

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

### SECOND-YEAR MODULES

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

### FINAL-YEAR MODULES

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

### ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules<sup>\*</sup>

<sup>^</sup> Denotes Interdisciplinary Studies module. For more details on IS modules, please log on to [www.np.edu.sg/is/](http://www.np.edu.sg/is/)

<sup>\*</sup> 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
<b>YEAR 1</b>		
<b>Level 1.1 (25 hours per week)</b>		
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
<b>Level 1.2 (23 hours per week)</b>		
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
<b>YEAR 2</b>		
<b>Level 2.1 (23 hours per week)</b>		
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
<b>YEAR 2</b>		
<b>Level 2.2 (24 hours per week)</b>		
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
<b>YEAR 3</b>		
<b>Level 3.1 (25 hours per week)</b>		
27.	Industrial Engineering Practices	5
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
<b>Level 3.2 (25 hours per week)</b>		
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/](http://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.

## DIPLOMA IN ENGINEERING INFORMATICS (EI) (3-YEAR COURSE)

SCHOOL OF ENGINEERING



The **Diploma in Engineering Informatics (EI)** prepares students for a career in designing, developing, maintaining and integrating IT-based applications and information systems. The School leverages on its expertise and curriculum strengths to produce IT professionals who meet the demands of the large IT-driven engineering and manufacturing industries. Students undertake broad-based and hands-on training in IT, engineering systems and applications. They learn about e-enterprise processes, various manufacturing processes and technical skills to harness the power of information and Internet technologies. The course also equips students with software skills in, for example, computer programming, software design, web services, web design, multimedia and business processes.

In their final year, students can choose to go on an industrial attachment, locally or overseas, or take on an in-house project. The industrial attachment allows students to apply the knowledge acquired to real-time working environments, while project work offers opportunities to develop innovations and collaborate on industry-linked programmes at our Technology Centres.

The course also caters for students who aspire to pursue further studies or work in non-engineering fields through the Diploma Plus Programme (DPP). This is an optional programme that aims to provide students with the opportunity to broaden their knowledge and deepen their skills in specific areas. Students can graduate with a Diploma Plus Certificates or Enhancement Certificates.

### 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.

## CAREER PROSPECTS

With the knowledge and skills in both IT and engineering, EI graduates can look forward to good career prospects in IT-driven companies in, for example, the chemical, pharmaceutical, healthcare, electronics and manufacturing-related sectors.

Companies employ EI graduates as IT professionals to help the former to realise their IT goals, or as Internet Applications Specialists, Network Support Specialists, System Integrators, Computer-Aided Design/Manufacturing System Administrators, Engineering Applications Programmers, IT Engineers, Project Leaders, Computer Programmers and Management Information System (MIS) Specialists.

## ACCREDITATION FOR FURTHER STUDIES

The Nanyang Technological University, National University of Singapore, Singapore Management University, and a number of universities in Australia and the United Kingdom have offered EI graduates advanced standings for entry into their IT-related and engineering degree courses.

## COURSE STRUCTURE

### FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none"><li>• Engineering Mechanics</li><li>• Programming Fundamentals</li><li>• Engineering Mathematics 1</li><li>• Manufacturing Technology &amp; Materials</li><li>• Creativity &amp; Applied Thinking Skills<sup>^</sup></li><li>• Sports &amp; Wellness<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Operating Systems &amp; Networking</li><li>• Object-Oriented Programming</li><li>• Engineering Mathematics 2</li><li>• Web Publishing</li><li>• Individual &amp; the Community<sup>^</sup></li><li>• Communication Toolkit<sup>^</sup></li></ul>

### SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none"><li>• Database Systems</li><li>• Software Engineering</li><li>• Circuit Analysis</li><li>• Engineering Mathematics 3B</li><li>• Product Modelling &amp; Realisations</li><li>• Any 2 Interdisciplinary Studies (IS) modules<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Automation Technology</li><li>• Project Management</li><li>• Web Applications Development</li><li>• Business Information Systems</li><li>• Digital Electronics &amp; Computer</li><li>• Innovation &amp; Enterprise in Action<sup>^</sup></li></ul>

### FINAL-YEAR MODULES

Level 3.1	Level 3.2 (Pathway 1)
<ul style="list-style-type: none"><li>• Process Control Systems</li><li>• Embedded Mobile Systems</li><li>• E-Applications &amp; Security</li><li>• Wireless Networking &amp; Applications</li><li>• World Issues: A Singapore Perspective<sup>^</sup></li><li>• Any 1 Interdisciplinary Studies (IS) module<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Industrial Attachment Programme (IAP)/Final-Year Project or</li><li>• In-House Project (IHP)/Final-Year Project</li></ul>

### ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules<sup>°</sup>

<sup>^</sup> Denotes Interdisciplinary Studies (IS) module. For more details on IS modules, please log on to <http://www.np.edu.sg/is/>

<sup>°</sup> 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 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.

#### Programming Fundamentals

This module teaches students to use programming tools in problem solving. Topics covered include roles of programming language, development environment of C# and Java, language statements and compound statements, control structures and loops, simple input and output array, programming concepts, methodology and program testing. Students learn through hands-on exercises and mini-projects.

#### 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.

#### Manufacturing Technology & Materials

This module examines the manufacturing technology employed in discrete and process industries, and introduces engineering materials used in the industries. Topics include classification, properties, testing and applications of common engineering materials and polymers, concepts of machining, and various processes. Quantitative analysis of manufacturing systems, functions and activities, types of manufacturing systems, plant layout, and production planning and control are also taught.

### LEVEL 1.2

#### Operating Systems & Networking

This module surveys various types of operating systems, their roles and functions, including commonly used operating system commands and simple scripting, and introduces students to inter-networking with the use of routers. Topics covered in computer networking include various types of transmission media, data communication protocol, layered protocol concepts, network topologies, introduction to Transmission Control Protocol/Internet Protocol and Wireless Application Protocol, and network connection devices. Students will be involved in lab activities such as setting up a basic LAN configuration.

#### Object-Oriented Programming

This module introduces students to the concepts and skills of object-oriented programming using Java programming language. Concepts of object-oriented programming include abstraction, encapsulation, inheritance and polymorphism. Students learn how to implement these concepts in Java through hands-on practices and mini-projects.

### **Engineering Mathematics 2**

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 trigonometry, coordinate geometry, differentiation and integration with applications.

### **Web Publishing**

This module is designed to equip students with the skills to develop static Web pages using Web development tools. Topics covered include an introduction to the Internet, Internet architecture, Hyper Text Markup Language and client-side scripting language.

### **LEVEL 2.1**

#### **Database Systems**

This module aims to equip students with a knowledge of the fundamental concepts, design, management and applications of database systems. Topics covered include database concepts, storage structures, Entity-Relationship data modelling, relationships model of data, normalisation, structure query language, database administration and database applications development.

#### **Software Engineering**

This module provides an introduction to the fundamentals of developing and delivering useful software through an object-oriented approach in analysis, design, testing and implementation. Also covered are the concepts of software life cycle and process, and the tools and techniques used in software development. The unified modelling language (UML) will be used in modelling and developing the software system that involves UML diagrams such as the use case diagram, class diagram, interaction diagram, sequence diagram and activity diagram.

#### **Circuit Analysis**

This module provides students with a basic knowledge in DC and AC circuit analysis as well as an introduction to analogue electronics devices and circuits to prepare them for modules dealing with computer interfacing and controls in the later part of the course. Topics include Ohm's Law, Kirchhoff's Voltage and Current Laws, DC series and parallel circuits, AC concepts and circuits, capacitors and inductors. Students are also introduced to commonly used analogue devices and circuits, such as diodes, semiconductors, transistors, operational amplifiers and their practical applications.

### **Engineering Mathematics 3B**

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 integration with applications, differential equations, Laplace transform, probability and statistics.

### **Product Modelling & Realisations**

This module equips students with a fundamental knowledge of graphics, using 3D parametric modelling software to create 3D model and engineering drawing for manufacturing. Computer-Aided Engineering and Computer-Aided Manufacturing technologies will be used to simulate, analyse and generate manufacturing data to create products. It also covers the concept of a product life cycle and an overview of rapid prototyping.

### **LEVEL 2.2**

#### **Automation Technology**

Students gain a broad-based understanding of logic and sequential controls, and their applications in the manufacturing and process industries. Topics include the hardware components used in automated systems, and developing programmable solutions for applications. Widely accepted industrial control programming standards will be covered, in conjunction with lessons on programming controllers and computer interfaces. Essential concepts, technologies and applications of industrial networking for equipment and device linking in manufacturing will also be addressed.

#### **Project Management**

This module introduces project management from both the engineering and software perspectives. Topics include project evaluation, selection, estimation, activity planning, resource allocation, monitoring and control, managing people and teams, software quality and standards. Project management tools are taught during the practical lessons.

#### **Web Applications Development**

This module aims to introduce server-side Web development with a focus on ASP.NET and C# as the platform and language for Web development. Topics include Web development architecture, Web-form, ASP.NET programming, state management, database accessing, validation and error handling, XML programming and Web service programming.

#### **Business Information Systems**

This module introduces students to the role information systems plays in business organisations, particularly in the manufacturing industry. In this module, the students will discover the common functions in business organisations, business models, organisational and enterprise-wide information systems, information system ethics, and the use of an Enterprise Resource Planning System Software.

### **Digital Electronics & Computer**

This module equips students with knowledge of binary systems and logic, and their applications in electronic devices such as the basic Boolean gates, flip-flop, encoders/decoders, and adders. Digital circuitry, storage, input/output interfacing and computer architecture will be covered. Students are also introduced to assembly language programming.

### **LEVEL 3.1**

#### **Process Control Systems**

This module equips students with core knowledge of how automated control systems and computer controls are implemented in process plants. It covers fundamental concepts and components of feedback control, system dynamics, Proportional, Integral, Derivative (PID) control modes, Fuzzy logic control, advanced control strategies, introduction to digital control techniques, computer interfaces and computer control of processes and field bus technology. Certain industrial standards such as Standard for the Exchange of Product Model Data (STEP) are also taught.

#### **Embedded Mobile System**

This module helps students to develop embedded applications for mobile system hardware platforms such as the Wavecom's WISMO using the Open AT@ development tool kits. Topics include infrastructure of mobile networks such as the GSM and GPRS, architecture of embedded mobile hardware platforms, Open AT@ commands structures and applications, and development of software and applications using the Open AT@ Development Tool kit.

#### **E-Applications & Security**

This module provides a fundamental knowledge of the role, operations and issues of e-commerce and e-manufacturing in the modern Internet economy, and the technology and tools to ensure secure transactions over the Internet. Topics include the e-Commerce business model, functions and components of a typical e-commerce application, e-manufacturing concepts, e-manufacturing implementations, social and legal issues relating to e-applications, cryptographic technology, digital certificates, Secure Socket Layer (SSL) and Secure Electronic Transaction (SET).

#### **Wireless Networking & Applications**

This module teaches the fundamentals of wireless communication and networking. The key aspects covered include technology, architecture, types of wireless networks and applications, as well as mobile devices such as mobile phones and Personal Digital Assistants (PDA). Students learn to develop mobile-based applications and services using various software development tools.

### **LEVEL 3.2**

#### **Industrial Attachment Programme (IAP)/Final-Year Project or In-House Project (IHP)/Final-Year Project**

The six-month, full-time placement-cum-project module or the six-month, full-time in-house development project module provides students with opportunities to apply the skills and knowledge gained from the various modules in the development of a software or IT-integrated system to solve practical problems. Students are expected to analyse the problem as well as design, document, implement and test the system. They also have to review the project process and product.

### **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.

#### **Engineering Category**

- 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
<b>YEAR 1</b>		
<b>Level 1.1 (24 hours per week)</b>		
1.	Engineering Mechanics	5
2.	Programming Fundamentals	6
3.	Engineering Mathematics 1	5
4.	Manufacturing Technology & Materials	4
5.	Creativity & Applied Thinking Skills <sup>^</sup>	2
6.	Sports & Wellness <sup>^</sup>	2
<b>Level 1.2 (24 hours per week)</b>		
7.	Operating Systems & Networking	5
8.	Object-Oriented Programming	5
9.	Engineering Mathematics 2	5
10.	Web Publishing	5
11.	Individual & the Community <sup>^</sup>	2
12.	Communication Toolkit <sup>^</sup>	2
<b>YEAR 2</b>		
<b>Level 2.1 (25 hours per week)</b>		
13.	Database Systems	5
14.	Software Engineering	4
15.	Circuit Analysis	5
16.	Engineering Mathematics 3B	4
17.	Product Modelling & Realisations	3
18.	Interdisciplinary Studies (IS) module <sup>^</sup>	2
19.	Interdisciplinary Studies (IS) module <sup>^</sup>	2
<b>Level 2.2 (25 hours per week)</b>		
20.	Automation Technology	4
21.	Project Management	4
22.	Web Applications Development	5
23.	Business Information Systems	3
24.	Digital Electronics & Computer	5
25.	Innovation & Enterprise in Action <sup>^</sup>	4
<b>YEAR 3</b>		
<b>Level 3.1(21 hours per week)</b>		
26.	Process Control Systems	5
27.	Embedded Mobile System	4
28.	E-Applications & Security	4
29.	Wireless Networking & Applications	4
30.	World Issues: A Singapore Perspective <sup>^</sup>	2
31.	Interdisciplinary Studies (IS) module <sup>^</sup>	2
<b>Level 3.2 (25 hours per week)</b>		
32.	Six-month Industrial Attachment Programme (IAP)/ Final-Year Project	25
<b>Across-Level Modules (Level 1.2 onwards) (6 hours per week)</b>		
33.	School of Engineering (SoE) elective module <sup>°</sup>	3
34.	School of Engineering (SoE) elective module <sup>°</sup>	3

### Notes:

<sup>^</sup> For more details on Interdisciplinary Studies (IS) modules, please log on to [www.np.edu.sg/is/](http://www.np.edu.sg/is/)

<sup>°</sup> 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.

NEW!

## DIPLOMA IN INTERNATIONAL SUPPLY CHAIN MANAGEMENT (ISCM) (3-YEAR COURSE)

SCHOOL OF ENGINEERING



ISCM provides essential knowledge and skills for managing supply chain in a global business context. Students are equipped with the necessary knowledge and skills to develop effective supply chains, to integrate multiple service suppliers and to manage customers' orders on a global scale.

Students can look forward to working with experienced professional staff in a vibrant learning environment. These staff provide valuable insights into international best practices. They also reinforce professional values and provide a credo of ethical and fair dealing, which is the bedrock of efficient supply chain operations.

The course hones students' professionalism and skills in supply chain management. The broad-based and hands-on learning experience enhances the student's employability in the burgeoning international supply chain management industry. The course also offers a wide range of elective modules. The aim of these modules is to provide every student with the opportunity to broaden his or her knowledge and deepen skills in specific areas.

### ENTRY REQUIREMENTS

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

Subject	'O' Level Grade
English	1-6
Mathematics (Elementary/Additional)	1-6
Any two other subjects	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science (Grade 1-9) or Design & Technology (Grade 1-9) and two other subjects.

### CAREER PROSPECTS

ISCM graduates can hold managerial and executive positions in areas such purchasing management, supply chain management, shipping documentation, freight forwarding (air, sea or land), dangerous goods, import/export/tradenet, transportation management (planning/scheduling) and risk/crisis management.

### ACCREDITATION FOR FURTHER STUDIES

The Diploma in International Supply Chain Management is an internationally recognised tertiary qualification. Graduates should be able to gain direct admission into local universities and selected overseas universities such as Curtin University of Technology and University of Tasmania (Australian Maritime College). Specific credit exemptions are currently being finalised.

The **Diploma in International Supply Chain Management (ISCM)** aims to meet the growing demand for professionals well-skilled in multi-modal transportation, international freight forwarding and supply chain management; professionals who support the growth and development of the international supply chain management industry.

## COURSE STRUCTURE

### FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none"><li>• Applied Statistics</li><li>• Business Computing Applications</li><li>• Introduction to SCM and Logistics</li><li>• Introduction to Freight Forwarding</li><li>• Electronic Commerce</li><li>• Creativity &amp; Applied Thinking Skills<sup>^</sup></li><li>• Sports &amp; Wellness<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Service Operations Management</li><li>• Dangerous Goods and Cargo Handling</li><li>• Mathematics</li><li>• Distribution Management</li><li>• Supply Chain Management</li><li>• Individual &amp; the Community<sup>^</sup></li><li>• Communication Toolkit <sup>^</sup></li></ul>

### SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none"><li>• Global Purchasing and Supply</li><li>• Project and Event Logistics</li><li>• Multimodal Transportation</li><li>• Maritime Management</li><li>• Any 2 Interdisciplinary Studies (IS) modules<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Risk Management</li><li>• Cold Chain</li><li>• Project Management</li><li>• Aviation Management</li><li>• Innovation &amp; Enterprise in Action<sup>^</sup></li></ul>

### FINAL-YEAR MODULES

Level 3.1	Level 3.2 (Pathway 1)
<ul style="list-style-type: none"><li>• Ports and Terminals Management</li><li>• Legal Issues in Freight and Trade</li><li>• Optimisation and Simulation</li><li>• Customs Brokerage Management</li><li>• World Issues: A Singapore Perspective<sup>^</sup></li><li>• Any 1 Interdisciplinary Studies (IS) module<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Industrial Attachment Programme or In-House Project</li></ul>

### ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules<sup>°</sup>

<sup>^</sup> Denotes Interdisciplinary Studies module. For more details on IS modules, please log on to [www.np.edu.sg/is/](http://www.np.edu.sg/is/)

<sup>°</sup> Students take two elective modules to complete their diploma. Electives are chosen and customised from a wider range of clusters under the Engineering and Non-Engineering categories.

## COURSE MODULES

### LEVEL 1.1

#### Applied Statistics

Students are introduced to basic statistical knowledge and techniques to solve problems. They will gain an overview of descriptive and inferential statistics, focusing on tools and models for decision-making. Students are also taught to analyse data and interpret the results using a software package.

#### Business Computing Applications

Students will develop the conceptual understanding and skill development necessary when applying computing to business. Topics include the use of spreadsheets in business, database concepts and methods, computer graphics and presentations, and SQL (the standard language for data manipulation). Students reinforce their understanding through extensive computer practical sessions. In addition, project assignments will further enhance their skills and knowledge in using computers for typical business applications.

### Introduction to SCM and Logistics

Students learn the impacts of supply chain management on the firm in purchasing, operations, logistics and the integration among supply chain participants. Topics include an overview of supply chain management, operations issues in supply chain management, principles and theory of logistics, and future trends. Company visits form part of the practical sessions.

### Introduction to Freight Forwarding

Students are equipped with the knowledge of air and sea freight forwarding from a management perspective. Topics covered include industry regulators and association, aircrafts, air cargo import and export, transshipment procedures, rates and charges, carriers and port clearance procedures, types of ships, international convention and regimes, location of major seaports, and operation flows.

### Electronic Commerce

Freight movement, particularly international freight movement, involves a complex set of parallel processes related to the exchange of information between multiple entities (governmental and commercial) and the concomitant transfer of goods within and between modes of transportation. This module provides students with an overview of all aspects of information exchange and opportunity on the Internet. Students also learn the Global Trade Item Number (GTIN), which is a key component of e-commerce transactions. Other topics include marketing products on the Internet, systems integration, virtual organisations, electronic payment systems, privacy and security, intellectual property, customs and excise and emerging issues in telecommunications.

### LEVEL 1.2

#### Service Operations Management

Students are introduced to concepts and techniques related to all aspects of the management and operation of services. The module develops students' skills in both strategic and operational issues pertaining to services. Topics cover both qualitative and quantitative aspects of service management, balanced scorecard and Six Sigma, so as to give students the 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 are used to enhance learning.

#### Dangerous Goods and Cargo Handling

The module inculcates a general but thorough understanding of the nature of dangerous goods, and how they are classified and identified under the United Nations system. It also covers how the packaging is chosen for the particular material, using UN specification packaging in almost every case, and how the packages are marked and labelled. The module also provides students with a thorough knowledge and skills in monitoring loading, stowage, securing and unloading of cargo and their care during the voyage and carriage of dangerous goods.

#### Mathematics

Students will develop a basic knowledge of mathematics relevant to engineering applications. Topics covered include algebra, trigonometry, geometry, differentiation and integration. Emphasis is placed on practical applications of these topics.

### **Distribution Management**

This module provides students with an understanding of the various aspects of distribution, and transportation of goods and services. Topics covered include the functions of physical distribution management, transportation management and costing, traffic management, containerisation systems, vehicle routing and scheduling, and customer services in distribution and transportation.

### **Supply Chain Management**

Students are introduced to the critical concerns involved in the design, control, operation and management of supply chain systems. Various models and tools developed for supply chain management will also be covered. Students are taught simple techniques that can be used to analyse various aspects of the supply chain.

## **LEVEL 2.1**

### **Global Purchasing and Supply**

This module introduces the topic of purchasing and supply management including purchasing principles, supplier relations, supplier management and strategic issues. It covers the fields of purchasing and supply management, the central concepts, and interfaces with other areas of the company, and their changing role within the business.

### **Project and Event Logistics**

This module provides students with knowledge on turnkey projects such as oversize cargo, heavy lifts such as earthmoving machinery, cranes, and explosives and missiles. Technical considerations include load distribution, route and site survey and lashing and securing of cargo. The module provides students with the knowledge, understanding and skills to plan and ensure safe loading, stowage, securing, and care during the voyage and unloading of cargoes. Students are equipped with the ability to establish and maintain effective communication during loading and unloading. The customs clearance and real-time status report are also critical issues in project operations. The Event Logistics component provides students with the knowledge on site-survey and analysis, transportation and handling of exhibits up to the fair grounds, dismantling, documentation, customs clearance, and re-packing and re-export by utilising improved communications and information flow.

### **Multi-Modal Transportation**

Students will be equipped with knowledge in the concept of intermodality, types of multimodal, multimodal documents, ASEAN framework, liability, alternative transport solutions, import and export shipments, project/household removals, and exhibition forwarding.

### **Maritime Management**

This module provides in-depth coverage of a wide range of topics such role of carriers, types of vessels, containers and cargo gears, preparation of sea waybills and bills of lading, maritime security and law, international sea transport conventions, including the Hague-Visby Rules, and major ports of call around the world.

## **LEVEL 2.2**

### **Risk Management**

This module teaches the basic concepts of contract management and managing risk. Topics include an introduction to contract management; contract management team formation; developing a contract plan; contract & supply information; managing risks; measuring performance, administration; relationship; disputes and termination of contract; general matters in contract management; pre-qualification of vendors & suppliers; and cross-border contract management.

### **Cold Chain**

This module discusses the local and international regulatory bodies, international handling, and storage practices and standards for different pharmaceutical and Food products. Students are provided with the tools for the implementation and monitoring of cold chain quality. Hazard Analysis and Critical Control Point (HACCP) and its implementation in cold chain will be discussed.

### **Project Management**

This module presents engineering economy in the context of a decision-making framework such that students understand the necessary tools and their application. It begins with an introduction to the basics of engineering economy (interest, time-value-of-money, and equivalence), then it explores the entire project evaluation process, from defining the problem through post-implementation analysis, just as one would when building a case for management in order to make an investment decision.

### **Aviation Management**

This module provides participants with the broad understanding of air cargo agency and airline operations. The module is structured so that the participants gain an understanding of aviation freight operations and security principles and practice, and how they need to be applied to achieve business success.

## **LEVEL 3.1**

### **Ports and Terminals Management**

This module covers the organisation and administration of ports and marine terminals as well as those of steamship companies. General cargo operations, tanker terminal operations, container operations, dry bulk operations, and related technical considerations including securing and lashing containers are also examined. The module reviews concerns regarding port construction, port material handling equipment, physical port and vessel restrictions as well as port and terminal security issues.

### **Legal Issues in Freight and Trade**

Students will be equipped with a sound working knowledge of legal liabilities and rights of Multimodal Transport Operators in international carriage of goods, cargo insurance and liability insurance and claims handling.

### **Optimisation and Simulation**

The module introduces students to a basic computer modeling and simulations package that allows the former to construct simple process models. Students are taught how to write management reports based on the results obtained from a model.

### Customs Brokerage Management

The module equips participants with the fundamental knowledge on import and export, and documentation. It also provides the basic knowledge involved in shipping, purchasing operations, freight forwarding and distribution activities.

### LEVEL 3.2

#### Industrial Attachment Programme (IAP) or In-House Project (IHP)

IAP/IHP forms an essential part of the course. It provides broad-based and practice-oriented training to equip students with the appropriate practical management and communication skills. It also offers them the opportunity to acquire the right attitude to enter the industry as logistics technologists. The six-month programme will be executed in close collaboration with the participating companies in the logistics industry.

### 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.

#### Engineering Category

- 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
<b>YEAR 1</b>		
<b>Level 1.1 (25 hours per week)</b>		
1.	Applied Statistics	4
2.	Business Computing Applications	4
3.	Introduction to SCM and Logistics	4
4.	Introduction to Freight Forwarding	5
5.	Electronic Commerce	4
6.	Creativity & Applied Thinking Skills <sup>^</sup>	2
7.	Sports & Wellness <sup>^</sup>	2
<b>Level 1.2 (25 hours per week)</b>		
8.	Service Operations Management	4
9.	Dangerous Goods and Cargo Handling	4
10.	Mathematics	5
11.	Distribution Management	4
12.	Supply Chain Management	4
13.	Individual & the Community <sup>^</sup>	2
14.	Communication Toolkit <sup>^</sup>	2
<b>YEAR 2</b>		
<b>Level 2.1 (24 hours per week)</b>		
15.	Global Purchasing and Supply	5
16.	Project and Event Logistics	4
17.	Multimodal Transportation	5
18.	Maritime Management	6
19.	Interdisciplinary Studies (IS) module <sup>^</sup>	2
20.	Interdisciplinary Studies (IS) module <sup>^</sup>	2
<b>Level 2.2 (23 hours per week)</b>		
21.	Risk Management	3
22.	Cold Chain	5
23.	Project Management	5
24.	Aviation Management	6
25.	Innovation & Enterprise in Action <sup>^</sup>	4
<b>YEAR 3</b>		
<b>Level 3.1 (22 hours per week)</b>		
26.	Ports and Terminals Management	4
27.	Legal Issues in Freight and Trade	3
28.	Optimisation and Simulation	5
29.	Customs Brokerage Management	6
30.	World Issues: A Singapore Perspective <sup>^</sup>	2
31.	Interdisciplinary Studies (IS) module <sup>^</sup>	2
<b>Level 3.2 (25 hours per week)</b>		
32.	Six-month Industrial Attachment Programme (IAP)/Final-Year Project	25
<b>Across-Level Modules (Level 1.2 onwards) (6 hours per week)</b>		
33.	School of Engineering (SoE) elective module <sup>°</sup>	3
34.	School of Engineering (SoE) elective module <sup>°</sup>	3

#### Notes:

<sup>^</sup> For more details on Interdisciplinary Studies (IS) modules, please log on to [www.np.edu.sg/is/](http://www.np.edu.sg/is/)

<sup>°</sup> 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.

## DIPLOMA IN LOGISTICS MANAGEMENT (LMGT) (3-YEAR COURSE)

SCHOOL OF ENGINEERING



### The **Diploma in Logistics Management (LMGT)**

focuses on meeting the manpower needs of Singapore's dynamic logistics industry. Logistics management has become a very important and integral part of business competitiveness. As such, the course aims to nurture students into professionals capable of planning, implementing and managing the challenges posed by today's demanding logistics businesses.

The course equips students with up-to-date logistics operations and management know-how, technologies, and business and IT skills essential for logistics management in the new economy. The broad-based multidisciplinary approach to training coupled with hands-on learning experience prepares students for a challenging and rewarding career in logistics management and maximises their potential for further studies.

A six-month Industrial Attachment Programme (locally or overseas) or in-house project experience enhances the students' problem-solving skills through practical work. It also provides students with a very good understanding of logistics operations, issues and challenges, beyond the classroom.

The course also caters for students who aspire to pursue further studies or work in non-engineering fields through the Diploma Plus Programme (DPP). This is an optional programme that aims to provide students with the opportunity to broaden their knowledge and deepen their skills in specific areas. Students can graduate with Diploma Plus Certificates or Enhancement Certificates.

### ENTRY REQUIREMENTS

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

Subject	'O' Level Grade
English	1-6
Mathematics (Elementary/Additional)	1-6
Any three other subjects	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science (Grade 1-9) or Design & Technology (Grade 1-9) and two other subjects.

### CAREER PROSPECTS

The course prepares students for employment in any industry or sector with logistics functions. LMGT graduates can be a supply chain analyst, logistics specialist, distribution specialist, distribution planner, transportation specialist, inventory analyst and many others. Graduates have also found employment with manufacturing companies as buyers or planners.

## ACCREDITATION FOR FURTHER STUDIES

Some universities in the UK, the US, Australia and Europe now offer undergraduate and master's degree courses in logistics. Universities from the UK, such as Huddersfield University and Northumbria University, also offer advanced standing and exemption to our graduates.

Advanced standing and accreditations are granted by leading institutions in Australia such as the Royal Melbourne Institute of Technology, University of Southern Queensland, Southern Cross University (New South Wales), University of Tasmania (Australian Maritime College) and Curtin University of Technology (Perth).

LMGT graduates can also gain entry into degree courses at local universities.

## COURSE STRUCTURE

### FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none"><li>• Introduction to Logistics</li><li>• Web Publishing</li><li>• Economics</li><li>• Mathematics</li><li>• Business Computing Applications</li><li>• Sports &amp; Wellness<sup>^</sup></li><li>• Creativity and Applied Thinking Skills<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Applied Statistics</li><li>• Business Finance</li><li>• Enterprise Information Systems</li><li>• Quantitative Logistics Analysis</li><li>• Individual and the Community<sup>^</sup></li><li>• Communication Toolkit<sup>^</sup></li></ul>

### SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none"><li>• Service Marketing</li><li>• Warehousing and Storage Systems</li><li>• Operation Planning &amp; Control</li><li>• Facilities Planning and Design</li><li>• Any 2 Interdisciplinary Studies (IS) modules<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Customer Relationship Management</li><li>• Inventory Management</li><li>• Quality Management</li><li>• Business Process Engineering</li><li>• Distribution and Transportation</li><li>• Innovation and Enterprise in Action<sup>^</sup></li></ul>

### FINAL-YEAR MODULES

Level 3.1	Level 3.2 (Pathway 1)
<ul style="list-style-type: none"><li>• Chemical Logistics</li><li>• Purchasing Management</li><li>• Supply Chain Management</li><li>• Six Sigma Philosophy</li><li>• Global Logistics Management</li><li>• World Issues: A Singapore Perspective<sup>^</sup></li><li>• Any 1 Interdisciplinary Studies (IS) module<sup>^</sup></li></ul>	<ul style="list-style-type: none"><li>• Industrial Attachment Programme (IAP) or In-House Project (IHP)</li></ul>

### ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules<sup>°</sup>

<sup>^</sup> Denotes Interdisciplinary Studies module. For more details on IS modules, please log on to [www.np.edu.sg/is/](http://www.np.edu.sg/is/)

<sup>°</sup> Students take two elective modules to complete their diploma. Electives are chosen and customised from a wider range of clusters under the Engineering and Non-Engineering categories.

## COURSE MODULES

### LEVEL 1.1

#### Introduction to Logistics

Students will study logistics as an integral part of an entire business operation. Topics include overview of logistics, principles and theory of logistics, logistics planning and control, logistical operations integration, supply chain concepts and future trends. Company visits form part of the practical sessions.

#### Web Publishing

This module equips students with the skills to develop static Web pages using Web development tools. Topics covered include an introduction to the Internet, Internet architecture, Hyper Text Markup Language and client-side scripting language.

#### Economics

This module gives an overall view 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 will be able to apply the basic concepts of economics and its tools to analyse economic problems and issues.

#### Mathematics

This module covers the fundamental concepts of mathematics in basic algebra, exponential and logarithmic equations, plane analytic geometry, basic inequality leading to linear programming, basic trigonometry, matrix, determinants, basic differentiation with application in maximisation and minimisation. This module provides basic mathematical foundation to the students.

#### Business Computing Applications

Students will develop the conceptual understanding and skill development necessary when applying computing to business. Topics include the use of spreadsheets in business, database concepts and methods, computer graphics and presentations, and SQL (the standard language for data manipulation). Students reinforce their understanding through extensive computer practical sessions. In addition, project assignments further enhance their skills and knowledge in using computers for typical business applications.

### LEVEL 1.2

#### Applied Statistics

Students are introduced to basic statistical knowledge and techniques to solve problems. They will gain an overview of descriptive and inferential statistics, focusing on tools and models for decision-making. Students are taught to analyse data and interpret the results using a software package.

### **Business Finance**

This module teaches the basic concepts and principles of business finance. The module provides knowledge of financial information required for the majority of the students entering the business today. The module equips students with the basic knowledge of economic factors affecting finance, financial statements and analysis, cash flow and financial planning, cost of capital, inventory management and cost of quality. Students are trained to evaluate the viability of a project with capital budgeting techniques such as payback period, nett present value and internal rate of return, and the profitability of a firm with breakeven analysis.

### **Enterprise Information Systems**

This module shows students the important role information systems play in business and industry. Students are introduced to some of the essential functional areas of an enterprise system, like sales and distribution, production and supply chain management, and production planning, and how information interacts and relates with one another through the use of an Enterprise Resource Planning (ERP) System Software. Students will be given hands-on experience and assignments to identify the business processes and to design an ERP System Software for a small enterprise.

### **Quantitative Logistics Analysis**

This module introduces students to various operational decision-making tools, including selected computer software used for the management and quantitative analysis of logistics operations in the manufacturing and service industries. Topics include decision tables and sequential decision trees, linear programming, transportation method, process planning, analysis, project management, scheduling, location analysis techniques in supply chain management, and simulation of inventory problems.

## **LEVEL 2.1**

### **Service Marketing**

This module teaches the concepts and principles involved in marketing goods and services. The module helps students to better understand and evaluate the marketing system in which products and services are planned, priced, promoted and distributed. Students will also appreciate the interaction of marketing variables and their impact on marketing decisions. They will get the opportunity to learn and apply marketing concepts in a creative way through projects, presentations and case studies.

### **Warehousing and Storage Systems**

This module gives students an understanding of the importance of warehousing and storage management towards the overall logistics management of a business organisation. Topics include warehouse roles in the supply chain management, warehousing decisions and operations, storage systems, warehouse material handling equipment and management, warehouse layout and design, barcode and radio frequency technologies.

### **Operation Planning and Control**

The module provides students with a thorough understanding of the principles of production planning and control and their applications in a wide spectrum of manufacturing industries. The major topics covered include master production scheduling, material requirements planning, capacity planning and production activity control. Recent advances in this field and the use of computer software in engineering production applications will be emphasised.

### **Facilities Planning and Design**

This module exposes students to the analytical aspects of the various approaches used in the planning and designing of facilities. Topics include the placement of single and multiple facilities, manufacturing processes, economic evaluation of processes, production systems, assembly line balancing and plant layout. Students also benefit from practical exposure in areas such as computer-aided design of plant layout, line balancing and computerised package on the centre-of-gravity model for facility location.

## **LEVEL 2.2**

### **Customer Relationship Management**

This module provides students with the understanding of Customer Relationship Management (CRM). It introduces CRM value proposition from a business perspective. It explains the importance of the transition from product focus to customer focus, and improving the customer's experience. It covers the new customer service strategies and technologies. It includes Sales Force Automation, the place where CRM takes place with a variety of tactical and strategic functions. It presents the challenges of the e-business. The analytical aspects of CRM leverages on the data gathered to make strategic decisions. It discusses CRM technologies and the ROI calculations. It also covers some controversial CRM trends as it takes a look into the future. This module is designed to include real-life case studies to provide students with a range of CRM applications. This prepares the students for the industry by giving them an understanding and appreciation of the CRM in the real e-business working world.

### **Inventory Management**

Students are introduced to techniques that can be used for maintaining minimum stocks of various industries and commercial enterprises, at minimum cost. Special emphasis is given to areas within the supply chain where cost of operations could be minimised through efficient management of inventory. An analysis of different inventory policies and the use of basic techniques in forecasting and simulation relevant for inventory management are also included.

### **Quality Management**

Students will learn the importance of quality, and how to apply quality concepts, management functional techniques and statistical techniques. Areas covered include statistical process controls, acceptance sampling techniques and design of experiments. The functional aspects of quality management such as benchmarking, quality systems and quality costs are also included to expose students to quality management functional techniques within the organisation.

### Business Process Engineering

Business Process Engineering (BPE) is a concept used to improve key business processes that will result in performance improvement and radical change. This module introduces students to the fundamental principles of innovative process change through BPE. The module provides an overview of BPE and how it can be implemented in the organisation.

### Distribution and Transportation

This module provides students with an understanding of the various aspects of distribution, and transportation of goods and services. Topics covered include an understanding of the functions of physical distribution management, transportation management and costing, traffic management, containerisation systems, vehicle routing and scheduling, and customer services in distribution and transportation.

### LEVEL 3.1

#### Chemical Logistics

This module equips students with knowledge of logistics practices in the chemical industry, and the transportation, handling and storage of dangerous goods. This module consists of seven independent chapters, which cover different areas of managing chemicals and their hazards. Guided tutorials, audio visual aids such as videos and Audio Video Interleave (Avi) files, quizzes, assignments and a project will be used to reinforce the theoretical aspects.

#### Purchasing Management

This module provides students with some essential practices and techniques for effective purchasing. It emphasises the proactive role of the purchasing function and its ability to contribute to the bottom-line. Students learn about the importance of partnership sourcing, value analysis and supplier development in increasing the organisation's competitiveness. Students are required to prepare case analysis during tutorial sessions and undertake a project assignment (term paper) relating to purchasing or procurement.

#### Supply Chain Management

Students are introduced to the critical concerns involved in the design, control, operation and management of supply chain systems. Various models and tools developed for supply chain management will also be covered. Students are taught simple techniques that can be used to analyse various aspects of the supply chain.

#### Six Sigma Philosophy

The objective of this module is to identify the meaning and benefits of implementing a Six Sigma programme in an organisation. Six Sigma issues involving knowledge-centred activity (KCA) opportunities, deployment, project selection, management needs, and tools and techniques are included. Students gain valuable insights into the strategies of business development, and tactics employed utilising the Six Sigma tools and techniques. This module also illustrates how service, business development and other functions can apply, and benefit from, the techniques.

#### Global Logistics Management

The complexity and intensity of today's global marketplace pose many challenges to logistics executives and managers. This module provides students with a good foundation in global logistics operations and an understanding of logistical practices and their key differences across different nations.

### LEVEL 3.2

#### Industrial Attachment Programme (IAP) or In-House Project (IHP)

IAP/IHP forms an essential part of the course. It provides broad-based and practice-oriented training to equip students with the appropriate practical management and communication skills. It also offers them the opportunity to acquire the right attitude to enter the industry as logistics technologists. The six-month programme will be executed in close collaboration with the participating companies in the logistics industry.

### 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.

#### Engineering Category

- 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
<b>YEAR 1</b>		
<b>Level 1.1 (25 hours per week)</b>		
1.	Introduction to Logistics	5
2.	Web Publishing	4
3.	Economics	4
4.	Mathematics	4
5.	Business Computing Applications	4
6.	Sports & Wellness ^	2
7.	Creativity & Applied Thinking Skills ^	2
<b>Level 1.2 (22 hours per week)</b>		
8.	Applied Statistics	4
9.	Business Finance	4
10.	Enterprise Information Systems	5
11.	Quantitative Logistics Analysis	5
12.	Individual and the Community ^	2
13.	Communication Toolkit ^	2
<b>YEAR 2</b>		
<b>Level 2.1 (23 hours per week)</b>		
14.	Service Marketing	4
15.	Warehousing and Storage Systems	5
16.	Operation Planning and Control	5
17.	Facilities Planning and Design	5
18.	Interdisciplinary Studies (IS) module ^	2
19.	Interdisciplinary Studies (IS) module ^	2
<b>Level 2.2 (25 hours per week)</b>		
20.	Customer Relationship Management	4
21.	Inventory Management	4
22.	Quality Management	4
23.	Business Process Engineering	4
24.	Distribution and Transportation	5
25.	Innovation and Enterprise in Action ^	4
<b>YEAR 3</b>		
<b>Level 3.1 (24 hours per week)</b>		
26.	Chemical Logistics	4
27.	Purchasing Management	4
28.	Supply Chain Management	4
29.	Six Sigma Philosophy	4
30.	Global Logistics Management	4
31.	World Issues: A Singapore Perspective ^	2
32.	Interdisciplinary Studies (IS) module ^	2
<b>Level 3.2 (25 hours per week) (Student to do one)</b>		
33.	Industrial Attachment Programme	25
34.	In-House Project	25
<b>Across-Level Modules (Level 1.2 onwards) (6 hours per week)</b>		
35.	School of Engineering (SoE) elective module <sup>o</sup>	3
36.	School of Engineering (SoE) elective module <sup>o</sup>	3

**Notes:**

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

<sup>o</sup> 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.

## ADVANCED DIPLOMA IN INDUSTRIAL ENGINEERING & MANAGEMENT (AD-IEM) (1-YEAR PART-TIME COURSE)

SCHOOL OF ENGINEERING

The **Advanced Diploma in Industrial Engineering & Management (AD-IEM)**, a 1-year part-time course, is designed for working professionals or individuals who wish to acquire and upgrade themselves with the necessary tools and management skills in the areas of Industrial Engineering, Quality Engineering and Management.

AD-IEM provides participants with the necessary quality tools and management skills for a career in the areas of Industrial Engineering, Quality Engineering and Management. Generally, each module has an average of 60 hours of lectures, tutorials and mini-project work.

The course is accredited by the Professional Engineers Board under the Continuing Professional Development Programme for professional engineers in Singapore. Participants will gain 480 PDU upon completion of the course. Course participants must complete this course with at least an 80% attendance rate.

### COURSE STRUCTURE

#### Semester 1:

- Quality Engineering (Taguchi Methods)
- Total Quality Management
- Productivity and Performance Measurement

#### Semester 2:

- Technology Management
- Engineering Operations Management
- Six Sigma Philosophy

#### Semester 3:

- Operations Research & Project Management
- In-House/Company Project

This diploma is administered by the Centre for Professional Development (CPD). For more information about this course, please log on to [www.np.edu.sg/cpd/](http://www.np.edu.sg/cpd/) or contact the CPD at 64606353.

## DIPLOMA IN TECHNOLOGY (LOGISTICS) (3-YEAR PART-TIME COURSE)

SCHOOL OF ENGINEERING

The **part-time Diploma in Technology (Logistics)** addresses the needs of employers in the logistics service industry, manufacturing logistics and other logistics-related sectors, as well as the needs of employees who wish to upgrade their skills. The course equips students with up-to-date logistics operations, technological, and management know-how; and business and IT skills essential for logistics management in the new economy.

### COURSE STRUCTURE

#### Stage 1

- Introduction to Logistics
- Global Logistics Management
- Chemical Logistics

#### Stage 2

- Purchasing Management
- Operations Planning & Control
- Electives

#### Stage 3

- Warehousing Management
- Distribution Management
- Inventory Management
- Electives

#### Stage 4

- Supply Chain Management
- Electronic Logistics
- Enterprise Information Systems
- Electives

#### Stage 5

- Business Finance
- Principles of Marketing
- Electives

#### Stage 6

- Business Process Engineering
- Quantitative Logistics Analysis
- Electives

#### Note on Electives

For the electives, students can choose from a list of core/non-core electives offered. They can also select from a list of online elective modules. The electives offered can be viewed at <http://www.np.edu.sg/cpd/prguide.htm>

This diploma is administered by the Centre for Professional Development (CPD). For more information about this course, please log on to [www.np.edu.sg/cpd/](http://www.np.edu.sg/cpd/) or contact the CPD at 64606353.