

## 1.6.1 Degree programmes and requirements

### Undergraduate study

#### Bachelor of Engineering (Mechanical Engineering)

##### Curriculum structure (Mainstream)

###### First Year Core Courses

FE0001 Foundation Physics \*  
HW001 English Proficiency \*\*  
FE1001 Physics I  
FE1002 Physics II  
FE1003 Chemistry  
BS1004 Life Sciences  
FE1005 Materials Science  
FE1006 Mathematics 1  
FE1007 Mathematics 2  
FE1008 Computing  
HW110 Effective Communication  
FE1071 Laboratory 1A  
FE1072 Laboratory 1B

\* Students with only GCE 'O' level Physics are required to take FE0001 Foundation Physics. A pass is required.

\*\* HW001 English Proficiency is to be taken by a candidate who has not passed or is not exempted from the Qualifying English Test.

###### Second Year Core Courses

MP2001 Mechanics of Materials  
MP2002 Kinematics and Dynamics of Machinery  
MP2003 Thermodynamics  
MP2004 Manufacturing Technology and Materials  
MP2005 Fluid Mechanics  
MP2006 Mathematics 3  
MP2007 Mathematics 4  
MP2008 Electrical and Electronics: Circuits and Devices  
HW210 Technical Communication  
MP2011 Engineering Graphics and Machine Components  
MP2071 Laboratory 2A  
MP2072 Laboratory 2B  
MP2079 Engineering Innovation and Design

###### Third Year Core Course

MP3001 Dynamics and Control  
MP3002 Mechanics of Deformable Solids  
MP3003 Heat Transfer  
MP3011 Engineering Design  
MP3071 Laboratory 3  
MP3079 Industrial Attachment

Besides the 22-week Industrial Attachment, engineering students can also opt for the 10-week Industrial Orientation or the 30-week Enhanced Industrial Attachment. More details are available at: <http://www.ntu.edu.sg/cao>

###### Fourth Year Core Courses

MP4004 Advanced Manufacturing and Nanotechnology  
MP4005 Fluid Dynamics  
MP4007 Engineers and Society  
MP4008 Human Resource Management  
HW310 Professional Communication  
MP4011 Mechanical System Design and Analysis  
MP4079 Final Year Project

### **Major Prescribed Electives**

In addition to core courses, mainstream students have to read four Major Prescribed Electives which can be chosen from more than one specialisation group. Students who have read at least three Major Prescribed Electives from one specialisation group would be deemed to have specialised in that area.

#### **Specialisation Group One: Aeronautical Engineering**

MP4A01 Aerodynamics  
MP4A02 Aircraft Structures  
MP4A03 Aircraft Propulsion  
MP4A04 Flight Mechanics and Control  
MP4A05 Mechanics of Aerospace Materials  
MP4A06 Non-Destructive Testing  
MP4A08 Computational Fluid Dynamics  
MP4E05 Materials Selection and Design

#### **Specialisation Group Two: Biomedical Engineering**

MP4C01 Biomechanics  
MP4C03 Biomaterials  
MP4C04 Surgical Assist Technology  
MP4G08 Biomechatronics

#### **Specialisation Group Three: Energy and the Environment**

MP4D01 Air Conditioning – An Energy Approach  
MP4D02 Building Services Engineering  
MP4D04 Energy for a Sustainable Future  
MP4D05 Noise and Vibration Control  
MP4D06 Clean Technology and the Environment

#### **Specialisation Group Four: Innovative Design**

MP4E01 Industrial Design  
MP4E02 Human Factors in Design\*  
MP4E03 Strategic Management of Product Development\*  
MP4E04 Mechanism Design  
MP4E05 Materials Selection and Design  
MP4E06 Visualisation and Virtual Reality in Product Design  
MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management\*

\* Core Course for Design Stream

#### **Specialisation Group Five: Manufacturing Engineering**

MP4F01 Materials Engineering  
MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management\*  
MP4F04 Integrated Supply Chains  
MP4F07 Net Shape Manufacturing  
MP4F09 High Vacuum Technology  
MP4F10 Electronics Manufacturing and Packaging

\* Core Course for Design Stream

#### **Specialisation Group Six: Systems Engineering**

MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management\*  
MP4F04 Integrated Supply Chains  
MP4F05 Operations Research  
MP4F06 Engineering Logistics

\* Core Course for Design Stream

**Specialisation Group Seven: Mechatronics and Control**

MP4C04 Surgical Assist Technology  
MP4G02 Robotics\*  
MP4G03 Motion Control System  
MP4G05 Microprocessor Systems\*  
MP4G08 Biomechatronics

\* Core Course for Mechatronics Stream

**Specialisation Group Eight: Marine and Offshore Engineering**

MP4A06 Non-Destructive Testing  
MP4D04 Energy for a Sustainable Future  
MP4D05 Noise and Vibration Control  
MP4F01 Materials Engineering  
MP4J01 Naval Architecture and Marine Engineering  
MP4J02 Marine and Offshore Structural Integrity  
MP4J03 Marine Engineering Systems and Control

Notes:

- 1) Students on the ASMI scholarship have to read MP4J01 Naval Architecture and Marine Engineering as a compulsory Major PE and any other three Major PEs from the Marine and Offshore Engineering specialisation.
- 2) Mainstream students who want to specialise in Marine and Offshore Engineering have to read MP4J01 Naval Architecture and Marine Engineering as a compulsory Major PE and at least any two Major PEs from the Marine and Offshore Engineering specialisation. The fourth Major PE can be read from either the Marine and Offshore Engineering specialisation or from one of the other seven final-year specialisations.

**Curriculum structure (Mechatronics Stream)**

**First Year Core Courses**

FE0001 Foundation Physics \*  
HW001 English Proficiency \*\*  
FE1001 Physics I  
FE1002 Physics II  
FE1003 Chemistry  
BS1004 Life Sciences  
FE1005 Materials Science  
FE1006 Mathematics 1  
FE1007 Mathematics 2  
FE1008 Computing  
HW110 Effective Communication  
FE1071 Laboratory 1A  
FE1072 Laboratory 1B

\* Students with only GCE 'O' level Physics are required to take FE0001 Foundation Physics. A pass is required.

\*\* HW001 English Proficiency is to be taken by a candidate who has not passed or is not exempted from the Qualifying English Test.

**Second Year Core Courses**

MP2001 Mechanics of Materials  
MP2002 Kinematics and Dynamics of Machinery  
MP2004 Manufacturing Technology and Materials  
MP2005 Fluid Mechanics  
MP2006 Mathematics 3  
MP2007 Mathematics 4  
MP2008 Electrical and Electronics: Circuits and Devices  
HW210 Technical Communication  
MP2010 Thermodynamics and Heat Transfer  
MP2011 Engineering Graphics and Machine Components  
MP2013 Mechatronics System Interfacing  
MP2071 Laboratory 2A

MP2072 Laboratory 2B  
MP2079 Engineering Innovation and Design

**Third Year Core Courses**

MP3001 Dynamics and Control  
MP3002 Mechanics of Deformable Solids  
MP3006 Microprocessor Systems  
MP3007 Real-time Software for Mechatronics Systems  
MP3011 Engineering Design  
MP3072 Laboratory 4  
MP3079 Industrial Attachment

Besides the 22-week Industrial Attachment, engineering students can also opt for the 10-week Industrial Orientation or the 30-week Enhanced Industrial Attachment. More details are available at: <http://www.ntu.edu.sg/cao>

**Fourth Year Core Courses**

MP4006 Robotics  
MP4007 Engineers and Society  
MP4008 Human Resource Management  
HW310 Professional Communication  
MP4010 Mechatronics Systems Design and Analysis  
MP4079 Final Year Project

**Major Prescribed Electives**

In addition to core courses, Mechatronics Stream students have to read three Major Prescribed Electives which can be chosen from more than one option group.

**Group One: Aeronautical Engineering**

MP4A01 Aerodynamics  
MP4A02 Aircraft Structures  
MP4A03 Aircraft Propulsion  
MP4A04 Flight Mechanics and Control  
MP4A05 Mechanics of Aerospace Materials  
MP4A06 Non-Destructive Testing  
MP4A08 Computational Fluid Dynamics (wef AY08/09)  
MP4E05 Materials Selection and Design

**Group Two: Biomedical Engineering**

MP4C01 Biomechanics  
MP4C03 Biomaterials  
MP4C04 Surgical Assist Technology  
MP4G08 Biomechatronics

**Group Three: Energy and the Environment**

MP4D01 Air Conditioning – An Energy Approach  
MP4D02 Building Services Engineering  
MP4D04 Energy for a Sustainable Future  
MP4D05 Noise and Vibration Control  
MP4D06 Clean Technology and the Environment

**Group Four: Innovative Design**

MP4E01 Industrial Design  
MP4E02 Human Factors in Design\*  
MP4E03 Strategic Management of Product Development\*  
MP4E04 Mechanism Design  
MP4E05 Materials Selection and Design  
MP4E06 Visualisation and Virtual Reality in Product Design  
MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management \*

\* Core Course for Design Stream

**Group Five: Manufacturing Engineering**

MP4F01 Materials Engineering  
MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management\*  
MP4F04 Integrated Supply Chains  
MP4F07 Net Shape Manufacturing  
MP4F09 High Vacuum Technology  
MP4F10 Electronics Manufacturing and Packaging

\* Core Course for Design Stream

**Group Six: Systems Engineering**

MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management\*  
MP4F04 Integrated Supply Chains  
MP4F05 Operations Research  
MP4F06 Engineering Logistics

\* Core Course for Design Stream

**Group Seven: Mechatronics and Control**

MP4C04 Surgical Assist Technology  
MP4G02 Robotics\*  
MP4G03 Motion Control Systems  
MP4G05 Microprocessor Systems\*  
MP4G08 Biomechatronics

\* Core Course for Mechatronics Stream

**Group Eight: Marine and Offshore Engineering**

MP4A06 Non-Destructive Testing  
MP4D04 Energy for a Sustainable Future  
MP4D05 Noise and Vibration Control  
MP4F01 Materials Engineering  
MP4J01 Naval Architecture and Marine Engineering  
MP4J02 Marine and Offshore Structural Integrity  
MP4J03 Marine Engineering Systems and Control

Note:

Students on the ASMI scholarship have to read MP4J01 Naval Architecture and Marine Engineering as a compulsory Major PE and any other three Major PEs from the Marine and Offshore Engineering specialisation.

**Curriculum structure (Design Stream)**

**First Year Core Courses**

FE0001 Foundation Physics \*  
HW001 English Proficiency \*\*  
FE1001 Physics I  
FE1002 Physics II  
FE1003 Chemistry  
BS1004 Life Sciences  
FE1005 Materials Science  
FE1006 Mathematics 1  
FE1007 Mathematics 2  
FE1008 Computing  
HW110 Effective Communication  
FE1071 Laboratory 1A  
FE1072 Laboratory 1B

\* Students with only GCE 'O' level Physics are required to take FE0001 Foundation Physics. A pass is required.

\*\* HW001 English Proficiency is to be taken by a candidate who has not passed or is not exempted from the Qualifying English Test.

**Second Year Core Courses**

MP2001 Mechanics of Materials  
MP2002 Kinematics and Dynamics of Machinery  
MP2005 Fluid Mechanics  
MP2006 Mathematics 3  
MP2007 Mathematics 4  
MP2008 Electrical and Electronics: Circuits and Devices  
HW210 Technical Communication  
MP2010 Thermodynamics and Heat Transfer  
MP2011 Engineering Graphics and Machine Components  
MP2012 Creative Thinking and Design  
MP2071 Laboratory 2A  
MP2072 Laboratory 2B  
MP2079 Engineering Innovation and Design

**Third Year Core Courses**

MP3004 Concurrent Design and Engineering  
MP3005 Computer-aided Design  
MP3010 Engineering Product Design  
MP3104 Manufacturing Technology and Materials  
MP3071 Laboratory 3  
MP3079 Industrial Attachment

Besides the 22-week Industrial Attachment (IA), engineering students can also opt for the 10-week Industrial Orientation (IO) or the 30-week Enhanced Industrial Attachment (EIA). More details for the various options can be found at the following website: <http://www.ntu.edu.sg/cao>

**Fourth Year Core Courses**

MP4001 Quality Assurance and Management  
MP4002 Human Factors in Design  
MP4003 Strategic Management of Product Development  
MP4007 Engineers and Society  
MP4008 Human Resource Management  
HW310 Professional Communication  
MP4011 Mechanical System Design and Analysis  
MP4102 Mechanics of Deformable Solids  
MP4079 Final Year Project

**Major Prescribed Electives**

In addition to core courses, Design Stream students have to read two (2) Major Prescribed Electives which can be chosen from more than one option group.

**Group One: Aeronautical Engineering**

MP4A01 Aerodynamics  
MP4A02 Aircraft Structures  
MP4A03 Aircraft Propulsion  
MP4A04 Flight Mechanics and Control  
MP4A05 Mechanics of Aerospace Materials  
MP4A06 Non-Destructive Testing  
MP4A08 Computational Fluid Dynamics (wef AY08/09)  
MP4E05 Materials Selection and Design

**Group Two: Biomedical Engineering**

MP4C01 Biomechanics  
MP4C03 Biomaterials  
MP4C04 Surgical Assist Technology  
MP4G08 Biomechatronics

**Group Three: Energy and the Environment**

MP4D01 Air Conditioning – An Energy Approach  
MP4D02 Building Services Engineering  
MP4D04 Energy for a Sustainable Future  
MP4D05 Noise and Vibration Control  
MP4D06 Clean Technology and the Environment

**Group Five: Manufacturing Engineering**

MP4F01 Materials Engineering  
MP4F02 Manufacturing Systems and Automation\*  
MP4F03 Quality Assurance and Management  
MP4F04 Integrated Supply Chains  
MP4F07 Net Shape Manufacturing  
MP4F09 High Vacuum Technology  
MP4F10 Electronics Manufacturing and Packaging

\* Core Course for Design Stream

**Group Six: Systems Engineering**

MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance and Management\*  
MP4F04 Integrated Supply Chains  
MP4F05 Operations Research  
MP4F06 Engineering Logistics

\* Core Course for Design Stream

**Group Seven: Mechatronics and Control**

MP4C04 Surgical Assist Technology  
MP4G02 Robotics  
MP4G03 Motion Control Systems  
MP4G05 Microprocessor Systems\*  
MP4G08 Biomechatronics

\* Core Course for Mechatronics Stream

**Group Eight: Marine and Offshore Engineering**

MP4A06 Non-Destructive Testing  
MP4D04 Energy for a Sustainable Future  
MP4D05 Noise and Vibration Control  
MP4F01 Materials Engineering  
MP4J01 Naval Architecture and Marine Engineering  
MP4J02 Marine and Offshore Structural Integrity  
MP4J03 Marine Engineering Systems and Control

**Note:**

Students on the ASMI scholarship have to read MP4J01 Naval Architecture and Marine Engineering as a compulsory Major PE and any other three Major PEs from the Marine and Offshore Engineering specialisation.

**General Education Requirement - Unrestricted Electives (GER-UE)**

In addition to the core courses and major prescribed electives, students from Mechanical Engineering (Mainstream, Design and Mechatronics Stream) must take a number of GER-UE offered by the School or by other Schools.

Student admitted from Year 1 must read 9AUs of GER-UE. Direct entry students with Mechanical Engineering diplomas must read 6AUs of GER-UE. Direct entry students with non-Mechanical Engineering diplomas must read 3AUs of GER-PE.

The GER-UEs currently offered by the School are:

MP0103 Creative Problem Solving  
MP0104 Undergraduate Research Opportunity Programme

MP0107 Mind of Sun Tzu  
MP0110 Dynamics of Teamwork and Co-operation

### **General Education Requirement - Prescribed Electives (GER-PE)**

In addition to the core courses and major prescribed electives, students from Mechanical Engineering (Mainstream, Design and Mechatronics Stream) must take a number of GER-PE to be selected from any combination of courses from the three categories namely Arts, Humanities and Social Sciences, Management and Business and Science, Technology and Society. Students admitted to Year 1 must read 15AUs of GER-PE. All direct entry students must read 6AUs of GER-PE.

The GER-PEs currently offered by the School are:

MP8082 Systems for Everyone  
MP8083 Frontiers in Mechanical Engineering  
MP8084 Infrared Technology In Engineering, Medicine And Biology  
MP8085 History of Great Inventions  
MP2014 Engineering Management Analysis

\*Direct entry students with mechanical engineering diplomas are required to pass MP0001 Essential Mathematics and FE1001 Physics I.

\*Direct entry students with non-mechanical engineering diplomas are required to pass MP0001 Essential Mathematics, FE0001 Foundation Physics and FE1001 Physics I.

## **Bachelor of Engineering (Aerospace Engineering) Curriculum structure**

### **First Year Core Courses**

AE1001 Discovery Course I  
AE1002 Discovery Course II  
FE1001 Physics I  
FE1002 Physics II  
FE1003 Chemistry  
FE1005 Materials Science  
FE1006 Mathematics 1  
FE1007 Mathematics 2  
FE1008 Computing  
HW110 Effective Communication  
FE1071 Laboratory 1A

### **Second Year Core Courses**

AE2001 Fluid Mechanics  
AE2002 Mathematics 3  
AE2003 Aerodynamics I  
AE2004 Circuits and Electronics  
AE2005 Aerospace Dynamics  
AE2006 Thermodynamics  
AE2007 Mathematics 4  
AE2008 Mechanics of Materials  
AE2009 Aerospace Materials  
HW210 Technical Communication  
AE2011 Introduction to Aircraft Design and Manufacturing  
AE2071 Laboratory 2A  
AE2072 Laboratory 2B  
MP2079 Engineering Innovation and Design

### **Third Year Core Courses**

AE3001 Aircraft Structures I  
AE3002 Flight Mechanics  
AE3003 Heat Transfer  
AE3004 Aircraft Electrical Devices and Systems



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AE3005 Aerodynamics II

AE3006 Aircraft Propulsion

AE3071 Aerospace Laboratory

AE3079 Industrial Attachment

Besides the 22-week Industrial Attachment, engineering students can also opt for the 10-week Industrial Orientation or the 30-week Enhanced Industrial Attachment. More details are available at: <http://www.ntu.edu.sg/cao>

**Fourth Year Core Courses**

AE4001 Aircraft Structures II

AE4002 Aerospace Control Theory

AE4003 Aircraft Navigation and Flight Computers

AE4007 Engineers and Society

AE4008 Human Resource Management

HW310 Professional Communication

AE4079 Final-Year Project

AE4011 Aircraft Design

**Major Prescribed Electives**

AE4101 Spaceflight Dynamics

AE4102 Satellite Engineering

AE4103 Aviation Management and Operation

AE4104 Computational Fluid Dynamics

AE4105 Rotary Wing Aircraft

AE4106 Unmanned Aerial Vehicles

**General Education Requirement - Unrestricted Electives (GER-UE)**

In addition to the core courses and major prescribed electives, students from Aerospace Engineering must read 9AUs of GER-UE offered by the School or by other Schools.

The GER-UEs currently offered by the School are:

MP0103 Creative Problem Solving

MP0104 Undergraduate Research Opportunity Programme

MP0107 Mind of Sun Tzu

MP0110 Dynamics of Teamwork and Co-operation

**General Education Requirement - Prescribed Electives (GER-PE)**

In addition to the core courses and major prescribed electives, students from Aerospace Engineering must read 15AUs of GER-PE to be selected from any combination of courses from the three categories namely Arts, Humanities and Social Sciences, Management and Business, and Science, Technology and Society.

The GER-PEs currently offered by the School are:

MP8082 Systems for Everyone

MP8083 Frontiers in Mechanical Engineering

MP8084 Infrared Technology In Engineering, Medicine And Biology

MP8085 History of Great Inventions

MP2014 Engineering Management Analysis

**Part-Time Bachelor of Engineering (Mechanical Engineering)**

**Curriculum structure**

**First Year Core Courses**

FE0001 Foundation Physics \*

HW001 English Proficiency \*\*

FE1001 Physics I

MP0001 Essential Mathematics

MP2002 Kinematics and Dynamics of Machinery

MP2005 Fluid Mechanics

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MP2008 Electrical and Electronics: Circuits and Devices  
HW210 Technical Communication  
MP2071 Laboratory 2A

\* Students with non-mechanical engineering diplomas are required to take FE0001 Foundation Physics. A pass is required.

\*\* HW001 English Proficiency is to be taken by a candidate who has not passed or is not exempted from the Qualifying English Test.

**Second Year Core Courses**

MP2001 Mechanics of Materials  
MP2003 Thermodynamics  
MP2004 Manufacturing Technology and Materials  
MP2006 Mathematics 3  
MP2007 Mathematics 4  
MP2014 Engineering Management Analysis  
MP2072 Laboratory 2B

**Third Year Core Courses**

MP2011 Engineering Graphics and Machine Components  
MP3001 Dynamics and Control  
MP3002 Mechanics of Deformable Solids  
MP3003 Heat Transfer  
MP4001 Quality Assurance and Management  
MP3071 Laboratory 3  
Prescribed Elective 1

**Fourth Year Core Courses**

MP3011 Engineering Design  
MP4004 Advanced Manufacturing and Nanotechnology  
MP4005 Fluid Dynamics  
MP4011 Mechanical System Design and Analysis  
MP4079 Final Year Project  
Prescribed Elective 2

**Fifth Year Core Courses**

MP4008 Human Resource Management and Entrepreneurship  
HW310 Professional Communication  
MP4007 Engineers and Society  
MP4079 Final Year Project  
Prescribed Elective 3  
Prescribed Elective 4

**Major Prescribed Electives**

Students are allowed to choose their major Prescribed Electives from any of the two Specialisation groups. Students who have read at least three courses from a specialisation are deemed to have specialised in that area.

**Manufacturing Engineering\***

MP4F01 Materials Engineering  
MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance & Management^  
MP4F04 Integrated Supply Chains  
MP4F07 Net Shape Manufacturing  
MP4F09 High Vacuum Technology  
MP4F10 Electronics Manufacturing and Packaging (Revised)

**Innovative Design**

MP4E01 Industrial Design  
MP4E02 Human Factors in Design  
MP4E03 Strategic Management of Product Development  
MP4E04 Mechanisms Design  
MP4E05 Materials Selection and Design  
MP4E06 Visualisation and Virtual Reality in Product Design

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MP4F02 Manufacturing Systems and Automation  
MP4F03 Quality Assurance & Management^

\* Previously titled Manufacturing Systems Engineering, this course is now renamed Manufacturing Engineering.

^ Syllabus of MP4001 and MP4F03 is the same. For students admitted from the 2003 intake onwards, MP4F03 cannot be registered as a PE.

**Note:**

Part-time students are exempted from MP2079 Engineering Innovation and Design if they have six months of relevant working experience in Year 2 of study, and MP3079 Industrial Attachment, if they have six months of relevant working experience in Year 3 of study.