

# Framework for the Minor in Systems Management

School of Mechanical and Aerospace Engineering

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## Introduction to Minor in Systems Management

Systems Engineering and Management encompasses the journey of bringing a product, be it big or small, simple or complex, to realisation. Courses related to the product realisation spectrum are therefore the essence of what is proposed for this minor. It effectively integrates knowledge and skills from engineering sciences, economic sciences, human sciences and is supported with skills from the information sciences.

The **Minor in Systems Management (MSM)**, offered by the School of Mechanical and Aerospace Engineering, thus provides the students with a spectrum of applicable knowledge in the following areas: (a) customer and enterprise creation, (b) product engineering, (c) manufacturing systems and automation, or process engineering (d) supply chain and logistics engineering, or operational/logistics engineering and (e) systems thinking and engineering management in order to align the whole system at all times. This product realisation spectrum is schematically illustrated in Figure 1 below.

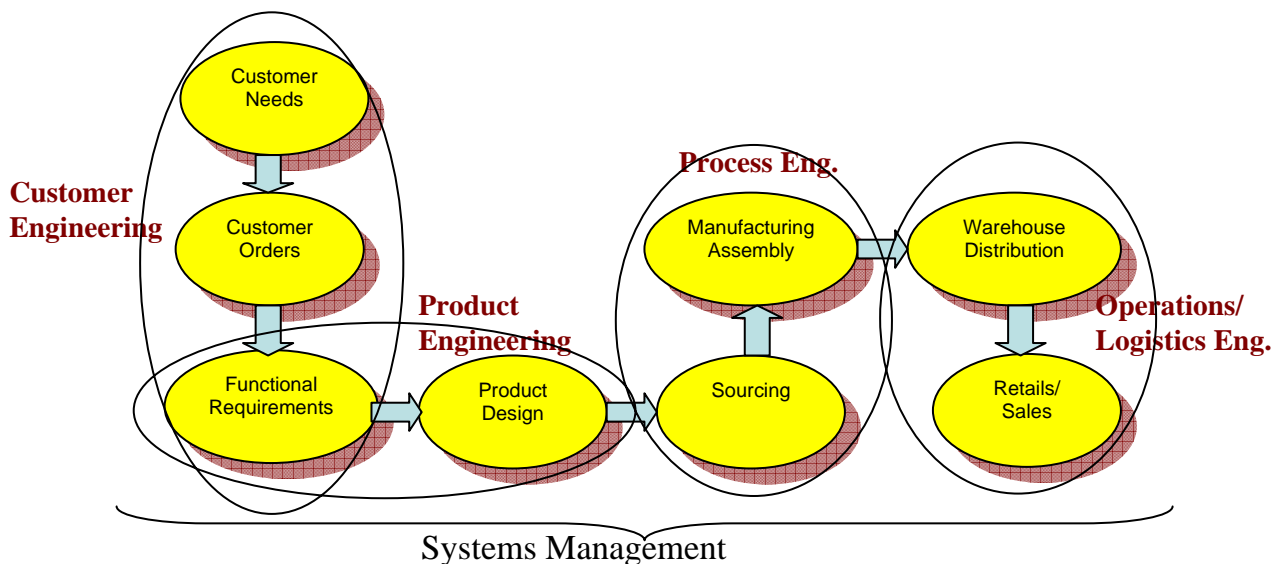


Figure 1: Spectrum of Systems Management

The **Minor in Systems Management** is designed for NTU undergraduate student to understand a broader paradigm on knowledge creation related to intertwining aspects of product and project development for the activities that they have to carryout in their professional life. With the ability to view a given system, both in the lowest level and from the broader level, our graduates will be placed in a better position to understand the complexity of business and technological development. Such skills contribute to enterprise creation and sustenance. This way the students are equipped with paradigms and skill sets associated with current, as well as new engineering enterprises in the 21<sup>st</sup> century.

A strong balance of breath and depth over the course spread are planned for **MSM**. Learning outcomes include understanding the micro aspects of product realisation to the macro aspects of systems engineering and management – aspects essential to **Leaders in Industry**.

The Minor in Systems Management offers educational excellence through a balanced programme of ‘soft’ and ‘hard’ aspects of systems engineering and management, creating further value and mileage for the undergraduate educational experience at NTU.

### **[Basket of Courses for Minor in Systems Management](#)**

Each course under Minor in Systems Management is of 3 Academic Units (AUs) as shown in Table 1. The lecturers will use lectures (primary), seminars and case studies to disseminate the knowledge on the course area. Students are required to fulfill a total of 15 AUs for the Minor programme.

**Table 1: Basket of course for Minor in Systems Management**

<b>Product Engineering (* )</b>	<b>Process Engineering (# )</b>	<b>Operations Engineering (# )</b>	<b>Systems Management (@ )</b>
<ul style="list-style-type: none"> <li>• MP4F03 Quality Assurance and Management (3 AUs)</li> <li>• MP4E02 Human Factors in Design (3 AUs)</li> <li>• MP4E03 Strategic Management of Product Development (3 AUs)</li> </ul>	<ul style="list-style-type: none"> <li>• MP3004 Concurrent Design and Engineering (3 AUs)</li> <li>• MP4F02 Manufacturing Systems and Automation (3 AUs)</li> </ul>	<ul style="list-style-type: none"> <li>• MP4F04 Integrated Supply Chains (3 AUs)</li> <li>• MP4F05 Operations Research (3 AUs)</li> <li>• MP4F06 Engineering Logistics (3 AUs)</li> </ul>	<ul style="list-style-type: none"> <li>• MP8082 Systems for Everyone (3 AUs)</li> </ul>
Soft / Hard	Soft / Hard	Hard	Soft / Hard

**Legend:** \* Operations Level # Tactical Level @ Strategic Level  
 It would be good to choose at least one course from each of five areas mentioned above.

So come and **take the challenge!** Gear yourself towards **becoming a leader** in the future.

You will **get the large picture** before others can even see it!

**Who can take the Minor in Systems Management?**

The Minor in Systems Management is open to all students in NTU except students from the School of Mechanical & Aerospace Engineering.

**When to complete the requirements?**

A total of 15 AUs shall constitute the **MSM** and may be obtained over the duration of the student's respective degree course. Further, reading of courses under Minor also fulfill General elective requirement under unrestricted electives (GER-UE). (Please see [http://www.ntu.edu.sg/oas2/minor/minor\\_FAQ.pdf](http://www.ntu.edu.sg/oas2/minor/minor_FAQ.pdf)).

To obtain a **Minor in Systems Management**, students will be required to choose any 5 courses totaling 15 AUs from a basket of eleven courses.

NTU students may seek advice from faculty members teaching courses related to **MSM**, on which courses may be more value-adding to their NTU educational experience (e.g. Business versus Engineering students) based on the courses they have read at their host schools. **We welcome you all to enrich your experience!**

### **[Curriculum Details for Minor in Systems Management](#)**

The details of the courses for **Minor in Systems Management** are given below:

#### **MP4F03: Quality Assurance and Management (QAM)**

Quality is an important aspect in today's manufacturing and business processes. Through this course, the students will learn the fundamentals of quality assurance, acceptance sampling and control charts, design of experiments, reliability engineering, total quality management, ISO 9000 and ISO 14000 series quality management systems, and environmental management systems. These topics form the backbone of quality assurance and they would help the student to gain in-depth knowledge to make their business a successful venture.

#### **MP4E02: Human Factors in Design (HFD)**

People work around the equipment. Equipments design are generally handled by the technicians but what about the people? Are the technology suitable for

people to whom it is designed for? This course will address this situation in order to improve the working environment. The topics to be discussed in this course include the introduction to human factors, human capabilities and limitations, anthropometry, human environment interactions, human-machine interactions, human computer interactions, product and workstation design, cognitive ergonomics, human factors in extreme environment, and socio-technical perspective of human factors in design.

#### **MP4E03: Strategic Management of Product Development (MPD)**

This course helps the students to understand issues and protocols relating to product development. It covers the product development cycle and strategy, teaching students on setting goals and planning. The topics to be covered in this course include the introduction to product development, product development cycle and strategy, managing new product processes, prototyping and test cycles, organizing for product development, organizing and leading project teams.

#### **MP3004: Concurrent Design and Engineering (CDE)**

Designing of a product by a team of people located in different spatial locations and sometime with different background is becoming common. Therefore, this course will help the student to understand the concurrency aspect in design and engineering of a product. The topics to be discussed in this course include the introduction to concurrent design and engineering,

integrated product development, design for manufacturing, assembly and recycling, cost and scheduling, quality control and customer user requirements.

#### **MP4F02: Manufacturing Systems and Automation**

Engineering manufacturing is important for product realization. Therefore, students should have adequate knowledge as to the important aspects considered in a manufacturing or assembly based organization. The topics to be discussed include manufacturing systems, rapid prototyping and applications, computer-aided manufacturing, industrial robots and automatic assembly.

#### **MP4F04: Integrated Supply Chains**

Value creation through product realization is important in today's business. The holistic view for value creation requires an understanding of supply chain processes. Therefore, the topics to be discussed in this course include the concept of supply chain integration, the role of supply chains in manufacturing and services, material, information and payment flow systems, customer relations and supplier development, advanced inventory systems, e-logistics, warehousing, distribution, transportation engineering and management systems, performance measurements for supply chains.

### **MP4F05: Operations Research**

Application of scientific techniques to obtain optimal conditions for a business is important for today's managers. Therefore, the topics to be discussed in this course include engineering and management dimensions of operations analysis and modeling, optimization, mathematical and linear programming, probabilistic models, uncertainty, risk and other decision models, simulation and functional applications to manufacturing.

### **MP4F06: Engineering Logistics**

Distributing the product is an arduous task for a business. A smooth flow of materials and products at the time of need and at the required quantity can help to reduce logistics costs and make the business more attractive. Therefore, the topics to be discussed in this course include the introduction to logistics engineering, strategic logistics management, logistics information management, demand forecasting and analytical models in logistics.

### **MP8082: Systems for Everyone**

Understand the business in totality or with holistic perspective is essential to thrive in today's business environment. Therefore, this course helps the student to view the big picture and systems management aspects in engineering product realization. The topics to be discussed in this course include of systems principles, systems thinking through visualizing systems, interactive systems problem solving, and systems failures.

## Curriculum Structure and Schedule

### Semester 1 Only

Course Code and Title	No. of hrs per week				No. of AUs	Pre-requisites	Offered as G. E.
	Lect	Tut	Lab	Total			
MP3004 Concurrent Design and Engineering	3	-	-	3	3	NONE	Y
MP4E02 Human Factors in Design	3	-	-	3	3	NONE	Y
MP4F05 Operations Research	3	-	-	3	3	NONE	Y

### Semester 1 and 2

Course Code and Title	No. of hrs per week				No. of AUs	Pre-requisites	Offered as G. E.
	Lect	Tut	Lab	Total			
MP4F02 Manufacturing Systems And Automation	3	-	-	3	3	NONE	Y
MP4F03 Quality Assurance and Management	3	-	-	3	3	NONE	Y
MP4E03 Strategic Management of Product Development	3	-	-	3	3	NONE	Y
MP4F06 Engineering Logistics	2	1	-	3	3	NONE	Y
MP8082 Systems for Everyone	2	1	-	3	3	NONE	Y

### Semester 2 only

Course Code and Title	No. of hrs per week				No. of AUs	Pre-requisites	Offered as G. E.
	Lect	Tut	Lab	Total			
MP4F04 Integrated Supply Chains	3	-	-	3	3	NONE	Y

**NOTE:** Some of the courses may not be offered as mentioned above due to various constraints. Please check with the undergraduate office in advance for the courses to be offered in a semester. But plan early.

### Further Information

For further enquiries, please contact:

Associate Professor Shaligram Pokharel

Coordinator, Minor in Systems Management

Email: [mspokharel@ntu.edu.sg](mailto:mspokharel@ntu.edu.sg)

Phone : 6790 4272