Subject Description Form

Subject Code	CSE509
Subject Title	Quantitative Techniques in Construction Planning
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Mutual exclusions: *Project Management Techniques (BRE513)*
Objectives	To provide the students with advanced knowledge on quantitative techniques in managing modern construction projects, with emphases on project planning, financing, cash flow analysis, and decision optimization.
Intended Learning Outcomes	Upon completion of the subject, students will be able: a. to apply the knowledge of financial/economic analysis tools to evaluate a project's financial and economic feasibilities; b. to analyze the cash flow of a construction project and assess its impacts on project profit; c. to use linear optimization techniques to find optimal solutions for problems in construction; d. to apply dynamic programming techniques and AHP (analytic hierarchy process) techniques to obtain optimal decisions in construction problems; and to develop creativity and critical thinking, and the ability to work independently.
Subject Synopsis/ Indicative Syllabus	**Keyword syllabus:** i) Economic Feasibility and Financial Analysis of Projects Present worth and equivalent annual cost; DCF and IRR; financial analysis; socio-economic analysis; preparation of economic feasibility study report. ii) Mathematical Techniques for Construction Planning Advanced linear programming; mixed integer programming; goal programming; dynamic programming. iii) Decision Theory Decision analysis; analytic hierarchy process (AHP).
Teaching/Learning Methodology	Lectures will provide fundamental knowledge related to the theoretical tools of financial/economic appraisals, linear optimization techniques and decision making tools (e.g. dynamic

<table>
<tr><td></td><td>programming, AHP). Students will be required to do exercises, which will enable them to understand fully the taught materials.

Tutorials will provide opportunities for students to ask questions or to discuss any theoretical or practical problems arising from the taught materials, course works, or real life situations related to the topics taught.

Other study efforts will require students to conduct some problem solving course works independently including reading of books and academic papers.</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="4">Intended subject learning outcomes to be assessed (Please use √ as appropriate)</td></tr>
<tr><td>a.</td><td>b.</td><td>c.</td><td>d.</td></tr>
<tr><td>1. Continuous Assessment</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Written Examinations</td><td>60%</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></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:

Continuous assessment will be based on homework assignments. These include the preparation of a feasibility analysis, or the formulation and solution of linear programming models, goal programming models, and decision hierarchy models.

Written examination is evaluated by final examination.

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.
</td></tr>
</table>

Reading List and References	**Books** Barish, N.N. and Kaplan, S., *Economic Analysis for Engineering and Managerial Decision Making*, 2nd Ed., McGraw-Hill (1978). Chang, Y.L. and Sullivan, R.S., *Quantitative Systems for Business Plus*, Prentice-Hall (1989) (Software Package included). Grant, E.L., Ireson, W.G. and Leavenworth, R.S., *Principles of Engineering Economy*, 8th Ed., Wiley (1990). Levin, R.I., Kirkpatrick, C.A. and Rubin, D.S., *Quantitative Approaches to Management*, 8th Ed., McGraw-Hill (1992). Squire, L. and Van der Tak, H.G., *Economic Analysis of Projects*, John Hopkins University Press (1975). Taha, H.A., *Operations Research*, 7th Ed., Macmillan (2003). Tang, S.L., Ahmad, I., Ahmed, Syed M. and Lu, M., *Quantitative Techniques for Decision Making in Construction*, Hong Kong University Press (2004). Tang, S.L., *Economic Feasibility of Projects: Managerial and Engineering Practice*, 3rd Ed., Chinese University Press, Hong Kong (2003). Tang, S.L., *Linear Optimization in Applications*, Hong Kong University Press (1999). Wagner, H.M., *Principles of Operations Research*, 2nd Ed., Prentice-Hall (1975). **Journals** Construction Management and Economics International Journal of Construction Management International Journal of Production Economics International Journal of Project Management Journal of Construction Engineering and Management, the American Society of Civil Engineers Journal of Construction Research Journal of Management in Engineering, the American Society of Civil Engineers The Engineering Economist