overview' below, detailed assessment guides will be made available in the weeks indicated. Students who perform poorly in the AT1 are recommended to discuss progress with the lecturer during the term.

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. However, the lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Where a student is unable to attend any exam, special permission will need to be obtained from the University and approved by the course coordinator, in order to make alternative arrangements.

PENALTIES

Late work will be penalised at the rate of 10% per day after the submission due date and time have expired.

ASSESSMENT OVERVIEW

Item	Description	Weighting	Learning outcomes assessed	Assessment Criteria and Due Date
AT1: Early Session Assignment	1000-word essay (1hr)	20%	CLO1	**ASSESSMENT CRITERIA:** An Assessment Guide for AT1 (including the marking rubric) will be released in the Week 1 workshop. The essay will require you to demonstrate an understanding of human factors limitations and vulnerabilities in a real-world road crash scenario. **DUE DATE:** Students will be required to write the essay in **class time**, during Lecture 1a of Week 3. (Wednesday 30th September 2020). Will be marked and feedback provided before Sunday, 11th October 2020 (Week 4).
AT2: Mid-Session Exam	1000-word essay + 25 MCQ (~1.5 hours (across 2 lectures)	40%	CLO1 and CLO2	**ASSESSMENT CRITERIA:** An Assessment Guide for AT2 (including the marking rubric will be released in the Week 4 workshop. For the Multiple Choice Quiz (MCQ) component of the exam, student will be presented with a total of 25 multiple choice questions drawn from Lecture content delivered during Weeks 1-3. For the essay component of the exam, students will be presented with a series of photographs of various road and traffic situations which are illustrative of poor design from human factors perspective. Students will be required to identify, for each of the photographs, the design deficiencies present, and to explain based on the lecture material during Weeks 1-6, why these are considered to be design deficiencies. For each photograph, students will be required to recommend how these design deficiencies could be overcome. **DUE DATE:** Students will be required to write the essay and complete the MCQ in **class time**, during Lecture 1a and 1b of Week 7 (Wednesday 28th October 2020). Will be marked and feedback provided before Sunday, 15th November 2020 (Week 9).
AT3: Group Research Project: Presentation	20-minute group presentation	10%	ALL	**ASSESSMENT CRITERIA:** An Assessment Guide for AT3 (including the marking rubric) will be released in the Week 2 workshop. This assessment will require groups of students, of 4-5 (allocated randomly), to identify an intersection or length of road in NSW which has a sizable crash problem. Each group will be asked to investigate the location, understand the crash problem and hypothesise why the crash problem may be occurring, applying knowledge of HF principles. Groups will then be asked to propose potential countermeasure(s), which could be implemented to prevent or mitigate

				the crash problem. The outputs for this activity will be a 15-minute group presentation in Week 10 workshops, with 5 minutes of questions **DUE DATE:** Presentations will be delivered during Week 10 workshops (Thursday 19th November 2020). Will be marked and feedback provided before Sunday, 6th December 2020.
AT4: Group Research Project: Individual Report	1500 words	30%	ALL	**ASSESSMENT CRITERIA:** An Assessment Guide for AT4 (including the marking rubric and submission mechanism) will be released in the Week 2 workshop. This assessment is an extension of AT3. In AT3, Groups were asked to propose potential countermeasure(s), which could be implemented to prevent or mitigate the crash problem, at a chosen location. In AT4, Individuals will also be asked to design a suitable research study to evaluate the effectiveness of one of the countermeasures proposed in the AT3 presentation. A 1500-word individual report detailing the findings (15%). **DUE DATE:** 11:59pm, Friday, 29th November 2020 (Week 11) Will be marked and feedback provided before Sunday, 13th December 2020.

RELEVANT RESOURCES

E-books available via UNSW Library

- Fuller, R., & Santos, J. A. (Eds.). (2002). Human Factors for Highway Engineers. Pergamon Press.
- Lehto, M. R., & Landry, S. J. (2012). Introduction to human factors and ergonomics for engineers. CRC Press.
- Sandom, C. & Roger, S. (2004). Human Factors for Engineers. Stevenage, UK: The Institution of Engineering and Technology (IET).
- Wickens, C. D., Gordon, S. E., Liu, Y., & Lee, J. (2004) An Introduction to Human Factors Engineering. (2nd Edition) Pearson Prentice Hall

Selected Chapters (E-copies to be made available during the course)

- Sanders, M. S., & McCormick, E. J. (1998). Human Factors in Engineering and Design (7th Edition). New York; McGraw-Hill.

Book Chapters: E-versions available via UNSW Library

- Cunningham, M., Regan & M., Cairney, P. (2017). Human Factors in Road and Traffic Engineering (Chapter 2). In Delbosc, A.& Young, W. (Eds). Traffic Engineering and Management (7th Edition). Monash Institute of Transport Studies.
- Dewar, R.E. (2002). Roadway design. In Dewar, R.E & Olson, P.L (Eds). Human Factors in Traffic Safety. (Chapter 12) Lawyers and Judges Publishing Company.
- Ogden, K.W (2003). Human Factors in Traffic Engineering (Chapter 2.1). In Young, W., Ogden, K. W., & Taylor, S.Y (Eds). Traffic Engineering and Management (3rd Edition). Monash Institute of Transport Studies.

Guidelines: E-versions available via UNSW Library

- Austroads (2020). Guide to Traffic Management Part 13: Safe System Approach to Transport Management Sydney, Australia: Austroads
- PIARC (2015). Designing for Road Users Characteristics and Compliance (Version 1 – 20/10/15). World Road Association (PIARC)
    - https://roadsafety.piarc.org/en/planning-design-operation/designing-road-users

Reports: E-versions available via UNSW Library

- OECD (1990). Behavioural adaptations to changes in the road transport system

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://student.unsw.edu.au/dates

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are

and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

https://student.unsw.edu.au/plagiarism

ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership