

Subject Description Form

Subject Code	CSE372
Subject Title	Applied Mathematics for Environmental and Occupational Safety & Health
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	<p>This subject aims to provide the basic tools of mathematics to enable the students to:</p> <ol style="list-style-type: none"> (1) optimize a linear objective subjecting to linear constraints, and (2) formulate EOSH problems in statistical terms, and to (3) apply statistical tools for their interpretation of data.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. apply the fundamentals of science, in particular, logic and mathematics, to formulate problems in environmental and occupational safety & health (EOSH); b. apply such fundamentals to synthesize cost effective solutions; c. apply such fundamentals to explore, summarizing and presenting data so as to identify EOSH problems using statistical methods; d. design and carry out statistical tests and interpret the results for evaluation of EOSH management; e. appreciate probabilistic nature of EOSH sciences and develop ability to quantify risk; f. communicate logically and lucidly in statistically language and in English writing; g. recognize the need for, and an ability to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. System of linear equations, matrices, linear inequality. 2. Linear programming, Simplex Method, maximization and minimization. 3. Descriptive and summary statistics, means, SD, SEM, median, centiles. Outliers, missing data. Random variables and expectation. Variance, covariance. Data description and probability distributions. 4. Samples of Environmental data, frequencies, estimators, variability, confidence intervals. Graphical presentations, histograms, scatter plots. Checking normality, transformations. 5. Hypothesis testing and tests of significance. p values, power of a test. 6. Mean exceeding standards. Implications of change of mean and standard deviation with time. 7. Inference of two populations. Comparison of environmental quality at different time and different locations, t-test.

	<p>8. Inference of more than two populations. One way ANOVA. Two way ANOVA. Randomized block.</p> <p>9. Chi square test. Checking normality of data. Contingency table.</p> <p>10. Correlation and regression analysis, coefficients and residuals. General linear model, multiple regression. ANOVA applied to regression. Identification of long term trend and contributing factors.</p>
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Teaching/Learning Methodology	<p>Basic concepts and theory are delivered through lectures. Short questions will be asked occasionally to develop philosophical and conceptual thinking rather than recognise and recall.</p> <p>Real life examples in environmental and occupational safety & health will be given and explained during lectures.</p> <p>10 exercises based on real environmental data will be given as home work and scoring rubrics will be explained. The scoring rubrics will remind students different outcomes which are expected from them.</p> <p>The power point presentation of homework solutions can help students to develop their team work, critical thinking skills, and enhance their own personal development.</p>
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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	g
	1. Assignments	30	✓	✓	✓	✓	✓	✓	✓
	2. Final Examination	70	✓	✓	✓	✓			
	Total	100							
<p>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.</p> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Assignments - Problem solving teaches students how to carry out statistical tests and interpret the results. Real life data set given in assignments help students learn how to explore, summarize and present data. It teaches students how to formulate problems, search for appropriate data, think independently and hence develop lifelong learning skills.</p> <p>The final examination tests how much the students has learnt in this module. It reinforces and assesses the learning outcomes.</p>									

Student Study Effort Expected	Class contact:	Average hours per week
	▪ Lectures / Tutorials	3 Hrs.
	Other student study effort:	
	▪ Assignment	3 Hrs.
	▪ Self Study	3 Hrs.
	Total student study effort	9 Hrs.
Reading List and References	<p>Keller G., <i>Statistics for Management and Economics</i>, 8th edition, Thomson, 2009.</p> <p>Barnett R.A. & Ziegler M.R., <i>College Mathematics</i>, 6th ed., Macmillan Publishing Co., 1993.</p>	