REP Year 1 Semester 1 (AY2017/18 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 for the different groups of Materials. The aims of the course are to support students in:

- Relating atomic, molecular and microstructural features to the properties of engineering materials such as alloys, polymers, ceramics and composites.
- Understanding the material properties and failure mechanisms most relevant to engineering applications.
- Understanding the evolution of manufacturing processes to shape engineering components.

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 – CHEMICAL & BIOMOLECULAR ENGINEERING FUNDAMENTALS & APPLICATIONS
Acad Unit: 3 AU
Pre-requisite: NIL

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

The first part (biomoleculer engineering) is designed for those who have minimal biology background to learn the fundamentals of life sciences and its application in biotechnology. It emphasizes on conceptual appreciation of biological molecules, cellular structures and processes, and molecular interplays which are the basis of "chemical processes" in living systems. The objective of this part is to provide students with a comprehensive and concise overview of biological science with emphases on its application to biotechnology.

The second part (chemical engineering) introduces fundamental concepts and core competencies in chemical engineering with illustrations of key applications in relevant industries (e.g. petrochemical, pharmaceutical, and food).

The third part focuses on application and impact of relevant technology. It provides students with a comprehensive and concise overview of biological science with emphasis on its relationship with biomedical engineering. Another objective of this part is to build on fundamentals of basic mathematics, physics and chemistry in order to explore applications of engineering in biology and medicine. More importantly, this part emphasizes conceptual appreciation of the molecular interactions which are the basis of "biochemical processes" in living systems.

RE8011 – FUNDAMENTALS OF MANAGEMENT
Acad Unit: 3 AU
Pre-requisite: NIL

This course provides an introduction to the fundamental principles and practices 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 organizations 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. The four main functions of contemporary management - planning, organizing, leading, and controlling (P.O.L.C.) – constitute the foundational framework for this course.

Subject to changes

HY0001 – ETHICS & MORAL REASONING
Acad Unit: 1 AU
Pre-requisite: NIL

NTU undergraduates have moral/ethical duties as participants in an institution of higher learning, as citizens of a diverse nation, and as human beings in co-existence with others. HY0001 is a required 1 AU GER online learning course designed to provide NTU undergraduates with an opportunity to analyze and appreciate basic moral/ethical values such as benevolence, impartiality, and integrity. These basic values will be explored from the perspective of several leading ethical theories in contemporary moral philosophy. The ethical theories will serve as benchmarks to facilitate critical thinking on issues that raise difficult moral questions. Students will be challenged to articulate reasoned answers to these moral questions. Also, exercises in moral reasoning will be carried out through a comprehensive study of academic integrity and research ethics. The course will conclude with a discussion of the importance of ethics in thinking about efforts to sustain the natural environment.

GC0001 – SUSTAINABILITY: SEEING THROUGH THE HAZE
Acad Unit: 1 AU
Pre-requisite: NIL

The course aims to convey the importance of sustainability by providing comprehensive understanding through various academic disciplines. The course aims to inspire students to think about the sustainability issues, and motivate them to study their own disciplines in relation with sustainability. The course will help students develop the ability to analyze issues of sustainability through holistic understanding of multiple perspectives and disciplines.

ML0001 – ABSOLUTE BASICS FOR CAREER
Acad Unit: 1 AU
Pre-requisite: NIL

This course seeks to take students through a journey of career discovery in a fun and interactive manner. It aims to provide students with a deeper understanding of oneself and the know-how of crafting and establishing a professional brand of oneself through various job application methods and techniques. The objective is that students will benefit from the skills learnt through this course and perform well during internships and full-time employment.

Subject to changes

REP Year 1 Semester 2 (AY2017/18 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 course aims to first develop students' understanding in the fundamental concepts, implementations and applications associated with data structures in computing such as arrays, stacks, queues and linked lists, and to use such data structures to solve real world problems. Abstract data types and dynamic memory allocation will also be covered. Students will be 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 also 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 then be introduced to the fundamental knowledge of Linux based system running on low-power devices (e.g. Raspberry Pi board) and the common Linux operational commands. This will enable students to learn how to setup the multimedia tools and implement machine learning applications (e.g., object detection, facial recognition etc. on the Raspberry Pi board), as well as to design and to program an innovative application.

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, mechanical properties of materials and bending. 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 & ELECTROMAGNETISM
Acad Unit: 3 AU
Pre-requisite: NIL

The first part of this course aims to provide students with the introductory fundamentals 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 electromagnetism including static and time-varying electric and magnetic fields, Maxwell's equations and electromagnetic wave propagation in lossless and conductingmedium.

RE8012 – ACCOUNTING
Acad Unit: 3 AU
Pre-requisite: NIL

This course is designed for students who will face a business world increasingly complicated by ethical issues, globalization, environmental and climatic changes and rapid advancement in technology. The course aims to equip students with accounting skills and knowledge that are essential for making informed judgments and decisions to meet these challenges.

SP0001 – WRITING AND REASONING
Acad Unit: 3 AU
Pre-requisite: NIL

This course has two aims. First, students will learn to compose scholarly essays, craft arguments that are clear, rigorous in logic and evidence, original, and persuasive. Students will gain these skills through studying and discussing exemplary writing, emulating these examples in a series of increasingly demanding essay assignments, and critiquing the essay work of their peers. Second, students will develop a more critical perspective on university education and reflect on the purpose of that education.

Subject to changes

REP Year 2 Semester 1 (AY2017/18 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, the application of computer-aided tools to the design/evaluation/manufacturing process of products/systems.

RE8013 – FINANCIAL MANAGEMENT
Acad Unit: 3 AU
Pre-requisite: NIL

The objective of this course is to provide students with a broad understanding of the key financial principles, concepts and analytical tools. This is an introductory course in finance. Topics include the time value of money, interest rates, bond and stock valuation, capital budgeting, risk and return, cost of capital, capital structure, payout policy and an introduction to options.

RE0003 – COMMUNICATING AS A 21ST CENTURY ENGINEER
Acad Unit: 3 AU
Pre-requisite: NIL

This course aims to help students to become highly skilled communicators. Students will explore in depth how to use language appropriately and effectively, in varied academic and professional contexts, to achieve desired purposes with different audiences. While the course focuses on how to write and present dynamic technical proposals and reports, students will learn important general principles that they can apply to other forms of written and spoken communication. An important aspect of the course is that students will learn how to learn about effective communication on their own. This will involve them learning how to read, analyse and respond critically to a range of texts from engineering and other disciplines. The course also covers non-verbal aspects of communication, such as the use of graphics, as well as ethical dimensions of academic and professional communication.

Subject to changes

ML0002 – CAREER POWER UP
Acad Unit: 1 AU
Pre-requisite: ML0001

This module aims to polish students by furnishing them with intermediate career skills. It trains students with skills to transit and works effectively in their jobs. This will be done through training their networking and dining etiquette and furnishing them with business communication and resiliency in tackling their first job. In addition, this module will have a stronger focus on work values and ethics.

Subject to changes

REP Year 2 Semester 2 (AY2017/18 Cohort)

RE2012 – RENAISSANCE DESIGN II
Acad Unit: 4 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 knowledge about optimizing, prototype-building and evaluating their designs, and the use of visual/graphic communication for promoting their designs, 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.

RE8010 – STRATEGIC MARKETING
Acad Unit: 3 AU
Pre-requisite: NIL

The aim of this course is to challenge students to deal with evolving marketing situations and to learn to cope with uncertainty, ambiguity, time pressure, and interpersonal conflicts. The key course learning objectives are to sharpen analytical thinking and decision making skills, instill a sense of professional accountability, and to develop teamwork and interpersonal skills.

RE0004 – FOUNDATION OF ENGINEERING LEADERSHIP
Acad Unit: 1 AU
Pre-requisite: NIL

To be successful in today's VUCA (volatile, uncertain, complex, and ambiguous) world, engineers need to be able to do more than just solving technical problems and generating technical solutions. Organisations expect engineers to also have the ability to lead oneself, lead others and even lead the business as they progress in their careers from an individual contributor to a department head.

This foundational course is designed to teach students how to lead themselves as a start before they attempt to learn how to lead others and how to lead the business. Since the first step to become a great leader is to start from within, the course will begin by exploring what behaviours, traits and skills students display as a leader. Having gained clearer insights into who they are as a leader, the course will then explore the different ways in which students could develop their leadership competencies.

Subject to changes

REP Year 4 Semester 1 (AY2017/18 Cohort)

RE6019 – ADVANCED TOPICS IN ENGINEERING LEADERSHIP
Acad Unit: 3 AU
Pre-requisite: NIL

This course is designed to get you really thinking about what leadership means for you, learn ways to think and act like a leader, and plan what you need to do, beyond the course, to continue to develop your own leadership. The course will be presented in a blended learning format, which involves on-line readings, case studies and interactive activities; and in-class discussions, debates and leadership simulations

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Subject to changes

REP Year 4 Semester 2 (AY2017/18 Cohort)

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 our engineering 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.

RE6013 – BUSINESS ANALYTICS & APPLIED MACHINE LEARNING
Acad Unit: 3 AU
Pre-requisite: NIL

Business Analytics involves the art of problem definition, data exploration, visualization, communication and the Data Science of analysing large quantities of data in order to discover and validate meaningful patterns and useful insights to support or enhance decision-making. The primary objective of this course is to introduce students to various techniques and best practices to extract deep insights from the data. At the end of the course, students will not only see the substantial opportunities in our real world, but also learn techniques that allow them to exploit those opportunities

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.

Subject to changes

REP Year 5 Semester 1 (AY2017/18 Cohort)

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 of the course will be focused on the legal treatment of intellectual property (IP), which could be (albeit vaguely) 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.

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.

Subject to changes

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.

RE6018 – OPERATIONS AND 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, analyze 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

The elective course can be taken from the MSc programmes offered by the 6 engineering schools under College of Engineering. Students can choose to take the elective course starting from Year 4 Semester 1.

Subject to changes