COURSE CONTENT

Academic Year	AY2018-19,	**Semester**	1
Course Coordinator	Assoc Prof Wong Yiik Diew		
Course Code	CV3014		
Course Title	Transportation Engineering		
Pre-requisites	Nil		
No of AUs	3		
Contact Hours	Total : 39 Hours (Lectures: 26 hrs and tutorials: 13 hrs)		
Proposal Date	8 Jan 2019		

Course Aims

This course is open to Year 3 students. By the end of the course, you shall be equipped with essential knowledge of land transportation planning, traffic engineering and highway engineering. This knowledge is applied in planning, design and construction of land transport infrastructure.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) shall be able to:

1. identify the variety and complexity of land transportation as a system and as an engineering discipline;
2. apply the four-step process in transportation planning;
3. define the traffic flow parameters by various methods of measurement;
4. apply the principles of traffic flow theory to calculate performance measures;
5. apply the key principles of geometric design for vertical and horizontal alignments of highways;
6. determine earthwork quantities for highway construction;
7. describe the functions of road pavement as a civil engineering structure; and
8. apply pavement design concepts to design a road pavement.

Course Contents

S/N	Topic	Lecture	Tutorial
1	Land transportation systems	2	1
2	Transportation planning	6	3
3	Traffic flow theory and studies	4	2
4	Geometric design of highways	5	2.5
5	Earthworks	3	1.5
6	Structural design of highways	6	3
	Check for Hours	26	13

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	* Related Programme LO or Graduate Attributes	Weightage	Team / Individual	Assessment Rubrics
1. **Final exam**	All (in above ILO	CVE SLO (2018): a, b, c	60%	Individual	Appendix 1

	section)				
2.Continuous Assessment: **Quiz**	1,2,3,4, 5 (in ILO section)	CVE SLO (2018) : a, b	25%	Individual	Appendix 2
3. Continuous Assessment: **Team-based project**	1, 2, 3, 4, 5 (in ILO section)	CVE SLO (2018): a, b, c, d, i, j	15%	Team	Appendix 3
Total			100%		

***CVE SLO (2018)**

a) **Engineering Knowledge**: Apply the knowledge of mathematics, natural science, engineering fundamentals, and civil engineering specialisation to the solution of complex civil engineering problems.

b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex civil engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c) **Design/development of Solutions**: Design solutions for complex civil engineering problems and design system components or processes with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

d) **Investigation**: Conduct investigations of complex problems using research-based knowledge and methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex civil engineering activities with an understanding of the limitations.

f) **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and the need for the sustainable development.

h) **Ethics**: Apply ethical principles and commit to professional and moral responsibilities in the civil engineering practice.

i) **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

j) **Communication**: Communicate effectively on complex civil engineering activities with the engineering community and with society at large, be able to comprehend and write effective

reports and design documentation, and make effective presentations.

k) **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to work, as a member and leader in a multidisciplinary team.

l) **Life-long Learning**: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological evolution.

Formative feedback

Instructors take questions at end of lectures, and provide on-the-spot clarifications or at review in next lecture. Students also confer with instructors at tutorials, at appointed consultations or via email.

Students are assessed on one 45-minute Quiz consisting of MCQ and True/False questions; feedbacks are given for the quiz in terms of summary quiz scores and instructors go through (in the lecture) common mistakes made by students.

Students are assessed by a team project; feedbacks on projects are given as and when required, and particularly at project presentation.

Learning and Teaching approach

Approach	**How does this approach support students in achieving the learning outcomes?**
Lectures	Lecture sessions are conducted to a large group in lecture theatre, and all lectures are recorded. Instructors take questions at end of lectures. Instructors may provide on-the-spot clarifications, and during review of taught materials in class. Individual students can confer with instructors via emails or appointed face-to-face consultations. All these enhance the achievement of targeted learning outcomes.
Tutorials	Students are given problems related to prevailing lectures, and are to solve them in advance before the weekly face-to-face tutorial sessions conducted in small groups, in smart tutorial rooms. Students pose queries to tutor who share solution pointers in an interactive manner. Tutors also translate applied problems to the wider context of industry developments. Such practices serve to enhance the students' learning experience.
Team projects	Students work on team projects over the span of a semester. Each team project entails a problem related to course aims. Each team comprises 5-6 students who shall co-operatively participate to scope the problem, collect and analyse the data, write a short report and make a presentation. Project teams are supervised by the tutor in his/her tutorial group, which allows weekly project consultation. Solving a real problem in a team setting strengthens the learning outcomes.

Reading and References

Text

Banks, J.H., "Introduction to Transportation Engineering", 2nd ed., McGraw-Hill, 2002.

Supplementary reading materials are provided by instructors.

Course Policies and Student Responsibilities

As a student of the course, you are required to abide by both the University Code of Conduct and the Student Code of Conduct. The Codes provide information on the responsibilities of all NTU students, as well as examples of misconduct and details about how students can report suspected misconduct. The university also has the Student Mental Health Policy. The Policy states the University's commitment to providing a supportive environment for the holistic development of students, including the improvement of mental health and wellbeing. These policies and codes concerning students can be found in the following link.
http://www.ntu.edu.sg/SAO/Pages/Policies-concerning-students.aspx

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognise your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors AY2018/19

Instructors	Office Location	Phone	Email
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Asst/P Zhu Feng	N1-01b-45	6790 5267	zhufeng@ntu.edu.sg

Planned Weekly Schedule

Week	Contents	Course LO	Activities
	***Module 1**: Land Transportation Systems*		
1	Introduction. Introduction to transportation planning process and transportation systems. Data and surveys for planning studies.	1, 2	Lecture & Tutorial
	***Module 2**: Transportation Planning*		

2	Travel demand modelling.	2	Lecture & Tutorial
3-4	Trip generation, trip distribution, modal split. Network analysis. Trip assignment.	2	Lecture & Tutorial
***Module 3**: Traffic Flow Theory and Studies*			
5	Traffic flow characteristics: flow, speed, density. Volume, speed and travel time surveys.	3	Lecture & Tutorial
6	Relationships among flow, speed and density.	4	Lecture & Tutorial
***Module 4**: Geometric Design of Highways*			
7	The design process and standards. Design speed and sight distances. Design documentation. Vertical alignment	4, 5	Lecture & Tutorial
8-9	Horizontal alignment. Super-elevation. Intersections and Interchanges.	5	Lecture & Tutorial
***Module 5**: Earthworks*			
9, 10	Earthwork. Mass diagrams.	6	
***Module 6**: Structural Design of Highways*			
11	Components of flexible and rigid pavements. Design factors.	7	Lecture & Tutorial
12	Components of flexible and rigid pavements. Design factors. Structural design of flexible pavement.	7, 8	Lecture & Tutorial
13	Stresses in rigid pavement. Joints and reinforcement. Structural design of rigid pavement.	7, 8	Lecture & Tutorial

Appendix 1: Assessment for Final Examination
It is a 2.5-hour, closed-book examination (weightage: 60%) that covers ILO 1-8. Questions cover concepts and calculations; marks are indicated for each question.

Appendix 2: Assessment for Quiz
It is a 45-minute closed-book quiz (weightage: 25%) that covers ILO 1-8. Questions are MCQ and True/False format; marks are indicated for each question.

Appendix 3: Assessment for Team Project

It is a project on a real problem done by teams of 5-6 students each (weightage: 15%). Projects cover topics related to ILO 1-5 (which are delivered earlier on in the semester). Marks are given for 10-page report and speaking presentation; assessors pose questions to each of you in the team at the presentation.

Criteria	Good (8-10)	Ave (6-7)	Fair (4-5)	Poor (1-3)	Remarks
Project Background/ Objective/ Purpose (10%); ILO 1, 2, 3, 4 & 5					Accurate contextualisation of project background and description. Well defined project; clear objectives.
Methodology/ Experiment / Data Collection (20%); ILO 1, 2, 3, 4 & 5					Ability and independence in acquiring relevant mobility information/data for the project. Good data visualisation, as provided in Appendices of report.
Results and Discussion (20%); ILO 1, 2, 3, 4 & 5					Well-presented results with discussion, showing ability to understand problem, interpret data obtained, and be cognisant of imitations.
Conclusions and Recommendations (15%); ILO 1, 2, 3, 4 & 5					Summarise report clearly and show ability to make appropriate and relevant conclusions, with clear and workable recommendations.
References and Report Format (10%); ILO 1, 2, 3, 4 & 5					Report is clear and concise; good grammar and spelling with appropriate Tables/ graphs/ Figures. Report is presented well with logical sequence
Presentation Skills (15%); ILO 1, 2, 3, 4 & 5					Ability to present/answer clearly on key points. Make good use of presentation aids. Integrate well as a team.
Presentation Slides (10%); ILO 1, 2, 3, 4 & 5					Coherent layout of slides. Make good use of visuals, video images.
TOTAL (100%)					