BEng (Hons) Mechatronics - E441 (Under Review)

1. Objectives

The Mechatronics course combines mechanical, electrical/electronic and computer modules in an attempt to demonstrate the close integration of these disciplines in product design. The Programme offers both theory and laboratory work designed to enable the students to understand the principles underlying the application of intelligent controllers in the control of machine components. The knowledge and skills gained will be useful to deal with a broad range of engineering products such as robotics, automated production systems, consumer goods and so on. The scheme of study also offers adequate background for further studies/research at graduate level and beyond both locally and abroad.

2. General Entry Requirements

As per General Entry Requirements for admission to the University for Undergraduate Degrees.

3. Programme Requirements

2 GCE 'A' Level Passes in Mathematics and one of the following subjects: Physics, Physical Science, Engineering Science, Physics with Chemistry, Design & Technology (Technology).

4. (i) Minimum Requirements for Degree Award – 133 Credits

- For the degree award all core modules prescribed by the Department must be completed.
- Vacation Training & Industrial training must be completed satisfactorily for the award of the degree.

(ii) Minimum Requirements for Diploma Award

A student may opt for a Diploma in Mechatronics provided s/he satisfies the following minimum requirements.

MODULES	**CREDITS**
Modules from Levels 1 & 2	54
Diploma Project	6
TOTAL	**60**

The Diploma project would normally be of 8 weeks duration for an input of at least 90 hours.

5. Programme Duration:

	Normal	**Maximum**
Degree:	4 years	7 years

6. Credits per Year: Minimum 18, Maximum 48 subject to Regulation 5 above.

7. Assessment

Assessment will be based on a written examination of 2 to 3-hour duration (normally a paper of 2 hour duration for modules carrying less or equal to 3.5 credits and 3 hour paper for modules carrying four-six credits) and on continuous assessment done during the semester or year.

Written examinations for all modules, whether taught in semester 1 or in semester 2 or both, will be carried out at the end of the academic year (unless otherwise stated).

The continuous assessment will count for 10-40% of the overall percentage mark of the module(s), except for a Programme where the structure makes for other specific provision(s). Continuous assessment may be based on laboratory work, seminars and/or assignments and **should include at least 1 class test.**

There will be a compulsory class test for all modules taught in semester 1 at the end of semester 1 of the given academic year unless stated otherwise in the Programme Structure.

A minimum of at least 30% should be attained in each of continuous assessment and written examination, with an overall total of 40% for a candidate to pass a module.

Special examinations (e.g. class tests) will be arranged at the end of semester 1 or semester 2 for exchange students who have registered only for one semester. In case of yearly modules, credits will be assigned on a pro-rata basis.

8. Programme Plan – BEng (Hons) Mechatronics

YEAR/LEVEL 1

Code	Module Name	Hrs/Wk L+P	Credits
CORE			
MECH 1001Y(1)	Mechanics of Materials & Machines I	2+1	5
MECH 1003Y(1)	Engineering Graphics	2+2	6
CSE 1010e(1)	Introduction to Information Technology	O.E.	3
COMS 1010(1)	Communication Skills	D.E.	3
MATHS 1111(1)	Mathematics 1	D.E.	3
MATHS 1211(1)	Mathematics 2	D.E.	3
ELEC 1033Y(1)	Electrical Technology	3+1	7
ELEC 1031Y(1)	Electronics	2+1	5
ELEC 1032Y(1)	Basics of Computer Programming	1+2	4
MECH 1000	Vacation Training*	-	0 (I or S)

YEAR/LEVEL 2

Code	Module Name	Hrs/Wk L+P	Credits
CORE			
MECH 2002Y(3)	Mechanics of Materials & Machines II	2+1	5
MECH 2005Y(1)	Thermofluids	2+1	5
MECH 2006Y(3)	Mechanical Processing of Materials	3+1	7
ELEC 2001Y(3)	Analytical Techniques	3+0	6
ELEC 3001Y(5)	Microprocessors	2+2	6
SEMESTER CORE MODULES			
MECH 2019(3)	Project Appraisal Techniques	2+0	2
ELEC 2034(3)	Signals and Systems	3+0	3
ELEC 2032(3)	Electromechanical Systems	3+1	3.5
ELEC 2033(3)	Electrical Energy Systems	2+0	2

YEAR/LEVEL 3

Code	Module Name	Hrs/Wk L+P	Credits
MECH 3003Y(5)	Drives and Controls	3+1	7
SEMESTER CORE MODULES			
MECH 3062(5)	Engineering Management 1	3+0	3
MECH 3060(5)	Factory Automation	3+0	3
MECH 3064(5)	Engineering Design*	1+2	2
ELEC 3031(5)	Power Electronic Devices & Converters	3+1	3.5
ELEC 3032(5)	Control Engineering 1	3+0	3
SEMESTER 2			
MECH 3000 Industrial Training will be done in Semester 2 of Level 3			

* To be assessed by continuous assessment only

YEAR/LEVEL 4

Code	Module Name	Hrs/Wk L+P	Credits
MECH 4000Y(5)	Project	-	12
MECH 4007Y(5)	Robotics & Machine Intelligence	2+0	4
ELEC 4037Y(5)	Measurement & Control	2+0	4
ELEC 4012Y(5)	Digital Signal Processing	2+0	4
SEMESTER 2 CORE MODULE			
MECH 4205(5)	Engineering Management II	3+0	3
ELECTIVES	**CHOOSE TWO, ONE FROM EACH DEPT**		
Mechanical			
MECH 4003(5)	Reliability & Safety Engineering	3+0	3
MECH 4008(5)	Automotive Electronics Systems	3+0	3
MECH 4014(5)	Mechanical Vibration	3+0	3
Electrical			
ELEC 4002Y(5)	Power Electronic Drives	2+0	4
ELEC 4238(5)	Power Systems	3+0	3
ELEC 4239(5)	Control Engineering 2	3+0	3

9. Outline Syllabus

This outline syllabus is not prescriptive and is intended to serve as a guide only.

Note: Pre-requirement (PQ), Pre-requisite (PR).

CSE 1010e(1) - INTRODUCTION TO INFORMATION TECHNOLOGY
IT and Computers; Stepping in the Computer; Input and Output Devices; Secondary Storage; Programming; Systems Software; Applications Software; Systems Development; Computer Networks; The internet; Computer Security; Software Utilities; Issues and Trends in IT.

COMS 1010(1) - COMMUNICATION SKILLS
Writing skills, non-verbal communication, modes of speech delivery and presentation aids, speeches, perception and listening skills, business and technical writing.

ELEC 1031Y(1) - ELECTRONICS
Semiconductors, PN Junctions, Diode Circuits, Operational Amplifiers, BJT Physics and Electrical Characteristics, BJT Large Signal Model and Analysis, BJT Amplifier, BJT Switch, JFET, MOSFET, Boolean Variables, Logic Gates, Logic Functions, Boolean Algebra, Implementation of Combinatorial Logic Circuits, Minimization of Boolean Expressions, Sequential Logic Circuits, Flip-Flops, Digital Arithmetic, Counters, Decoders, Encoders, Multiplexers, Demultiplexers.

ELEC 1032Y(1) - BASICS OF COMPUTER PROGRAMMING
Introductory concepts, C fundamentals, Operators and Expressions, Data Input and Output, Flowcharts and Pseudocodes, Control Statements, Functions, Arrays, Pointers, Data files, Structures.

ELEC 1033Y(1) - ELECTRICAL TECHNOLOGY
Current Electricity, Electrical components and their characteristics, Electrical Power and Energy, Dc circuit analysis, Network Theorems, Magnetism and Electromagnetic Induction, Single Phase Ac circuits and phasor diagrams, Power factor and correction, Ac circuit analysis using complex notation, Series and parallel resonance, 3 phase circuit analysis, Star and delta connected supplies and loads, Balanced and unbalanced 3-phase systems. Statistic characteristics of measurement systems, Sensors, Detectors and Transducers. Signal conditioning elements, Dynamic Characteristics of Measurement systems, Analogue ac and dc measuring instruments: moving coil, moving iron and electrodynamic instruments, Measurement of current, voltage, resistance, power and energy, Classification of data and errors, Error bands. Uncertainty analysis.

ELEC 2001Y(3) - ANALYTICAL TECHNIQUES (PQ: MATHS 1211(1))
Laplace Transforms: Introduction to transforms and operators, Laplace transforms of basic functions, unit step function, transforms of 1^{st} and 2^{nd} derivatives, application to electrical circuits, transfer functions, inverse Laplace transforms, derivation using partial fractions, Direct (s-domain) analysis of electrical circuits, interpolation of s-domain functions, system poles and their effect on system response, initial and final value theorems, transforms of piecewise continuous functions; Fourier Transforms; Fourier Series; Matrix solution of simultaneous linear equations, row reduction methods, Gaussian and Gauss Jordan elimination, consistency of simultaneous linear equations, transpose and inverse of a matrix, use of inverse to solve simultaneous linear equations, determinants, properties of eigenvectors, diagonalisation, couples linear systems; Generating functions: Recurrence relations, Proof using mathematical induction; Probability and statistics: Permutations and combinations, random events and assignment of probability, axioms of probability, Venn diagrams, independence, conditional probability and Baye's rule, Bernoulli trials, discrete and continuous random variables, Probability density (PDF) and cumulative distribution (CDF) functions, mean and variance, uniform, Gaussian and Poisson PDFs, The Central Limit Theorem, Estimation and Hypothesis testing, Linear regression and correlation, Examples: SNR of a PCM signal, bit error rate for binary data with Gaussian noise.

ELEC 2034(3) - SIGNALS AND SYSTEMS
Continuous-time signals and systems, differential equations, discrete-time signals and systems, difference equations, impulse response and convolution, frequency response, Fourier series and transform, Laplace transform, Z-transform.

ELEC 2032(3) - ELECTROMECHANICAL SYSTEMS I (PQ: ELEC 1033Y(1))
Magnetic Circuits and Energy Conversion in Machines. Transformer Theory, Connection and Operation. DC Machines: Principles and Characteristics/Operation of DC Motor and Generators. Induction Machines: Principles, Applications and Operation. Synchronous Machines.

ELEC 2033(3) - ELECTRICAL ENERGY SYSTEMS
Electrical Energy Demand, Power Plant Economics, Thermal Power Stations, Hydro-Electric Power Stations, Diesel Electric Power Stations, Gas Turbine Plants, Introduction to Transmission and Distribution, Introduction to Switchgear and Protection.

ELEC 3001Y(5) - MICROPROCESSORS
Binary and Hexadecimal representation of numbers. Binary arithmetic. Architecture of 8085 microprocessor. Introduction to Assembly level and Machine Code programming. Internal Registers. Software Concepts Addressing Modes, Data transfers. Instruction sets for 8085. Data Processing. Further Programming. Test and Branch. Stack (software and hardware), subroutines, CALL instructions. Encoder/decoder, tristate, interfacing. Memory Systems RAM and ROM type of memories, EPROM and EEPROM, commercial memory chips. Memory and bit maps, address decoding, memory interfacing. Microprocessor timing and instruction design timing diagram and conventions, T-states, M-cycles, I-cycles, Instruction length and execution time.
Interrupts: RST Instructions and implementation of interrupts. Multiple interrupts and priorities, RIM and SIM Instructions. A/D and D/A conversions. Successive Approximation A/D converters. Programmable Interface chips: Intel 8155 and 8255 and their different modes of operation. Interfacing A/D converters and printers via Intel 8255. DMA. Serial communication, Standards: RS-232C. Asynchronous serial I/O. Data transmission to TTY and data reception from TTY. Serial I/O using programmable chip, Intel 8251A Programmable Communication Interface.

ELEC 3031(5) - POWER ELECTRONIC DEVICES AND CONVERTERS
Characteristics of Power Semiconductor devices, Losses and Thermal flow models in switching devices, thermal design, switching aid and snubber circuits, Switch Mode Dc-dc Converters: Buck, Boost, Buck-boost and bridge topologies, Continuous and Discontinuous Modes of Operation, Closed loop control of dc-dc converters. Introduction to controlled rectification. Gate drive circuit design: Transformer and opto-isolated drive circuits, Single phase dc to ac inverters. Dc motor drive operating modes; Control of dc drives using switch mode power converters.

ELEC 3032(5) - CONTROL ENGINEERING 1 (PQ: ELEC 2034(3))
Modelling of mechanical, hydraulic, pneumatic, and electrical systems. Brief Revision of Laplace transforms, Block Diagrams, Transfer functions, Signal Flow Graphs and their reduction. State space representation of SISO systems. System Analysis: Transient response of SISO systems, steady-state errors, stability, Routh-Hurwitz criterion, root-locus method. Frequency Response Analysis: Bode diagram, Polar plots, Nyquist plot and stability criterion.

ELEC 4002Y(5) - POWER ELECTRONIC DRIVES (PQ: ELEC 3031(5))
3-phase dc to ac inverter configurations, Single phase and three-phase switch mode ac to dc converter topologies; continuous and discontinuous modes of operation. Motor drive applications and selection criteria, Mechanical system requirements and torque speed characteristics, Synthesis of low frequency ac voltages for motor drives, Inverter based Induction motor adjustable speed drives, Speed control using 3-phase ac voltage controllers, Single phase thyristor-based ac voltage controllers, Power Quality issues and Uninterruptible Power Supply Systems.

ELEC 4012Y(5) - DIGITAL SIGNAL PROCESSING (PQ: ELEC 2034 (3))
Continuous-time to discrete-time conversion and back, discrete-time systems and definition of DSP, DTFT, filter specifications, sampling rate conversions, DFS, DFT, FFT, filter structures, IIR filter design, FIR filter design, autocorrelation and power spectral density of random signals, applications.

ELEC 4037Y(5) - MEASUREMENT AND CONTROL (PQ: ELEC 3032(5))
Introduction to Transducers. Transducer Signal Conditioning. ADC/DAC operation. Temperature, Displacement, Optical, Flow transducers. Measurement & Errors.
Controller design in continuous time-domain: Proportional, PI, PD, PID, Phase-Lead, Phase-Lag, Lead-Lag.

ELEC 4238(5) - POWER SYSTEMS (PQ: ELEC 2033(3))
Power Flow Analysis, Economic Operation of Power Plants, Fault Analysis, Stability, Parallel Operation of Alternators, System Interconnections, System Security.

ELEC 4239(5) - CONTROL ENGINEERING 2 (PQ: ELEC 3032(5))
State-Space Representation of Transfer Functions, Control Systems Analysis and Design by State-Space Methods, Multiple-Input Multiple-Output (MIMO) systems. Controllability, Observability, Design via Pole-Placement, Ackermann's Formula,. Z-transform, Numerical Integration, Linear Difference Equations,

Discrete Transfer Function, Sampled Data System, Analysis of Sample and Hold, Design of Sampled-Data Control System, Direct Digital Control Design, Emulation of Continuous Time Controller, w-plane design. Process Control Models, Tuning Rules for PID Controllers, Ziegler-Nichols Tuning, Modifications of PID Control Schemes, Two-Degrees of Freedom Control.

MATHS 1111(1) - MATHEMATICS 1
Calculus of one and several variables. Polar coordinates. Complex numbers. Hyperbolic functions. Limits. Ordinary differential equations.

MATHS 1211(1) - MATHEMATICS 2
Matrix Algebra: Matrices and determinants. Solution of linear systems of equations. Eigenvalues and eigenvectors. Infinite Series: Comparison test and Ratio test for non-negative series. Vector Algebra: Scalar and vector products, triple products. Vector equations. Vector Analysis: Gradient, divergence and curl. Line and multiple integrals. Green's theorem in the plane, Divergence theorem and Stokes' theorem.

MECH 1001Y(1) - MECHANICS OF MATERIALS AND MACHINES I
Applied Mechanics Concepts, Direct Stress and Strain, Frameworks, Shear and Torsion, Shear Force and Bending Moment, Bending of Beams, Simple Harmonic Motion, Velocity & Acceleration Diagrams, Balancing, Crank Effort Diagrams, Belt Drives.

MECH 1003Y(1) - ENGINEERING GRAPHICS
Introduction to Drawing Office Practice, BS 308, etc; Geometrical constructions; Blending of curves; Linkages, Locus, Ellipse, cycloid, epicycloid, etc; Introduction to development (Prisms, cylinders, etc); Orthographic Projection (systems of projection); Dimensioning and Tolerancing; Sections and sectional views. Introduction to isometric projection; Standard Parts (Threading, Fasteners, etc); Assembly Drawing.
Further Isometric projection, True lengths & True Shapes, Further Development & Interpenetration, Development of Truncated Parts & Transition pieces, Assembly & Working Drawings, Drawing analysis, Cams, Gearing & Gears, Piping Drawing, Welding representation, Limits, Fits and Tolerances - BS 4500, Geometrical Tolerancing, Freehand sketching & Perspective Drawing.

MECH 2002Y(3) - MECHANICS OF MATERIALS AND MACHINES 2 (PQ: MECH 1001Y(1))
Strain Energy, Complex Stress and Strain, Theories of Elastic Failure, Thick Cylinders, Torsion of Non-Circular Sections, Cams, Clutches, Gear Trains, Gyroscopes.

MECH 2005Y(1) - THERMOFLUIDS
Introduction: Basic Concepts; Thermodynamic properties, the system, work and heat, temperature, processes, 1st Law & 2nd Law: The closed cycle, Open System. Steady flow energy equation. Application to boiler, turbine, compressor, pump, etc. Heat engine, Clausius version of 2nd Law, reversibility, thermodynamic temperature scale. Entropy: Entropy, T-s & h-s diagrams for water/steam. Air standard cycles; Carnot engine cycle, Rankine, Otto and Diesel cycles. Combustion: Chemical reactions and equations. Stoichiometric A/F ratio. Fluid Mechanics and Fluid Statics, pressure forces, Buoyancy

MECH 2006Y(3) - MECHANICAL PROCESSING OF MATERIALS
Fundamentals of Materials: Properties of materials (hardness, ductility, UTS, etc.), Introduction to Heat Treatment, Microstructure Analysis of common metals (Iron, different carbon steels, copper, aluminium), Production of materials, Properties & Applications (Iron & Steel, Copper, Aluminium, Plastics, Ceramics, Elastomers, etc.), Case studies to demonstrate selection of materials for particular applications, Introduction to conventional Machining processes: Turning, Milling, Drilling, Shaping, Reaming, Grinding & Finishing Processes, Machining Tools, Introduction to Joining Processes, Metrology (Standards, Dimensional Properties & Errors, Tolerance, Fits & Gauges, Linear Measurement, Comparators & Angular Measurement, Introduction to Surface Texture Measurement, Surface Roundness Measurement, Interferometry, Introduction to CMM), Non-conventional machining: EDM, ECM, USM, etc, Micro-machining using non-conventional processes, introduction to nano-machining technologies.

MECH 2019(3) - PROJECT APPRAISAL TECHNIQUES
Introduction to different branches of Economics. Microeconomics: Supply and Demand Analysis, Monopoly & Competition Macroeconomics: National Income Accounting, Multiplier Effect, Open and Closed

economies. Engineering Economics: Investment Appraisal Techniques, Resource and Environmental economics. Welfare Economics: Indifference curves, Choices for the development of society. Accounting for decision- making: concepts, Elements of Costing methods and Techniques, Accounting ratios, applications to engineering.

MECH 3003Y(5) - DRIVES AND CONTROL

Pneumatics & Hydraulics Systems; Standards; Generation of Pneumatic & Hydraulic Power; Design and Implementation of Pneumatics and Hydraulics Circuits; Pneumatics and Hydraulics Components – Valves, Actuators, etc; Design of cascade circuits and troubleshooting; Electrohydraulic & Electropneumatic Systems and Components; Proportional Control; Systems Integration and Interfacing to PLC's and Microprocessors; Safety Aspects; Applications and Comparisons between Different Systems. Demonstration. Fluidics - Wall attachment principle; Fluidic elements- applications. Programmable Logic Controllers; Microcontrollers; PC based systems; Mini-project.

MECH 3000 - INDUSTRIAL TRAINING

The industrial attachment is for a minimum period of 20 weeks to be undertaken within a company. The industrial training report will be assessed.

MECH 3062(5) - ENGINEERING MANAGEMENT I

Introduction to the Production and Operations Management; Decision Analysis; Capacity Planning; Process Selection and Facility Layout; Location Planning and Analysis; Introduction to Quality; Introduction to Inventory Management: Requirements of an effective Inventory Management System; EOQ & EBQ models, Reorder levels, Quantity Discounts; Materials Requirement Planning; Project Management.

MECH 3064(5) - ENGINEERING DESIGN

Course Introduction, Design for Quality and Manufacturability, Manufacturing Considerations for Designers, Conceptual Design, Generating Design Specifications, Evaluating Design Alternatives.
Material Selection, Design Problem Formulation and evaluation, Mechanical Component Design, Communicating Engineering Design, Patents, Liability and Ethics, Design Project Presentation.

MECH 3060 (5) - FACTORY AUTOMATION

Fundamentals of Manufacturing and Automation; Type of Automation Systems and Strategies; Design for Automation; Line Balancing; Automated Assembly Lines; Automated Materials Handling and Storage; Automated Inspection; Numerical Control, NC Part Programming; Introduction to CAD/CAM; Introduction to CIM; Group Technology; Flexible Manufacturing Systems.

MECH 4000Y(5) - PROJECT

Project in Mechatronics and Related Areas.

MECH 4003Y(5) - RELIABILITY & SAFETY ENGINEERING

Reliability: Definition of reliability, failure determination and measures; Failure frequency distributions; Graphical analysis of item failure data, Trend analysis, Reliability and Availability Assessment of systems; Failure Mode Effect & Criticality Analysis (FMECA); Fault Tree Analysis (FTA); Implications for Maintenance; Industrial Case Studies.
Definition of critical maintenance terms, the basic model of the maintenance system, Maintenance approaches, relationship between reliability and failure, common types of failure in components, safe system of work for maintenance, Principles of preventive maintenance: definition of a plant item, maintainability diagrams, Models for optimising the balance of preventive and corrective work, Selection of the best maintenance procedure in the light of cost and safety factors, The Top-down Bottom-up (TDBU) approach to the formulation of maintenance strategy, Introduction to Reliability-Centred Maintenance, its uses and limitations, Total Productive Maintenance, Integrated Condition Based Maintenance, Machine Life cycles, Trend Monitoring, Parameter Symptom limits, Thermal monitoring, Lubricant monitoring, Vibration monitoring, Machine faults and frequency range of symptoms.
Safety: *The Workplace*: Safety of the Workplace, Safety in Construction and Demolition Work, Safety during Maintenance Work, Work in Confined Spaces, Fire Safety, Storage of Flammable Materials, Fire and Explosion Hazards and Precautions, Safe Use of Electricity, Chemical Process Safety, Safe Working

Practices in Construction and Demolition Work, Storage and Transport of Flammable, Toxic and Corrosive Substances, Environmental Pollution and Waste Management.
Work Equipment: Selection, Use and Maintenance of Work Equipment, Basic Machinery Safety, Safety in the Movement of People and Materials, Electrical Equipment Safety, Plant and Machinery Safety Programmable Electronic Systems, Integrity of Materials and Components, Pressure Systems.
Relevant legislation for occupational health and safety in Mauritius.

MECH 4007Y(5) - ROBOTICS & MACHINE INTELLIGENCE
Course Overview, Importance of a knowledge of Robotics Systems for engineers; Fundamentals of Robotics & Automation; Robot characteristics; Control Systems and Components; Robot Motion Analysis and Control; Robot End Effectors; Sensors in Robotics: Internal & External sensors; Introduction to Machine Vision & Edge detection techniques; Robot Programming and Languages; Robot Cell Design and Control; Economics of Robotic Systems; Robot Applications in Manufacturing; Robot Implementation and safety requirements; Mini-project + Hands on sessions. Representation of knowledge; Knowledge based systems; Introduction to fuzzy systems and inexact reasoning; Artificial neural networks; Pattern matching; Control techniques; Expert systems design.

MECH 4008Y(5) - AUTOMOTIVE ELECTRONICS SYSTEMS
Semiconductors, Transistors, Digital circuit principles, Sensors, Actuators, Electronics Control Unit (ECU); Combustion and Ignition; Engine Fuelling; Engine and Exhaust Management; Instrumentation and Auxiliaries; Comfort, Safety and Security; Road wheel control; other electronic fault diagnosis applications.

MECH 4205(5) - ENGINEERING MANAGEMENT II (PQ: MECH 3062(5))
Human Resource Management: Evolution of Management, Concepts - management by exception; management by objectives; management by learning, continuous improvement, Types of leadership, Motivation, Recruitment, Training and Development, Evaluation, Control and Reward System.; Industrial Relations & Law: Industrial Disputes and Discipline, Workers bargaining power and participation; Introduction to Marketing: The marketing Environment, Customer buying behaviour, Segmentation, Targeting and Positioning, The 4 P's of Marketing; Contracts & Tendering.

MECH 4014(5) - MECHANICAL VIBRATION

Definitions, Properties of Oscillatory Motion, Equation of Motion and Solution for Free Vibration problems, Energy Method, Stability, Damped Free Vibration, Logarithmic Decrement. Forced Harmonic Vibration, Rotating Unbalance, Support Motion, Vibration Isolation, Impulsive Excitation, Response due to Arbitrary Excitation, General Periodic Excitation, Systems with Multiple Degrees of Freedom, Normal Mode Vibration, Coordinate Coupling, Principle Coordinates, Free Vibration, Matrix methods for Multi-Degree of Freedom Systems, Vibration Measurement and Applications, Vibrometers and accelerometers, Spectrum analyzers, Introduction to Modal Testing, Laboratory Demonstrations.