The following course content is for MAE students under the NTU Education (BRC).

The courses shown below do not reflect the offering status. As the curriculum will be reviewed on a yearly-basis, the course offerings are subject to the curriculum directions and availability of resources. Please refer to the pages that indicate the semester offerings.

(Offering in AY2017/18 & AY2018/2019)

MA1008 Introduction to Computational Thinking
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Overview of Programming Languages; Basic internal operation of computer; Basic program structure; CT concepts (Abstraction, Decomposition, Pattern recognition, Algorithm); Limit of computing; Computing trends; Social-Ethical Issues and Ramifications of Computing

FE1073 An Introduction to Engineering and Practices
[Pre-requisites: Nil; Academic Unit: 1.0]
Content: (Lab C1) Resultants and equilibrium of forces, (Lab C2) Deformation of elastic body, (Lab M1) Work and energy, (Lab M2) Conservation of momentum, (Lab E1) Electric field, (Lab E2) Magnetic field, (Seminar C1) Introduction to Civil and Environmental Engineering, (Seminar M1) Introduction to Mechanical and Aerospace Engineering, (Seminar E1) Introduction to Electrical and Electronic Engineering.

HW0188 Engineering Communication I
[Co-requisites: HW0001; Academic Unit: 2.0]
Content: Produce short academic prose relevant to the field; Write an audience-specific short technical proposal/report; Present key topics in engineering

HW0288 Engineering Communication II
[Pre-requisites: HW0188; Academic Unit: 2.0]
Content: Apply various principles of technical writing to produce an effective FYP report; Understand the communication demands of the contemporary workplace; Make effective technical presentations, with reference to their FYPs and the workplace.

MH1810 - Mathematics 1
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Complex numbers, vectors and matrices, Limits and continuity of functions, Derivatives, Applications of derivatives, Integration, Integration methods, Applications of integration.

MH1811 Mathematics 2
[Pre-requisite: Nil; Academic Unit: 3.0]

MH2810 Mathematics A
This course is only applicable to Poly Direct Entry Students.
[Pre-requisite: Nil; Academic Unit: 4.0]

PH1011 Physics
[Pre-requisites: A level physics; Academic Unit: 3.0]
PH1012 Physics A
This course is only applicable to Poly Direct Entry Students and JC students without A Level Physics.
[Pre-requisites: Basic trigonometry and calculus; Academic Unit: 4.0]


MA0101 Engineers & Society
[Pre-requisite: Nil; Academic Unit: 3.0]

Content: History of Engineering; Pre-independence history of Singapore; Social and political development issues; Economic and industrial development issues; National cohesion and total defence; Engineering practice in Singapore; Engineering ethics; Our neighbours and international; Challenges of globalization and the new economy; Contribution of engineers in the new millennium.

MA1001 Dynamics
[Pre-requisite: Having read PH1011/PH1012/CY1305/CY1308 and MH1810/MH2812/CY1201; Academic Unit: 3.0]

Content: Kinematics of Particles; Kinematics of Rigid Bodies; Kinetics of Particles; Kinetics of Rigid Bodies

MA1002 Fundamental Engineering Materials
[Pre-requisite: Nil; Academic Units: 3.0]


MA1700 Aerospace Discovery Course
[Pre-requisites: Nil; Academic Unit: 1.0]

Content: Laboratories and design competition

MA1701 Introduction to Aerospace Engineering
[Pre-requisite: Nil; Academic Unit: 3.0]

Content: Historical Perspective Of Aerospace Engineering & Overview Of Aerospace Clusters; Introduction To Aerodynamics; Introduction To Propulsion; Overview Of Aircraft Systems and Aircraft Support Systems; Introduction To Aerospace Structures & Materials; Aircraft Performance, Stability & Control; Introduction To Helicopters.

MA2001 Mechanics of Materials
[Pre-requisite: Nil; Academic Unit: 3.0]

Content: Review, Stress And Strain, Torsion, Shearing Stress in Beams, Transformation of Stress and Strain, Deflection of Beams, Columns.

MA2002 Theory of Mechanism
[Pre-requisite: MA1001; Academic Unit: 3.0]


MA2003 Introduction to Thermo-fluids
[Lectures: 26 hrs; Tutorials: 13 hrs; Pre-requisite: Nil; Academic Unit: 3.0]


MA2004 Manufacturing Processes
[Pre-requisite: Nil; Academic Units: 3.0]

MA2005 Engineering Graphics
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Orthographic projections; Pictorial views and technical sketching; Drawing standards and practices; Sectional views and machine drawings; Development of surfaces; Dimensioning standards, systems and conventions; Dimensioning features and finishes; Tolerance dimensioning and limits; Geometric dimensioning.

MA2006 Engineering Mathematics
[Pre-requisite: FE1006/MH1810 and FE1007/MH1811 or CY1201 and CY1203 or MA1003/MH2812; Academic Unit: 3.0]
Content: Linear algebra, vector calculus, Laplace transformation and Fourier analysis.

MA2007 Thermodynamics
[Pre-requisite: MA2003; Academic Unit: 3.0]

MA2009 Introduction to Electrical Circuits & Electronics Devices
[Pre requisite: Nil; Academic Unit: 3.0]
Content: Analysis of Resistive Linear Networks, Energy Storage Elements and Transient Analysis, AC network analysis, Operational Amplifiers and applications, Basic semiconductor devices and applications, Logic Circuits

MA2011 Mechatronics System Interfacing (Mechatronics Stream only)
[Pre-requisite: Nil; Academic Unit: 3.0]

MA2012 Introduction to Mechatronics Systems Design (Mechatronics Stream only)
[Pre-requisite: Nil; Academic Unit: 3]
Content: Introduction to Mechatronics system, Embedded Systems, Interfacing to actuators & sensors, Interfacing to input and output devices, Introduction to web tools. Students are required to complete a group project where they are to design, fabricate and demonstrate your product to the class.

MA2013 Creative Thinking and Design (Design Stream only)
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Fundamental Design, Design Methods, Creative Thinking

MA2014 Product Presentation (Design Stream only)
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Presentation Techniques, Model-Making Methods

MA2071 Laboratory Experiments (ME)
[Pre-requisite: Nil; Academic Unit: 1.0]
Content: Consists of 10 experiments related to Year 2 MAE core courses.

MA2072 Laboratory Experiments (AE)
[Pre-requisite: Nil; Academic Unit: 1.0]
Content: Consists of 10 experiments related to Year 2 MAE core courses.

MA2079 Engineering Innovation and Design
[Pre-requisite: Nil; Academic Unit: 2.0 ]
Content: Introduction to Business planning, and Project management; Practice in generating ideas and creative products, and technology and innovative engineering solutions through i-Project.
MA2700 Aerospace Materials & Manufacturing Processes
[Pre requisite: Nil; Academic Units: 3.0]

MA2701 Flight Performance
[Pre-requisite: MA1001 and MA1700; Academic Unit: 2.0]

MA3001 Machine Element Design
[Pre-requisite: Having read MA2001 and MA2002; Academic Unit: 3.0]

MA3002 Solid Mechanics and Vibration
[Pre-requisite: MA2001; Academic Unit: 3.0]

MA3003 Heat Transfer
[Pre-requisite: MA2007; Academic Unit: 3.0]

MA3004 Mathematical Methods in Engineering
[Pre-requisite: MH1810 and MH1811 or CY1203 or MH2812; Academic Unit: 3.0]

MA3005 Control Theory
[Pre-requisite: Having read MA2006; Academic Unit: 3.0]
Content: Introduction and Revision of Laplace Transform, System Responses - transient and steady, PID Controls, Root Locus Technique, Frequency Response Methods.

MA3006 Fluid Mechanics
[Pre-requisite: MA2003; Academic Unit: 3.0]
Content: Momentum equation and its applications. Dimensional analysis and similitude. Internal flows and piping systems. Principles and applications of fluid machines.

MA3010 Thermodynamics & Heat Transfer
[Pre-requisite: MA2003; Academic Unit: 3.0]

MA3071 Engineering Experiments (ME)
[Academic Unit: 1.0]
Content: Consists of projects and experiments related to Year 3 MAE core courses.

MA3072 Engineering Experiments (AE)
[Academic Unit: 1.0]
Content: Consists of projects and experiments related to Year 3 MAE core courses.

MA3700 Aircraft Structures I
[Pre-requisites: MA2001; Academic Unit: 3.0]
Content: Structural components of an aircraft. Loads on aircraft. Aircraft structural components and

**MA3701 Aerodynamics**  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Introduction, fundamental principles, potential flows, incompressible flows over airfoils, finite wings, fundamentals of gas dynamics, shocks, subsonic compressible flow, transonic flows, linearized supersonic flows.

**MA3702 Aircraft Propulsion**  
[Pre-requisite: MA2007; Academic Unit: 3.0]  
**Content:** Essentials of Thermodynamics, Fundamentals of Aircraft Propulsion, Propulsion Engines and Performance Analysis, Combustor and Combustion, Introduction to Rocket Propulsion.

**MA3703 Flight Dynamics**  
[Pre-requisite: MA2701 and MA3705; Academic Unit: 2.0]  
**Content:** Introduction. Static stability and control. Six degree-of-freedom aircraft flight modeling. Linearization and linear system theory. Linearized aircraft equations of motion. Longitudinal and lateral-directional dynamics. Introduction to aircraft control.

**MA3704 Aircraft Electrical Devices**  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Aircraft electrical power systems, Electromagnetic principles and actuators, Electrical transformers, Electrical rotating machines.

**MA3705 Aerospace Control Theory**  
[Pre-requisite: MA3703 and having read MA2006; Academic Unit: 3.0]  

**MA4001 Engineering Design (Mainstream only)**  
[Pre-requisite: Having read MA3001; Academic Unit: 4.0]  
**Content:** Product Definition; Conceptual Design; Embodiment Design; Detailed Design and Engineering Analysis And Documentation; Mechanical Power Transmission Systems; Hydraulic And Pneumatic Systems; Electric Motors And Linear Motion Systems; Programmable Logic Control (PLC) techniques. Review of basic engineering materials properties and failure modes; Basics materials selection in design; Effect of component geometry in materials selection; Compound objectives and multiple constraint problems; Cost estimation tools.

**MA4002 Fluid Dynamics**  
[Pre-requisite: MA3006; Academic Unit: 3.0]  

**MA4011 Engineering Product Design (Design Stream only)**  
[Pre-requisite: Having read MA3001; Academic Unit: 4.0]  
**Content:** Product definition; Conceptual design; Embodiment design; Detailed design and engineering analysis and documentation; Mechanical power transmission systems; Hydraulic and pneumatic systems; Electric motors and linear motion systems; Programmable logic control (PLC) techniques. Review of basic engineering materials properties and failure modes; Basics materials selection in design; Effect of component geometry in materials selection; Compound objectives and multiple constraint problems; Cost estimation tools.

**MA4012 Mechatronics Engineering Design (Mechatronics Stream only)**  
[Pre-requisite: Having read MA3001; Academic Unit: 4.0]  
**Content:** Product definition; Conceptual design; Embodiment design; Detailed design and engineering analysis and documentation; Mechanical power transmission systems; Hydraulic and pneumatic systems; Electric motors and linear motion systems; Programmable logic control (PLC) techniques. Review of basic engineering materials properties and failure modes; Basics materials selection in design; Effect of
component geometry in materials selection; Compound objectives and multiple constraint problems; Cost estimation tools.

**MA4701 Aircraft Design**  
[Pre-requisites: MA3701, MA3702, and MA3703, Academic Units: 3.0]  

**MA4702 Aircraft Structures II**  
[Pre-requisites: MA2001, MA3700, and MA3701; Academic Unit: 3.0]  

**MA4704 Aeroelasticity**  
[Pre-requisite: MA3700 and MA3701; Academic Unit: 3.0]  
**Content:** Introduction to Aeroelasticity, Review of Structural Dynamics, Static Aeroelasticity, Unsteady Aerodynamics, Flutter.

**MA4705 Aircraft Navigation and Flight Computers**  
[Pre-requisite: MH1811/FE1007/CY1203/CY1602/MH2812/MH2810; Academic Unit: 3.0]  
**Content:** Introduction to Signal and Processes; Radio and Inertial Navigation; Basics of Navigation Data Processing; Fundamental and Trend of Flight Computers and Flight Control Systems.

**MA4803 Noise and Vibration Control**  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Fundamentals of Vibration; Measurement of Vibration; Design for Vibration Control; One-Dimensional Acoustic Waves; Acoustic Transmission Phenomenon; Sound in Enclosed Space; Sound Propagation Outdoors; Human Response to Noise and Measurement of Noise.

**MA4804 Optimisation Theory and Applications**  
[Pre-requisite: MH1810/CY1201/MH2810; Academic Unit: 3.0]  
**Content:** Introduction and Overview; Fundamental Concepts in Optimization; Categorization of Optimization Problems and Methods; Non-Linear Programming; Linear Programming; Discrete Optimization; Software Tools; Multi-Objective Optimization.

**MA4807 Marine Structural Integrity**  
[Pre-requisite: MA2001; Academic Unit: 3.0]  
**Content:** Loads and its effect on Marine structures. Analysis of Marine structures. Fatigue and fracture analysis in Marine engineering systems component. Failure analysis in Marine engineering systems component. Structural integrity design of welded structures. Structural integrity design of Offshore structures.

**MA4808 Marine Control Systems**  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** This course introduces Electrical Machines and Electrical Power Systems, Fluid Power Control, Pumps and Piping Systems, Automation & Control in Marine Engineering Systems.

**MA4811 Psychrometry and Air Conditioning**  
[Pre-requisite: MA3003; Academic Unit: 3.0]  

**MA4813 Building Services Engineering**  
[Pre-requisites: MA3003; Academic Unit: 3.0]  
**Content:** A strong emphasis is placed on the study of fire in buildings as it is recognised that fire in buildings claims the lives of around 10-20 people per million of population each year and its total cost could
amount to 1% of a nation's GDP. This course will cover the principles of enclosure fire dynamics, its applications to building fire and smoke analysis and basic design methods for fire-fighting systems. Similarly, a modern high-rise building will need efficient vertical transportation, a safe potable water supply, and hygienic waste water disposal system. As such the concept of statistical analysis of demand and cost effective systems design applied to piped services and vertical transportation systems are covered.

**MA4814 Computational Fluid Dynamics**

[Pre-requisites: MA3006 and MH1811/CY1203/MH2812/MH2810; Academic Units: 3.0]

**Content:** Introduction to computational fluid dynamics. Basic concepts of discretization. Numerical solution of model flow equations. Complex geometries and mesh generation. Turbulence models. Invited Industrial Application Seminar. Computational fluid dynamics laboratory experiments.

**MA4822 Measurements and Sensing Systems**

[Pre-requisite: Nil; Academic Unit: 3.0]

**Content:** An introductory level to the principles of measurements and the various types of sensors used in common engineering applications. The course content will cover measurement principles and errors, the operating principles and the underlying physics of the sensors and selection criteria.

**MA4825 Robotics**

[Pre-requisite: (From AY2019:MA3001 Machine Element Design & MA3005 Control Theory); Academic Unit: 3.0]

**Content:** Introduction to robotics. Robot actuators and sensing systems. Fundamentals of rigid body motion. Kinematics of robot manipulators. Motion planning and programming. Dynamics and control of robot manipulators. Robotics design and applications.

**MA4830 Realtime Software for Mechatronic Systems**

[Pre-requisite: Nil; Academic Unit: 3.0]


**MA4831 Computer-aided Engineering**

[Pre-requisite: Nil; Academic Unit: 3.0]


**MA4832 Microprocessor Systems**

[Pre-requisite: Nil; Academic Unit: 3.0]


**MA4837 Net Shape Manufacturing**

[Pre-requisite: MA2004 or RE1006; Academic Unit: 3.0]


**MA4838 Non-conventional Manufacturing Processes**

[Pre-requisite: Nil; Academic Unit: 3.0]

**Content:** This course will cover the subject of non-conventional manufacturing processes- an area which has relevance to industries such as biomedical, aerospace and precision engineering. The course will begin by comparing non-conventional processes with the more traditional manufacturing approaches. This will be followed by each of the main removal mechanisms (mechanical, chemical and thermal) being presented along with their advantages, limitations and applications. The combination of these techniques amongst themselves or with more traditional machining processes will be covered under hybrid processes. The course will conclude with a series of case studies reinforcing the proliferation of these processes in industry.

**MA4842 Engineering Metrology**

[Pre-requisite: Nil; Academic Unit: 3.0]

**Content:** Metrology is an important topic covering all aspects of engineering and science. This course will focus on introducing the students to the fundamentals of measurement including topics such as why we
measure, the SI system as well as the terminology used. Calibration has long been a neglected area of measurement but with the rapid adoption of ISO quality standards the need to demonstrate the frequency and method of calibration has taken on added importance. The main areas of metrology which are relevant to mechanical engineers are mechanical, surface, dimensional and optical metrology. These four areas will be addressed with detailed coverage of the principles, the instrumentation and their application. The course will also place significant importance on the case studies as a way of reinforcing the concept as well as demonstrating their widespread use in industry. Some of the case studies will look at historical examples of famous metrological failures, various measurement examples as well as industry-based problems.

MA4843 Management of Product Development  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Product development is an integrated process of marketing, engineering and production and effective management of the product development ensures that quality products are launched on time. It focuses on planning processes, identifying customer needs, defining the product specifications, generating concepts, concept selection and testing and organizational support. This course provides CoE undergraduates with a deep understanding of product development concepts and equips them with skills to manage the various stages of product development. This course connects new product development to management issues on concept generation, selection, development and evaluation. This course also includes innovative management, product/brand strategy so the student can acquire knowledge about new product development needed when they start work.

MA4845 Manufacturing Automation  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** In this 39-hour course, students will acquire the basic knowledge of manufacturing automation. The content includes topics on types of manufacturing automation, Additive Manufacturing (AM) and its applications, Computer-aided manufacturing and automatic assembly.

MA4846 Product Design Engineering  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** In this course, students will acquire the basic knowledge of plastic, die and sheet metal design culminating in Design for Manufacture. With the acquired knowledge, students will embark on a team project to conceptualize a new product that will require the use of such parts.

MA4849 Operations Research  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Refresher on probability models; Decision-making under uncertainty; Utility and risk analysis; Forecasting; Queuing models; Inventory models, planning and control; linear and integer programming; transportation and assignment problems; network optimization; Application to manufacturing, logistics and healthcare systems.

MA4850 Supply Chain and Logistics Management  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Introduction to supply chain management; Value of information; Multi-echelon Inventory models; Supply Chain strategies; Supply chain and logistics network design; Warehousing and transportation management; SC benchmarking and performance measurement.

MA4853 Manufacturing Systems  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Introduction to Manufacturing Systems, Facility layout design and line balancing, Production planning, Variability, Production scheduling and shop floor control.

MA4854 Quality Assurance and Management  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** Introduction to Quality Assurance and Management including the fundamentals, philosophies, practices, tools and international standards.

MA4856 Naval Architecture and Marine Engineering  
[Pre-requisite: Nil; Academic Unit: 3.0]  
**Content:** This course introduces Ship Layout & Stability, Ship Structural Strength, Ship Resistance, Ship Propulsion, Marine Power Plants, Advanced Power Plant Technologies, and Ship Service Systems.
MA4857 Human Factors for Design
[Pre requisite: Nil; Academic Unit: 3.0]
Content: This course is designed to develop an understanding of human anthropometrics, physiology, biomechanics and psychology. It provides a multidisciplinary background in these areas, as well as their application to the practical problems in ergonomics and usability that are encountered when designing products, environments, and services.

MA4858 Product Design
[Pre requisite: MA2014 Product Presentation & MA2013 Creative Thinking and Design; Academic Unit: 3.0]
Content: This course encourages students to identify potential areas where new technologies can offer solutions to user needs. It seeks to develop in the student an understanding of how by identifying user needs and applying the principles of human-centric design, new products can be developed. In order to ascertain how people actually use products the students will do hands-on research by observing potential users, conducting user surveys and analyzing the results. From this data the students will develop and refine their product design ideas. The students are encouraged to look at emerging technologies that could be incorporated into their design solutions. The course culminates in a project where students learn to ideate, design, develop using 3D CAD techniques and create working/non-working prototypes (dummy models) that meets the needs and fits the ergonomic requirements of the user. In doing so the incorporation of emerging technologies in an appropriate and innovative manner is also addressed.

MA4870 Mechanics of Composite Materials
[Pre-requisite: MA2001; Academic Unit: 3.0]
Content: Introduction to Composite Materials; Mechanics of Components; Analysis of Laminated Plates; Design of Composite Structures.

MA4871 Non-Destructive Testing
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: The course will introduce the Review of NDT, NDT Methods.

MA4872 Aircraft Reliability and Maintainability
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Introduction to Maintenance, Repair and Overhaul; Reliability; Maintainability; Availability; Data Collection and Analysis; Management; Safety.

MA4873 Intermediate Aerodynamics
[Pre-requisite: MA3703; Academic Unit: 3.0]
Content: Viscous flows, solution of the Navier-Stokes equations, boundary layer theory, hypersonic flows, panel codes, biological aerodynamics, aerodynamic design examples.

MA4878 Unmanned Aerial Vehicles
[Pre-requisite: MA3701 and MA3703; Academic Unit: 3.0]

MA4880 Airport Operations and Systems [to be offered from AY2018/19 S2]
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Introduction to Airport as a System; Airport Master Planning and Forecasting; Airfield Design: Runways and Taxiways; Airport Obstruction Analysis; Airport Tower Sitting Requirements; Airport Terminal Design; Airport Air Traffic Control (Approach, Tower and Ground); Airport Navigation Aids (DME, VOR, ILS, PAPI, VASI, RAILS); Airport Weather Systems (TAF and METAR); Airport Environmental Impact (Aviation Noise); Airport Capacity Modelling; Airport Delay Modelling

MA4881 Air Traffic Management [to be offered from AY2019/2020 S1]
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Introduction to Air Traffic Management; Airspace Structures and ATC Procedures; Air Traffic Communication Systems and Procedures; Air Navigation System and Procedures; Air Traffic Surveillance Systems; Airspace Operations in Singapore; Airport Operations; ATC Tower Operations; Weather and ATM; Environmental Impact of ATM; Human Factors in ATM; Advanced ATM Concepts

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MA8005 Aircraft Electrical and Electronics Circuits
[Pre requisite: Nil; Academic Unit: 3.0]
Content: Logic Circuits; Resistive circuits and circuit theorems; Energy storage elements and transient response; AC circuits; Operational Amplifiers; Diode Circuit Analysis; Transistor Switches.

MA8103 Human Resource Management
[Pre-requisite: Nil; Academic Unit: 3.0]

MA8105 Engineering Management Analysis
[Pre-requisite: Nil; Academic Unit: 3.0]

MA9001 Introduction to Energy
[Pre-requisites: Nil; Academic Units: 3.0]
Content: Overview of energy scenario with respect to demand, availability, environmental concerns, and followed by description of the electricity system. Then each energy source is introduced briefly, covering both conventional and renewable sources. The challenges in energy storage and conversion are discussed. Lastly, efficient energy utilization and energy conservation are discussed.

MA9030 Bioprinting: Principles and Applications
[Pre-requisites: Nil; Academic Units: 3.0]
Content: Introduction to Tissue Engineering; Scaffolds for Tissue Engineering; Materials for Bioprinting; Cell Sources for Bioprinting; Bioprinting Techniques; 3D Cell Culture Techniques; Computational Design

MA9031 3D Printing and Additive Manufacturing – Principles and Applications [only offered for GEM Trailblazer Summer programme ]
[Pre-requisites: Nil; Academic Units: 3.0]
Content: Introduction; Process Chain; Liquid Based 3D Printing Systems; Solid Based 3D Printing Systems; Powder Based 3D Printing Systems; STL File Format; Applications and Case Studies; Benchmarking, Groth and Trends

MA9032 Standards and Laser in 3D Printing [only offered for GEM Trailblazer Summer programme ]
[Pre-requisites: Nil; Academic Units: 3.0]
Content: Introduction to 3D printing; Standards and Measurement Sciences Roadmap; Data Format Standard and Process Monitoring; Material characterization; Equipment qualifications; Benchmarking; Intro to Lasers and Basic Optics for 3D Printing and Manufacturing; Materials for Laser-based 3D Printing and Manufacturing; One-, Two-, and Three-Dimensional Laser Assisted Manufacturing; Laser-based 3D Printing; Advanced 3D Manufacturing: Micro and Nanoscale Patterning; Future prospects & Laser Safety

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MA4829 Machine Intelligence
[Pre-requisite: MA3005/MA3705; Academic Unit: 3.0]

MA4833 Visualization and Virtual Reality in Product Design
[Academic Unit: 3.0]
Content: Visualization and VR play an important role in modern product design. Research and development in Visualization and VR are also developing at a very fast pace. This subject introduces both basic concepts and advanced techniques to enable engineering students to use Visualization and VR for product design applications. This Course emphasizes fundamentals on graphics, visualization and VR and applies them to product design issues on realism, real-time interaction, immersion and integration. Hands-on laboratory and project work is an integral part of the subject allowing students to build up practical knowledge and skills while using the latest visualization and VR technology.

MA4874 Rotorcraft
[Pre-requisite: MA3701; Academic Units: 3.0]

MA4876 Advanced Aircraft Propulsion
[Pre-requisite: MA3702; Academic Unit: 3.0]
Content: The course will introduce the fundamental principles of fluid mechanics and thermodynamics encountered in supersonic and hypersonic flight. The working principles and the performance analysis of ramjet and scramjet engines will be covered.