Subject Description Form

Subject Code	CSE30312
Subject Title	Transportation and Highway Engineering
Credit Value	3
Level	3
Exclusion	CSE312 Transportation and Highway Engineering
Objectives	(1) To promote a basic appreciation of the nature of transportation engineering; (2) To introduce students to those engineering activities essential to the planning and design of highway and transportation systems; (3) To enable students to acquire basic principles of highway planning and engineering; (4) To train students with basic techniques in highway design and pavement material studies; (5) To enable students to make engineering judgment on highway planning and design.
Intended Learning Outcomes	Upon completion of the subject, students will be: a. Able to apply the fundamentals of applied physics and principles of engineering design to carry out geometric design of highway alignments and mix design of pavement materials and know the basic facts about local roadway network; b. Able to exercise professional judgement and engineering sense in the design and evaluation of alternative highway alignment schemes in view of the complex site environment; c. Able to analyze and interpret laboratory data for optimal design of highway pavement materials; d. Able to explain the design of highway alignments and pavement materials logically and lucidly; e. Able to understand the limitations of the site constraints and to recognize the assumptions and principles adopted in the highway design so as to develop alternative highway design schemes and optimal mix for pavement materials. f. recognize the need for and engage in life-long learning

Subject Synopsis/ Indicative Syllabus	1. Introduction to Transportation and Highway Engineering (1 wee k) The scope of transportation engineering. Transportation in society; economic, social and environmental factors. Transportation modes. Urban transportation problems; aspects of transport planning studies and traffic management. 2. Highway Planning (2 weeks) Highway hierarchy, classification and design standards; Standard layout of roads; Cross-section elements of highways; Highway junctions: at-grade and grade-separated junctions. Safety considerations. 3. Geometric Design (5 weeks) Design principle and procedure; Basic assumptions and theories for geometric design; Sight distance; Design of vertical and horizontal alignment: Circular curve, transition curve, horizontal curve widening; sag curve and summit curve. 4. Highway Construction (1 week) Application of the principles of soil mechanics to subgrade compaction and testing. California Bearing Ratio Test of subgrade. Highway materials and construction control. Soil stabilization. 5. Road Structures and Components (2 weeks) Principal types of road structures. Structural elements of flexible and rigid pavements and their functions. Preparation of subgrade. Joints for rigid pavements and construction details. 6. Highway Materials (2 weeks) Bituminous road materials. Types and uses of pre-mixed bituminous materials. Recycled materials. Design of bituminous materials; Marshall test procedure. Binder characteristics; consistency and composition tests. Mechanical tests on bituminous mixture; indirect tensile fatigue test, indirect tensile stiffness modulus test, rutting test. Non-bituminous materials for road base. 7. Laboratory Basic highway material testing procedures; Marshall test, California Bearing Ratio test.
Teaching/Learning Methodology	Fundamental knowledge will be covered in lectures. Tutorials will provide opportunities for discussion of lecture materials and will also be conducted in the form of example class and problem-solving session to supplement understanding from lectures. Laboratory work will help students appreciate the basic principles and familiarize themselves with basic instruments.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
(1) Assignments, Seminar Report, and Lab Reports	28	√		√	√	√	√
(2) Mid-term Test(s)	12	√	√			√	
(3) Final Examination	60	√	√			√	
Total	100						

Students must pass the final examination and achieve a passing overall score/ grade to pass the subject.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The students will be assessed with three components, i.e., the laboratory session and assignment, mid-term test(s) and a final examination at the end of the semester. The students will be required to attend laboratory sessions and submit group laboratory reports. These laboratory sessions will enable students to acquire basic laboratory techniques and report writing. The works in the laboratory sessions are closely related to practicing highway engineering requirements. Students will have to exert engineering judgments to complete the laboratory sessions. The laboratory sessions to together with the report writing are best to achieve intended learning outcomes a, c, and d. The mid-term test will emphasize on assessing students' basic concept and current practices of highway engineering. It is appropriate to achieve intended learning outcomes a, b and e. The final examination will consolidate students' learning in lectures and tutorials. It is most appropriate to achieve the intended learning outcomes a, b, and e.

Student Study Effort Expected

Class contact:	Average hours per week
▪ Lectures / Tutorials / Laboratory	3 Hrs.
Other student study effort:	
▪ Reading and studying	4 Hrs.
▪ Completion of Assignments/Lab Reports	2 Hrs.
Total student study effort	9 Hrs.

Reading List and References	**Essential Textbooks** "Pavement Analysis and Design" 2nd Edition, Yang H. Huang, Pearson, 2003. "Highways", 3rd Edition, O'Flaherty, C.A. (Edward Arnold), 1986-1988. **Reference Textbooks** "Traffic and Highway Engineering" 5th Edition, CL Engineering, 2014. "The Asphalt Handbook", 7th Edition, Asphalt Institute, November, 2007. "Highway Design Characteristics, Transport Planning and Design Manual", Vol. 2, Hong Kong Transport Department, June 2001.. "Highway Materials, Soils & Concretes", Atkins, H.N. (Reston), 2003. "Principles of Highway Engineering and Traffic Analysis, 7th Edition", Mannering, F.L., Washburn, S.S. (John Wiley & Sons), 2019. American Association of State Highway and Transportation Officials (AASHTO). AASHTO Guide for Design of New and Rehabilitated Pavement Structures, 2002. http://www.hyd.gov.hk/eng/public/publications/index.htm "Traffic and Highway Engineering" 5th Edition, CL Engineering, 2014 **Reference Journals** ASCE Journal of Transportation Engineering, Part B: Pavements Road Materials and Pavement Design International Journal of Pavement Engineering