SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

THE UNIVERSITY OF NEW SOUTH WALES

Session 1 2008

CVEN 3401 SUSTAINABLE TRANSPORT AND HIGHWAY ENGINEERING

COURSE DETAILS

Units of Credit 6
Contact hours 5 hours per week

Lecture	Tuesday,	16.00 – 18.00	Physics Theatre
Lecture	Wednesday,	10.00 – 11.00	Science Theatre
Tutorial	Wednesday,	11.00 – 13.00	Mathews 102
Tutorial	Wednesday,	11.00 – 13.00	Mathews 104
Tutorial	Wednesday,	11.00 – 13.00	Mathews 107
Tutorial	Wednesday,	11.00 – 13.00	Mathews 308
Tutorial	Wednesday,	11.00 – 13.00	Mathews 309
Tutorial	Wednesday,	11.00 – 13.00	Mathews 310
Tutorial	Wednesday,	11.00 – 13.00	Mathews 312

Lecturers Markus Oeser (MO), course coordinator
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Room CE 503

Peter Hidas (PH)
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Room CE 607

INFORMATION ABOUT THE COURSE

This is the first introductory course into the discipline of transport engineering as part of the broad field of civil and environmental engineering. An outline of the field of transport engineering and its relationships with other engineering and non-engineering disciplines is provided within the course. The basic concepts and terminology of the discipline is introduced. The course comprises of two strands.

The first strand covers 4 weeks of the session, and is taught by Dr Peter Hidas. This strand is concerned with the analysis, design and evaluation of traffic and transport systems, including the interactions between transport and land use.

The second strand of the course is taught by Dr. Markus Oeser and covers 8 weeks of the session. This strand is subdivided into two components. The first component deals with pavement design and evaluation. The aim of this component is to present the knowledge necessary for the design of the most economic pavement thickness and composition, which will provide a satisfactory level of service for the anticipated traffic. We will address the pavement composition, the pavement analysis, the traffic load, pavement materials, and the pavement thickness design. The design methodology taught in the course is based on the Austroads Pavement Design Guide. In the tutorials students are supposed to solve task relevant for pavement material characterization and pavement design.

Aim of the second component is to give students a brief overview of the geometric design of Rural Highways and Roads. Road design is usually undertaken by specialists under the supervision of a civil engineer. The engineer must therefore have a good understanding of the design methods and the quality requirements to enable him/her to evaluate the design. To enable students to gain practical experience in road design, a major assignment is set in the first lecture. Students are expected to work on their own project during tutorials. The progress of the project work will be noted by the tutors. Some extra time will be required to complete the project assignment. The course is based on the Austroads Road Design Guide.

Link to virtual handbook:
http://www.handbook.unsw.edu.au/undergraduate/courses/2008/CVEN3401.html

OBJECTIVES

The first strand is expected to develop skills related to the analysis of traffic and transport systems. Topics include: overview of the transport task, trends in motorization, sustainable transport, motorized and non-motorized transport, traffic flow fundamentals, definitions and concepts related to land use and transport systems; prediction methods of future transport demand; modeling and evaluation of transport systems; transport operations and traffic management.

- Understand components of the field of transport engineering.
- Learn the basic terminology of transport and traffic engineering practice.
- Learn urban transport planning concepts adopted by planning agencies and the Roads and Traffic Authority.
- Learn computation methods related to various stages of transport planning.

The second strand is expected to develop skills related to highway design and pavement evaluation. Topics include: introduction to road design including elements, history, terminology and driver influence; route location process; design practice of urban and rural roads, intersections and interchanges; computer aided design; road traffic loadings; subgrade evaluation; base and sub-base materials; surfacing; design of flexible pavements.

- Understand the basic principles of road geometric design.
- Learn the methods of geometric design including horizontal and vertical alignment design and cross-sections, earthwork volume calculations.
- Understand the principles of design evaluation.
- Understand the basic concepts of intersection design and evaluation.
- Understand the benefits and limitations of computer aided road design.
- To gain the skill in selection and thickness design of pavements.
- To study the fundamental characteristics of various pavement components and pavement materials.
- To understand the factors affecting the performance of pavements.

TEACHING STRATEGIES

The following teaching strategies will be used the course.

Private Study

- Review lecture material and textbooks
- Do set problems and assignments

- Use WebCT for discussions
- Download class notes from WebCT if not collected during classes
- Reflect on class problems and assignments

Lectures

- Find out what you must learn
- See methods that are not in the textbooks
- Follow worked examples
- Hear announcements on course changes

Tutorials

- Be guided by tutors
- Practice solving set problems
- Ask questions

Assessments

- Demonstrate your knowledge and skills
- Demonstrate higher understanding and problem solving abilities

EXPECTED LEARNING OUTCOMES

By successfully completing of the first strand of this course students will be able to

- Explain differences between the various fields of transport and traffic engineering;
- Recognise the importance of transport within the framework of Ecologically Sustainable Development;
- Explain relationships between fundamental traffic flow parameters;
- Describe the relationships between Land Use, Transport and the Environment;
- Calculate trip generation from land use activity data;
- Solve a trip distribution problem using the Gravity model;
- Illustrate transport system equilibrium with simple examples of land use – transport interaction;
- Solve simple inter- and intra-modal assignment problems;
- Evaluate the transport system conditions based on demand forecast;

A successful study of the second strand will enable students to

- Develop horizontal and vertical alignments for simple rural road sections on different types of terrain;
- Evaluate the alignment design according to various design criteria;
- Design cross-sections appropriate for various types of roads;
- Calculate the earthwork volumes of a designed road section;
- Present and document a road design in a standard format;
- Select type and composition of a pavement;
- Perform analyses of flexible pavements
- Evaluate traffic load for pavement thickness design;
- Assess and specify pavement materials to meet performance requirements;
- Thickness design of flexible pavements.

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

ASSESSMENT

The final grade for this course will be based on the sum of the scores from the assignments and the final examination. For the values of the single components see the table below:

Strand	Component	Type of assessment	Value
1	1	Assignment	1/6
1	1	Exam	1/6
2	1	Assignment	1/6
2	1	Exam	1/6
2	2	Assignment	1/3
2	2	Exam	none

The second component of the second strand is assessed entirely on a road design assignment. No question on this part of the course will appear in the final examination. The Final Examination is closed-book. Its duration is 2 hours. The formal exam scripts may not be retained by candidate. Students who perform poorly in the assignment and tutorials are recommended to discuss progress with the lecturer during the semester. The lecturer reserves the right to adjust the final scores by scaling if agreed to by the Head of School.
Please note that passing of all of the components of the course is required to pass the subject.

ASSIGNMENTS

Assignment 1 – Land-Use Planning Problem Due: Wednesday, 23 Apr 4pm, CE503
Assignment 2 – Pavement Design Due: Wednesday, 7 May 4pm, CE503
Assignment 3 – Road Design Due: Wednesday, 4 Jun 4pm, CE503
Details of the assignments are given in separate briefs.

COURSE PROGRAM

Week	Date	Topic
Taught by Dr. Peter Hidas:		
1	Tuesday, 11 Mar	Introduction to Transport Engineering, ESD
1	Wednesday, 12 Mar	Traffic flow, Performance measures of traffic
2	Tuesday, 18 Mar	Land-Use - Transport interaction, Trip generation
2	Wednesday, 19 Mar	Trip Distribution
3	Tuesday, 1 Apr	Transport System equilibrium
3	Wednesday, 2 Apr	Mode choice
4	Tuesday, 8 Apr	Traffic Assignment
4	Wednesday, 9 Apr	Environmental Impacts and ESD
Taught by Dr. Markus Oeser:		
5	Tuesday, 15 Apr	Historical developments, Pavement overview
5	Wednesday, 16 Apr	Pavement Types
6	Tuesday, 22 Apr	Material Characterization
6	Wednesday, 13 Apr	Subgrade evaluation, Unbound granular Materials
7	Tuesday, 29 Apr	Hot mixture asphalt
7	Wednesday, 30 Apr	Pavement design factors
8	Tuesday, 6 May	Mechanistic-empiric design of flexible pavements
8	Wednesday, 7 May	Computer aided pavement design
Taught by Dr. Markus Oeser:		
9	Tuesday, 13 May	Introduction, Road Classes, Design Approach
9	Wednesday, 14 May	Road Design Considerations, Route Location
10	Tuesday, 20 May	Speed parameters, Sight distances

10	Wednesday,	21 May	Vertical alignment
11	Tuesday,	27 May	Horizontal alignment
11	Wednesday,	28 May	Cross section, Earth works
12	Tuesday,	3 Jun	Interchanges, Intersections
12	Wednesday,	4 Jun	Computer aided road design

REQUIRED/RECOMMENDED READING

All required reading will be provided in the form of lecture notes. Recommended reading (available in the library):

- Blunden WR and Black JA (1984) The Land use/Transport system, Pergamon Press
- Ortuzar, J. D. and Willumsen L. G. (1994) Modelling Transport, 2nd edn. Wiley.
- Rural Road Design, AUSTROADS, 1989.
- Underwood, R.T. (1991) The Geometric Design of Roads, Macmillan.
- Underwood, R.T (1995) Road Engineering Practice , Macmillan
- Huang, Y.H. (2004) "Pavement Analysis and Design", 2nd ed., Pearson.
- Pavement Design: A Guide to the Structural Design of Road Pavements, Austroads 2004
- Yoder, E. J. and Witczak, M. W. (1975). Principles of pavement design, 2nd ed., John Wiley & Sons.

WEBCT

Copies of class notes are available in WebCT:
http://vista.elearning.unsw.edu.au/webct/entryPageIns.dowebct

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:
https://my.unsw.edu.au/student/resources/KeyDates.html

COMMON SCHOOL INFORMATION

The minimum attendance requirement is 80% of all classes, including lectures and tutorials. You may fail the course if more than 20% absences are recorded. Please see the section on Special Consideration.
For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

Refer to Common School Information on the School website available at:
http://www.civeng.unsw.edu.au/currentstudents/ug/common_ug.htm