The Hong Kong Polytechnic University

Subject Description Form

Subject Code	LGT5137
Subject Title	Lean Six Sigma and Quality Management Techniques
Credit Value	3
Level	5
Normal Duration	1-semester
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objectives of this subject mainly cover the following: 1 To comprehend and master the leading and prominent quality management technique of Lean Six Sigma, which combines two most powerful quality management techniques, namely Lean Manufacturing/Management that aims at eliminating wastes and non-value-added activities as well as Six Sigma that focuses on reducing defects. 2 To provide students with a focused and systematic approach to adopt and apply Lean Six Sigma and other quality management techniques and methodologies to satisfy and serve the purposes and objectives of quality management. 3 To develop students with hands-on knowledge and ability to familiarize themselves with Lean Six Sigma techniques and methodologies that cover the unique, logical, sequential, and scientific steps of Define, Measure, Analyse, Improve, and Control (DMAIC) for operational and process improvement to eliminate both waste/non-value-added activities and defects arising from operational and process problems and corresponding root causes due to inferior and sub-optimal operations and processes. 4 To develop students with ability to identify and develop the opportunities for operational and process improvements in business, manufacturing, and service environments through adopting and applying Lean Six Sigma and other quality management techniques, such as Voice of Customer, Kaizen, etc., for quality management, customer satisfaction, organizational performance, business excellence, and continuous improvement.

	This subject contributes to the following Intended Learning Outcomes for the following programme(s): MSc in Operations Management #2: Develop the specific operations management knowledge.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. apply Lean Six Sigma, quality management techniques, and other relevant operational, process, and continuous improvement techniques and methodologies to identify, tackle, analyse, and resolve problems and their corresponding root causes to improve operations and processes through elimination of wates and non-value-added activities as well as reduction of defects. b. develop the ability to adopt and apply new techniques and methodologies to synthesise new knowledge and skills in quality management and continuous improvement focusing on operations and processes. c. analyse the basic business and operational data using quality management techniques and methodologies, especially in the case of Lean Six Sigma, in a systematic way. d. cooperate efficiently and effectively in project improvement team to apply quality management tools, techniques, and methodologies to accomplish and attain pre-determined objectives and goals in quality management, customer satisfaction, organizational performance, business excellence, and continuous improvement. e. identify the opportunities for operational and process improvements in business, manufacturing, and service environments through applying Lean Six Sigma and other quality management techniques, such as Voice of Customer, Kaizen, etc., to achieve continuous improvements in these areas through continuous incremental changes and breakthroughs in operations and processes. f. explore and understand the impacts of emerging techniques (for examples, artificial intelligence, blockchain, etc.) on quality management in Quality 4.0, and how these emerging technologies are related to the improvement projects of Lean Six Sigma and quality management techniques and methodologies. [Note: Students who completed and passed this subject are eligible to apply for any one of the following professional qualifications with Six Sigma Institute (Hong Kong) (SSI)::]

	1. Lean Six Sigma Green Belt Certificate (LSSGBC) and Registered Lean Six Sigma Green Belt Professional Qualification (RLSSGB), or 2.1. Six Sigma Green Belt Certificate (SSGBC) and Registered Six Sigma Green Belt Professional Qualification (RSSGB) and 2.2. Lean Leader Certificate (LLC) and Registered Lean Leader Professional Qualification (RLL), and exemption of Module 2: Lean Transformation Methods of Lean Specialist Certificate. 3. After student obtained the professional recognitions and qualifications of Registered Lean Six Sigma Green Belt Professional Qualification (RLSSGB) per point 1 above or Registered Six Sigma Green Belt Professional Qualification (RSSGB) per point 2 above, student is also eligible to apply for Certified Six Sigma Green Belt Professional Qualification with the China Association for Quality (CAQ) under the mutual recognition between SSI and CAQ. Furthermore, if student also completed and passed LGT5111 Practice of Operations Management, the student is further eligible to apply for (1) Lean Six Sigma Black Belt Certificate (LSSBBC) with SSI to pursue (2) Registered Lean Six Sigma Black Belt Professional Qualification (RLSSBB) with SSI, and can further eligible for (3) Certified Six Sigma Black Belt Professional Qualification with CAQ.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	<u>Fundamental Concept and Application – The Foundation and Fundamental of Quality Management and Quality Management Techniques</u> • Basic Premise of Product and Service Quality (the purpose of quality management to satisfy customer) • Quality Management and Quality Management Framework (the trilogy covering quality management infrastructure, quality management practices, and quality management tools and techniques) • Cost of Quality Concept (the correct and precise understanding of the cost of quality – "Quality is Free") • Kaizen – Continuous Improvement for Sustainable Success (continuous operational and process improvements in daily operations, common sense, simple, straightforward, less cost, and collectively high success rate) • Voice of Customer – Relentlessly Customer-Focused by Quality Management (identification and determination of the "critical-to-quality" as the basis to identify and develop operational and process improvement projects)

	<u>Lean Six Sigma Methodology – The Business Framework for Close to Perfect with Minimum Wastes and Non-value-added Activities</u> • Explanation, motivation, rationale, development, and understanding of Lean Six Sigma – the combination of Lean and Six Sigma (the combined purposes of Lean Six Sigma to eliminating wastes and non-value-added activities on the one hand and reducing defects on the other) • Structure and responsibilities of the martial art structure of Lean Six Sigma project team • DMAIC methodology – its unique features, steps, and techniques applied by Lean Six Sigma for process analysis and improvement (cover process mapping, problems and corresponding root causes identification and analysis, problem and corresponding root causes solving methods, customer value analysis, etc.) • Basic statistical tools for Lean Six Sigma <u>Quality Management Tools and Techniques of Quality Management and Lean Six Sigma – The Need for Performance Measurement System by Statistical Analysis and Teamwork</u> • The classical tools for quality management and Lean Six Sigma • Measurement System Analysis • SIPOC and Process Mapping • Value Stream Mapping • Process Capability • Statistical Process Control and Control Chart <u>Emerging Technologies and Quality Management Techniques</u> Contemporary issues and quality management technology trends urged by Quality 4.0 stemming from Industry 4.0 and emerging digital technologies.
Teaching/Learning Methodology *(Note 3)*	Lectures will adopt a systematic approach focusing on the use of different quality management tools, techniques, and methodologies, such as Lean Six Sigma, Kaizen, Voice of Customer, etc. Students are expected to present their evaluation and analysis of case studies and other related project assignments during the individual assignment and group presentation assignment.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
Continuous Assessment – Coursework	50%	✓	✓	✓	✓	✓	✓
Final Examination	50%	✓	✓	✓	✓	✓	✓
Total	100 %						

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

The various methods are designed to ensure that all students are able to deliver the above-mentioned outcomes/objectives upon completion of this subject, specifically the following:

- The individual assignments/cases in the continuous assessment component are used to enable students to improve their knowledge and abilities to achieve the outcomes of a – f with emphasis on the outcomes of a – c.

- The group assignment presentations/cases in the continuous assessment component are used to enable students to improve their knowledge abilities to achieve the outcomes of a – f with emphasis on the outcomes of d – f. The group assignment presentation forms the evidence and basis to apply for the professional qualification of Lean Six Sigma as a Registered Lean Six Sigma Green Belt (RLSSGB), or Six Sigma as a Registered Six Sigma Breen Belt (RSSGB), or Lean as a Registered Lean Leader (RLL) from the Six Sigma Institute (Hong Kong).

- The invigilated written final examination is used to test the knowledge and abilities of the students to master and apply all the necessary concepts and methods of quality management techniques and methodologies, including roadmaps in carrying out a quality improvement project, in a typical business environment with emphasis on the outcomes a – f.

To reflect the significant technology content in this subject, 10% (or more) of the overall weighting of this subject is based on individual assessment concerning technology-related knowledge.

<table>
<tr><td rowspan="6">Student Study Effort Expected</td><td colspan="2">Class contact:</td></tr>
<tr><td>• Lectures / tutorials (if any)</td><td>39 hrs.</td></tr>
<tr><td colspan="2">Other student study effort:</td></tr>
<tr><td>• Preparation of coursework (in individual assignment and group assignment presentation)</td><td>43 hrs.</td></tr>
<tr><td>• Self-study for preparing lectures, tutorials (if any) and final examination</td><td>44 hrs.</td></tr>
<tr><td>Total student study effort</td><td>126 hrs.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Recommended Reference Books:

• Tarantino, A. (2022 or the latest version). Smart Manufacturing: The Lean Six Sigma Way. Hoboken, New Jersey: Wiley.

• Souraj, S. & Abdur, R. (2019 or the latest version). An Integrated Company-wide Management System: Combining Lean Six Sigma with Process Improvement. Cham: Springer.

• Erick, J.C. (2014 or the latest version). Quality Management for Organizations: Using Lean Six Sigma. Boca Raton, FL: CRC Press.

• Sheila, S. & Shahbaz, S. (2012 or the latest version). Lean Six Sigma. New York: McGraw-Hill.

• George, M.L., Rowlands, D. and Kastle, B. (2010 or the latest version). New York: McGraw-Hill.

• Taghizadegan, S. (2006 or the latest version). Essentials of Lean Six Sigma. Amsterdam: Elsevier.

• Evans, J. R. & Lindsay, W. M. (2005 or the latest version). The Management and Control of Quality. South-Western College Publishing.

• Lean Six Sigma and Minitab, QSB Consulting, (latest edition)

Recommended Relevant Journals:

• Asia-Pacific Journal of Quality Management
• Decision Science
• International Journal of Quality and Reliability Management
• International Journal of Lean Six Sigma
• International Journal of Productivity and Quality Management
• International Journal of Six Sigma and Competitive Advantage
• International Journal of Service Industry Management</td></tr>
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	• Journal of Operations Management • Journal of Quality Management • Management Science • Quality Management Journal • Harvard Business Review

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.