Subject Description Form

Subject Code	CSE30390
Subject Title	Transportation Systems Analysis
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: AMA1110
Objectives	1. To familiarise students with the essential numerical techniques and operations research methods which are applicable in most engineering problems. 2. To enable students to relate the previously acquired mathematical theories to practical problems. 3. To provide students with a solid bridge between mathematical theories and real-world transportation systems. 4. To enable students to analyse the advantages and limitations of the commonly adopted numerical techniques and operations research methods. 5. To prepare students for tackling practical engineering problems, with a combination of strong theoretical background and sound engineering sense.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Make use of operational research techniques for transportation system design and optimisation under various constraints. b. Perform simple statistical analysis on field data, sample estimation and hypothesis testing. c. Design suitable sampling and experimental methods for transportation system analysis and realise error sources.
Subject Synopsis/ Indicative Syllabus	1. ***Operations research*** (5 weeks) Linear programming, simple Simplex algorithms, sensitivity analysis, shortest path and maximum flow problems, integer programming, branch and bound algorithm, applications in transportation. 2. ***Probability & statistics*** (6 weeks) Random variables, probability distributions, sample distributions and means, Central Limit Theorem, Bayesian Theorem, statistical inference, significance and hypothesis testing. 3. ***Data collection and experimental design*** (2 weeks) Use of field data and data gathering techniques, sources of errors, considerations of sample size; experiment design and analysis techniques.

<table>
<tr><td>Teaching/Learning Methodology</td><td>Most of the concepts will first be introduced in lectures. Tutorials provide opportunities for students to enhance understanding through practicing on calculation exercises and have chance to discuss with the lecturers to clarify misunderstanding. Lab sessions would introduce students to computer programs that are useful in dealing with real-size problems.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Assignments</td><td>10%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Lab reports</td><td>10%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3.Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>4.Final exam</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td></td><td></td><td></td></tr>
</table>
Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.

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

Students will be assessed by four methods: assignments, lab reports, quizzes, and final exam. Students will demonstrate their knowledge and numerical techniques related to transportation engineering problems in the written assignments. Assignments are appropriate to achieve intended learning outcomes (a) and (b). Through laboratory sessions, students will learn various useful programs and showcase their knowledge acquired through lab reports, and is targeted at intended learning outcome (a) and (b). The quizzes will focus on the numerical techniques and numerical methods required in this subject and will address intended learning outcomes (a) and (b). The final exam scheduled at the end of the semester consolidates the lectures, tutorials, and lab sessions and will address intended learning outcomes (a), (b), and (c).
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td>Average hours per week</td></tr>
<tr><td>▪ Lecture/ Tutorial/ Laboratory</td><td>3 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and Studying</td><td>3 Hrs.</td></tr>
<tr><td>▪ Completing of assignments, class presentations and lab reports</td><td>3 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>9 Hrs.</td></tr>
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Reading List and References	**Textbooks:** 1. F.S. Hillier, G.J. Lieberman. Introduction to operations research, McGraw Hill, 11st Edition, 2021 2. R.A. Johnson, I. Miller, J.E. Freund. Miller & Freund's probability and statistics for engineers, Pearson, 9th Edition, 2017