NTU Education (BRC) Course Listing

The following course content is for part-time ME 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.

MA0100 Environmental Sustainability
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Environmental degradation/Industrial ecology. Global landscape of environmental policies. Air pollution. Energy efficiency, renewable and clean energy. Sustainable materials. Waste and Recovery. Life cycle assessment.

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/C Y1305 and MH1810/MH2812/C Y1201; 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]
Content: Engineering materials and their mechanical properties. Bonding, Crystal Structure, Defects, and Diffusion. Strengthening and toughening mechanisms. Creep, fatigue and fracture. Ceramic Materials, Structure and Properties. Structure of Polymers. Corrosion and Degradation.

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]
Content: Fundamental Concepts of Mechanisms, Gears and Gear Train, Motion in Mechanisms: Kinematic Analysis, Motion in Mechanisms: Static-Force Analysis, Motion in Mechanisms: Dynamic-Force Analysis, Design and Analysis of Cam-and-Follower Systems.

MA2003 Introduction to Thermo-fluids
[Lectures: 26 hrs; Tutorials: 13 hrs; Pre-requisite: Nil; Academic Unit: 3.0]
Content: Properties of pure substances. Work and heat. Energy and the first law. Energy balance for closed systems and steady state control volumes. Submerged surfaces and bodies. Elementary fluid dynamics.

MA2004 Manufacturing Processes
[Pre-requisite: Nil; Academic Units: 3.0]
Content: Introduction and overview of manufacturing. Dimensions and surfaces measurement. Casting. Shaping processes for polymers. Sheet metalworking. Materials removal processes. Joining processes. Microelectronics manufacturing.

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]
Content: Second law and entropy. Entropy balance for closed systems and steady state control volumes. Ideal gas mixtures and psychrometrics. Thermodynamic cycles for power plants and refrigeration systems. Reacting mixtures and combustion.

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

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

MA3001 Machine Element Design
[Pre-requisite: Having read MA2001 and MA2002; Academic Unit: 3.0]
Content: Power transmission components. Dimensioning and tolerancing according to ISO standards, surface finish. Bearings. Threaded fasteners, power screw, Design of load carrying joints. Designing against fatigue loading and wear. Design of machine structures.

MA3002 Solid Mechanics and Vibration
[Pre-requisite: MA2001; Academic Unit: 3.0]
Content: Energy Method of Analysis. Fracture Mechanics. Fatigue. Vibrations for Single-Degree-of-Freedom System. Vibrations for Two-Degree-of-Freedom System.

MA3003 Heat Transfer
[Pre-requisite: MA2007; Academic Unit: 3.0]
Content: Conduction, Convection, Heat Exchangers, Radiation Heat Transfer.

MA3004 Mathematical Methods in Engineering
[Pre-requisite: MH1810 and MH1811 or CY1203 or MH2812; Academic Unit: 3.0]
Content: Partial Differential Equations (PDEs). Finite Element Method (FEM). Computational Fluid Dynamics (CFD).

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]
Content: Second law and entropy. Entropy balance for closed systems and steady state control volumes. Ideal gas mixtures and psychrometrics. Heat transfer: conduction, convection and radiation..

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

MA4001 Engineering Design
[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]
Content: General equations of motion. Potential flow. Isentropic compressible flow. Normal shock waves, Fanno and Rayleigh line flows. Boundary layer flow. External flow. Performance characteristics of pumps and turbines. Unsteady flow.

MA4831 Computer-aided Engineering
[Pre-requisite: Nil; Academic Unit: 3.0]
Content: Introduction. Overview. Historical perspective. Computer graphics. Computer-aided design. Dynamic analysis. Computer-aided manufacturing.

MA4837 Net Shape Manufacturing
[Pre-requisite: MA2004 or RE1006; Academic Unit: 3.0]
Content: Advanced metal casting. Powder metallurgy. Powder shaping and full density processes. Bulk deformation proceses. Sheet metal forming processes. Plastics shaping processes. New and emerging technologies.

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 part design, sustainable design and 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.

MA8103 Human Resource Management

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

Content: The Nature of Human Relations. The study of individual behavior. Behavior of Groups and Productivity Practices. Managing Technological Change. Managing in Knowledge-based Futures. Fundamentals of Leadership. HRM Skills of a Leader: Developing, Appraising and Rewarding Staff. Managing Performance: Corporate, Group and Individual. Productivity Innovation, Creativity and Inventive Culture. Internationalization and HRM. Managing Industrial Relations. Personal Career Development. Topical HRM Issues.

MH2810 Mathematics A

[Pre-requisite: Nil; Academic Unit: 4 .0]

Content: Complex numbers. Vectors. Calculus of single variable: Limits, Derivatives. Integration. Sequences & Series. Power Series (Taylor Series & Maclaurin Series). Ordinary Differential Equations. Multivariable calculus: Partial Derivatives & Applications, Double/Triple integrals & Applications.

PH1012 Physics A

[Pre-requisites: Basic trigonometry and calculus; Academic Unit: 4.0]

Content: Vectors, Kinematics, Forces and Torques, Newton's Laws of Motion, Impulse and Momentum, Work and Energy, Thermal Physics, Electric Field, Magnetic Field, Motion of Charged Particles and Applications, Circuits.