

1.6.2 Description of courses

MSc (Biomedical Engineering)

Core Courses

M6503 Biomedical Instrumentation

AUs: 3, Prerequisites: NIL, Semester: 2

Introduction to Medical Instrumentation, Transducers and the Measurement of Physiological Events, Chemical Biosensors, Clinical Laboratory Instrumentation, Electrodes and Bioelectric Events, Stimulators and Stimulation, Lasers and Medical Optics, Radiant Energy Devices, Computer, Interfacing and Electrical Safety of Medical Instrumentation System.

M6506 Clinical and Health Services Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

The overall aim is to acquire a comprehensive education and development in the fundamentals of biomedical engineering in medical care delivery. It enhances the knowledge of graduate students on the science and application of biomedical engineering. The approach of the course is practical and problem-oriented. The major part of the course will involve applying concepts, analytic tools and frameworks, and intuition clinical and health services issues which real-world biomedical industry face. Much of the theory and concepts are drawn from other disciplines – notably statistical theory and methods, survival analysis, medical device regulation, clinical evidence and the use of standards, quality and risk management, life support technology, artificial organs in clinical use, drug delivery and pharmacokinetics, health care systems engineering and management. These are all topics which will be subsumed under the general heading of this course.

M6511 Anatomy and Physiology

AUs: 3, Prerequisites: NIL, Semester: 1

Foundation; Support and Movement - the Articular Skeleton; Cell Biology; Tissues, Organs and Systems; Physiology of the Nervous System; Control Systems of the Human Body; Variability in Human Biology.

M6514 Biomaterials

AUs: 3, Prerequisites: NIL, Semester: 1

The course covers metallic, polymer, ceramic and composite biomaterials apart from natural materials for a wide range of biomedical applications. Properties, performance as well as degradation of biomaterials are discussed within the human body environment. Physical (including surface), mechanical and structural evaluations of biomaterials are discussed. Concepts of tissue engineering are introduced.

Elective Module A

M6522 Life Support Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

Mathematical modelling and computer simulation of physiological and other biomedical systems; application of ordinary and partial differential equations. Bioheat (micro & macro) and biomass transfer models (by diffusion and convection). Benchmarking of bioheat equation for numerical simulation. Principles of thermal imaging, image processing, thermal physiology and skin. Medical applications of thermography, preparation of patient, clinical implications. General circulation. Mass transport in the lungs. Circulation and Function of Kidneys. Hepatic Circulation and Function. Hazards associated with the extra corporeal Circulation. Biomaterials issues in artificial organs. Operating principles of the heart-lung machine. Operating principles of the dialyser. Modelling of dialysis processes. Cardiovascular medicine and surgery. Cardiac and Vascular Surgery. Cardiac assist device engineering.

M6525 Medical Informatics & Telemedicine

AUs: 3, Prerequisites: NIL, Semester: 1

Introduction to Medical Informatics, Introduction to Networking, Object Oriented Design and Modelling, Electronic Medical Records, Derivatives of a Computer Based Patient Record, Nursing Information Systems, Diagnostic Reporting Systems, Standards for Medical System, Terminology and Coding Systems in Medicine, Telemedicine, Medical Imaging, Decision Support, Bioinformatics, Ethics and Confidentiality.

M6532 Biomechanics and Rehabilitation Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

The first part consists of basic biomechanics: Bone mechanics. Biomechanics of musculoskeletal soft tissue. Biomechanics of upper and lower limbs. Biomechanics of the spine. The second part of the course applies the concepts from biomechanics in the delivery of rehabilitative systems and devices. It involves a more focused discussion on the disorders of the spine as well as the lower and upper extremities. An understanding of the basics of human movements and locomotion is important for the design of rehabilitation systems. Injuries and mobility disorders will also be looked into. The use of prosthetic, orthotic and assistive technology devices to improve impaired functions will be covered.

DM6123 Scientific Visualization

AUs: 3, Prerequisites: NIL, Semester: 2

The course will be organised around designing interactive visual solutions for exploring large datasets. The students will learn about techniques that help in designing visualisation solutions for specific scientific needs. Each student, sometimes alone and sometimes in a small group, will design and/or realise several visualisation approaches during the semester culminating in a final project. Topics covered include: Visualisation overview, coordinate systems, sample theory, navigation, interaction. Perception: light, brightness, contrast, constancy, color theory, components of an effective visualization, 2D scalar visualisation methods. Surface extraction: isosurface, convex hull. VolVis: direct volume rendering, MIP, ray casting, texture-based rendering, splatting, transfer functions, methods for time-varying data. FlowVis: design & traditional techniques, texture-based techniques. Information visualization: goals & problems, web-based tools. Case studies: algorithm and program visualisation, geographical and weather visualisation, financial data visualisation, bio visualisation, etc.

Elective Module B

M6134 Theory and Applications of Finite Element Analysis

AUs: 3, Prerequisites: NIL, Semester: 2

Basic concepts of finite element method. Direct and variational formulations. Methods of weighted-residual. Iso-parametric mapping. Practical introduction to a commercial FE software. Finite elements for 1-D and 2-D heat conduction and elasticity problems. Convergence requirements of trial solution. Beam, plate and shell elements. Structural equilibrium equations in finite element analysis and their solution methods: Steady state solution; Eigensolution; Modal superposition and time-marching solutions.

M6545 Computational & Clinical Biology

AUs: 3, Prerequisites: NIL, Semester: 1

An introductory course on computational biology. Background of molecular structures and biochemistry. Techniques in cell and molecular biology. Fundamentals of molecular biology and biological analysis. Principles of computational biology. Computing techniques for molecular biology. Applications in clinical biology.

M6601 Human Factors Engineering Fundamentals

AUs: 3, Prerequisites: NIL, Semester: 1

This course provides the students with the necessary background and fundamentals of human factors engineering for the programme. The topics include: Overview of human factors and its design process. Cognitive Human Factors and Human Computer Interaction. Human Machine Interaction. Physical Human Factors and Ergonomics. Organisational Aspects and Macro Ergonomics. Environmental Aspects.

M6806 Engineering Research Methodology

AUs: 3, Prerequisites: NIL, Semester: 1

Preparation, planning, research sources review and data analysis. Analysis of experimental and quasi-experimental methods. Presentation of research findings.

Others

M6588 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study subject to the agreement of the Programme Director. The candidate will have to demonstrate expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

MSc (Computer Integrated Manufacturing)

Core Courses

M6208 Foundations of Computer Integrated Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 1

CIM Overview. Modern manufacturing system structure. Computer Architecture and Languages. Computer networks. Data Structure and Algorithms. Object Oriented Method. The Internet. Quantitative Methods. Probability and statistical concepts. Sampling methods. Descriptive statistics.

M6209 Management of Global Manufacturing Operations

AUs: 3, Prerequisites: NIL, Semester: 2

Introduction and overview. Global manufacturing operations: planning and implementation. Justification and evaluation of global manufacturing. Global manufacturing operations: management. Case study.

M6221 Networking & Databases

AUs: 3, Prerequisites: NIL, Semester: 2

Network design. ISO/OSI reference model. Manufacturing data communication. Networks in a manufacturing environment. The Internet, Intranet and Extranet. Databases. Relational databases. Object-oriented databases systems. EDI.

M6401 Product Design & Development

AUs: 3, Prerequisites: NIL, Semester: 1

Multi-disciplinary approach to product design and development. Product development process and strategies. Need identification and product specifications. Generation and evaluation of ideas and concepts. Product architecture. Product aesthetics and form creation. Product semantics and identity.

Elective Module A

M6202 Systems Design

AUs: 3, Prerequisites: NIL, Semester: 2

Systems Principles and Techniques. Systems Dynamics. Systems Engineering. Object Oriented Software Technology. Mentor Software Development Methodology. Systems Architecture: Frameworks for Enterprise Modelling.

M6205 Systems Simulation & Modelling

AUs: 3, Prerequisites: NIL, Semester: 1

Discrete-event simulation; Basic model-building blocks; Simulation of global manufacturing facilities; System life cycle analysis; Simulation validation and verification; Continuous Simulation; Supply Chain Modelling; Simulation Case Study.

M6226 Virtual Design & Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 2

Computer graphics, hardware and software. Projections, transformations and viewing. Geometric modelling. Curves, surfaces and solids. Computer-aided design. Parametric and feature-based design. Display and visualisation. Product data management. Computer-aided manufacturing. Numerical control machines. Rapid prototyping.

M6234 Advanced Manufacturing Systems

AUs: 3, Prerequisites: NIL, Semester: 1

This course covers the changing strategies, architectures and technologies of advanced manufacturing systems to cater for the fast changing manufacturing environment, through the introduction of computer technologies. Topics covered include flexible, agile, adaptive and reconfigurable manufacturing strategies, advanced manufacturing architecture, optimization technologies and intelligent system technologies, and advanced robotics technologies and automated sensors and controllers.

M6301 Advanced Metrology & Sensing Systems

AUs: 3, Prerequisites: NIL, Semester: 2

International standards, linear & geometric tolerances. Surface, mechanical and optical metrology. Pneumatic and hydraulic devices for measurement. Transducers for in-process & post-process

measurements, piezo devices, signal handling & processing, computer-aided-metrology, residual stress measurement. Scanning electron microscopy, atomic force microscopy and electron probe micro analysis.

M6421 Advanced Design for Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 1

DFM principles and strategies. Classification system for manual, automatic and robotic assemblies. Evaluation of assembled parts. Analysing products for high-speed automatic assembly. Procedure for redesign. Design of parts for feeding and orienting. Vibratory and non-vibratory feeders. QFD process. Reliability analysis for product design. Selection of materials and processes. Design for repair and recycling.

Elective Module B

L6003 Corporate Resource Planning

AUs: 3, Prerequisites: NIL, Semester: 2

Planning and investing corporate resources for innovation, growth and competitive advantage. Global manufacturing and the design of supply chain strategies. Technical and economic analysis of different approaches to corporate strategies. Impact of technological changes. International operations planning. Enterprise and integration. Enterprise resource planning. Organization and capacity planning. Performance evaluation.

M6141 Quality Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Quality concepts, statistical process control, process improvement, design of experiments, reliability, quality management systems and design, product liability. Case studies and examples of industrial applications will be used throughout the course. The course develops an appreciation of advanced quality engineering techniques and a perception of how quality can be built into all stages of a product life cycle.

M6232 Economics & Law for Global Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 2

Economics and Law in the new economy. Economic and legal impact of global business communication, interaction and exchanges. Policies on competition; pricing, auctions, contracts, costs and revenue. Business Models: evolving forms of organisations, production strategies and e-Manufacturing, logistics. Legal aspects of the Internet, e-commerce and global manufacturing.

M6803 Computational Methods in Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Overview of computational requirements in engineering. Review of fundamentals: Number systems and error analysis, convergence and accuracy. algorithms and data structures, software engineering principles. Functions and derivatives. Approximation. Interpolation and quadrature. Eigenvalue problems. Systems of equations. Optimisation. Numerical solutions to ODEs and PDEs. Use of a symbolic computing package: MATLAB.

Others

M6288 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study subject to the agreement of the Programme Director. The candidate will have to demonstrate expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

MSc (Human Factors Engineering)

Core Courses

M6601 Human Factors Engineering Fundamentals

AUs: 3, Prerequisites: NIL, Semester: 1

This course provides the students with the necessary background and fundamentals of human factors engineering for the programme. The topics include: Overview of human factors and its design process.

Cognitive Human Factors and Human Computer Interaction. Human Machine Interaction. Physical Human Factors and Ergonomics. Organisational Aspects and Macro Ergonomics. Environmental Aspects.

M6602 Interaction Design

AUs: 3, Prerequisites: NIL, Semester: 1

The main objective is to give an overview of the most important research issues in human-computer interaction. Several design methodologies as well as specific design information will be reviewed. On completion of the course, students should be able to design and evaluate an interface. The topics include: Cognitive Issues in Interaction Design. Design of Computer Systems. Organisational Issues in Software Design. Evaluation of HCI.

M6603 Human Factors Method

AUs: 3, Prerequisites: NIL, Semester: 1

This course will cover human factors in a systems development context, research methods in Human Factors, assessment of workload, measuring of pain, pleasure and stress, cognitive work analysis and cognitive task analysis.

M6604 Cognitive Ergonomics

AUs: 3, Prerequisites: NIL, Semester: 2

This course will introduce students to cognitive ergonomics (basic behavioral and psychological factors, such as sensory, perceptual, cognitive and learning processes), perception, decision making as well as human performance measures and methodologies.

Elective Module A

M6605 Experimental Design and Statistics

AUs: 3, Prerequisites: NIL, Semester: 2

This course will cover basic statistics, experimental design, non-parametric statistics as well as other common statistical methods.

M6607 Accident Analysis and Safety Management

AUs: 3, Prerequisites: NIL, Semester: 2

This course will introduce students to accident and safety analysis. It will also cover individual and cognitive factors, accidents in the organisational context, physiological and biomechanical aspects of work and safety, as well as occupational safety and health and safety management.

Elective Module B

M6202 Systems Design

AUs: 3, Prerequisites: NIL, Semester: 2

Systems Principles and Techniques. Systems Dynamics. Systems Engineering. Object Oriented Software Technology. Mentor Software Development Methodology. Systems Architecture: Frameworks for Enterprise Modelling.

M6205 Systems Simulation & Modelling

AUs: 3, Prerequisites: NIL, Semester: 1

Introduction to Systems. Classification of Systems and Models. Manufacturing organisations as Systems. Time Series Forecasting: Short, intermediate and long-term forecasting. Systems Dynamics. Supply Chain Dynamics : Modelling the Supply Chain. Discrete Event Simulation. Intelligent Collaborative Environments.

M6401 Product Design & Development

AUs: 3, Prerequisites: NIL, Semester: 1

Multi-disciplinary approach to product design and development. Product development process and strategies. Need identification and product specifications. Generation and evaluation of ideas and concepts. Product architecture. Product aesthetics and form creation. Product semantics and identity.

M6525 Medical Informatics & Telemedicine

AUs: 3, Prerequisites: NIL, Semester: 1

Introduction to Medical Informatics, Introduction to Networking, Object Oriented Design and Modelling, Electronic Medical Records, Derivatives of a Computer Based Patient Record, Nursing Information Systems,

Diagnostic Reporting Systems, Standards for Medical System, Terminology and Coding Systems in Medicine, Telemedicine, Medical Imaging, Decision Support, Bioinformatics, Ethics and Confidentiality.

M6426 Management of Technology & Innovation

AUs: 3, Prerequisites: NIL, Semester: 2

Introduction to productivity, quality and innovation. System thinking and approach. The innovation process. Project management techniques. System modelling, analysis, and design. Systems approach to organisation. The management of innovation and change.

MSc (Logistics)

Core Courses

L6002 Quantitative Methods for Logistics Analysis

AUs: 3, Prerequisites: NIL, Semester: 2

Probability and Statistical Concepts. Sampling Methods. Statistical Inference: Estimation, Hypothesis Testing. Goodness-of-fit Tests. Non-Parametric Procedures. Regression Analysis. Optimisation Techniques for Solving Logistics Problems. Linear and Integer Programming. Network Flow Analysis. Queuing Theory. Computer Applications.

L6003 Corporate Resource Planning

AUs: 3, Prerequisites: NIL, Semester: 2

Planning and investing corporate resources for innovation, growth and competitive advantage. Global manufacturing and the design of supply chain strategies. Technical and economic analysis of different approaches to corporate strategies. Impact of technological changes. International operations planning. Enterprise and integration. Enterprise resource planning. Organisation and capacity planning. Performance evaluation.

L6004 Applications of Advanced Technologies in Logistics

AUs: 3, Prerequisites: NIL, Semester: 1

Artificial Intelligence and Knowledge-based Expert system for Resources Allocation, Fleet and Crew Scheduling. Applications of Geographical Information Systems and Relational Database Systems. Global Positioning Systems and Applications in Fleet Management. Computer Simulation.

L6102 Procurement & Supplier Development

AUs: 3, Prerequisites: NIL, Semester: 1

Procurement Planning and Practice. Supplier Profiling, Performance Review and Benchmarking. Supplier Scheduling. Network Sourcing. Localising. Creating World Class Suppliers. Strategic management of Cross Cultural / Border Supplier Communications and Relationships. Supplier Process and Quality Management Planning. Technology Transfer and Management. Legal aspects and Negotiations.

Elective Module A

L6103 Supply Chain Strategy & Design

AUs: 3, Prerequisites: NIL, Semester: 1

Customer Service Dimension. Measuring Logistics Costs and Performance. Benchmarking the Supply Chain. Managing the Global Pipeline. Strategic Lead-Time Management. Strategic Alliances and Supplier Partnership Programme. Managing the Supply Chain. Supply Chain Integration and Optimisation. Actual vs the Virtual / Extended Enterprise Concept. Strategic Application of IT in Supply Chain Management. Supplier Selection Strategies and Criteria.

L6104 E-Supply Chains

AUs: 3, Prerequisites: NIL, Semester: 1

Fundamental concepts and issues of E-supply chains. Developments in the ICT; national, global IT infrastructures. Market mechanisms. Economics of information. E-commerce, E-procurement, E-collaboration in design and logistics; value chains, supply chain integration. Organisational issues. Project management. Change Management.

L6105 Demand Chain Analysis

AUs: 3, Prerequisites: NIL, Semester: 2

Nature of supplier-customer relations. Demand chain management and optimisation. Modelling and techniques for customer requirements and demand analysis: Mass customisation. Customer relationship management. Human factors in customer relations. Demand innovations. Strategic positioning.

M6205 Systems simulation & Modelling

AUs: 3, Prerequisites: NIL, Semester: 1

Introduction to Systems. Classification of Systems and Models. Manufacturing organisations as Systems. Time Series Forecasting: Short, intermediate and long-term forecasting. Systems Dynamics. Supply Chain Dynamics : Modelling the Supply Chain. Discrete Event Simulation. Intelligent Collaborative Environments.

Elective Module B

L6115 Management of Logistics Functions

AUs: 3, Prerequisites: NIL, Semester: 1

This course will provide the students with knowledge on the management of three main logistics functions: freight management, warehousing management and distribution management. Topics covered include: Introduction to Logistics Function and their Management, Distribution Management, Warehousing Management, Transportation Management, Freight Resource Planning, and Case Study in Management of Logistics Functions.

Others

L6188 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study subject to the agreement of the Programme Director. The candidate will have to demonstrate expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

MSc (Mechanical Engineering)

Core Courses

M6104 Advanced Mechanics of Materials

AUs: 3, Prerequisites: NIL, Semester: 1

Analysis of stress, stress transformations, Cauchy formula, equations of equilibrium, principal stresses and stress invariants. Analysis of strain, infinitesimal and finite strains, compatibility. Constitutive equations, linear elastic, plastic and viscoelastic behaviour. Boundary value problems: fundamentals, 1-D and 2-D (plane strain and stress).

M6801 Advanced Thermal Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Principles of Convection; Equations of Boundary Layers; Momentum transfer; Heat transfer; Mass transfer; Convective heat transfer at high velocity; Applications. (*new* course; the contents are subjected to further modification)

M6802 Engineering Measurements

AUs: 3, Prerequisites: NIL, Semester: 1

Advanced principles of measurement that examine the static and dynamic characteristics of instruments. The design of measurement system through the application of sensing and signal conditioning elements for data acquisition. Overview of the operations of some specialised measurement systems which have important industrial applications.

Elective Module A

M6803 Computational Methods in Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Overview of computational requirements in engineering. Review of fundamentals: Number systems and error analysis, convergence and accuracy. algorithms and data structures, software engineering principles. Functions and derivatives. Approximation. Interpolation and quadrature. Eigenvalue problems. Systems of

equations. Optimisation. Numerical solutions to ODEs and PDEs. Use of a symbolic computing package: MATLAB.

M6134 Finite Element Analysis

AUs: 3, Prerequisites: NIL, Semester: 2

Basic concepts of finite element method. Discrete systems. Formulation of numerical solutions. Interpolation theory and natural coordinates. Numerical integration. Boundary value problems: steady state heat conduction, elasticity and low speed fluid flows. Patch test. Computer implementation of finite element. Initial-boundary value problems: transient heat conduction, dynamic and electronic packaging. Solution methods: semi-analytical methods and time discretization approach. Non-linear finite element analysis and parallel computing.

Elective Module B

L6103 Supply Chain : Strategy & Design

AUs: 3, Prerequisites: NIL, Semester: 1

Customer Service Dimension. Measuring Logistics Costs and Performance. Benchmarking the Supply Chain. Managing the Global Pipeline. Strategic Lead-Time Management. Strategic Alliances and Supplier Partnership Programme. Managing the Supply Chain. Supply Chain Integration and Optimisation. Actual vs. the Virtual / Extended Enterprise Concept. Strategic Application of IT in Supply Chain Management. Supplier Selection Strategies and Criteria.

M6102 Advanced Materials Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

Metallic materials and composites: metallurgical fundamentals and fracture, copper, stainless steels, advanced composite materials, heat resistant superalloys. Selection and service performance of materials: materials selection in design, materials testing, failure of engineering materials. Polymeric materials: polymer synthesis and classification, engineering polymers, polymer blends, liquid crystalline polymers. Ceramic materials: functional ceramics, optical ceramics, magnetic ceramics, colossal magneto-resistant ceramics, case studies. Superconductors.

M6202 Systems Design

AUs: 3, Prerequisites: NIL, Semester: 2

Systems Principles and Techniques. Systems Dynamics. Systems Engineering. Object Oriented Software Technology. Mentor Software Development Methodology. Systems Architecture: Frameworks for Enterprise Modelling.

M6205 Systems Simulation & Modelling

AUs: 3, Prerequisites: NIL, Semester: 1

Introduction to Systems. Classification of Systems and Models. Manufacturing organisations as Systems. Time Series Forecasting: Short, intermediate and long-term forecasting. Systems Dynamics. Supply Chain Dynamics: Modelling the Supply Chain. Discrete Event Simulation. Intelligent Collaborative Environments.

M6226 Virtual Design & Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 2

Computer Graphics and Geometric Modelling. Computer-aided Design. Computer-aided Manufacturing.

M6234 Advanced Manufacturing Systems

AUs: 3, Prerequisites: NIL, Semester: 1

Flexible, agile, adaptive and reconfigurable manufacturing strategies, advanced manufacturing architecture, optimisation technologies and intelligent system technologies, advanced robotics technologies and automated sensors and controllers.

M6301 Advanced Metrology & Sensing Systems

AUs: 3, Prerequisites: NIL, Semester: 2

International standards, linear & geometric tolerances. Surface, mechanical and optical metrology. Pneumatic and hydraulic devices for measurement. Transducers for in-process & post-process measurements, piezo devices, signal handling & processing, computer-aided-metrology, residual stress measurement. Scanning electron microscopy, atomic force microscopy and electron probe micro-analysis.

M6303 Fundamentals of Precision Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

History of precision engineering. Principles and definitions of precision machine design. State-of-the art in research, prototyping and full production from ultra precision machining through micro-engineering, microelectronics and molecular manipulation. Application of displacement transducers to machines and instruments. Tolerance technology.

M6325 Advanced Electronic Packaging

AUs: 3, Prerequisites: NIL, Semester: 2

Electrical design for electronic packaging; interconnect design and printed circuit board design, design of SMP. Material design and reliability; manufacture of ICs, IC package, and advanced substrates; ceramic packaging; thin film packaging. Surface mounting and advanced interconnections; surface mounting assembly; assembly techniques for array packages such as BGA and CSP; TAB, flip chip, wire bonding and MCM; Thermal management and reliability of electronic packages.

M6329 Micro Electro Mechanical Systems

AUs: 3, Prerequisites: NIL, Semester: 2

Development of MEMS. Definition of terminology, Operation modes, transducer and sensing theory. Basic design considerations, Choice of Damping factors, Management of Stiction, Design Rules, Design packages, Simulations, Optimisation. Review of basic fabrication processes. Introduction to advanced fabrication techniques. LIGA, electroplating. Micro-moulding, non-silicon substrates. Wafer bonding. Robotics. Vision systems. Wafer dicing and sawing. Chemical dicing. Packaging considerations, Damping, Dynamic Modal Evaluation, Reliability Assessment, Sensitivity, Bandwidth, Linearity, Cross-talk determination, temperature sensitivity. Assembly techniques including robotics. Open or closed loop operation. Force balanced sensors. Critical Damping, Minimising device limitations, CMOS control design. Case studies of commercial available devices as well as devices presently under development.

M6401 Product Design & Development

AUs: 3, Prerequisites: NIL, Semester: 1

Multi-disciplinary approach to product design and development. Product development process and strategies. Need identification and product specifications. Generation and evaluation of ideas and concepts. Product architecture. Product aesthetics and form creation. Product semantics and identity.

M6402 Advanced Microprocessor Applications

AUs: 3, Prerequisites: NIL, Semester: 1

Microprocessor architecture and concepts. Microprocessor families. Software building blocks and expansion methods. I/O interfacing and software development tools. Signal Processing in mechatronics.

M6404 Advanced Mechanism Design

AUs: 3, Prerequisites: NIL, Semester: 2

Overview of mechanism design and simulation. Analytical synthesis. Advanced mechanism synthesis. Computer-aided kinematic modelling and analysis. Computer-aided dynamic modelling and analysis.

M6426 Management of Technology & Innovation

AUs: 3, Prerequisites: NIL, Semester: 2

Introduction to productivity, quality and innovation. System thinking and approach. The innovation process. Project management techniques. System modelling, analysis, and design. Systems approach to organization. The management of innovation and change.

M6429 Thermal Management in Product Design

AUs: 3, Prerequisites: NIL, Semester: 1

Thermal issues in product design. Related heat and fluid flow fundamentals. Methodologies for thermal analysis. Heat transfer enhancement techniques: free and forced convection in channels, extended surfaces, compact heat exchangers, liquid cooling, heat pipes and microscale cooling devices. Applications to small components and enclosures. Thermal design optimisation.

M6522 Life Support Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

Mathematical modeling and computer simulation of physiological and other biomedical systems; application of ordinary and partial differential equations. Bioheat (micro & macro) and biomass transfer models (by diffusion and convection). Benchmarking of bioheat equation for numerical simulation. Principles of thermal

imaging, image processing, thermal physiology and skin. Medical applications of thermography, preparation of patient, clinical implications.

M6806 Engineering Research Methodology

AUs: 3, Prerequisites: NIL, Semester: 1

Preparation, planning, research sources review and data analysis. Analysis of experimental and quasi-experimental methods. Presentation of research findings.

Others

M6888 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study subject to the agreement of the Programme Director. The candidate will have to demonstrate expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

MSc (Mechanics and Processing of Materials)

Core Courses

M6102 Engineering Materials

AUs: 3, Prerequisites: NIL, Semester: 1

Metallic materials and composites: metallurgical fundamentals and fracture, copper, stainless steels, advanced composite materials, heat resistant superalloys. Selection and service performance of materials: materials selection in design, materials testing, failure of engineering materials. Polymeric materials: polymer synthesis and classification, engineering polymers, polymer blends, liquid crystalline polymers. Ceramic materials: functional ceramics, optical ceramics, magnetic ceramics, colossal magneto-resistant ceramics, case studies. Superconductors.

M6106 Mechanics of Materials

AUs: 3, Prerequisites: NIL, Semester: 1

(* Students who have passed M6133 Composite Materials & Structures cannot take this course.)

Statically determinate and indeterminate systems. Stress-strain relations. Failure Criteria. Stress Concentrations. Creep and Viscoelasticity. Lamina and Laminate analysis. Strength analysis of composites. Governing equations. Constitutive equations. Compatibility equations. Thin plate and shell analysis. Exact and approximate methods of analysis. Modified governing equations. Coupling problems in composites. Standard mechanical testing methods of composites and their constituents.

Elective Module A

M6104 Advanced Mechanics of Materials

AUs: 3, Prerequisites: NIL, Semester: 1

Analysis of stress, stress transformations, Cauchy formula, equations of equilibrium, principal stresses and stress invariants. Analysis of strain, infinitesimal and finite strains, compatibility. Constitutive equations, linear elastic, plastic and viscoelastic behaviour. Boundary value problems: fundamentals, 1-D and 2-D (plane strain and stress).

M6134 Theory and Applications of Finite Element Analysis

AUs: 3, Prerequisites: NIL, Semester: 2

Basic concepts of finite element method. Direct and variational formulations. Methods of weighted-residual. Iso-parametric mapping. Practical introduction to a commercial FE software. Finite elements for 1-D and 2-D heat conduction and elasticity problems. Convergence requirements of trial solution. Beam, plate and shell elements. Structural equilibrium equations in finite element analysis and their solution methods: Steadystate solution; Eigensolution; Modal superposition and time-marching solutions.

M6135 Failure Analysis & Prevention

AUs: 3, Prerequisites: NIL, Semester: 1

Introduction to fracture and fatigue. Linear elastic fracture mechanics. Small-scale yielding concepts. Elastic-plastic fracture mechanics, CTOD and JIC toughness concepts. Interfacial fracture mechanics. Fatigue

design philosophies. Macro-mechanisms of fatigue initiation and propagation. Fatigue design of engineering components. Fatigue crack growth analysis and life prediction. Failure analysis and fracture of composites. Case studies.

Elective Module B

L6003 Corporate Resource Planning

AUs: 3, Prerequisites: NIL, Semester: 2

Planning and investing corporate resources for innovation, growth and competitive advantage. Global manufacturing and the design of supply chain strategies. Technical and economic analysis of different approaches to corporate strategies. Impact of technological changes. International operations planning. Enterprise and integration. Enterprise resource planning. Organisation and capacity planning. Performance evaluation.

M6141 Quality Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Quality concepts, statistical process control, process improvement, design of experiments, reliability, quality management systems and design, product liability. Case studies and examples of industrial applications will be used throughout the course. The course develops an appreciation of advanced quality engineering techniques and a perception of how quality can be built into all stages of a product life cycle.

M6143 Polymer Processing

AUs: 3, Prerequisites: NIL, Semester: 2

(Students who have passed M6142 Materials Processing II cannot take this course.)*

Plastic injection molding, part and mold design. Runner, cooling and ejector systems. Cavity and runner balancing, gate location optimisation. Polymer materials and additives for different applications and products. Selection of processing methods. Rheological properties of polymer melts and solutions, filled polymers and thermoset polymers. Methods of mixing. Extrusion, compression molding, thermal transfer molding, blow molding, rotational molding etc.

M6156 Advanced Characterization Techniques

AUs: 3, Prerequisites: NIL, Semester: 2

Overview of advanced characterisation techniques. Surface characterisation. Structural characterisation. Chemical characterisation. Separation & purification techniques, Thermal analysis. Non-destructive defect characterisation, including ultrasonics, radiography, eddy current, liquid penetrant & magnetic particle inspection. Laboratory modules.

M6301 Advanced Metrology & Sensing Systems

AUs: 3, Prerequisites: NIL, Semester: 2

International standards, linear & geometric tolerances. Surface, mechanical and optical metrology. Pneumatic and hydraulic devices for measurement. Transducers for in-process & post-process measurements, piezo devices, signal handling & processing, computer-aided-metrology, residual stress measurement. Scanning electron microscopy, atomic force microscopy and electron probe micro analysis.

M6303 Fundamentals of Precision Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

History of precision engineering. Principles and definitions of precision machine design. State-of-the art in research, prototyping and full production from ultra precision machining through micro-engineering, microelectronics and molecular manipulation. Application of displacement transducers to machines and instruments. Tolerance technology.

M6325 Advanced Electronic Packaging

AUs: 3, Prerequisites: NIL, Semester: 2

Electrical design for electronic packaging; interconnect design and printed circuit board design, design of SMP. Material design and reliability; manufacture of ICs, IC package, and advanced substrates; ceramic packaging; thin film packaging. Surface mounting and advanced interconnections; surface mounting assembly; assembly techniques for array packages such as BGA and CSP; TAB, flip chip, wire bonding and MCM; Thermal management and reliability of electronic packages.

Others

M6188 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study subject to the agreement of the Programme Director. The candidate will have to demonstrate expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

MSc (Precision Engineering)

Core Courses

M6102 Advanced Materials Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

Metallic materials and composites: metallurgical fundamentals and fracture, copper, stainless steels, advanced composite materials, heat resistant superalloys. Selection and service performance of materials: materials selection in design, materials testing, failure of engineering materials. Polymeric materials: polymer synthesis and classification, engineering polymers, polymer blends, liquid crystalline polymers. Ceramic materials: functional ceramics, optical ceramics, magnetic ceramics, colossal magneto-resistant ceramics, case studies. Superconductors.

M6301 Advanced metrology & Sensing Systems

AUs: 3, Prerequisites: NIL, Semester: 2

International standards, linear & geometric tolerances. Surface, mechanical and optical metrology. Pneumatic and hydraulic devices for measurement. Transducers for in-process & post-process measurements, piezo devices, signal handling & processing, computer-aided-metrology, residual stress measurement. Scanning electron microscopy, atomic force microscopy and electron probe micro analysis.

M6303 Fundamentals of Precision Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

History of precision engineering. Principles and definitions of precision machine design. State-of-the art in research, prototyping and full production from ultra precision machining through micro-engineering, microelectronics and molecular manipulation. Application of displacement transducers to machines and instruments. Tolerance technology.

M6304 Ultraprecision & Micromachining Processes

AUs: 3, Prerequisites: NIL, Semester: 2

Atomic structure, electrical and physical properties of atoms. Diamond turning, grinding and polishing. Effects of tooling, material and the environment on the surface characteristics of workpieces. Material removal using electron, photon, or ion beams. Molecular beam epitaxy, chemical and physical vapour deposition. Advanced sputtering and ion-implantation. Deposition techniques, process controls, and film characteristics.

Elective Module A

M6141 Quality Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Quality concept, statistical process control, process improvement, experimental design, product liability, quality management systems and design. Case studies and examples of industrial applications will be used throughout the course. The course develops an appreciation of advanced quality engineering techniques and a perception of how quality can be built into all stages of a product life cycle and throughout an industrial enterprise.

M6321 Precision Mechanism Design

AUs: 3, Prerequisites: NIL, Semester: 1

Fundamental concepts in designing precision machinery; metrological instrumentation, ultra-precision motion generators, and precision assembly. Flexure mechanisms for precision engineering. Mechanics of contact, kinetic coupling, vibration isolation and material selection. Actuators and sensors to control mechanisms. Manufacturing of micron scale machinery and structures using non-conventional processes. Case studies on precision instruments.

M6325 Advanced Electronic Packaging

AUs: 3, Prerequisites: NIL, Semester: 2

Electrical design for electronic packaging; interconnect design and printed circuit board design, design of SMP. Material design and reliability; manufacture of ICs, IC package, and advanced substrates; ceramic packaging; thin film packaging. Surface mounting and advanced interconnections; surface mounting assembly; assembly techniques for array packages such as BGA and CSP; TAB, flip chip, wire bonding and MCM; Thermal management and reliability of electronic packages.

M6328 Optical Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

Coherent optics: fundamentals, theory, fibre optics. Geometrical optics: paraxial optics, monochromatic and chromatic aberrations, computer evaluation of optical systems, spot diagrams, MTF. Light sources, detectors and imaging systems. Industrial laser applications and optical systems. Optical interferometry: applications to precision measurement. Optical materials and precision manufacturing of optical components.

M6329 Micro Electro Mechanical Systems

AUs: 3, Prerequisites: NIL, Semester: 2

Development of MEMS. Definition of terminology, Operation modes, transducer and sensing theory. Basic design considerations, Choice of Damping factors, Management of Stiction, Design Rules, Design packages, Simulations, Optimisation. Review of basic fabrication processes. Introduction to advanced fabrication techniques. LIGA, electroplating. Micro-moulding, non-silicon substrates. Wafer bonding. Robotics. Vision systems. Wafer dicing and sawing. Chemical dicing. Packaging considerations, Damping, Dynamic Modal Evaluation, Reliability Assessment, Sensitivity, Bandwidth, Linearity, Cross-talk determination, temperature sensitivity. Assembly techniques including robotics. Open or closed loop operation. Force balanced sensors. Critical Damping, Minimising device limitations, CMOS control design. Case studies of commercial available devices as well as devices presently under development.

Elective Module B

M6802 Engineering Measurements

AUs: 3, Prerequisites: NIL, Semester: 1

Advanced principles of measurement which examine the static and dynamic characteristics of instruments. The design of measurement system through the application of sensing and signal conditioning elements for data acquisition. Overview of the operations of some specialised measurement systems which have important industrial applications.

M6221 Networking & Databases

AUs: 3, Prerequisites: NIL, Semester: 2

Overview. Network Design. ISO/OSI Reference Model. Manufacturing Data Communication. Networks in a Manufacturing Environment. Databases. Relational Databases. Object-Oriented Databases Systems. EDI. The Internet, Intranet and Extranet.

M6226 Virtual Design & Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 2

Overview. Fundamentals of Computer Graphics and Geometric Modelling. Computer-Aided Design. Computer-Aided Manufacturing. Rapid Prototyping. Design Communication: The Internet and Intranet in Manufacturing, HTML, VRML and Java Programming in CIM.

Others

M6388 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study subject to the agreement of the Programme Director. The candidate will have to demonstrate expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

MSc (Smart Product Design)

Core Courses

M6401 Product Design & Development

AUs: 3, Prerequisites: NIL, Semester: 1

Multi-disciplinary approach to product design and development. Product development process and strategies. Need identification and product specifications. Generation and evaluation of ideas and concepts. Product architecture. Product aesthetics and form creation. Product semantics and identity.

M6402 Advanced Microprocessor Applications

AUs: 3, Prerequisites: NIL, Semester: 1

Microprocessor architecture and concepts. Microprocessor families. Software building blocks and expansion methods. I/O interfacing and software development tools. Signal Processing in mechatronics.

M6403 Applied Mechatronic

AUs: 3, Prerequisites: NIL, Semester: 2

Elements of mechatronic systems and introduction to tools for design. Industrial automation in manufacturing systems. Study of power electronics and drives. Electromechanical drives and their control techniques. Fundamentals of micro-processor controlled motion systems. Examples of mechatronic systems highlighting the various elements and their interactions.

M6404 Advanced Mechanism Design

AUs: 3, Prerequisites: NIL, Semester: 2

Overview of mechanism design and simulation. Analytical synthesis. Advanced mechanism synthesis. Computer-aided kinematic modelling and analysis. Computer-aided dynamic modelling and analysis.

Elective Module A

M6421 Advanced Design for Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 1

DFM principles and strategies. Classification system for manual, automatic and robotic assemblies. Evaluation of assembled parts. Analysing products for high-speed automatic assembly. Procedure for redesign. Design of parts for feeding and orienting. Vibratory and non-vibratory feeders. QFD process. Reliability analysis for product design. Selection of materials and processes. Design for repair and recycling.

M6423 Prototype & Rapid Prototyping

AUs: 3, Prerequisites: NIL, Semester: 2

Introduction to prototyping. Soft and virtual prototyping. Fundamentals of rapid prototyping. Rapid prototyping systems. Rapid prototyping data format. Applications of rapid prototyping.

M6426 Management of Technology & Innovation

AUs: 3, Prerequisites: NIL, Semester: 2

Introduction to productivity, quality and innovation. System thinking and approach. The innovation process. Project management techniques. System modelling, analysis, and design. Systems approach to organization. The management of innovation and change.

M6429 Thermal Management in Product Design

AUs: 3, Prerequisites: NIL, Semester: 1

Thermal issues in product design. Related heat and fluid flow fundamentals. Methodologies for thermal analysis. Heat transfer enhancement techniques: free and forced convection in channels, extended surfaces, compact heat exchangers, liquid cooling, heat pipes and microscale cooling devices. Applications to small components and enclosures. Thermal design optimisation.

M6602 Interaction Design

AUs: 3, Prerequisites: NIL, Semester: 1

The main objective is to give an overview of the most important research issues in human-computer interaction. Several design methodologies as well as specific design information will be reviewed. On completion of the course, students should be able to design and evaluate an interface. The topics include: Cognitive Issues in Interaction Design. Design of Computer Systems. Organisational Issues in Software Design. Evaluation of HCI.

Elective Module B

M6102 Advanced Materials Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

Metallic materials and composites: metallurgical fundamentals and fracture, copper, stainless steels, advanced composite materials, heat resistant superalloys. Selection and service performance of materials: materials selection in design, materials testing, failure of engineering materials. Polymeric materials: polymer synthesis and classification, engineering polymers, polymer blends, liquid crystalline polymers. Ceramic materials: functional ceramics, optical ceramics, magnetic ceramics, colossal magneto-resistant ceramics, case studies. Superconductors.

M6141 Quality Engineering

AUs: 3, Prerequisites: NIL, Semester: 2

Quality concepts, statistical process control, process improvement, design of experiments, reliability, quality management systems and design, product liability. Case studies and examples of industrial applications will be used throughout the course. The course develops an appreciation of advanced quality engineering techniques and a perception of how quality can be built into all stages of a product life cycle and throughout an industrial enterprise.

M6226 Virtual Design & Manufacturing

AUs: 3, Prerequisites: NIL, Semester: 2

Computer graphics, hardware and software. Projections, transformations and viewing. Geometric modelling. Curves, surfaces and solids. Computer-aided design. Parametric and feature-based design. Display and visualisation. Product data management. Computer-aided manufacturing. Numerical control machines. Rapid prototyping.

M6303 Fundamentals of Precision Engineering

AUs: 3, Prerequisites: NIL, Semester: 1

History of precision engineering. Principles and definitions of precision machine design. State-of-the art in research, prototyping and full production from ultra precision machining through micro-engineering, microelectronics and molecular manipulation. Application of displacement transducers to machines and instruments. Tolerance technology.

M6321 Precision Mechanism Design

AUs: 3, Prerequisites: NIL, Semester: 1

Fundamental concepts in designing precision machinery; metrological instrumentation, ultra-precision motion generators, and precision assembly. Flexure mechanisms for precision engineering. Mechanics of contact, kinetic coupling, vibration isolation and material selection. Actuators and sensors to control mechanisms. Manufacturing of micron scale machinery and structures using non-conventional processes. Case studies on precision instruments.

M6601 Human Factors Engineering Fundamentals

AUs: 3, Prerequisites: NIL, Semester: 1

This course provides the students with the necessary background and fundamentals of human factors engineering for the programme. The topics include: Overview of human factors and its design process. Cognitive Human Factors and Human Computer Interaction. Human Machine Interaction. Physical Human Factors and Ergonomics. Organisational Aspects and Macro Ergonomics. Environmental Aspects.

M6802 Engineering Measurements

AUs: 3, Prerequisites: NIL, Semester: 1

Advanced principles of measurements which examine the static and dynamic characteristics of instruments. The design of measurements system through the application of sensing and signal conditioning elements for data acquisition. Overview of the operations of some specialised measurements systems which have important industrial applications.

Others

M6488 Independent Study

AUs: 3, Prerequisites: NIL, Semester: 1 and 2

This a creative course based on an issue, case study, problem or an area of interest related to the programme. The candidate is required to propose and undertake an independent supervised research on a topic of study course to the agreement of the Programme Director. The candidate will have to demonstrate

expertise in the topic of study, together with creativity, diligence and critical thinking in addressing the problems and issues on the topic.

Graduate Courses for Research Students

M7102 Advanced Materials Engineering

AUs: 4, Prerequisites: NIL, Semester: 1

(M6102 + Research Module) Metallic materials and composites: metallurgical fundamentals and fracture, copper, stainless steels, advanced composite materials, heat resistant superalloys. Selection and service performance of materials: materials selection in design, materials testing, failure of engineering materials. Polymeric materials: polymer synthesis and classification, engineering polymers, polymer blends, liquid crystalline polymers. Ceramic materials: functional ceramics, optical ceramics, magnetic ceramics, colossal magneto-resistant ceramics, case studies. Superconductors. Research students have to complete an additional literature review project and submit a 20 - 25 page report.

M7202 Systems Design

AUs: 4, Prerequisites: NIL, Semester: 2

(M6202 + Research Module) Systems Principles and Techniques. Systems Dynamics. Systems Engineering. Object Oriented Software Technology. Mentor Software Development Methodology. Systems Architecture: Frameworks for Enterprise Modelling. Research students have to write an extended essay (case study) explaining how one system engineering activity (Functional analysis, System integration, Accelerated stress testing, Design for maintainability, Design for the environment, Value engineering) can be applied to a problem faced by a company. Minimum length of the essay is 2500 words.

M7802 Engineering Measurements

AUs: 4, Prerequisites: NIL, Semester: 1

(M6802 + Research Module) Advanced principles of measurement that examine the static and dynamic characteristics of instruments. The design of measurement system through the application of sensing and signal conditioning elements for data acquisition. Overview of the operations of some specialised measurement systems which have important industrial applications. Research students have to complete an additional research module relating to this course.

M7803 Computational Methods in Engineering

AUs: 4, Prerequisites: NIL, Semester: 2

(M6803 + Research Module) Overview of computational requirements in engineering. Review of fundamentals: Number systems and error analysis, convergence and accuracy, algorithms and data structures, software engineering principles. Functions and derivatives. Approximation. Interpolation and quadrature. Eigenvalue problems. Systems of equations. Optimisation. Numerical solutions to ODEs and PDEs. Use of a symbolic computing package: MATLAB. Research students have to complete an additional research project relating to this course.

M7805 Advanced Engineering Mathematics

AUs: 4, Prerequisites: NIL, Semester: 2

Students would acquire fundamental mathematical knowledge and the necessary problem solving skills for their numerical and experimental research works and stay updated on the most recent developments in applied PDEs. Topics covered include: Partial differential equations, Introduction to non-linear problems, Numerical methods for partial differential equations. For numerical methods for PDEs, these topics are covered: Higher-order Discretisation, Multi-dimensional Methods and Solutions methods for systems of algebraic equations.

M7806 Engineering Research Methodology

AUs: 4, Prerequisites: NIL, Semester: 1

(M6806 + Research Module) Preparation, planning, research sources review and data analysis. Analysis of experimental and quasi-experimental methods. Presentation of research findings. Research students are required to do additional continual assignments.

M9002 Mechanical Vibrations

AUs: 3, Prerequisites: NIL, Semester: 1

The course is designed to provide full-time graduate students in CoE to learn about Mechanical Vibrations. 30 hours are to cover vibration theories of mechanical systems of 1, 2 and multiple degrees of

freedom. The remaining 9 hours will then introduce numerical and experimental tools (namely, finite element method and dynamic testing) in solving complicated problems based on the theories.