UNSW Course Outline

CVEN4405 Human Factors in Civil and Transport Engineering - 2024

Published on the 28 Aug 2024

General Course Information

Course Code : CVEN4405
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Civil and Environmental Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Human factors is the scientific discipline concerned with the understanding of interactions between humans and other elements of a system. The 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 the fundamental knowledge and skills necessary for human-centred design across many civil engineering disciplines, with a 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 the critical human considerations that are critical in the successful design, operation and evaluation of intelligent and automated transport systems (including connected and automated vehicles), now and into the future.

Course Aims

The course aims to familiarise students with principals of human-centric design in Civil and Transport Engineering, with a particular focus on the design of traffic systems. It introduces students to fundamental Human Factors theory, principles, methods and data and their application to road and traffic engineering design, in order to optimise human well-being and overall performance of the road and traffic management system.

The course provides complementary learning to the core Civil Engineering subjects and broadens their perspectives, by introducing engineering students to multidisciplinary concepts and theories related to human behaviour and their interactions with engineering systems in general, and transport systems in particular.

The course will prepare students to assess engineering systems from the perspective of human interactions and safety. It gives them the ability to methodically analyse human-factors-related safety issues in engineering design, offer solutions and assess the effectiveness of such solutions.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Explain the Fundamental Principles of Human Factors that can be used by Civil and Transport Engineers to Facilitate User-Centred Design.
CLO2 : Apply and Integrate HF principles, methods and data into the design of the Road and Traffic Management Systems, now and in the future.
CLO3 : Utilise HF Research Methods to Design and Evaluate Road and Traffic Management Systems.

Course Learning Outcomes	Assessment Item
CLO1 : Explain the Fundamental Principles of Human Factors that can be used by Civil and Transport Engineers to Facilitate User-Centred Design.	• Assignment 1 • Assignment 2 • Final Exam
CLO2 : Apply and Integrate HF principles, methods and data into the design of the Road and Traffic Management Systems, now and in the future.	• Assignment 3 • Assignment 1 • Assignment 2 • Final Exam
CLO3 : Utilise HF Research Methods to Design and Evaluate Road and Traffic Management Systems.	• Assignment 3 • Assignment 1 • Assignment 2 • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 Assessment Format: Group	10%	Start Date: Not Applicable Due Date: 27/10/2024 06:00 PM
Assignment 2 Assessment Format: Group	10%	Start Date: Not Applicable Due Date: 29/09/2024 06:00 PM
Final Exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: UNSW Final Exam Period
Assignment 3 Assessment Format: Individual	30%	Due Date: 15/11/2024 11:00 PM

Assessment Details
Assignment 1

<u>Assessment Overview</u>

An approximately 1,500 words report, plus verbal presentation during workshop by the group - rubric-based assessments for both the written and verbal presentation components.

Feedback will be provided by Census Date.

<u>Course Learning Outcomes</u>

- CLO1 : Explain the Fundamental Principles of Human Factors that can be used by Civil and Transport Engineers to Facilitate User-Centred Design.
- CLO2 : Apply and Integrate HF principles, methods and data into the design of the Road and Traffic Management Systems, now and in the future.
- CLO3 : Utilise HF Research Methods to Design and Evaluate Road and Traffic Management Systems.

<u>Detailed Assessment Description</u>

CVEN4405 Assessment Task 2: Group Assignment

Total Assessment Weight: 10%

Assignment summary

This assessment will require groups of students, of 3-4 (allocated randomly in Moodle), to identify an intersection or length of road in NSW which has a sizable (severe/fatal) crash problem (of any kind, including vehicles or vulnerable road users). The group subsequently visits the site, makes observations and gathers information that can potentially explain the high rate of crashes (i.e., the group make informed speculations). The group then proposes a potential intervention to mitigate the problem and proposes a study to determine the effectiveness of that intervention.

1. Identify a location

Identify an intersection or length of road in NSW which has a sizable crash problem involving motor vehicles. Each location must include at least 4 crashes in between the "reporting year" 2016-2020, with at least one serious injury crash.

Use the NSW Centre for Road Safety – <u>Interactive Crash Map</u>, to a find a suitable site.

2. Analyse the crash types

Groups will be asked to investigate the location, in terms of the roadway, road infrastructure and "Road User Movements" to understand the nature of the crash problem.

3. Use a 'Human Factors Crash Investigation checklist' to Evaluate the Crash Location

A checklist, provided as a separate handout, contains criteria against which the location can be assessed in terms of Human Factors issues that might be contributing to crashes at that location.

The criteria will relate to the following issues [see Appendix D of Austroads (2020) Guide to Traffic Management Part 13: Safe System Approach to Transport Management]:

- Stimuli and events being missed
- Stimuli and events being ignored
- Confusing stimuli and events
- Unexpected stimuli and events
- Stimulus-to-noise ratio too low
- Inability to respond
- Insufficient time to process stimuli and events correctly (e.g., due to distraction)
- Insufficient time to react to stimuli and events
- Insufficient time to respond to stimuli and events
- Missing inadequate feedback.
- Misjudgements in decision (e.g., related to stress, arousal, conditioning, expectation, impairment,

experience, motivation).

The checklist evaluation can be completed in a number of ways: for example, by conducting a desktop review (e.g., using google street view) or by observing traffic behaviour around the site directly.

Visual evidence could be provided in the report to better explain the problem on the site.

4. Propose potential countermeasure(s) to the crash problem.

Given what you have found from your group activity, you will now consider how you might redesign the road and traffic environment in order to prevent or mitigate the Human Factors issues identified through the checklist activity.

5. Design/propose a study to evaluate the impact of your potential countermeasure.

Design a study that could be undertaken in order to determine the effectiveness of one of the proposed countermeasures in reducing the frequency and severity of the crash problem.

Report (8%) – Due date: 27/10/2023 06:00 PM

An approximately 1,500-word report is expected.

Presentation (2%) – Presented during the week 8 workshops

Few slides and 5-6 minutes presentation. The presentation can optionally be delivered by a representative of the group or multiple members.

Suggested Structure for the Group Report

The individual report should be set out under the following headings:

1. Project title
2. Project Group Members (including zID)
3. Aim of the investigation
4. Desktop Crash Investigation of site
5. Applying the Human Factors Safety Assessment Checklist at the site
6. Proposed Countermeasure(s)
7. Evaluation Study*
8. Potential implications/applications of the investigation

Assessment Length

1500 words

Assignment submission Turnitin type

This is not a Turnitin assignment

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing

functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see here.

Assignment 2

Assessment Overview

An approximately 1,500 words report, plus verbal presentation during workshop by the group - rubric-based assessments for both the written and verbal presentation components.

Course Learning Outcomes

- CLO1 : Explain the Fundamental Principles of Human Factors that can be used by Civil and Transport Engineers to Facilitate User-Centred Design.
- CLO2 : Apply and Integrate HF principles, methods and data into the design of the Road and Traffic Management Systems, now and in the future.
- CLO3 : Utilise HF Research Methods to Design and Evaluate Road and Traffic Management Systems.

Detailed Assessment Description

CVEN4405 Assessment Task 1: Group Assignment

Total Assessment Weight: 10%

Assignment Summary

This assessment will require groups of students, of 3-4 (allocated randomly in Moodle), to interview 3-4 drivers of modern cars (each group member interviews one driver), identify a vehicle safety issue involving human factors or a distraction issue that they face involving vehicle-driver interactions, select one of those issues and propose a study design to scientifically investigate/document (and quantify the extent of) the problem.

Assessment Activities:

1. Interview with a driver of modern car

Each group member interviews a driver of a modern car (could be a friend, relative, parent etc) and asks them to identify a single most important safety issue that they can pinpoint while driving their vehicle, one that involves human factors. This could be, for example, a safety issue related to the interactions of the driver with various features of the vehicle. The only individual-level information that is required from the person who is being interviewed are (i) the model, make and year of manufacture of the vehicle and (ii) number of years of driving experience of the person who is interviewed. The interview will be kept anonymous.

2. Summarise the interviews and select one issue

The main essence of each interview is summarised in a few sentences, including a brief explanation of the issue raised by the driver as well as the individual-level information. Each of those issues are reported in the assignment briefly. The group members reach a consensus on which issue they find most interesting/important and report their justification of this selection in only few sentences.

3. Conduct brief research on the features of the vehicle and the raised issue

Depending on which interview is selected for further investigation, brief research is conducted on features of the vehicle type and model mentioned in the selected interview. Any information related to the specific issue raised by the interviewee will be of value. This is reported in a short paragraph. Visual aids and images (where possible) are allowed and encouraged to put the problem into context more tangibly.

4. Propose a research study to systematically investigate the human factor safety issue.

The group assumes that they are tasked by an external client (e.g., the manufacturing company, or a court, or another independent entity) to conduct an objective and scientific investigation of the identified issue. The group proposes a study design, one that is ethical, safe to conduct, practical, unbiased (to the extent possible) and valid (internally and externally, to the extent possible). The group concisely explains all features of the study, including the method and study tool, study procedure, proposed sample size and sample characteristics, experimental conditions and treatments, potential variables and metrics of interest etc.

5. Outline potential implications of the study findings

The group explains in concise terms how the findings of the study can be used for policy, intervention design and vehicle design, or any other potential implications of the findings of the

proposed study.

Report (8%) – Due date: 29/09/2024 06:00 PM

An approximately 1,500-word report is expected.

Presentation (2%) – Presented during the week 4 workshops

Few slides and 5-6 minutes presentation. The presentation can optionally be delivered by a representative of the group or multiple members.

Feedback will be provided by Census Date.

Suggested Structure for the Group Report

The individual report could be structured according to the following headings:

1. Project title (Assignment 1: [Title] (choose a nice title for your proposed study/topic))
2. Project Group Members (including zID's)
3. Aim of the investigation.
4. Summary of interviews with drivers
5. More details on the selected Human Factors Safety issue and vehicle characteristics
6. The proposed study design (including what is being measured, how it is being measured, where it is being measured, participants (who, and how many), equipment/facilities needed, etc).
7. Potential implications/applications of the findings

Assessment Length

1500 words

Assignment submission Turnitin type

This is not a Turnitin assignment

Generative AI Permission Level

Simple Editing Assistance

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Final Exam

Assessment Overview

2 hour exam during the formal exam period. A mixture of multiple choice, true-false and short and long answer questions.

Course Learning Outcomes

- CLO1 : Explain the Fundamental Principles of Human Factors that can be used by Civil and Transport Engineers to Facilitate User-Centred Design.
- CLO2 : Apply and Integrate HF principles, methods and data into the design of the Road and Traffic Management Systems, now and in the future.
- CLO3 : Utilise HF Research Methods to Design and Evaluate Road and Traffic Management Systems.

Detailed Assessment Description

2 hour exam during the formal exam period. A mixture of multiple choice, true-false and short and long answer questions.

Hurdle rules

A hurdle of 40 (out of 100) is applied for this assessment.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see here.

Assignment 3

Assessment Overview

An approximately 2,000 words written report, a literature analysis on an agreed topic - rubric-based assessments for the report.

Feedback will be provided within 2 weeks.

Course Learning Outcomes

- CLO2 : Apply and Integrate HF principles, methods and data into the design of the Road and Traffic Management Systems, now and in the future.
- CLO3 : Utilise HF Research Methods to Design and Evaluate Road and Traffic Management Systems.

Detailed Assessment Description

CVEN4405 Assessment Task 3: Individual Assignment

Total Assessment Weight: 30%

Assignment summary

This assessment will require each student to write a brief but critical literature review report (approximately 3,500-4,000 words, excluding references) and consists of three parts.

Part 1. A short analysis to estimate the number of lives "saved" on Australian roads since 1980 (up to 1000 words)

Part 2. A short report (about 1000-1500 words) on one of these two topics of your choosing:

1. A literature and data-driven analysis on why NT's road death rate is much higher than other states
2. A literature and data-driven analysis on the road safety risks faced by First Nations people

Part 3. A literature review report (about 1,500 words) on one of the ten broad topics listed at the end of this assignment description. The topics have been chosen in alignment with the course material and are meant to provide an avenue for further learning on the topics that are covered during the course. The assignment has been designed to further enhance students' appreciation and understanding of the subject matter through a limited investigation in the published scholarly literature. The allocation of topics is based on the last digit of the student's zID. If the

zID ends in 1, then the student is allocated topic #1, …, if the zID ends in 9, then the student is allocated topic #9 and if the zID ends in 0, then topic #10.

1. Identify 3-5 papers from reputable journals related to your allocated topic

Students will conduct systematic and non-systematic searches in major scholarly databases (i.e., Google Scholar, Scopus, Web of Science) using keywords etc to identify 3-5 interesting papers related to their topic. It is recommended that each student initially identify a set of 5-10 articles and filter 5 of them based on the quality of their content and the harmony and relation that they show to one another as well as the chosen topic. The papers need to have some relation to one another so that their content can be integrated. The proposed 10 topics are all broad topics. It is up to the students to choose a nice and interesting topic within that broad topic and review that one.

2. Closely study the papers and review them critically

The literature review provides an overview of the topic, the chosen papers, and their relation to one another and why they were chosen. It outlines novelties observed within the reviewed articles, any consistency or inconsistency across their findings, it highlights methodological discrepancies, potential methodological limitations, and also identifies some limitations and knowledge gap that they have not addressed. A potential topic for some potential follow-up study is proposed to address some of those limitations and gaps.

Report (30%) – Due date: 15/11/2023 11:00 PM

An approximately 3,500-4,000 words report is expected.

The broad topics are listed below:

1. Applications of the Theory of Planned Behaviour in road safety
2. Driver safety issues of automated and semi-automated vehicles
3. Applications questionnaires/inventories (other than DAS/DAX) in road safety
4. Moral dilemma in autonomous vehicles
5. The effect of motion sickness on driver behaviour experiments
6. Internal and external validity (generalisability) of driving simulator experiments

7. Safety issues in interactions of drivers with technological features of semi-automated vehicles
8. Safety issues in interactions of micro-mobility users (pedestrians, scooters, e/scooters, bikes)
9. Applications of neuroimaging methods in road accident research
10. Applications of eye-tracking methods in road accident research

Assessment Length

4000 words

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Generative AI Permission Level

Simple Editing Assistance

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General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Topic	Human Factors in road systems - Economics of road safety
Week 2 : 16 September - 22 September	Lecture	Human Factors in road systems - Epidemiology of road safety
Week 3 : 23 September - 29 September	Lecture	Human Factors in road systems - Social Psychology of road safety
Week 4 : 30 September - 6 October	Lecture	Human Factors in road systems - Neuroscience of road safety
Week 5 : 7 October - 13 October	Lecture	Human Factors in road systems - Philosophical aspects of road safety
Week 7 : 21 October - 27 October	Lecture	Human Factors in road systems - Social science of road safety
Week 8 : 28 October - 3 November	Lecture	Human Factors in Built Environments - Public safety
Week 9 : 4 November - 10 November	Lecture	Human Factors in road systems - Mathematical modelling applications in road safety
Week 10 : 11 November - 17 November	Lecture	Human Factors in construction - Occupational safety

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Prescribed Resources

Lecture slides provided by the course convenor.

Recommended Resources

Lecture slides provided by the course convenor.

Course Evaluation and Development

The delivery of this course is adjusted each term using student feedback from the MyExperience survey.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Milad Haghani					No	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see the Nucleus: Student Hub. They are located inside the Library – first right as you enter the main library entrance. You can also contact them via http://unsw.to/webforms or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about the this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.