REP Year 1 Semester 1 (AY2016/17 Cohort)

RE1001 - MATHEMATICS I  
**Acad Unit**: 4 AU  
**Pre-requisite**: A-Level H2 Mathematics

This course covers topics in basic mathematics with emphasis on real valued functions of a real variable. Limits of such functions, continuity and the Intermediate Value Theorem. Differentiability, chain rule, critical points, the Mean Value Theorem. Inverse functions and derivatives of inverse functions. Integrability and integrals. Fundamental Theorems of Calculus. Trigonometric, logarithm and exponential functions. Techniques of integration. Taylor’s formula. Infinite sequences. Infinite series. Power series and radius of convergence. Ordinary Differential Equations and techniques for solving such. Through the sample questions/exercises provided in the course material, the students will have chances to pick up the fundamental principles related concepts into engineering science applications.

RE1002 – ELECTRONICS & INFORMATION ENGINEERING I  
**Acad Unit**: 3 AU  
**Pre-requisite**: NIL

This course serves as an introductory course to circuit analysis, analog electronic and digital electronic. It first equips students with the fundamental principles of circuit theorems and circuit elements, circuit analysis using Laplace transforms. The concepts of frequency response and filter design, which are related to information engineering, will also be introduced. Following that, the course offers a brief introduction of fundamental electronic devices. The specific materials pertaining to analog electronics include diodes, Metal Oxide Semiconductor Field Effect Transistors (MOSFET), basic amplifier configurations, operational amplifiers. Lastly, it covers a broad range of fundamental digital circuits. The concepts of digital signals, number systems, logic gates, Boolean algebra, basic combinatorial and sequential logic circuits and programmable logic devices are to be imparted to the students.

RE1003 – MECHANICAL & STRUCTURAL ENGINEERING I  
**Acad Unit**: 3 AU  
**Pre-requisite**: NIL

The course aims to teach students about the basic fundamentals of statics, dynamics and mechanics of materials so that with this knowledge they can grapple with other engineering subjects in the first year dealing with rigid and deformable bodies. Knowledge of this course paves the foundation for a more specialized course Mechanical & Structural Engineering II to be offered in the 2nd year which deals with structural analysis of a system under static and dynamic forces.

*Subject to changes*
**RE1004 – ENGINEERING SCIENCE I**

Acad Unit : 3 AU  
Pre-requisite : NIL  

Engineering Science I serves as an introductory course for all Renaissance students in year-1. This course covers topics in basic physics with emphasis on electricity, magnetism, light and optics, and basic chemistry with more advanced discussions on the fundamental concepts and materials used in the earth, sustainability, chemical systems, biomedical processes and environmental related problems. Through the sample questions/exercises provided in the course material, the students will have chances to pick up the fundamental principles related concepts into engineering science applications. Students will also be exposed to laboratory sessions in drug synthesis, characterization and purification, and technical report writing and presentation.

**RE1005 – INTRODUCTORY THERMAL SCIENCES AND ELECTRICITY**

Acad Unit : 3 AU  
Pre-requisite : NIL  

The first part of this course aims to provide students with an understanding of the basic principles of electric power and machines. It covers the fundamentals of power systems, electromagnetism, transformers and rotating machines. The second part of this course aims to provide students with a good understanding of the fundamental principles of thermal-fluids sciences. It covers topics on fluid mechanics, temperature and ideal gases, laws of thermodynamics and mechanisms of heat and mass transfer. Applications of these concepts in solving simple engineering problems will also be covered.

**RE8003 – 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 (POLC) – constitute the foundational framework for this course.

*Subject to changes*
E1006 – MATERIALS & MANUFACTURING ENGINEERING
Acad Unit : 3 AU
Pre-requisite : RE1003 MECHANICAL & STRUCTURAL ENGINEERING I

This course provides an essential foundation to subsequent courses in the curriculum. As well as providing fundamental description of the underlying material science concepts, it enables the student to appreciate how these factors relate to the development of mechanical properties, functional properties, as well as manufacturing processes.

A pivotal objective in the course is environmental awareness and responsibility for material choice. The course is taught by a flipped classroom approach augmented with team based learning.

RE1021 - MATHEMATICS II
Acad Unit : 4 AU
Pre-requisite : RE1001 Mathematics I

Mathematics II serves as a second mathematics course for all Renaissance students in year 1. This course covers:
Calculus of Several variables: Partial derivatives, limits and continuity, chain rule, directional derivatives, gradients, Lagrange multipliers. Double integrals, area of a surface, triple integrals. Vector calculus, line integrals, Green’s Theorem, surface integrals, Gauss’s divergence theorem, Stokes’ Theorem.

Through the sample questions/exercises provided in the course material, the students will have chances to pick up the fundamental principles for engineering science applications.

RE2002 – ELECTRONICS & INFORMATION ENGINEERING II
Acad Unit : 3 AU
Pre-requisite : NIL

This is the second course on electronic and information engineering. It builds on the basic concepts and principles covered in Electronic and Information Engineering I to study more in-depth concepts of the laws of electromagnetism and transmission line circuits and control and information engineering. It first equips students with the necessary knowledge of the laws of electromagnetism, electromagnetic energy transfer and transmission lines. Following that, the course equips students with the fundamental system knowledge to model, analyse and control engineering systems. Lastly, the course offers a brief introduction on how control systems can be implemented using computer control, plus the associated issues of data and computer communications which are the foundations of information engineering will be imparted to the students.

*Subject to changes
RE2005 – ENGINEERING SCIENCE II
Acad Unit : 3 AU
Pre-requisite : NIL

The objective of the course is to provide students with a comprehensive and concise overview of biological science with emphases on its relationship with biomedical engineering. Another objective of this course is to build on fundamentals of basic mathematics, physics and chemistry in order to explore applications of engineering in energy, biology and medicine. Molecular cell biology from molecular structure, gene regulation to protein function will be presented from a bio/biomedical engineer's perspectives. The course emphasizes conceptual appreciation of the molecular interplays which are the basis of "biochemical processes" in living systems.

Engineering Science II serves as an introductory course for all REP students in year 2. It aims to equip students with a firm foundation and superior problem-solving skills in the science of chemistry and molecular cell biology. As an introductory course, it exposes the student to a wide spectrum of technical concepts. The topics include: introduction to cell, cell membrane & organelles, protein structure & function. DNA replication, recombination, transcription, translation, control of gene expression, cell division, cycle control, cell death, and biomechanics, molecular recognition, systems physiology, spectroscopy and pharmacokinetics. Student will also be introduced to the relevant applications of biotechnology and medicine, including applications such as regenerative medicine, biosensors and artificial organ devices.

RE2006 – ENGINEERING COMPUTATION
Acad Unit : 3 AU
Pre-requisite : NIL

This course aims to develop students’ understanding of 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. Furthermore, this course also aims at developing students’ understanding of a typical microprocessor that is used in a computer, how it functions and how it is programmed to solve problems. Students are introduced to the hardware architecture of the CPU used in typical microprocessors, the timing of different types of signals that control the functioning of the CPU. They are taught how to program a microprocessor using assembly language that resembles very closely the codes that are executed by the CPU. They also learn how different peripheral devices are interfaced to the CPU in order for a computer to interact with the external world.

RE8002 – ACCOUNTING
Acad Unit : 3 AU
Pre-requisite : NIL

This course is designed for Renaissance Engineering Programme (REP) 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.

*Subject to changes
REP Year 2 Semester 1 (AY2016/17 Cohort)

RE2003 – MECHANICAL & STRUCTURAL ENGINEERING II
Acad Unit : 3 AU
Pre-requisite : RE1003 MECHANICAL & STRUCTURAL ENGINEERING I

The course aims to provide students with the fundamental knowledge in the kinematics and dynamics of planar mechanisms, such as linkages mechanism. Both graphical and analytical techniques will be introduced and students will be able to apply the techniques in solving problems in mechanisms. It will also cover fundamental aspects of the vibrations of single degree and multiple degrees of freedom systems.

This course introduces the students some basic mechanisms including linkages, cams and gears. Mechanisms are the building blocks of a machine. In a machine design problem, very often the first task is to determine the type and configurations of mechanisms to provide the desired motions. Once the kinematic issues are addressed, the dynamic analysis can then be performed. In this course, techniques for the kinematic and dynamic analyses of mechanisms will be covered. A course in the theory of mechanisms is essential for any mechanical engineer as the knowledge is fundamental in understanding the working of machines. Apart from analytical ability, it also provides students the opportunities to develop their design capability.

On vibration of structural systems, it covers the equations of motion of single degree and multiple degrees of freedom systems, effects of damping, and the structural response to ground excitations.

RE2004 – RENAISSANCE DESIGN I
Acad Unit : 4 AU
Pre-requisite : NIL

The course is the first part of a two-part REP year 2 integrated engineering innovative and designs curriculum. The course contents span a wide spectrum of design thinking and techniques needed by REP students to plan and execute their designs. The special seminar on design will be delivered by a personage known for her/his design thinking and execution. After successfully completing this Course, REP students will be equipped with the requisite knowledge to go on to Part II, which is the instantiation of their design. The Course begins with creative/innovative thinking preceding conceptual design generation and an appreciation of design methodology. Superimposed on this is an understanding of the significance of aesthetics and user experience in design. Finally, students will be introduced to Computer-aided Design and Manufacturing and Computer-aided Engineering as enablers to bring to fruition their conceptual designs.

*Subject to changes*
RE8005 – FINANCIAL MANAGEMENT
Acad Unit : 3 AU
Pre-requisite : NIL

This objective of the 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.

*Subject to changes*
REP Year 2 Semester 2 (AY2016/17 Cohort)

RE2008 – RENAISSANCE DESIGN II
Acad Unit : 4 AU
Pre-requisite : RE2004 RENAISSANCE DESIGN I

This Course is part II of a two-part REP Year 2 integrated innovative engineering design curriculum. Having understood the basics of design in part I, in this Course Year 2 REP students are taught how to optimize their designs and to build prototypes for validation testing. At the same time, they will acquire knowledge of their design as a system, and also how to promote / market their invention. A special seminar to be delivered by a person renowned for innovative designs is being planned to cap the Course.

RE8010 – 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 during the course. The key course learning objectives are to sharpen analytical thinking and decision making skills, instil a sense of professional accountability, and to develop teamwork and interpersonal skills. The Markstrat simulation will be the main learning platform in this course. The bulk of the course activities will consist of executive briefings/debriefs, exercises, team meetings, and consultations with the instructor, memo writing, and applied assignments revolving around Markstrat, both in and outside the classroom.

*Subject to changes*
RE6005 – TECHNOLOGY, NETWORKS, E-BUSINESS
Acad Unit : 3 AU
Pre-requisite : NIL

This course explores the online and internet economy to understand the transformational role that IT can play and how businesses can leverage it to craft digital business strategies. 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 discussion-oriented, based completely on the concept of participant-centred learning. It is designed to prepare future executives for proactive leadership roles and responsibilities in a world which is being constantly challenged and shaped by IT and other digital technologies. It aims to impart participants with knowledge and a sense of responsibility when it comes to using and leveraging IT.

RE6006 – BUSINESS OPERATIONS MANAGEMENT
Acad Unit : 3 AU
Pre-requisite : NIL

The course objectives are two-fold. The first is to develop students’ analytical abilities and their knowledge of operations management, which will help them to better understand different problems, concepts, issues, and opportunities associated with businesses. The second objective is to help them understand linear programming, a technique that can be useful in solving business problems pertaining to optimization. The course is designed and intended primarily for engineering students who can potentially integrate their technical expertise with knowledge of how businesses operate in an increasingly globalized world. The project is intended to merge theory and practice.

*Subject to changes*
RE6003 – SUPPLY CHAIN MANAGEMENT
Acad Unit : 3 AU
Pre-requisite : NIL

In this course, students will learn four key challenges facing supply chain managers, six drivers of supply chain performance, techniques to optimize these key drivers, supply chain best practices, as well as strategies for supply chain coordination and integration. They will learn how to optimally leverage on facilities, inventory, transportation, information, sourcing and pricing in order to address the complexity, uncertainty, dynamic environment and fragmented ownership inherent in supply chains. The aims of the course are to provide an understanding and appreciation of key challenges in supply chain management and key drivers of supply chain performance as well as to expose students to techniques and strategies used to optimise supply chain decisions and to anticipate or explain supply chain phenomena.

RE6004 – SUBTAINABLE OPERATIONS: STRATGIES & METHODOLOGIES
Acad Unit : 3 AU
Pre-requisite : NIL

The objective of this course is to provide students with an understanding of the strategies, concepts and methodologies to make the manufacturing and service operations of an organization more sustainable (in terms of its usage of natural resources and in terms of its impact on the environment and the communities along its value chain.) Through case studies, the course will also discuss the technologies and innovations adopted by firms to implement sustainability in its operations. Topics covered in the course include business strategies for sustainability, framework for implementing sustainable operations, design for environment, life cycle assessment/analysis, standards for measurement of CO2 emissions, remanufacturing and reverse logistics, sustainable supply chains, policies for controlling carbon emissions, sustainable transportation, energy management, sustainable operations in agriculture and food supply chain, and socially responsible operations.

RE6007 – STRATEGY AND TECHNOLOGY INNOVATION MANAGEMENT
Acad Unit : 3 AU
Pre-requisite : NIL

The course aims to provide students with the ability to use tools for designing and implementing innovations that will address the opportunities and threats and frameworks for strategic analysis of technology-enabled opportunities and threats. This course focuses on innovation within small and large organisations, and across organisations in an ecosystem. Students will learn the fundamentals of organisation strategy and learn important innovation tools such as design thinking, opportunity analysis in technology commercialisation and innovation adoption. In the second half of the course, students will learn about critical innovation concepts such as technology-enabled disruptive innovations, technology ecosystem innovations, and emerging economy innovations.

*Subject to changes*
RE6008 – MANAGEMENT OF INTELLECTUAL PROPERTY & INNOVATION
Acad Unit : 3 AU
Pre-requisite : NIL

This course aims to provide students a good grounding in how the law facilitates and protects the development, management and use of innovations. It focuses on the protection of innovations under the various intellectual property (IP) laws and how they can be exploited in the manufacturing, marketing and service industries generally. The course also covers facets of the innovation process, strategic applications of IP in building competitiveness and the licensing and transfer of technology. In addition, the course incorporates the special concerns of IP in the areas of information technology, the Internet and the life sciences.

RE6011 – SPECIAL PROJECTS
Acad Unit : 6 AU
Pre-requisite : NIL

This course will enable students to apply their knowledge and skills in a real world setting with engineering/technology and business interdisciplinary interface (aligned with the multi-disciplinary pedagogical foundation of REP). It will also provide a curated platform for students to learn from the best in the industry through workshops, events and mentoring sessions. In addition, it provides a hands-on environment for students to work with entrepreneurs to develop plans and solutions (ie social marketing plan, data analytics plan, fundraising plan etc) to challenges faced by the start-ups. The course will enable students to develop a multitude of both soft skills (ie networking, confidence, presentation, etc) and hard knowledge on entrepreneurship.

*Subject to changes