1.5.2 Description of courses

Year 1

HW001 English Proficiency
#To be taken by students who fail the Qualifying English Test
AUs: NIL, Prerequisites: NIL, Semester 1
This course employs a task-based approach using authentic language activities to raise students' awareness of their individual language proficiency problems. It introduces key drafting and editing skills, equips students with the means to continue improving their proficiency skills post-course, and focuses on specific language skills such as the accurate use of grammar, clear expression, clear organisation and coherent development of ideas. Reading, listening and speaking skills are taught as part of class activities and discussions.

HW110 Effective Communication
AUs: 2, Prerequisites: NIL, Semester 2
The content of this course include:

- communication model and process - meaning, importance and levels
- written communication - purpose, audience analysis; organisation
- language use and types of written messages
- oral presentation - delivery skills, persuasion, and group presentation
- interpersonal skills - listening; group interactions, and social skills

MS1001 Physics I
AUs: 3, Prerequisites: NIL, Semester 1
Physics I provides a comprehensive introduction to basic concepts of light, heat and mechanics to prepare students for higher level engineering courses. The course develops logical thinking, analysis and problem-solving skills

MS1002 Physics II
AUs: 3, Prerequisites: NIL, Semester 2
Physics II provides a comprehensive introduction to basic concepts of electricity, magnetism and quantum physics to prepare students for higher level engineering courses. The course develops logical thinking, analysis and problem-solving skills.

FE1003 Chemistry
AUs: 3, Prerequisites: NIL, Semester 2
The basic concepts of atoms, molecules and ions in organic and inorganic chemistry are explored in this introduction to chemistry for engineering students. Covered under inorganic and physical chemistry are such topics as reaction kinetics, chemical equilibrium, ionic equilibrium, and electrochemistry, and under organic chemistry, organic compounds, their structures, properties, nomenclature and applications.

FE1005 Materials Science
AUs: 3, Prerequisites: NIL, Semester 1
Materials Science is a field where the properties of materials are related to its structure at the atomic, microscopic and macroscopic levels. Understanding this relationship helps us to achieve the required combination of properties in a given material for a specific application. Since materials are used by all engineers for different purposes, this course attempts to cover the use of materials in all branches of engineering. Interesting and technologically impacting developments in materials that have found important critical applications in our lives will be highlighted.

FE1006 Mathematics 1A
AUs: 3, Prerequisites: NIL, Semester 1
The basic concepts of limits, differentiation and integration are introduced in this course. Also included are applications of differential and integral calculus, and topics on complex numbers, vectors and matrices to prepare students for other courses in Year one.

FE1007 Mathematics 1B
AUs: 3, Prerequisites: NIL, Semester 2
This course extends the basic concepts of differentiation and integration learned in Mathematics 1 to the operations on functions of multiple variables. Advanced applications of differential and integral calculus are included. In addition, the course covers topics on series and ordinary differential equations.

FE1008 Computing
AUs: 3, Prerequisites: NIL, Semester 2
This course introduces fundamental concepts in computing, with an emphasis on applications in engineering. Students will acquire the software "literacy" that is indispensable to working creatively in Engineering. A brief introduction to basic computer architecture is followed by problem solving and programming techniques including necessary library routines. With this as background, the course focuses on available techniques and solutions in the engineering context.

FE1071 Laboratory IA
AUs: 1, Prerequisites: NIL, Semester 2
Laboratory experiments related to Physics, Chemistry and Materials Science.

FE1072 Laboratory IB
AUs: 1, Prerequisites: NIL, Semester 1
Laboratory experiments related to Physics, Chemistry and Materials Science.

BS1004 Life Sciences
AUs: 3, Prerequisites: NIL, Semester 1
As Singapore continues to build up the life sciences industry for a knowledge-based economy that places a premium on technology, innovation and talent, it is timely for engineering students to be introduced to fundamental ideas and concepts in the life sciences especially with relevance to engineering practices. Part one of this course will cover basic concepts of biology. Part two will give an engineering perspective to some of the challenging opportunities in research and industry offered by the life sciences. Part three will round off the series of lectures with a discussion on various aspects of life sciences applications and research that impact ethical, legal and social issues.

GER 1
AUs: 3, Prerequisites: NIL, Semester 1

GER 2
AUs: 3, Prerequisites: NIL, Semester 2

Year 2

HW210 Technical Communication
AUs: 2, Prerequisites: NIL, Semester 1
This course teaches principles of technical communication for academic and professional needs and focuses on basic written and oral skills essential in presenting technical information effectively. A key feature is the use of project-based learning approach in learning technical communication.

MS2001 Mathematics II
AUs: 3, Prerequisites: NIL, Semester 2
This advanced course builds upon first year mathematics and covers important topics that prepares students for the solution and interpretation of many practical problems encountered in engineering disciplines. Topics covered: Matrix analysis, Vector calculus, Fourier analysis, Laplace transform, Partial differential equation, and an introduction to numerical solution and regression analysis.

MS2002 Introduction to Manufacturing Processes
AUs: 3, Prerequisites: NIL, Semester 1
This course introduces the various processes for the making and shaping of materials and thus prepares students for their 24-week industrial attachment in their third year.

MS2003 Applied Chemistry
AUs: 3, Prerequisites: FE1003[@], Semester 2
This applied chemistry course for materials engineers will cover selected chemistry theories and methods that are important for materials engineering applications including topics related to electro, analytical and surfactant chemistry.

MS2004 Materials Structure and Mechanical Behaviour
AUs: 3, Prerequisites: FE1005[@], Semester 2
This introduction to materials structures, defects and mechanical properties explores the relationship between the mechanical behaviors of materials and their microstructures. The study of deformation in solids correlates the role of microstructure, crystallography, and dislocations with the materials' behavior at both room and high temperatures.

MS2005 Mechanics of Materials
AUs: 3, Prerequisites: MS1001[@], Semester 1
Simple stress and strain. Torsion. Shear forces and bending moments. Stresses in beams. Analysis of stress and strain. Application of plane stress.

MS2006 Thermodynamics and Kinetics of Materials
AUs: 3, Prerequisites: NIL, Semester 2
The focus of this course falls on the principles of thermodynamics and kinetics and their application to important topics in materials engineering.

MS2008 Electronic & Magnetic Properties of Materials
AUs: 3, Prerequisites: MS1002[@], Semester 1
This introduction to the electronic, magnetic and optical properties of materials explores principles and theories in solid state physics relevant to the engineering principles of various materials. The materials design of an electronic or magnetic device is based on the understanding of these basic principles and theories.

MS2010 Polymers and Composites
AUs: 3, Prerequisites: FE1003[@], Semester 1
Essential topics in both chemical and physical aspects of polymers and fundamentals on composite materials are covered in this course for Materials Engineering students.

MS2030 Human Resource Management and Entrepreneurship
AUs: 3, Prerequisites: NIL, Semester 1
Nature of entrepreneurship and human resource management. Developing a new venture business plan. Business formation. Understanding individual behavior in organisation. Understanding group behavior in organisation. Leadership for change and innovation. Managing human assets and performance. Productivity and total quality management. Managing creativity and innovation. Labour-management relations.

MS2071 Laboratory IIA
AUs: 1, Prerequisites: NIL, Semester 2
In this course, students will study various scientific phenomena in materials and learn to use material characterisation and testing equipment. This course also teaches safety issues in materials and chemical laboratories.

MS2072 Laboratory IIB
AUs: 1, Prerequisites: NIL, Semester 1
In this course, students will study various scientific phenomena in materials and learn to use material characterisation and testing equipment. Also included is a series of laboratory experiments and exercises in support of the various materials engineering related courses.

GER 3
AUs: 3, Prerequisites: NIL, Semester 1

GER 4
AUs: 3, Prerequisites: NIL, Semester 2

MS2900 Essential Mathematics
(For Polytechnic Direct Entry Students)
AUs: 3, Prerequisites: NIL, Semester 1
Functions and derivatives, Integration, Complex numbers and vectors, Power series, Partial derivatives, Ordinary differential equations.

MS2901 Essential Materials Science
(For Polytechnic Direct Entry Students)
AUs: 3, Prerequisites: NIL, Semester 1
Materials Science is a field where the properties of materials are related to its structure at the atomic, microscopic and macroscopic levels. Understanding this relationship helps us achieve the required combination of properties in a given material for a specific application. Since materials are used by all engineers for different purposes, this course attempts to cover the use of materials in all branches of engineering. Interesting and technologically impacting developments in materials that have found important critical applications in our lives will be highlighted.

@ may be taken concurrently.

Year 3

MS3001 Metallic and Ceramic Materials
AUs: 4, Prerequisites: FE1005 MS2004@ MS2006@, Semester 1
In this introduction to metals and ceramics, two important classes of engineering materials, students will study:
the structure, properties and important engineering applications of metals and alloys
the crystal structures and microstructures of ceramics correlated with their mechanical properties and other physical properties, as well as the effect of ceramic processing methods on the microstructures of ceramics.

MS3002 Advanced Materials Processing
AUs: 4, Prerequisites: NIL, Semester 1
This course is offered to all third year students as an introduction to semiconductor materials processing. It is essential for students who desire to specialise in microelectronics device fabrication. It also serves as a prerequisite for the more advanced microelectronics elective modules offered in their fourth year. This course includes an introduction to fundamental semiconductor operation and device physics. The course covers the basics of semiconductor technology, from bare silicon to finished products. The process steps include bulk crystal growth, oxidation, diffusion, ion implantation, thin film deposition, lithography and etching. New technology processes such as chemical-mechanical polishing and electro-deposition are also introduced to the students. Factors that affect the materials' properties from the process steps will be highlighted. New materials that are incorporated into the state-of-the-art semiconductor processes are also discussed.
This introduction to semiconductor materials processing is essential for students who desire to specialise in microelectronics device fabrication, and also serves as a prerequisite for the more advanced microelectronics elective modules offered in the fourth year. Covered are:

- an introduction to fundamental semiconductor operation and device physics
- the basics of semiconductor technology, from bare silicon to finished products
- process steps including bulk crystal growth, oxidation, diffusion, ion implantation, thin film deposition, lithography and etching
- new technology processes such as chemical-mechanical polishing and electro-deposition
- factors that affect the properties of materials
- new materials that are incorporated into the state-of-the-art semiconductor processes

MS3003 Materials Failure
AUs: 3, Prerequisites: FE1003 MS2004@, Semester 1
This introductory course is focused on the study of major forms of materials failure and their prevention.

MS3005 Materials Aspects in Design
AUs: 3, Prerequisites: MS2005@ MS2010@ MS3001@, Semester 1
The design process, codes and standards, reverse engineering, modeling and simulation. Material selection charts, selection procedure, shape factors, selecting shape and material. Multiple constraints, methods employing fuzzy logic, compound objectives. Material processing and design. Case studies. Design project.

MS3007 Analysis of Materials
AUs: 3, Prerequisites: NIL, Semester 1
This course provides students with strategies for the systematic analysis of materials, including metals, ceramics and polymers. Students will be taught common methods to analyze materials including spectroscopic, microscopic, crystallographic, gravimetric and calorimetric techniques. The instrumental

techniques will include X-ray fluorescence spectrometry, atomic absorption spectroscopy, scanning electron microscopy, powder X-ray diffraction, infrared spectroscopy, ultraviolet-visible spectroscopy, nuclear magnetic resonance spectroscopy, thermal gravimetric analysis and differential scanning calorimetry.

MS3079 Industrial Attachment
AUs: 10, Prerequisites: Must have obtained 55AUs of core courses, Semester 2
Industrial Attachments exposeMaterials Engineering students to a real-life engineering environment. It is part of the academic curriculum and seeks to develop and enhance academic, professional and personal competencies.

GER 5
AUs: 3, Prerequisites: NIL, Semester 1

[@] may be taken concurrently

Year 4

HW310 Professional Communication [##]
AUs: 2, Prerequisites: FE1009 HW001, Semester 1
This advanced course equips students with oral and written skills necessary in their professional lives, prepares and grooms them for their job search and helps them manage career choices. Through a variety of activities, such as group discussions, role-plays, case studies, outdoor activities, and simulation, students will also develop the competencies to handle interpersonal, social, and professional relationships with clients and colleagues; be competent and professional in dealing with both verbal and written expressions; deal with intercultural issues; collaborate, make decisions and play effective roles as team members; demonstrate initiative and leadership qualities; and manage difficult and challenging professional situations.

MS4002 Quality Control
AUs: 3, Prerequisites: NIL, Semester 2
This course on the modern use of management and statistical methods for quality control and improvement seeks to:

- underscore the importance of quality management as an essential part of manufacturing and competitive business strategy by teaching quality management and quality control practices
- introduce statistical theory and methods used in quality control and quality assurance

In connection with current international management systems for quality, the environment, and occupational health and safety, the latest methodology for quality monitoring, analysis and improvement will also be discussed.

MS4003 Nanomaterials & Biomaterials
AUs: 4, Prerequisites: FE1005, MS2010, MS3001 (MS3001 may be taken concurrently), Semester 1

Nanomaterials - This course introduces the synthesis, processing, characterisation and applications of nano-materials, including the areas of physics and chemistry of nano-systems, energy spectrum, quantum effects, interface phenomena and thermodynamics. Various methods for producing nanomaterials will be studied, and these include sol gel processing, precipitation, thermal spraying, electrostatic atomisation etc. The various techniques used in the characterisation of nanomaterials will also be studied. **Biomaterials** - This course introduces the types of biomaterials used in health care applications, particularly metallic, ceramic and polymeric biomaterials. It will discuss: the biocompatibility of materials in relation to actual applications, in vitro and in vivo biocompatibility testing, key applications (case studies) of each type of biomaterial, and the failure of biomedical devices caused by biocompatibility problems.

MS4030 Engineers and Society
AUs: 3, Prerequisites: NIL, Semester 2
History of Singapore, international relations, new economy, History of engineering, Professional ethics for engineers.

MS4079 Project
AUs: 10, Prerequisites: MS3079, Semesters 1 and 2
Fnal year projects provide students with an opportunity to apply the knowledge they have learnt, their intellectual abilities and the practical skills to solve real, or close to real-life engineering problems. These

problems may take the form of an investigation or the development of engineering hardware, software or both.

Prescribed Elective 1
AUs: 3, Prerequisites: NIL, Semester 1

Prescribed Elective 2
AUs: 3, Prerequisites: NIL, Semester 1

Prescribed Elective 3
AUs: 3, Prerequisites: NIL, Semester 1

Prescribed Elective 4
AUs: 3, Prerequisites: NIL, Semester 2

Prescribed Elective 5
AUs: 3, Prerequisites: NIL, Semester 2

[@] may be taken concurrently
[##] Tutorial every alternate week

Prescribed Electives

1. A total of FIVE Prescribed Elective courses must be chosen from the following list as specified in the curriculum structure

2. All electives below are NOT necessarily available in any one year. Availability depends on staff constraints.

MS4500 Microelectronics Packaging
AUs: 3, Prerequisites: MS3002[@], Semester: NIL
This introduction to the fundamentals of microelectronic packaging, failure analysis and reliability covers packaging basics, package types, packaging materials and assembly processes. Thermal, Thermo-mechanical, and Electrical design aspects along with the main principles of failure analysis and reliability engineering arel also covered. Much of the knowledge gained by the student through materials science and engineering topics will be applied in this technology-based course.

MS4501 Principles of Semiconductor Devices
AUs: 3, Prerequisites: MS2008, Semester: NIL
This course provides the basics of semiconductor devices for students who may wish to specialise in the field of semiconductor materials and devices inlater years. The major objective is to familiarise students with the basic principles involved in the operation of modern solid state devices. Topics covered earlier in courses, such as MS281: Electronic and Magnetic Properties of Materials, will serve as the foundation for teaching this course. The knowledge gained through this course will be useful in understanding other courses, such as Fundamentals of Microelectronics Processing, LCD display, Photonic materials and devices, Failure Analysis and Reliability Studies of microelectronics.

MS4502 Materials and Processes for Electronics Displays
AUs: 3, Prerequisites: MS3002[@], Semester: NIL
Flat panel displays, especially active matrix liquid crystal displays, have emerged as an economically important multidisciplinary course at the confluence of materials engineering, physics and chemistry, and microelectronics engineering. This course brings together all these elements to form a cohesive introduction to all relevant aspects of liquid crystal displays, with an emphasis on active matrix transmissive displays and amorphous silicon thin film transistors as switching elements. Other flat panel technologies are also introduced in class assignments. The course is applications-oriented, using a design paradigm to highlight the interplay between engineering objectives and material and process limitations.

MS4503 Microelectronics Process Integration
AUs: 3, Prerequisites: MS3002, Semester: NIL
This course is offered to fourth year students who desire to study how individual processes are combined in various ways to produce silicon integrated circuits. It includes an overview of requirements in materials and process techniques for the development of new technologies, process development trends, process sequences for major process blocks of well, active, isolation, gate, contact, planarisation of interlevel dielectric layers, multilevel interconnects/metallisation and reliability issues. The fundamentals of MEMS technology is also introduced.

MS4504 Photonic Materials and Devices
AUs: 3, Prerequisites: MS3002[@], Semester: NIL
Knowledge and ideas about photonic materials and devices, most of which feature in our daily life, is the focus of this course. Topics covered include: the optical properties of semiconductor materials, some organic materials, non-linear optical materials and their devices, such as light emitting diodes, laser, detectors, display, sensors, etc.

MS4510 Advanced Biomaterials
AUs: 3, Prerequisites: MS473/MS4001/MS4003, Semester: NIL
This course builds on MS4001 (Biomaterials) to describe the functional performance of biomaterials. Covered are: Structure and properties of various metals and alloys used in biomedical implants. Magnetic materials and their applications in biomedicine. Various types of ceramics and glasses, structure and properties. Load-bearing and non-load-bearing applications. Discussion of merits and shortcomings of natural polymers. Importance of viscoelasticity in implants. Gels, natural and synthetic. Structure and mechanical properties of composites. Uses in implanted devices.

MS4511 Implanted Biomedical Devices
AUs: 3, Prerequisites: MS4001[@], Semester: NIL
This course focuses on practical aspects of biomaterials as used in biomedical devices. In particular, it focuses on the fabrication aspects of devices, including materials processing and selection. In addition, the performance of biomaterials (as part of devices) inside the body is also covered, with specific device examples. The body is an aggressive environment for all materials, and the deterioration of biomaterials in vivo will be discussed in detail. Finally, some current limitations of biomaterials and the ongoing research efforts to overcome them are discussed.

MS4512 Drug Delivery and Tissue Engineering
AUs: 3, Prerequisites: MS4001[@], Semester: NIL
In discussing the basic principles of drug delivery and tissue engineering, this course presents engineering analyses of drug delivery, along with biological and material aspects of tissue engineering. The course introduces the important role played by biomaterials and acquaints students with the design and selection criteria for biomaterials.

MS4520 Polymer Technology
AUs: 3, Prerequisites: MS2010, Semester: NIL
Covered in this course are:

- additives and processing techniques commonly used in the manufacture of thermoplastic and thermosetting polymeric products
- the effects of fillers and stabilisers on the properties of polymer materials
- factors affecting polymer processing, including basic theology, the importance of viscoelasticity in polymers, factors affecting polymer flow and flow through die channels of various geometries
- a three-hour case study to discuss special processing technology

MS4521 Solidification Processing
AUs: 3, Prerequisites: MS2006, Semester: NIL
This course aims to give a degree of specialisation to students in the area of solidification theory, and its application to improve/ manipulate microstructures and hence properties. To achieve these, more core content is initially developed in solidification theory and then it is shown how this knowledge is exploited in practice to design alloys, and to manipulate solidification parameters to achieve the desired microstructures. Modern rapid solidification techniques and directional solidification are introduced with alloy design principles for them.
This course gives students a degree of specialisation in solidification theory. It shows how knowledge in this area is exploited in practice to design alloys, and manipulate solidification parameters to achieve the desired

microstructures. Modern rapid solidification techniques and directional solidification are introduced with alloy design principles.

MS4523 Polymer Synthesis
AUs: 3, Prerequisites: MS2010, Semester: NIL
This course introduces the principal definitions of polymers, provides some fundamental knowledge of the science of the polymers, and introduces aspects of polymer chemistry such as the synthesis of polymers and copolymers and the different mechanisms involved.

MS4524 Polymer Physics
AUs: 3, Prerequisites: MS2010, Semester: NIL
This course aims to provide the students with some understanding of polymers with reference to its application as organic biomaterials, high temperature and high performance organic materials, composites and nanocomposites, and ecomaterials. Topics to be covered include the concept of average molecular weight and polydispersity based on dilution theory; the structure and properties of polymers, including blends, copolymers, composites/ nanocomposites and liquid crystal polymers; the factors affecting polymer properties including defects; the importance of thermal transitions in polymers; and the relationship between polymer microstructures and mechanical properties.

MS4525 Materials and Energy
AUs: 3, Prerequisites: MS2008, Semester: NIL
The Materials and Energy course is focused on the evaluation of currently used materials for energy technologies. It is also focused on the design of high performance materials for sustainable energy generation with an emphasis on understanding the relationships between their structure, property, and performance. This course covers such topics as materials for photovoltaics, fuel cells, batteries, supercapacitors, thermal solar energy conversion, thermoelectrics, hydrogen production and storage, materials design, chemical synthesis, nanomaterials applications, advanced materials characterization, prototype energy storage/conversion device fabrication and inventions in the field of future energy technology.

MS4550 Introduction to Modelling and Simulation in Materials Engineering
AUs: 3, Prerequisites: FE1008 MS2001, Semester: NIL
The focus of this course falls on the basic concepts of computer modelling in science and engineering using discrete particle systems and continuum fields. The following will be covered: techniques and software for statistical sampling, simulation, data analysis and visualization, statistical, molecular dynamics, and Monte Carlo and mesoscale methods for the study of fundamental physical phenomena in computational materials science. Applications will be drawn from a range of disciplines to build a broad-based understanding of complex structures and interactions in problems where simulation is on equal-footing with theory and experiment.

MS4551 Composite Materials Science
AUs: 3, Prerequisites: MS2010, Semester: NIL
In general, a composite is any mixture of two or more different materials to form a new one, which has some desired properties that are superior to those of its constituents. This course empowers students with the skills to design, manufacture and analyse composite materials from a material scientist's viewpoint.

MS4552 Environmental Degradation of Materials
AUs: 3, Prerequisites: FE1003 MS3003[@], Semester: NIL
This course covers the fundamental aspects of environmental degradation of materials with an emphasis on the corrosion of metallic materials, the interactions of engineering materials with specific environments in various industrial sectors, and practical methods and techniques for testing and materials performance evaluation.

MS4553 Advanced Analysis of Materials
AUs: 3, Prerequisites: MS2007, Semester: NIL
This advance course introduces materials analysis and characterisation techniques not covered in the introductory course MS2xx Characterisation of Materials, and more advanced XRD and electron microscopy techniques.

MS4554 Polymer Science
AUs: 3, Prerequisites: MS2010, Semester: NIL
This course aims to provide students with some understanding of polymers with reference to its application as organic biomaterials, high temperature and high performance organic materials, composites and nanocomposites, and ecomaterials. It covers polymer chemistry, such as the synthesis of polymers and copolymers and the different mechanisms involved, and the concept of average molecular weight and polydispersity and the techniques used to conduct these measurements. Also covered are the factors affecting polymer properties and their defects, the importance of thermal transitions in polymers, and the relationship between polymer microstructures and mechanical properties.

MS4555 Nanostructure of Functional Materials
AUs: 3, Prerequisites: MS3002 MS3003, Semester: NIL
The common interaction forces at nanoscale, general synthesis and fabrication techniques for structured materials, the relationship between the structures and properties, and the application of structured materials are taught in lectures. Some papers are discussed in tutorials. Both lecture and tutorials point the students towards the cutting edge of functional materials and their structures.
The scope of this course encompasses:

- the common interaction forces at nanoscale, general synthesis and fabrication techniques for structured materials
- the relationship between structures and properties
- the application of structured materials

Some papers are discussed in tutorials. Both lectures and tutorials point students towards the cutting edge of functional materials and their structures.

MS4556 Thin Film
AUs: 3, Prerequisites: NIL, Semester: NIL
This advanced course for fourth year students provides an in-depth understanding of different aspects of thin films, building upon knowledge gained in the Microelectronics processing and Electronic, Magnetic and Optical Properties of Materials courses.

MS4557 Introduction to Materials Simulation Methods
AUs: 3, Prerequisites: MS2001, Semester: NIL
This course equips students with basic knowledge of computer simulation and relevant physics, and familiarizes students with a number of essential numerical techniques such as the Monte Carlo method, the Newton-Raphson method, the relaxation iteration method, and the Metropolis algorithm. Students will also gain experience in molecular dynamics and simulation of stochastic processes and statistical ensembles. Related physics concepts are taught together with numerical techniques, and students are therefore expected to acquire substantial understanding and intuition on underlying physical processes.

MS4559 Special Topics *
AUs: 3, Prerequisites: NIL, Semester: NIL
Courses on topics of interest may be offered on an ad hoc basis when the School has visiting staff with expertise in special areas. The actual title will be decided at the time of offering.

[@] may be taken concurrently

General Education Requirement (GER) - Prescribed Elective

MS8001 Management with Humour
AUs: 3, Prerequisites: NIL, Semester: NIL
This course aims to provide a practical approach towards human resource management. The topics are condensed from various contemporary real-life examples and also co-relate to the theories of management. Topics include: The Art and Heart of Management; Managers' Dilemmas; Survivability; Heroism and humour; Management by communication; Motivation; Evolution of management; EQ and ethics.

MS8002 Science of Jewellery Materials
AUs: 3, Prerequisites: NIL, Semester: NIL
This course aims to provide a broad introduction to common materials and processes used in modern jewellery, their properties and reasons for their choice. Their properties will be explained and interpreted

from fundamental scientific principles that are comprehensible to anyone with high school general science knowledge. Students will be introduced to technical terms used in the trade and their scientific meanings will be explained. The main objective is to appreciate and admire the progress the jewellery trade has made in recent times in the materials and processes they use.

MS8003 Practical Anatomy and Physiology
AUs: 3, Prerequisites: NIL, Semester: NIL
This course aims to provide a board introduction to anatomy and physiology, particularly its practicalaspects. Students will study the main body systems, their functions and the diseases associated with them. The systems include: the skeletal system, muscular system, vascular system, cardiac system, neurological system, respiratory system and urological system.

MS8004 Introduction to Nanotechnology
AUs: 3, Prerequisites: NIL, Semester: NIL
Nanotechnology is broad in scope. Students in this course will gain a conceptual understanding of nanotechnology, its development and applications in various fields of technologies.

MS8005 Effective Interpersonal Communication
AUs: 3, Prerequisites: NIL, Semester: NIL
This course aims to equip students with the knowledge and skills for effective interpersonal communication that is essential for professional success and personal happiness. The course starts with a general introduction of interpersonal behavior and then covers various aspects of effective communication.

MS8006 Economics of Manufacturing
AUs: 3, Prerequisites: NIL, Semester: NIL
This course aims to provide an insight into the rise and fall of mass production. This study will help uncover the strength of Japanese techniques and methods as compared to the Western approach of economies of scale from the days of Henry Ford. We will make inroads into understanding how after World War II, Japan was able to reach its current economic preeminence. The study will embrace the entire food chain of tasks from product design to manufacturing to distribution.

MS8201 Health, Science and Society
AUs: 3, Prerequisites: NIL, Semester: NIL
This course provides an overview of disease and health care. Through studying one illness, for example diabetes mellitus, participants will learn about different components of disease and the different fields of knowledge that one has to draw upon to understand a disease. The course also covers a broad spread of medical and surgical emergencies, cardiac life support, and an introduction to basic radiology, as well as the psychosocial aspects of medicine and quality management initiatives in health care.

MS8202 Symmetry and Crystals
AUs: 3, Prerequisites: An interest in Chemistry will be helpful, Semester: NIL
This course will provide students with an enhanced appreciation of the sophisticated and vivid symmetry that surrounds us in architecture, art and science. Tessellation is the key to creating regular patterns, which are not only pleasing to behold but fundamentally control the properties of many technological materials. Crystal, large and small, are the scaffolding of the world-of-science and the world-at-large, and understanding the rules by which these building blocks of nature are constructed provides insights that would otherwise be impossible.

MS8203 Energy and the Environment
AUs: 3, Prerequisites: NIL, Semester: NIL
History of energy usage. The science and technology of energy harvesting, conversion and dissipation. Energy consumption in the industrialized world. Link between global warming and energy production/consumption. Alternative energy sources. Energy, as the ability to do work, has evolved from its muscular origin befitting our agricultural past to modern electrical and chemical forms more suited to our industrialized present. With the globalization of industrialization and a corresponding growth in energy demand, non-renewable forms of energy need to be managed as a finite resource. At the same time, the means to generate energy have been linked to environmental changes that portend to upset the ecology irreversibly. This course will examine the various forms of energy useful for industrial output, the technology behind their generation, the raw materials necessary to sustain that technology, and the environmental impact of energy production, transmission, and conversion. The complex issues of resource competition, management, legislation, and environmental protection will also be discussed. The course will also

showcase relevant guest lectures on the technology of alternative energy sources and current research efforts.

MS8204 Big Bangs: Introduction to the Science, Technology, and the Evolution of Music

AUs: 3, Prerequisites: NIL, Semester: NIL

An introduction to the science and technology of sound. Perception of Sound. Acoustics properties of various classes of instruments. Electronic production and reproduction of sound. Describing sound. The 5 big bangs that changed music history. Trends and future of music. This module aims to introduce students to the science behind sound and explore how technology and inventions have shaped the music industry through the ages. Topics include understanding how sound is produced and perceived, basic acoustics of instruments, electronic production and reproduction of sound, trends and future of the music industry. Designed as an introductory course, little mathematics is required. A comprehensive approach towards music will also be covered giving students a balanced perspective to better appreciate and describe sound and music in various styles and settings. No prior knowledge or required level of physics, engineering, or musical competency is assumed.