

## REP Year 1 Semester 1 (AY2024/25 Cohort)

### **RE1011 – MATHEMATICS I**

**Acad Unit: 4 AU**

**Pre-requisite: A-Level H2 Mathematics or equivalent**

This course aims to equip students with the subject knowledge, logical reasoning and communication skills required to independently and in teams, apply the concepts and methods of calculus of one or several variables, to engineering or business related problems.

### **RE1013 – MATERIALS & MANUFACTURING**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This is an introductory course on materials and manufacturing processes, with a focus on nanoscale materials as well as novel and sustainable materials.

The aims of the course are to support students in:

- Relating molecular structure of materials to its properties, functions and applications.
- Understanding the evolution and rationale behind processing methods to produce novel and sustainable materials.

### **RE1014 – ELECTRONIC & INFORMATION ENGINEERING**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course is related to electrical and electronic engineering. It introduces basic concepts of circuit analysis, analog electronics and digital electronics. After completing this course, students are equipped with the necessary basic knowledge to study more in-depth concepts on electrical and electronic engineering.

*\*Subject to changes*

## **RE1015 – BIO- AND CHEMICAL ENGINEERING FUNDAMENTALS & APPLICATIONS**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course is designed to introduce key concepts of bioengineering and chemical engineering to students, and to provide students with a comprehensive yet concise overview of the topic. It is divided into 3 parts: bioengineering, chemical engineering and their impact and applications.

Bioengineering is designed for individuals to build a solid foundational understanding of biology and develop a keen interest in the integration of various disciplines within bioengineering, including biomolecular engineering. This course covers the broad scope of bioengineering, which encompasses not only biomolecular engineering but also other aspects such as biomedical engineering and the application of modern technologies. Students will gain a comprehensive overview of the principles and practices at the interface of life sciences, biotechnology, and engineering.

Chemical Engineering introduces the students to the roles of chemical engineering in our everyday life with an emphasis on its role in enabling sustainable energy solutions. The students will be introduced to the key concepts of chemical engineering, i.e. (1) material balance in chemical processes and (2) chemical reaction engineering. The students will also learn how advances in artificial intelligence and data science will enable chemical engineers to decarbonize the chemical industry.

## **RE1101 – FUNDAMENTALS OF MANAGEMENT**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course provides an introduction to the fundamental principles of management. The frameworks, concepts and theories covered in the course explain how they can be used to deal with the diversity of issues faced in the management of organisations that have been transformed by social, technological, and environmental changes. How management goes about its key tasks of managing strategy, structures, and systems is examined in this course.

***\*Subject to changes***

## REP Year 1 Semester 2 (AY2024/25 Cohort)

### **RE1012 – MATHEMATICS II**

**Acad Unit: 4 AU**

**Pre-requisite: RE1011 Mathematics I**

This course aims to equip students with the subject knowledge, logical reasoning and communication skills required to independently and in teams, apply the concepts and methods of calculus and linear algebra, to engineering or business-related problems.

### **RE1016 – ENGINEERING COMPUTATION**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

The first aim of this course is to take students with no prior experience of thinking in a computational manner to a point where they can derive simple algorithms and code the programs using Python language. Students will learn fundamental programming concepts such as sequence, iteration and selection, function, data types and data structure, and the use of flow chart/pseudo code to design and code algorithms.

Students are then introduced to the hardware architecture and the operation of a typical microprocessor that is used in a computer, how it functions and how it is programmed to solve problems. Students will learn how to program a microprocessor using assembly language that resembles very closely the machines codes executed by the CPU, and how high-level language program is translated to the machines codes, which provide insights to good coding styles. Students will also learn how different peripheral devices can be interfaced to the CPU in order for a computer to interact with the external world.

### **RE1017 – INTRODUCTION TO ENGINEERING MECHANICS**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

The aim of this course is to provide fundamental knowledge for undergraduate students in statics, mechanics of materials and dynamics. It introduces the course participants to force vectors, force system resultants, equilibrium of a rigid body, structural analysis, centre of gravity, centroid and moment of inertia, stress and strain, and Euler-Bernoulli's bending formula. It also includes kinematics, general curvilinear motion, motion of a projectile, absolute dependent motion analysis of two particles, and relative motion analysis of two particles using translating axes.

*\*Subject to changes*

**RE1018 – INTRODUCTORY THERMAL SCIENCES, ELECTRICITY & MAGNETISM****Acad Unit: 3 AU****Pre-requisite: NIL**

The first part of this course aims to provide students with the introductory concepts of thermal sciences, viz., fluid mechanics, temperature and ideal gases, laws of thermodynamics and heat transfer mechanisms with rate equations while the second part equips students with knowledge of the fundamental laws of electricity and magnetism including static and time-varying electric and magnetic fields, Maxwell's equations and electromagnetic wave propagation in lossless and conducting media.

**EG1001 – ENGINEERS IN SOCIETY****Acad Unit: 2 AU****Pre-requisite: NIL**

This course aims to provide a general understanding of the society we live in and the engineers' roles and responsibilities towards society's well-being. The course covers a wide range of topics including the history of engineering, engineering ethics and practices, sustainability, and contributions by engineers towards society in the future. The students will have a holistic understanding of the role played by engineers and on their impact in society.

*\*Subject to changes*

## REP Year 2 Semester 1 (AY2024/25 Cohort)

### **RE2011 – RENAISSANCE DESIGN I**

**Acad Unit: 4 AU**

**Pre-requisite: NIL**

This course is the first of two parts to an integrated engineering innovate-and-design curriculum which aims to introduce a systematic engineering design process to the students and provide a design project experience to develop their design skills. The course therefore aims to provide students with an understanding of customer needs, product/design specifications, design concept generation, various design methodologies, aesthetics and industrial design, visual/graphic communication for promoting students' designs, and the application of computer-aided tools to the design/evaluation/manufacturing process of products/systems.

*\*Subject to changes*

## REP Year 2 Semester 2 (AY2024/25 Cohort)

### **RE2012 – RENAISSANCE DESIGN II**

**Acad Unit: 3 AU**

**Pre-requisite: RE2011 RENAISSANCE DESIGN I**

This course is the second of two parts to an integrated engineering innovate-and-design curriculum which aims to introduce a systematic engineering design process to the students and provide a design project experience to develop their design skills. The course therefore aims to provide students with the knowledge and experience of product/system design, prototype-building and testing, culminating in a design project with students working in teams to innovate multi-disciplinary engineering design solutions to practical problems with commercial/social/environmental considerations.

### **RE1201 – ACCOUNTING FOR MANAGERIAL DECISIONS**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course is designed for students who will confront an increasingly complex business world characterized by ethical issues, globalization, environmental and climatic changes, and rapid technological advancements. The course aims to provide students with essential accounting skills and knowledge to make informed judgments and decisions in addressing these challenges.

### **RE1202 – FOUNDATIONS OF ENGINEERING LEADERSHIP**

**Acad Unit: 1 AU**

**Pre-requisite: NIL**

This foundation course focuses on engineering leadership as a process of influencing self and others for some greater purpose. It helps students to understand their own engineering leadership style and how they can have more influence in their daily lives. It gives students practice at using various “interpersonal skills” that are increasingly required of engineers in a variety of settings.

The course is intended to be fun as this will help with learning both engineering leadership concepts and skills!

*\*Subject to changes*

## REP Year 4 Semester 1 (AY2024/25 Cohort)

### **RE1401 – FINANCIAL MANAGEMENT**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

The objective of this course is to provide a rigorous introduction to the foundations of financial management. The course is designed to equip students with the basic tools that are necessary in the financial management of a firm. Topics to be covered include time value of money, risk and return, portfolio and asset pricing theories, asset (stock, bond, and firm) valuation, investment decision, financing decision, and dividend policy.

### **RE6019 – ADVANCED TOPICS IN ENGINEERING LEADERSHIP**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course is designed to get students really thinking about what engineering leadership means for them, learn ways to think and act like an engineering (student) leader, and learn leadership skills that they can use in their day-to-day life. The course will be taught using a “flipped classroom” approach, meaning that students are required to do pre-seminar readings (through NTU CourseReserves) in their own time before coming to class. Each week, a seminar class will comprise interactive activities, role-plays, case studies and discussions, in which students are required to participate.

***\*Subject to changes***

## REP Year 4 Semester 2 (AY2024/25 Cohort)

### **RE1402 – STRATEGIC MARKETING**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course provides an experiential learning environment in which students will gain not only an appreciation but also a personal feel for the tasks of strategic marketing planning and decision making. Within this environment, students will learn to become an effective business decision maker with a market-oriented perspective, one who is capable of minimizing (though not completely removing) the uncertainties surrounding marketing decisions through disciplined analysis and prudent judgment.

### **RE6005 – DIGITAL TRANSFORMATION**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

Technology is changing the world. It is transforming the existing economic order and unleashing new ways of creating value. It is important for students who will be leading technology-enabled businesses, to understand that this new economic force means understanding technology, networks, and e-business. This course provides an overview of the new rules and dynamics of the digital world and the companies that rule it. The pedagogical approach is thus discussion-oriented, based completely on the concept of participant-centred learning. Classes are case-based and each class will be intensive and rely on directed peer-learning that is facilitated and moderated by the instructor.

### **RE6012 – THE LAW OF OBLIGATIONS & INTELLECTUAL PROPERTY**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

The Law of Obligations and Intellectual Property is a course that comprises two parts. In its first part, the course seeks to instill an understanding and appreciation of the key legal principles and concepts that underpin the law relating to contracts, which could be regarded as a fundamental aspect of the law described as the Law of Obligations. Students will be introduced to common law, equitable and statutory principles pertaining to the formation, contents, validity, termination and breach of contracts, as well as the various remedies available to contracting parties. The second part will focus on the legal treatment of intellectual property (IP), which could be described as creations of the human mind. Students will be introduced to three key types of IP, namely trademarks, copyright and patents, and will investigate how the law seeks to protect the rights of those who own IP and the limitations to such protection. In addition, students will have the opportunity of considering some of the current issues and emerging debates surrounding the protection of IP.

*\*Subject to changes*



## **RE6013 – GENERATIVE AI & WEB3 DECENTRALISED APPLICATIONS**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course addresses the transformative potential of combining Generative AI with Web3 decentralised applications to tackle real-world challenges. As industries shift towards decentralisation, understanding AI's role in creating practical solutions is crucial. The course offers hands-on experience in developing decentralised applications that leverage AI, focusing on projects and real-life problem-solving. Students will gain essential skills in innovation, digital content creation, and decentralised governance, preparing them to navigate and shape the future of technology with these cutting-edge tools.

*\*Subject to changes*

## REP Year 5 Semester 1 (AY2024/25 Cohort)

### **RE6015 – ENTREPRENEURSHIP, STRATEGY & INNOVATION: REAL WORLD APPLICATIONS**

**Acad Unit: 6 AU**

**Pre-requisite: NIL**

This course aims to enable students to learn concepts related to entrepreneurship, innovation and strategy, with a focus on applying the concepts in the real-world setting. Students will be exposed to start-up companies in various stages of the entrepreneurship process (starting, running and growing a business) and through hands-on projects, students will understand the challenges facing entrepreneurs at different stages of their life cycle. They will be working with start-ups and companies in this module and be able to experience first-hand real life business instances, develop multiple skills and acquire knowledge on concepts related to entrepreneurship, strategy and innovation management. Students will be systematically exposed to several cutting-edge technologies, such as AI/Big Data, CleanTech, FinTech, MedTech, and Emerging New Technologies, so that they can have a much better understanding in the innovation ecosystems around the world and in this region. In this module, students will be able to interact with different players in the start-up ecosystem and be able to seek their views and advice on the entrepreneurship process in Singapore. They will learn to avoid the mistakes made by these start-ups and hone their strategies and deliver feasible and implementable solutions. Finally, they will develop a full business plan for a proposed startup from each group, which will be judged by a panel of experienced industry experts, including CEOs of startups, VCs and Angels.

### **RE6016 – SYSTEM THINKING & HOLISTIC DECISION MAKING**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

The objective of this course is to introduce students to the fundamental theories on systems and practical techniques for holistic decision making. Lectures, case studies, and hands-on projects will be used in combination for teaching and assessment. At the end of the course, students are expected to be able to identify, define, analyse, and solve fairly complex system problems that cut across multiple disciplines including engineering, management, economics and finance etc. This course will help to prepare students to be future leaders and problem solvers who are capable of coming up with solutions that are not only technologically innovative but also with significant social impact.

*\*Subject to changes*

## **RE6017 – ETHICS & GOVERNANCE ISSUES IN TECHNOLOGY MANAGEMENT**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

This course will introduce students to the classical theories of ethical behaviour, as well as applied ethics, and their relevance and implementations in real-world technology applications faced regularly in the business world today. It aims to stimulate the students' sense of responsibility not just within the organisation, but to the society at large and to humanity in general. At the end of the course, students will be able to more readily recognise and be deeply aware of the various substantive ethical and governance issues pertaining to technology management and be able to apply the techniques that allow them to resolve the conundrums in a manner profitable to the business and ethically acceptable to society.

## **RE6018 – OPERATIONS & SUPPLY CHAINS**

**Acad Unit: 3 AU**

**Pre-requisite: NIL**

In this course, students will learn about operations strategy, and how it supports corporate strategy or how it inspires business model innovation. They will learn how to measure, analyse and design processes, which are critical to operational excellence. Subsequently, they will learn how to optimally leverage on the drivers of facilities, inventory, transportation, information, sourcing and pricing in order to address the complexity, uncertainty, dynamic environment, and fragmented ownership inherent in supply chains. In the process, the course will cover the success stories of Amazon's centralization, Walmart's cross-docking, Hewlett-Packard's postponement, Dell's modular design, Timbuk2's mass customization, Sport Obermeyer's quick response, Barilla's vendor-managed inventory, Ford's flexible manufacturing, and Blockbuster's revenue-sharing contract.

## **MSc Elective**

**Acad Unit: 3 AU**

**Pre-requisite: Depends**

Students may choose the MSc elective from the engineering schools under College of Engineering, College of Computing and Data Science, Nanyang Business School or NTU Entrepreneurship Academy. Places are subject to vacancies.

*\*Subject to changes*