

DIPLOMA IN BUSINESS PROCESS & QUALITY ENGINEERING (BPQE) (3-YEAR COURSE)

SCHOOL OF ENGINEERING



The only course offered by a polytechnic in Singapore in the field of quality studies, the **Diploma in Business Process & Quality Engineering (BPQE)** is specially designed to meet the needs of companies involved in manufacturing, service and support services. In keeping with global trends and developments, the curriculum focuses on quality management while retaining basic engineering modules. By combining engineering and management, BPQE produces highly sought after graduates with a sound grasp of modern quality techniques and concepts.

Students are exposed to an exciting variety of engineering, quality management and customer service concepts. Students take modules in diverse areas such as service management, project quality management, principles of marketing, and business process engineering.

The course also incorporates interdisciplinary studies and the application of various disciplines such as quality management, industrial and systems engineering, and materials and production engineering. This course is therefore particularly suitable for those who are technology- and business-minded.

In their final year, students can either undertake an industrial attachment locally or overseas, or participate in an in-house project. The Multidiscipline Engineering Division has a close relationship with companies such as Motorola, Yeakin Plastic, Dell Computer, Baxter Healthcare, and with industry bodies like the Singapore Quality Institute, which is affiliated with the American Society for Quality.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examinations (or equivalent) results:

Subject	'O' Level Grade
English	1-7**
Mathematics (Elementary/Additional)	1-6
Science (with Physics or Chemistry or Biology component) or Design & Technology	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science or Design & Technology and two other subjects.

**Candidates with English as a second language (EL2) must have attained a minimum grade of 6.

Candidates with severe vision deficiency should not apply for the course. Those with colour appreciation deficiency may be considered, subject to an in-house test.

CAREER PROSPECTS

BPQE graduates enjoy a host of diverse career opportunities in both the engineering and management-related sectors. Roles relating to the initiation, implementation and maintenance of quality management systems, such as those of a quality specialist, controller, consultant and auditor, would be particularly suitable for BPQE graduates. Prospects for advancement are good, and those who acquire further skills can progress to become Quality Managers and Quality Directors.

ACCREDITATION FOR FURTHER STUDIES

BPQE graduates may pursue further studies in areas such as Mechanical Engineering, Materials Engineering, Electrical Engineering, Industrial & Systems Engineering, Service Operations Management, and Engineering Management in both local and foreign universities

In particular, BPQE graduates can gain direct admission to the second year of the Materials Engineering, Mechanical Engineering and Electrical Engineering courses at the Nanyang Technological University (NTU). Also available is direct admission with advanced standing to the Industrial & Systems Engineering and Mechanical Engineering courses at the National University of Singapore (NUS).

Graduates can also gain admission into business-related and other relevant courses at NUS, NTU and the Singapore Management University.

Graduates may also gain admission into related courses at most UK and Australian universities.

COURSE STRUCTURE

FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none">• Engineering Mathematics 1• Engineering Materials• Fundamentals of Quality Management• CAD & Geometric Tolerancing• Engineering Mechanics• Creativity & Applied Thinking Skills[^]• Sports & Wellness[^]	<ul style="list-style-type: none">• Electrical Technology• Computer Programming• Applied Statistics• Engineering Mathematics 2• Individual & the Community[^]• Exploring Contemporary Issues[^]

SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none">• Financial Decision• Economics• Engineering Mathematics 3• Quantitative Analysis & Simulation• Product Innovation• Any two Interdisciplinary Studies (IS) modules[^]	<ul style="list-style-type: none">• Integrated Management System• Operation & Manufacturing Processes• Team & Project Management• Decision Analysis• Statistical Quality Control• Innovation & Enterprise in Action[^]

FINAL-YEAR MODULES

Level 3.1	Level 3.2 (Pathway 1)
<ul style="list-style-type: none">• Industrial Engineering Practices• Service Marketing• Reliability & Preventative Management• Business Process Engineering	<ul style="list-style-type: none">• Product Design & Development or• Industrial Attachment Programme

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules^{*}

[^] Denotes Interdisciplinary Studies module. For more details on IS modules, please log on to www.np.edu.sg/is/

^{*} Students take two elective modules to complete their diploma. Electives are chosen and customised from a wide range of clusters under the Engineering and Non-Engineering categories.

COURSE MODULES

LEVEL 1.1

Engineering Mathematics 1

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include algebra, trigonometry, logarithms, matrices and complex numbers.

Engineering Materials

The module gives students a fundamental and broad-based knowledge of the properties, processing and quality assurance aspects, selection and applications of engineering materials. To reinforce learning, laboratory practices, case studies and research assignments related to materials technology and applications are incorporated into this module. Tutorials, together with two materials mini-projects further reinforce an understanding and application of material covered in lectures. The total assessment of the module also includes regular class tests that are conducted at various intervals during the semester.

Fundamentals of Quality Management

This module introduces the basic principles of quality management. The concepts, philosophies and techniques of quality control are discussed with an emphasis on the practical application of this knowledge to analyse and solve quality problems. Where feasible, field trips will be organised to established companies to learn about the practical implementation of quality management in a manufacturing or service organisation.

CAD & Geometrical Tolerancing

Engineering Drawing or blueprint is a precise international language, and an understanding of it is essential for a great number of technologists, who are not directly involved in the actual preparation of drawing. This module furnishes an understanding of and the ability to read working drawings, and an appreciation of the use of CAD in design work. No prior engineering graphic or software knowledge is assumed.

Engineering Mechanics

Students learn to analyse problems in engineering mechanics based on basic principles and concepts such as equilibrium, friction, and Newton's laws of motion. This module covers both statics and dynamics with emphasis on free-body diagrams, and application of basic principles to solve engineering problems.

LEVEL 1.2

Electrical Technology

This module provides a foundation in electricity to prepare the students for more specialised subjects. It deals with the basic concepts of electrical circuits and the methods used to analyse them. The module emphasises an understanding of the basic electrical circuit laws (Ohm's Law, Kirchhoff's Voltage and Current Laws) and network theorems, and their application in electrical network analysis. Topics covered include fundamentals of electricity, network theorems, capacitance, electromagnetic induction and inductance, AC circuit theory and transformer fundamentals.

Computer Programming

This practical-oriented module equips students with the basic knowledge and skills in computer programming using 'C' language. The main topics include basic computing concepts, fundamentals of C, branching, loops, and C functions. On completion of the module, students will be able to explain and write C programs for simple engineering applications.

Applied Statistics

Students are introduced to basic statistical knowledge and techniques to solve problems encountered in their studies and future careers. Topics include introduction to statistics, descriptive statistics, introduction to probability and probability distributions, normal probability distribution, sampling distributions and parameter estimation, hypotheses testing, simple linear regression and correlation. Students are also taught to analyse data and interpret the results using a software package.

Engineering Mathematics 2

This module provides students with the fundamental skills in mathematics that are required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include trigonometry, coordinate geometry, differentiation and integration with applications.

LEVEL 2.1

Financial Decision

Students are introduced to a sound understanding of costs and cost behaviour, and the use of cost information for planning and control decisions, not just inventory valuation. The module equips students with knowledge in activity-based costing, target costing, the value chain, customer profitability analysis, and throughput costing while also including traditional topics such as job-order costing, budgeting and performance evaluation. This is to provide students with a systematic framework for financial decision-making.

Economics

This module gives an overview of macroeconomics and microeconomics. It focuses more on the microeconomics theory of demand and supply, resource allocation, consumer behaviour, market demand, production and cost theory, price and output of firms under conditions of perfect and imperfect competition. At the end of the module, students are able to apply the basic concepts of economics and its tools to analyse economic problems and issues. The section on macroeconomics provides students with the understanding of the working an economy. Macroeconomics issues such as economic growth, unemployment, inflation and the measurement of national income and national output will be discussed.

Engineering Mathematics 3

This module provides students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include integration with applications, differential equations, Laplace transform and Fourier Series.

Quantitative Analysis & Simulation

Students are introduced to the concepts and techniques related to the design, planning, control, and improvement of manufacturing and service operations. The module begins with a holistic view of operations, whereby we stress the coordination of product development, process management, and supply chain management. Topics include the areas of process analysis, materials management, production scheduling and product design.

Product Innovation

The module aims to provide students with a basic understanding of techniques for product innovation. Topics covered include the TRIZ principles, Value Engineering and House of Quality. The students learn how to apply these principles for product or service innovation. Case studies, project work will be used for teaching the module. Upon completion of the module, the student are able to understand the basics of product invention and use these techniques to develop prototype and for creative problem solving.

LEVEL 2.2

Integrated Management System

This module prepares the students for work in the area of documenting for the ISO 9000 series quality system. It provides grounding for all stages of reporting, both oral and written, with an emphasis on clarity, economy and readability. Special attention is given to understanding the principles of quality management, and implementing these principles through a documented quality management systems based on the requirements of the ISO 9000 series of standards. Students learn how to develop system procedures, work instructions and forms. Process mapping is done using flow-charting techniques. There will also be a course project to develop a quality manual. The students are also exposed to other International Standards that are currently used in the marketplace.

Operations and Manufacturing Processes

This module equips students with theoretical knowledge and practices in some of Singapore's common basic manufacturing processes and operational practices. It provides the basic manufacturing knowledge and the necessary operational skills to develop a simple operational/process plan. Manufacturing practices, hands-on demonstrations and practical assignments enhance students' understanding of the subject and enable them to work confidently with different processes or operations.

Team & Project Management

Students are introduced to the concepts and techniques related to project management and team management. The course begins with a holistic view of project management, and group and individual behaviour. Topics cover various aspects of project management techniques, foundations of individual behaviour, and the various factors affecting group behaviour.

Decision Analysis

Students will gain a sound understanding of the principles, basic concepts, and methodology of engineering economy. This helps them develop proficiency in these methods and in the process for making rational decisions in engineering project. The module provides a systematic framework of engineering economy for evaluating the economic aspects of competing design solutions. The foundation for such analyses is enumerated in the seven principles of engineering economy. These principles provide the basis for building predictive models of financial impact.

Statistical Quality Control

The module equips students with the necessary knowledge and skills to analyse problems in statistical process control, acceptance sampling and basic design of experiments. Topics covered are basic quality control chart theory, control charts for variables and attributes, acceptance sampling and fundamentals of experiment designs.

LEVEL 3.1

Industrial Engineering Practices

Students are introduced to theoretical knowledge and practical skills in some of the common industrial engineering practices that are applicable to service and manufacturing industries. This module provides the basic knowledge and nurtures the necessary practical skills for developing and implementing some of the common industrial practices that are pertinent to operational efficiency and effectiveness. As it is a highly practical approach, the content and projects enhance students' understanding of the subject matters and enable them to work confidently either in service or manufacturing operations.

Service Marketing

This module imparts the basic concepts and principles of the marketing of goods and services. The module helps students better understand and evaluate the marketing system, in which products and services are planned, priced, promoted and distributed. It also helps them appreciate the interaction of marketing variables and their impact on marketing decisions. Students are provided opportunities to learn and apply marketing concepts in a creative way through projects, presentations and case studies.

Reliability and Preventive Management

The module furnishes students with an understanding of the concepts and principles of reliability engineering. Students examine the fundamental principles and concepts of incorporating "reliability" into the design of a product, in addition to focusing on the "quality" aspect. Topics covered include systems reliability, the "bath-tub" curve, useful lifetime probability models such as exponential distribution & Weibull distribution; reliability prediction, redundancy, design review, failure data analysis, probability plotting techniques, reliability in design, preventive maintenance engineering, hazard analysis, failure mode effect analysis and fault tree analysis.

Service Innovation

Students are introduced to the concepts and techniques related to all aspects of the management and operation of services. The module is designed to develop students' skills in both strategic and operational issues pertaining to services. Topics covered include both qualitative and quantitative aspects of service management and also balanced scorecard and Six Sigma, so as to give students wide-ranging techniques for ensuring quality and evaluating long-term strategy planning. Students will be able to apply this knowledge for service innovations. Learner-centred strategy, together self-test quizzes, video clips, Service Model Software, and the Mortgage Service Game, is used to enhance learning.

Business Process Engineering

The key to improving business performance is systems thinking – focusing on the interactions and interdependencies among the various business components. To improve the way something functions, we need to understand it as a system. This module provides students with the fundamentals of business system thinking, and demonstrates how knowledge can be created to drive improvement and build a competitive position. With reference to a developed Business Process Management model, students are exposed to systemic thinking in developing the concept for product or service management and redesign, where the possibility of endless "system or scope creep", is the basis for innovation and improvement.

LEVEL 3.2

Industrial Attachment Programme (IAP)

Through this attachment programme, students have a longer period of practical experience in the quality assurance environment to prepare them for future careers in the manufacturing or service industry. Students are attached, on a full-time basis, to a company for six months, where they will work on a project assigned to them. This helps students to associate classroom knowledge with practical experience and to develop their problem-solving, interpersonal and communication skills under a job-training environment.

Product Design & Development (PDD)

Through this module, the students will integrate what they have learnt in the course to design and fabricate a product. This project could be done in-house with the school or with a company, on a part-time basis. This helps students to associate classroom knowledge with practical experience and to develop their problem solving, interpersonal and communication skills under a job-training environment.

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

School of Engineering Elective Modules and the Diploma Plus Programme

Students take two modules from a wide range of clusters under the engineering and non-engineering categories to complete their diploma. Furthermore, students can qualify for a diploma plus by simply topping up with two additional modules from the same cluster as one of the electives. The Diploma Plus Certificate helps students if they wish to pursue a university degree or increase their employability in discipline-specific areas. Students can choose electives from the range listed below.

- Advanced Engineering Mathematics Cluster*
- Aerospace Design Cluster
- Applied Physics Cluster*
- Applied Technology Cluster
- Biomedical Engineering Cluster
- Industrial Control Cluster
- Industrial Electronics Cluster
- Information Technology Cluster
- Mechanical Technology Cluster
- Telecommunication Distribution Technology Cluster
- Workplace Safety & Health Cluster

Non-Engineering Category

- Economics & Financial Applications Cluster
- Green Development Cluster
- Leisure & Retail Management Cluster

Other Available Diploma Plus Certificates

- Business
- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The syllabus is based on the first-year engineering mathematics and science curricula of NUS.

For detailed module descriptions under each cluster, please refer to page 182.

COURSE CURRICULUM

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (25 hours per week)		
1.	Engineering Mathematics 1	5
2.	Engineering Materials	4
3.	Fundamentals of Quality Management	4
4.	CAD & Geometric Tolerancing	3
5.	Engineering Mechanics	5
6.	Creativity & Applied Thinking Skills ^	2
7.	Sports & Wellness ^	2
Level 1.2 (23 hours per week)		
8.	Electrical Technology	6
9.	Computer Programming	4
10.	Applied Statistics	4
11.	Engineering Mathematics 2	5
12.	Individual & the Community ^	2
13.	Exploring Contemporary Issues ^	2
YEAR 2		
Level 2.1 (23 hours per week)		
14.	Financial Decision	4
15.	Economics	3
16.	Engineering Mathematics 3	4
17.	Quantitative Analysis & Simulation	4
18.	Product Innovation	4
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2
YEAR 2		
Level 2.2 (24 hours per week)		
21.	Integrated Management System	4
22.	Operation & Manufacturing Processes	4
23.	Team & Project Management	4
24.	Decision Analysis	3
25.	Statistical Quality Control	5
26.	Innovation & Enterprise in Action ^	4
YEAR 3		
Level 3.1 (25 hours per week)		
27.	Industrial Engineering Practices	4
28.	Service Marketing	4
29.	Reliability & Preventive Management	4
30.	Service Innovations	4
31.	Business Process Engineering	4
32.	World Issues: A Singapore Perspective^	2
33.	Interdisciplinary Studies (IS) module^	2

Module No.	Module Name	Credit Units
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	Level 3.2 (25 hours per week)	
34.	Industrial Attachment/ In House Project	25

Across-Level Modules (Level 1.2 onwards)
(6 hours per week)

35.	School of Engineering (SoE) elective module°	3
36.	School of Engineering (SoE) elective module°	3

Notes:

^ For more details on Interdisciplinary Studies (IS) modules, please log on to www.np.edu.sg/is/

° For more details on School of Engineering elective modules, please refer to page 182.

IS Modules

The School of Interdisciplinary Studies (IS) delivers the interdisciplinary curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge-based economy. IS modules challenge boundaries and offer insights into Communication, Entrepreneurship, Life Skills, Media & the Arts, and Science & Technology.

School of Engineering (SoE) Elective Modules

The SoE elective modules fall under a wide range of clusters under both Engineering and Non-Engineering categories. The aim is to provide students with the opportunity to broaden their knowledge and deepen their discipline-specific areas. Each cluster comprises a minimum of three 3-hour modules. Students are required to take two modules in order to satisfy the minimum graduating requirement.