National Diploma in Technology

Curriculum

Electrical Engineering Technology

Institute of Technology
University of Moratuwa

August 2004

First Year Syllabi

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Second Year Syllabi

1. DCE 102 Engineering Mechanics and Strength of Materials

Code : DCE 102		Division: Mechanical Eng. & Civil Eng.			
Title : Engineering Mechanics and Strength of Materials					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2x30	**2x15**	**2x15**	**2**	**2/2**	**2/2**
Method of Assessment : - 3 Hour Question Paper & Course Works					

General Objectives

On completion of this module, the students will be able to

- gain sufficient theoretical knowledge to deal with Statics and Dynamics of Mechanical Engineering components in machinery and
- apply the principles of strength of materials on simple objects under different load conditions.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1	**Engineering Mechanics** Introductory Topics	04	04
2	Energy	04	-
3	Friction and Friction Drives	12	06
4	Gears	02	
5	Dynamics	08	04
6	**Strength of Materials** Elasticity of Materials under Different Load Conditions	11	06
7	Sectional Properties	03	-
8	Shear Force and Bending Moment Diagrams for Beams	10	-
9	Torsion in Simple Practical Applications	04	06
10	Slope and Deflection of Beams	02	04
	Total	**30**	**30**

Summary Syllabus

Engineering Mechanics

1. Introductory Topics (04 hours)

- Review - Units and dimensions, statics of a rigid body
  - Scalar and vector quantities.
  - Force, couple and moment with graphical representation.
  - The principle of equilibrium
  - Necessary and sufficient conditions for the equilibrium
  - Free body diagrams
- Simple Machines
  - Load, effort, mechanical advantage, velocity ratio, and mechanical efficiency.
  - Introduction to simple machine, lifting machine and reversible machine, self-locking machine and compound machine.
  - Condition for the self-locking machine.
  - Law of a simple machine $P = aW + b$.
  - Maximum mechanical advantage and maximum mechanical efficiency

2. Energy – Work & Power (04 hours)

- Introduction, work, energy.
- Potential energy, Kinetic energy and strain energy.
- Kinetic energy of rotating body, rotating about a fixed axis.
- Power, efficiency law of conservation of energy theore

3. Friction (12 hours)

- Introduction, dry friction, fluid friction, semi lubricated friction.
  - Static friction, dynamic friction
  - Laws of dry friction, coefficient of static and kinetic friction
  - Rolling and slipping
- Screw friction
  - Introduction, pitch, thread angle, lead, no of starts.
  - Friction formulae for square and V-threads
  - Mechanical efficiency and the maximum efficiency.
  - Engineering applications, such as screw jack, nuts and bolts, turn buckles, presses and power screws.
- Simple clutches
  - Introduction, type of clutches
  - Simple clutch in uniform wear and uniform pressure conditions.
- Bearings
  - Introduction, frictional losses in thrust bearings
  - Flat pivot and collar bearings with uniform wear and uniform pressure.
- Belt drives
  - Introduction, frictional formulae for flat belt and ‘V’ belts drives
  - Power transmission, via belts, band brakes

4. Simple Gar Dives (02 hours)

- Introduction, spur gearing between parallel shafts, external and internal gearing
- Pitch, module, pitch circle diameter, dedendum circle, addendum circle

5. Dynamics (08 hours)

- Kinematics
  - Introduction, kinematics of a particle in linear motion with constant acceleration condition, graphical representation of velocity and acceleration.
  - Kinematics of a particle in curvilinear motion in polar co-ordinates.
- Kinetics
  - Introduction, rigid body in motion.
  - Newton' laws of motion, De Alembert's principle.
  - Newton's second law for system of particles.
  - Motion of a particle in a circular motion.
- Inertia
  - Introduction, mass moment of inertia, radius of gyration
  - Parallel axis theorem, perpendicular axis theorem.
  - Motion of a rotating body about a fixed axis, plane motion of a rigid body.

Strength of Materials

1. Elasticity of Materials under Different Load Conditions (11 hours)

- Review of fundamentals
  - The nature of rigidity, elasticity and plasticity of materials, Hooke's law, Linear elastic stress strain analysis.
- Composite members
  - Principles of elasticity in stress-strain analysis of composite bars under; direct tensile or compressive loads and thermal stresses.
- Shear stress and shear strain
  - Complementary and diagonal shear stresses.
  - Shear modulus.
  - Applications of shear – lap joints and butt joints (design & analysing)
- Volumetric stress and strain
  - Bulk Modulus, Poisson's Ratio and Relationship between the elastic moduli.

2. Sectional Properties (03 hours)

- First moment of area and second moment of area.
- Perpendicular axes theorem and parallel axes theorem.
- 2^{nd} moment of area for different standard shapes and their combinations.

3. Shear Force and Bending Moment Diagrams for Beams (10 hours)

- Types of loads and supports.
- Shear force and bending moment.
- Relationship between load, shear force and bending moment.
- Shear force and bending moment diagrams for different conditions of loads and supports.
- Bending of beams.
- Bending formula for simple applications.

4. Torsion in Simple Practical Applications (04 hours)

- Torsional shear stresses in solid and hollow circular shafts.
- Applications of torsion, Transmission of power and Helical springs.
- Torsion formula for closed coil helical spring.

5. Slope and Deflection of Beams (02 hours)

- Slope and deflection of cantilevers and simple supported beams.

List of Practicals : (30 hours)

Engineering Mechanics (14 hours)

1. Rotating Beams Apparatus
2. Inclined Plane
3. Compound Pendulum
4. Worm and Wheel Drive
5. Belt and Rope Friction
6. Screw Jack

Strength of Materials (16 hours)

1. Tensile test - Stress strain relationship of mild steel
2. Beam Deflection - Determination of Young's Modulus of timber
3. Torsion test - Determination of Modulus of Rigidity of steel
4. Helical Springs - Deformation of a helical spring under axial tension

Recommended Text Books :

1. Engineering Mechanics – Dynamics; R S Hibbler
2. Engineering Mechanics – Statics; J L Meriam and L G Kraige
3. Applied Mechanics; H Hannah, M J Hillier
4. Applied Mechanics and Strength of Materials; R S Khurmi
5. Theory of Machines; R S Khurmi and J K Gupta
6. Strength of Materials; G H Ryder
7. Strength & Elasticity of materials and Theory of Structures; W H Brooks
8. Mechanics of Solids and Structures; P P Benham and F V Warnock
9. Strength of Materials; John Case and A H Chilver
10. Problems in Strength of Materials; W V Sirk

2. DCH 102 Properties of Materials

Subject Code: DCH 102			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Properties of Materials					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**-**	**2**	**1**	**-**
Method of Assessment :- 3 Hour Question Paper					

General Objectives :

On the completion of this module students will be able to understand the structure, behavior and properties of materials in engineering applications.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Crystal Structure	08	-
2.	Phase Equilibria	10	-
3.	Mechanical Properties of Materials	04	-
4.	Electrical Properties of Materials	08	-
5.	Thermal Properties of Materials	03	-
6.	Polymers, Ceramics and Composites	09	-
7.	Treatment of Water	08	-
8.	Corrosion	10	-
	Total	**60**	**00**

Summary Syllabus

1. Crystal Structure (08 hours)

- Crystal systems, Crystal lattices, Unit cells.
- Lattice types of metals, their detailed study.
- Lattice transformation of Iron with temperature.

2. Phase Equilibria (10 hours)

- Definitions: Phase, Component, Degrees of freedom
- One component systems.
- Gibb's Phase rule.
- Two component systems : Alloys, solid solutions, intermetallic compounds
- Iron-Carbon phase diagram.

3. Mechanical Properties of Materials (04 hours)

- Stress Vs. strain curves.
- Creep.
- Fatigue.

4. Electrical Properties of Materials (08 hours)

- Conductivity, Resistivity.
- Conductors, Semiconductors and Insulators: Properties, structure and bonding, band structure.

5. Thermal Properties of Material (03 hours)

- Heat Capacity, Specific Heat, Thermal Conductivity.

6. Polymers, Ceramics and Composites (09 hours)

- Homopolymer, copolymer.
- Thermoplastic polymers
- Thermosetting polymers
- Elastomers
- Their structure and formation.
- Glass transition temperature.
- Degradation of polymers.
- Structure of Ceramics, bonding and related properties.
- Composites : Fibre reinforced, particle reinforced and dispersion strengthened.

7. Treatment of Water (08 hours)

- Impurities present in water.
- Removal of impurities.
- Hard water and Soft water.
- Units used to express hardness of water.
- Removal of hardness.
- Boiler types and importance of blow down.

8. Corrosion (10 hours)

- Difference between an electrolytic cell and an electrochemical cell.
- Direct corrosion
- Indirect corrosion.
- Prevention of corrosion.

List of Practicals: Nil

Recommended Text Books :

1. Elements of Materials Science, 6th Edition; Van Vlack (Addison Wesley)
2. Introductions to Materials Science for Engineers, 4th Edition; Shackleford (Prentice Hall International)
3. The Science of Engineering materials; Smith (Prentice Hall International)
4. Materials Science and Engineering, 4th Edition; Callister (Wiley)

3. DEE 102 Electrical Measurements and Basic Electronics

Subject Code : DEE 102			Division : Electrical & Electronic Engineering Technology		
Title : Electrical Measurements and Basic Electronics					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**30**	**2**	**1**	**2/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objective

On completion of this module the student will be able to:

- acquire the fundamental knowledge of Electrical Measuring Instruments and Basic Electronics.
- form a basis for advanced studies in Electrical Engineering to be undertaken in the 2nd Year.

	Subject Outline	Lecture (hr.)	Practical (hr.)
	Measurements		
01.	Moving Coil Instrument	04	03
02.	Moving Iron Instruments	04	03
03.	Electro-dynamic Instruments	04	03
04.	Electrostatic Voltmeter	04	-
05.	Sensitivity & Accuracy	04	03
06.	Kelvin's Double Bridge	04	03
07.	Meg-ohm Meter	02	03
	Basic Electronics		
08.	Semiconductor diodes	04	03
09.	Power Supplies and Rectifiers	04	03
10.	Smoothing Circuits	04	03
11.	Bipolar Junction Transistor	06	-
12.	Transistor Biasing	04	03
13.	Field Effect Transistors	04	-
	Digital Electronics		
14	Combinational Logic	04	-
15	Sequential Logic	04	-
	Total	**60**	**30**

Summary Syllabus

Electrical Measurement

1. Moving Coil Instrument (04 hours)

- Review of conversion of an ammeter to a Voltmeter
- Review of extension of ammeter range, extension of Voltmeter range
- AC theory and rectification, average, rms values and form factor of sinusoidal wave,
- Circuit diagram of a multi range ac Voltmeter-Ammeter
- Use of a moving coil meter as a Ohmmeter

2. Moving Iron Instruments (04 hours)

- Attraction type Moving Iron instrument, Repulsion type Moving Iron Instrument, its non linear scale and how to correct it

3. Electro-dynamic Instruments (04 hours)

- Operation of Electro-dynamic Instruments, Conversion into a ammeter / Voltmeter / Wattmeter, Connection Errors in Electro-dynamic Watt meters
- Errors due to inductance of watt meter coils

4. Electrostatic Voltmeter (04 hours)

- Operation of Electrostatic Voltmeter

5. Sensitivity and Accuracy (04 hours)

- Sensitivity and accuracy of Measuring Instruments & loading effects of Voltmeters

6. Kelvin's Double Bridge (04 hours)

- Operation of Kelvin's double bridge, Estimation of errors involved

7. Meg-Ohm Meter (02 hours)

- Crossed coil principle to use it as a ratio meter, also as a Meg-Ohm meter

Basic Electronics

8. Semiconductor Diodes (04 hours)

- Properties of semiconductors, PN junction, Extrinsic or impure semiconductors (n type & p-type), Current flows in a p-n junction, Diode characteristics
- Load line analysis,

9. Power Supplies & Rectifiers (04 hours)

- Half wave & full wave rectifiers
- Accumulators – Charging, discharging, Ampere-hour capacity

10. Smoothing Circuits (04 hours)

- C filter, LC Filter Section

11. Bipolar Junction Transistor (BJT) (06 hours)

- BJT Symbols & codes to identify BJTs, Transistor parameters, Leakage currents in BJTs

12. Transistor Biasing (04 hours)

- Biasing arrangement in C-B and C-E circuits of BJT, Load line equation for transistor circuits, Q-point analysis

13. Field Effect Transistors (04 hours)

- JFET and its Output characteristics

- MOSFET
- MOSFET & its drain characteristics, Equation for drain current, FET Biasing circuits
- DC load line and analysis
- AC load line in FET circuits

Digital Electronics

14. Combinational Logic (04 hours)

- Number systems & codes
- Basic logic gates and Boolean algebra
- Combination logic circuits & Minimisation techniques, k-maps
- Introduction to TTL & CMOS
- Transistorised Monostables, Bistable & Astable devises

15. Sequential Logic (04 hours)

- Sequential logic circuits, Optimization techniques

List of Practicals: (30 hours)

1. Measurements on Kelvin's Double Bridge
2. Measurements of power in single phase circuits
3. Study of moving coil meter
4. Study of non-linear resistor
5. Continuity and Insulation testing
6. Familiarization of electronic components
7. Semiconductor diode and its application
8. Smoothing and regulating circuits
9. Bipolar junction transistors
10. Field effect transistors

Recommended Texts :

1. Electrical Fundamentals; John Ryder, Prentice Hall International
2. Electrical Measurements & Measuring Instruments; E W Golding
3. Hughes Electrical Technology Revised; Ian McKenzie
4. Electrical Technology; H Cotton
5. Electrical Technology; Schaum Series
6. Electronic Engineering; Schelling & Belove
7. Electronic Principles; Gray & Searle, Wily International
8. Electronic Circuits; Milman & Haukias
9. Principles of Electronics; J E Holding & M R Garvin
10. Digital Systems; R J Tocci, Prentice Hall International
11. Pulse & Digital circuits; Milman & Taub, Mcgraw Hill
12. Digital Computer fundamentals; Douglas Lewin, Thomas Nelson (UK)
13. Electronics Engineering; Schaum Series

4. DEE 103 Principles of Electricity

Subject Code : DEE 103			Division : Electrical & Electronic Engineering Technology		
Title :- Principles of Electricity					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**30**	**2**	**1**	**2/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives :

On the completion of this module the student will be able to:

- acquire the fundamental knowledge of Basic Electricity.
- form a basis for advanced studies in Electrical Engineering to be undertaken in the 2nd Year.

	Subject Outline	Lecture (hr.)	Practical (hr.)
	Basic Electricity		
01	SI Units	01	-
02	Fundamental Laws of Electricity	01	05
03	Electric Power & Energy	01	-
04	Temperature Effects of Resistors	01	05
05	Network Theorems	04	-
06	DC Distribution Systems	03	05
	Electrostatics		
07	Electric Field	02	-
08	Electron Ballistics	03	-
09	Charging and Discharging Phenomena	03	05
	Magnetism		
10	Magnetic Field	03	-
11	Electromagnetism	02	-
12	Magnetic Circuits	03	-
13	Inductance in DC Circuits	03	-
14	Mutual Inductance	01	-
	Alternating Theory		
15	Alternating Voltages & Currents	08	05
16	Single Phase Circuits	04	-
17	Effect of Frequency in AC Circuits	03	-
18	Three Phase Circuits	12	-
19	Electrical Installation	02	05
	Total	**60**	**30**

Summary Syllabus

Basic Electricity

1. SI Units (01 hour)

- SI units for Force, Work, Power, Charge, Current, Resistance & Voltage

2. Fundamental Laws of Electricity (01 hour)

- Ohm's law, resistivity, conductivity and their units
- equivalent resistance of a series and parallel circuits
- Kirchoff's lows (current law and voltage law)
- ideal voltage and current source, practical voltage & current sources

3. Electric Power and Energy (01 hour)

- Efficiency of energy conversion

4. Temperature Effects of Resistors (01 hour)

- Temperature coefficient of resistance (+ve & -ve)

5. Network Theorems (04 hours)

- Active and positive networks, superposition theorem, Thevenin's theorem
- Norton's theorem

6. DC Distribution Systems (03 hours)

- Radial & Ring main systems
- Power loss in the distributors

Electrostatics

7. Electric Fields (02 hours)

- Static electricity, parallel plate capacitor, types of capacitors, Dielectric Strength
- Charge Vs applied voltage, parallel & series connected capacitors
- Electric force and Electric flux density, potential gradient, composite dielectric capacitors

8. Electron Ballistics (03 hours)

- Force on an isolated charge in an electric field
- Movement of a free electron in an electric field

9. Charging and Discharging Phenomena (03 hours)

- Charging & discharging current for series CR circuit. Time Constants, Stored energy in a capacitor, Force between oppositely charged plates

Magnetism

10. Magnetic Fields (03 hours)

- Magnetic poles, field strength, Magnetic Potential gradient, lines of magnetic flux, magnetic Induction and magnetic screening

11. Electromagnetism (02 hours)

- Right hand grip rule or cork screw rule
- Solenoid, toroid and force on a conductor carrying current in a magnetic field, Flemming's left hand rule, Lenz's law

12. Magnetic Circuits (03 hours)

- Mmf, magnetizing force, Magnetic flux
- Permeability of free space &r magnetic materials
- Relative permeability, absolute permeability
- Reluctance of a magnetic circuits, magnetic leakage and fringing
- Kirchoff's laws for the magnetic circuits
- B-H curve, Hysterisis

13. Inductance in DC Circuits (03 hours)

- Inductive and non inductive circuits, inductance of a coil, inductance of a long straight solenoid and a toroid coil
- Step response for LR circuit (Charging & decaying), energy stored in an inductive circuit, time constant of an inductive circuit

14. Mutual Inductance (01 hour)

- Mutual inductance, Self inductance, coupling coefficient

Alternating Theory

15. Alternating Voltages and Currents (08 hours)

- Sine wave, Phase angle (lead/lag), frequency, speed and no. of pole pairs Amplitude Alternating emf (single phase), Average, Peak and rms values of an alternating current, rotating vector, Manipulations with AC quantities, vector diagrams using rms values

16. Single Phase Circuits (04 hours)

- Analysis of ac circuits with R, L, C, RLC in series & RLC in parallel, Phasor diagrams, Power in ac circuits

17. Effect of Frequency in AC Circuits (03 hours)

- Series resonance, parallel resonance, active power and reactive power
- power factor using phasor diagrams

18. Three Phase Circuits (12 hours)

- Three phase generation, star and delta connection, line and phase voltage and currents in a star connected system & delta connected system
- power in three phase system with balanced load

19. Electrical Installations (02 hours)

- IEE wiring regulations, safety and Electrical shock, earthing, distribution systems, circuit breakers and fuses, basic domestic wiring installations
- Two way switch, Ring circuits of socket outlets, Radial circuit of socket outlets

List of Practicals : (90 hours)

1. Efficiency of Energy Conversion
2. Determination of RC – Time Constants
3. Study of Simple AC Circuits
4. Verification of Kirchoff's laws
5. Study of MCB's & Fuses
6. Study of 2-wire DC line Model

Recommended Text Books :

1. Electrical Fundamentals; John Ryder, Prentice Hall International
2. Electrical Measurements & Measuring Instruments; E W Golding
3. Electrical Engineering; G Hughes
4. Electrical Technology; H Cotton
5. Electrical Technology; Schaum Series

5. DIS 101 English

Subject Code : DIS 101		Division: Interdisciplinary Studies			
Title : English					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**-**	**2**	**1**	**-**
Method of Assessment :- Nine Assignments & 3 Hour question paper at the year end examination					

General Objectives

On Completion of this module the students will be able to

- Learn technical vocabulary and language necessary for scientific enquiry.
- Deal with concepts used in scientific discussion and writing in English.
- Develop an understanding of the English grammatical system at work.
- Produce language which look / sound natural.
- Develop writing skills.
- Get accustomed to various speech styles / situations and extract meaning.
- Achieve basic speaking skills needed to survive in speech situations.
- Achieve proficiency in social interaction.
- Develop presentation skills.
- Read and understand text.
- Read for specific information.
- Appreciate literary texts.

No.	Subject Outline	Lectures (hr.)	Practicals (hr.)
1	Core-Text - Basic English for Science	10	-
3	Listening	-	10
4	Speaking	10	20
5	Reading	15	-
6	Writing	25	-
	Total	**60**	**30**

* The first stage (foundation) of the course, which is the basic stage, is conducted prior to the commencement of the academic year & the 'foundation syllabus' is annexed.

Summary Syllabus

1. Technical vocabulary & concepts used in scientific discussion and writing in English.

(10 hours)

Core-Text - Basic English For Science (Peter Donovan - Oxford University Press)

- Giving simple instructions
- Reporting actions, observations & results, stating conclusions, accounting for results
- Understanding explanations, describing apparatus & experiments, interpreting results, describing attributes
- Describing experiment, stating results, describing & accounting for phenomenon
- Description of processes in detail

2.. Listening (10 hours)

- Listening activities
- Listening & Note-taking

4. Speaking (30 hours)

- Language of discussion
- Group discussions
- Basic Presentation skills
- Formal Presentations –individual / group

5. Reading (15 hours)

- Reading Comprehension
- Extracting contextual meaning of words
- Stated main ideas / implied main ideas
- Skimming and scanning a text to extract main idea / specific details
- Appreciating literary texts
- Reading & Note-taking

6. Writing (25 hours)

- Construction of sentences
- Paragraph writing – topic sentence / supporting details
- Simple compositions –narrative, descriptive, explanatory etc.
- Task-based assignments - report of experiment, description of process etc.
- Notices, invitations, notes, messages.
- Letter writing - Personal & Formal letters
- Report writing
- Job applications

Recommended Text Books :

1. Basic English for Science; Peter Donovan, OUP.
2. English for Physical Science; Allen & Widdowson, OUP.
3. Intermediate English Grammar; Raymond Murphy, Cambridge.
4. Advanced English Grammar; Raymond Murphy, Cambridge.

6. DIS 102 Introduction to Information Technology

Subject Code : DIS 102			Division : - Interdisciplinary Studies		
Title : Introduction to Information Technology					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
15	**-**	**15**	**1/2**	**-**	**1/2**
Method of Assessment: - Through Continues Assessment					

General Objective

On completion of this module the students will be able to:

- acquire a fundamental knowledge of computer systems and computer programming
- create professional quality spreadsheets and technical drawings.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction to Computers	02	-
2.	Data Representation	01	-
3.	Secondary Storage Devices	01	-
4.	Categories of Software	01	-
5.	Spreadsheet Applications	-	02
6.	Use of CAD in Engineering	02	08
7.	Fundamentals of Computer Programming	05	05
8.	Introduction to PC Network and Internet	03	-
	Total	**15**	**15**

Note: The subject will be evaluated by assignments and not by a year-end examination.

Summary Syllabus

1. Introduction to Computers (02 hours)

- Types of computers
- Main Components of a Computer
  - Central Processing Unit
  - Main Memory
  - Input and Output Devices

2. Data Representation in the Computer (01 hour)

- Numerical Data Representation
- Character Representation
- Memory Capacity
- Information storage in the main memory.

3. Secondary Storage Devices (01 hour)

- Use of secondary storage devices.
- Hard Disks, Floppy Disks, Optical Disks and Magnetic Tapes

4. Categories of Software (01 hour)

- Hardware, Software and Firmware
- System Software and Application Software.
- Types of system software
- Packaged Software and Custom-Written Software

5. Spreadsheet Applications* (02 hours)

- Work sheet, work book, row number, column letter, cell and an active cell, reference area.
- Numbers, Label and Formulae.
- Copying data, moving data, inserting, deleting, moving columns and rows, formatting cells
- Functions.
- Macros.
- Multiple work sheets.
- Charts.

6. Use of CAD in Engineering* (10 hours)

- Components of the AutoCAD window.
- Giving commands
- Function keys
- Creating a new drawing.
- Basic entities
- Basic Editing
- Display Control
- Aids to construction
- Drawing limits
- Advanced Editing
- Object Snap
- Layers
- Polylines
- Blocks
- Hatching
- Simple three-dimensional views

7. Fundamentals of Computer Programming* (10 hours)

- Visual development environment
- Event driven programming
- Variables and variable types.
- Input and Output
- Sequence control structure, Selection control structure and Loop control structure.
- Arrays.
- Modular programming.

8. Introduction to PC Networks and Internet (03 hours)

- Introduction to a PC Network
- Types of networks
- Network based applications and advantages of networks.
- Hardware requirements and software requirements.
- Internet its resources.

List of Practicals: (15 hours)

* Topics covered are listed under items 5, 6 and 7

Recommended Text Books :

1. Developing Applications With Visual Basic, P R Reed JR,
2. Teach Yourself Visual Basic 6 in 21 Days, G Perry.
3. Using the World Wide Web D A Wall
4. AutoCAD For Architects and Engineers: A Practical Guide to Design, John M Albright.& Elizabeth H Schaeffer
5. An AutoCAD workbook, A Yarwood
6. Computer Networks - Second Edition, Tanenbaum, S Andrew
7. Microsoft Office 97 Professional Edition, M L Swanson
8. Information Technology; A practical course, Harriet.Hraper
9. Introducing Computers: Concepts, Systems and Applications.
10. Computer and Information Processing, D D Spencer

7. DIS 103 Mathematics

Subject Code: DIS 103			Division : Interdisciplinary Studies		
Title : Mathematics					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
90	**30**	**-**	**3**	**1**	**-**
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- understand the basic concepts of mathematics
- develop rational thinking in formulating engineering problems
- use mathematical symbols and formulae
- apply mathematical knowledge in solving practical problems
- appreciate tidiness and orderliness

No.	Subject Outline	Lecture (hr.)	Tutorial (hr.)
	Algebra and Differential Equations		
1.	Determinants and Matrices	15	05
2.	Ordinary Differential Equations	15	05
3.	Vector Algebra	08	03
4.	Complex Numbers	06	02
	Calculus		
5.	Functions	04	01
6.	Application of Differentiation	06	02
7.	Application of Integration	04	01
	Probability and Statistics		
8.	Probability	05	02
9.	Statistics	12	04
	Numerical Methods		
10.	Numerical Methods	15	05
	Total	**90**	**30**

Summary Syllabus

Algebra and Differential Equations

1. Determinants and Matrices (15 hours)

- Determinants
- Types of matrices,
- Algebra of matrices,
- Adjoint
- Method of inversion,
- Solution of simultaneous equations,
- Echelon form,
- Gauss elimination method,
- Consistency

2. Ordinary Differential Equations (15 hours)

- Formulation,
- Solution of first order differential equations and second order differential equations with constant coefficients,
- Use of D-operators, simple applications

3. Vector Algebra (08 hours)

- Vector notations,
- Scalar and vector products,
- Triple products,
- 3-D geometrical applications

4. Complex Numbers (06 hours)

- Algebra of complex numbers,
- De Moivre's theorem,
- Argand diagram,
- Roots of complex numbers
- Algebraic equations

Calculus

5. Functions (04 hours)

- Exponential,
- Hyperbolic and logarithmic functions,
- Inverse functions and implicit functions.

6. Application of Differentiation (06 hours)

- Stationary points and curve sketching,
- Mean value theorem,
- L'Hospital's rule for limits,
- Leibnitz's theorem,
- Partial differentiation and error calculations,
- Taylor series in one or two variables.

7. Application of Integration (04 hours)

- Areas and volumes,
- Moments,
- Lengths of arcs,
- Radius of curvature.

Probability and Statistics

8. Probability (05 hours)

- Elementary probability theory,
- Conditional probability and Bayer's theorem.

9. Statistics (15 hours)

- Classification, tabulation and presentation of data,
- Measures of location and dispersion,
- Discrete and continuous probability distributions: Binomial, Poisons and Normal with simple applications.

Numerical Methods

10. Numerical Methods (15 hours)

- Solution of equations in one variable
- Successive substitution method
- Method of false position
- Simple iterative method
- Newton-Raphson method
- Solution of simultaneous linear equations; Jacobi method, Gauss – Seidal method
- Finite differences and interpolation,
- Numerical differentiation,
- Numerical integration: Trapezoidal and Simpson's rules,

Recommended Text Books :

1. Advanced Calculus; Murray R Spiegel, Schaum's Outline Series
2. College Algebra; Murray R Spiegel, Schaum's Outline Series
3. Fourier Series; Murray R Spiegel, Schaum's Outline Series
4. Laplase Transforms; Murray R Spiegel, Schaum's Outline Series
5. Probability and Statistics; Murray R Spiegel , Schaum's Outline Series
6. 1st Year College Mathematics; Frank Ayres, Schaum's Outline Series
7. Calculus; Frank Ayres, Schaum's Outline Series
8. Differential Equations; Frank Ayres, Schaum's Outline Series
9. Matrices; Frank Ayres, Schaum's Outline Series
10. Engineering Mathematics; K A Stroud, Macmillan
11. Introduction to University Mathematics; J L Smyrl, Hodder and Stoughton
12. Intermediate Mathematics; Blakey, Oxford Press

8. DME 101 Applied Thermodynamics & Fluid Mechanics

Subject Code : DME 101		Division : Mech. Eng. Tech. & Maritime Studies			
Title : Applied Thermodynamics & Fluid Mechanics					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	30	2	2/2	2/2
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

Section A - Applied Thermodynamics

On completion of this module the students will have

- an understanding of the fundamentals of thermodynamics.
- an exposition of the principles of thermodynamics.

Section B - Fluid Mechanics

On completion of this module, the students will be able to;

- understand the basic principles of Hydrostatics and Hydrodynamics as applied to flow through pipes and orifices.
- understand the basic principles and characteristics of Hydraulic Machinery such as pumps and turbines.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	**Applied Thermodynamics** Fundamental Concepts	02	02
2.	First Law of Thermodynamics	02	-
3.	Non Flow and Flow Processes	02	-
4.	Second Law of Thermodynamics	05	-
5.	Properties of Fluids	04	02
6.	Application of Non Flow Processes to Particular Fluids	05	-
7.	Application of Flow Processes to Particular Fluids	03	-
8.	Air Standard Cycles	04	04
9.	Combustion of Fuels	03	06
1.	**Fluid Mechanics** Fundamental Concepts	01	-
2.	Hydrostatic Pressure	05	02
3.	Impact of Jets	03	02
4.	Buoyancy of Bodies in a Fluid	03	02
5.	Pipe Flow	09	04
6.	Discharge through Small Orifices	05	02
7.	Discharge through Large Orifices	02	-
8.	Notches & Weirs	02	04
	Total	**60**	**30**

Summary Syllabus

Applied Thermodynamics

1. Fundamental Concepts (02 hours)

- Properties used to specify the state, or condition of a substance, units in which the property is measured and usual symbols.
- The terms “system” and “boundary”.
- Thermodynamic properties.
- Reversibility and reversible work.

2. First Law of Thermodynamics (02 hours)

- Conservation of energy.
- Cyclic process.
- First law of thermodynamics.
- Corollaries of first law of thermodynamics.

3. Non Flow and Flow Processes (02 hours)

- Non flow energy equation and reversibility.
- Non flow processes.
- Steady flow energy equation.
- Open systems with steady flow.
- Non steady flow processes.
- Practical applications of steady flow process

4. Second Law of Thermodynamics (05 hours)

- Cycle efficiency of a cyclic process.
- Heat engine and Heat pump.
- Second law of thermodynamics.
- Corollaries of second law thermodynamics.
- Entropy.

5. Properties of Fluids (04 hours)

- Properties of a prefect gas
- Properties of liquids and vapours
- Tables of properties
- Diagrams of properties such as temperature – entropy diagram, enthalpy – entropy diagram, pressure – enthalpy diagram

6. Application of Non Flow Processes to Particular Fluids (05 hrs)

- Constant volume process for a perfect gas and steam.
- Behavior of the steam and perfect gas in constant pressure process.
- Isothermal process for steam and perfect gas.
- Characteristics of steam and perfect gas in adiabatic process.
- Behavior of steam and perfect gas on polytropic process.

7. Application of Flow Processes to Particular Fluids (03 hours)

- Steady flows in boilers and condensers.
- Adiabatic steady flow processes in nozzles, diffusers, turbines and rotary compressors.
- Irreversible steady flow process in throttle valves.
- Isothermal steady flow process in reciprocating compressors.
- Non steady flow

8. Air Standard Cycles (04 hours)

- Carnot cycle with carnot efficiency.
- Constant pressure cycle (Joule cycle).
- Air standard cycle for petrol engine (Otto cycle).
- Diesel cycle.

9. Combustion of Fuels (03 hours)

- Fuels and their combustion processes.
- Chemical equations of combustion.
- Stoichiometric air fuel ratio.
- Practical analysis of combustion products.

Fluid Mechanics

10. Fundamental Concepts (01 hour)

- Historical back ground
- Density, Specific gravity and Specific weight.
- Surface tension
- Viscosity - Dynamic viscosity and Kinematic viscosity

11. Hydrostatic Pressure (05 hours)

- Action of pressure within a liquid
- Measurement of pressure – absolute pressure & gauge poressure.
- Applications of pressure - Hydraulic jack, lock gates, sluice gates etc.
- Action of pressure on vertical, non vertical and curved surfaces.
- Pressure diagram.

12. Impact of Jets (03 hours)

- Pressure on a fixed flat plate
- Pressure on a moving flat plate
- Pressure on a curved fixed vane
- Pressure on a curved moving vane
- Jet propulsion

13. Buoyancy of Bodies in a Liquid (03 hours)

- Archimede's principle
- Principle of buoyancy of bodies in a liquid.
- Terminology in connection with buoyancy, such as Metacentre, center of gravity, Metacentric height, Center of buoyancy
- Stability of a floating body.
- Metacentric height of a floating object by Moment method, Oscillation method and Analytical method

14. Pipe Flow (09 hours)

- Principles of pipe flow (3 Hrs)
  - Continuity and mass balance in a flowing liqud.
  - Energy stored in a liquid flowing through a pipe
  - Pressure head, Velocity head, Datum head and Total head of a flowing liquid
  - Bernauli's principle – proof
  - Limitations of Bernaulli's principle and the assumptions used in the derivation.
  - Applications of Bernauli's principle in various practical situations.
- Flow measuring devices (1Hr)
  - Pitot tube
  - Venturimeter
- Frictional flow in pipes(4Hrs)
  - Laminar flow and Turbulent flow
  - Reynolds Number
  - Reynolds Number as a criterion to separate Laminar flow and Turbulent flow
  - Darcy's law for friction
  - Moody Diagram (Nikuradse's Chart) to find λ value in the formula to find the head loss due to friction.
  - Formulae derived from Moody Diagram to find λ.
  - Apply head loss due to friction in various practical situations
- Hydraulic Syphons (1 Hr)
  - Saturation vapour pressure (SVP)
  - Application of SVP to determine the pressure at which dissolved air in water is released, such as in pipe flow over summits.

15. Discharge through Small Orifices (05 hours)

- Description of small orifice
- Terminology connected with orifice discharge such as; Vena Contracta, Coefficient of contraction (C_c), Coefficient of velocity (C_v), Coefficient of discharge (C_d)
- Calculations to determine (C_c) ,(C_v) & (C_d) , using constant and falling head methods
- Time of emptying tanks
  - Time of emptying a simple tank through an orifice
  - Time of emptying a spherical tank through an orifice
  - Time of flow from one tank to another
  - Time of emptying a tank with inflow
  - Application of the time of emptying tanks in few practical situations

16. Discharge through Large Orifices (02 hours)

- Discharge through an open orifice
- Discharge through a submerged orifice
- Discharge through a partially submerged orifice

17. Notches and Weirs (02 hours)

- Discharge through sharp crested weirs – rectangular, V shape & Trapezoidal
- Velocity of approach

List of Practicals : (30hours)

Applied Thermodynamics (14 hours)

1. Calibration of Pressure Gauge
2. Redwood Viscometer
3. Separating and Throttling Calorimeter
4. Orast's Apparatus
5. Thompson's Calorimeter
6. Boys' Calorimeter

Fluid Mechanics (16 hours)

1. Analysis of Metacentre & Metacentric Height using a Pontoon
2. Analysis of Hydrostatic Pressure on a Plane Surface
3. Flow Measurements in Pipes
4. Frictional flow through pipes
5. Flow through Nothes & Weirs
6. Pelton wheel (Impact of jets)

Recommended Text Books :

Thermodynamics

1. Applied Thermodynamics for Engineering Technologists - S.I.Units; T.P.Eastop, A.McConkey; Longman, ISBN No.:0 582 44197-8
2. Engineering Thermodynamics – Work and Heat Transfer, G.F.C.Rogers, Y.R.Mathew; ELBS, ISBN No.:0 582 05376 5

Fluid Mechanics

1. Hydraulics & Fluid Mechanics; E H Lewitt, English Language Book Society & Sir Isaac Pitman and Sons Ltd.
2. A Text Book of Hydraulics; R S Khurmi, S Chand and Company Ltd., New Delhi.
3. A Text Book of Hydraulics; K N Karna, Khanna Publishers, New Delhi.

9. DME 103 Engineering Drawing

Subject Code : DME 103			Division : Mech. Eng. Tech. & Maritime Studies		
Title :- Engineering Drawing					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
30		**90**	**1**	**-**	**3**
Method of Assessment: - 4 Hour Question Paper & Continuous Assessments					

General Objectives

On completion of this subject the students will be able to:

- understand the need of Engineering Drawings in Industry.
- read and understand Engineering Drawings.
- produce Engineering Drawings conforming to Engineering Drawing Standards.
- express ideas on paper quickly and clearly by sketches.

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Introduction to Engineering Drawing & Equipment	01	03
2.	Orthographic Projection	02	06
3.	Dimensioning	01	03
4.	Completing Third View from Two Given Views	01	09
5.	Sectional Views	02	12
6.	Screw Threads & General Engineering Terms	01	03
7.	Assembly Drawings	10	21
8.	Conic Sections	02	06
9.	Pictorial Views	02	06
10.	Loci - Rectification of Arcs, Involutes & Cycloids	02	03
11.	Helix & Mechanisms	01	03
12.	True Lengths & Inclinations	01	03
13.	Developments	02	06
14.	Interpenetration Curves	02	06
	Total	**30**	**90**

* **Practicals** – Drawing Office Practice

Summary Syllabus

1. Introduction to Engineering Drawing and Equipment (01 hour)

- Engineering Drawing as a International Language, graphical communication
- Standards used – *SLS 409:1977 – Engineering Drawing Practice and ISO Standards Handbook on Technical Drawing*
- Types of Line, Lettering used in Engineering Drawing Standards
- Use and care of Drawing equipment
- Layout of drawing paper

2. Orthographic Projection (02 hour)

- Principles of Orthographic Projection
- First Angle Projection, labeling of views and standard symbol of projection
- Third Angle Projection, labeling of views and standard symbol of projection
- Freehand sketching of Orthographic Views from pictorial views of simple objects
- Setting out an Orthographic Views of simple solids

3. Dimensioning (01 hour)

- Principles and terms used in dimensioning of engineering component
- Properties of dimensioning and why they are needed
- Principles of dimensioning according to SLS and ISO standards

4. Completing Third View from Two Given Views (01 hour)

- Projecting details from one view to the other and completing the third view when two views are given

5. Sectional Views (02 hour)

- Sectioning of engineering parts in terms of clarification of interior details
- Imaginary cutting plane, direction of view, labeling a Sectional View and Section lines
- Rules governing cutting plane through Web/Rib, Standard parts and common features etc.
- Local sectioning, Half section, Thin section, Successive sections, Revolved section and Section in two intersecting planes

6. Screw Threads and General Engineering Terms (01 hour)

- Screw threads and ISO Metric Thread designations
- Internal and external screw threads and to draw them using standard methods
- Application of General Engineering Terms

7. Assembly Drawings (10 hours)

- Temporary and Permanent fastening methods
- Nuts, Bolts and Washers using standard ratios used for drawing purposes
- Section plane through assembled component
- Exploded Views – use and applications
- Couplings, Bearings, Valves use and applications
- Assembly when the parts are scattered in a given drawing

8. Conic Sections (02 hours)

- Conic Sections – Cone, Section Plane and True Shape – Section of a cone
- Conics using locus of point, fixed point, fixed straight line and eccentricity and to draw tangents and normal
- Parabola using Rectangular method and to find the Focus
- Ellipse by common construction methods

9. Pictorial Views (02 hours)

- Principles of Pictorial projection
- Isometric Views
- Explain Isometric Scale

10. Loci - Rectification of Arcs, Involutes & Cycloids (02 hours)

- Involutes and applications, Involute of a circle
- Cycloids and applications

11. Helix and Mechanisms (01 hours)

- Helix and applications
- Locus of a point on a moving mechanism and profile of safety guard for a mechanism

12. True Lengths & Inclinations (01 hour)

- Point and Line in space
- True length of a line and inclination to Vertical Plane and Horizontal Plane

13. Developments (02 hours)

- Use and applications of Developments
- Developments be the following methods
  - - Parallel line method
  - - Radial line method
  - - Triangulation method

14. Interpenetration Curves (02 hours)

- Interpenetration Curves
- Interpenetration line of two plane surfaces – two prisms
- Construct Interpenetration Curves: Cylinder to Cylinder, Cone and Cylinder, Cone and Plane, Cone and Sphere, Sphere and Plane, Machine Parts

<u>List of Practicals</u> (Drawing Office Practice): (90 hours)

Machine Drawing

1. Solids 1
2. Solids 2
3. Bracket
4. Bearing
5. Bearing Bracket
6. Steering Gear Bracket
7. Column Bearing
8. Carburetor Body
9. Disc Crank
10. Plummer Block
11. G Clamp
12. Machine Vice
13. Cross Head for a Vertical Steam Engine
14. Gate Valve

Graphics

15. Conics
16. Ellipse
17. Isometric Views
18. Loci
19. Helix & Mechanisms
20. True Lengths & Inclinations
21. Developments
22. Interpenetration Curves

Recommended Text Books :

1. Sri Lanka Standard 409: 1977 Engineering Drawing Practice
2. Technical Drawing; A Yardwood
3. Technical Drawing for G.C.E. & C.S.E ; J N Green
4. Engineering Drawing I with worked examples ; F Pickup & M A Parker
5. Engineering Drawing II with worked examples ; F Pickup & M A Parker
6. Engineering Drawing Volume I; K R Gopalakrishna
7. Engineering Drawing Volume II; K R Gopalakrishna
8. Engineering Drawing with Problems & Solutions; K R Hart
9. Engineering Drawing for Technicians Volume 1; O Ostrowsky
10. Engineering Drawing for Technicians Volume 2; O Ostrowsky
11. Engineering Drawing with CAD Applications; O Ostrowsky

10. DME 104 Workshop Technology I

Subject Code : DME 103		Division : Mech. Eng. Tech. & Maritime Studies			
Title : Workshop Technology I					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
30	-	90	1	-	3
Method of Assessment :- 3 Hour Question Paper & Continuous Assessments					

General Objectives

On completion of this module, students will be able to;

- understand the fundamentals of workshop theory and practice
- describe and appreciate the methods of production and properties of engineering materials
- gain skills and experience in handling machine tools and carrying out metal cutting and welding operations

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction to Workshop Technology	01	-
2.	Safety	01	-
3.	Engineering Materials	04	-
4.	Production of Pig Iron, Cast Iron and Steels	04	-
5.	Mechanical Properties of Materials	04	-
6.	Heat Treatment of Metals	04	-
7.	Classification of Manufacturing Processes	02	-
8.	Metal Cutting	03	-
9.	Screw Threads	01	-
10.	Machine Tools	04	-
11.	Joining of Materials	02	-
12.	Carpentry and Joinery	-	21
13.	Sheet Metal, Welding and Smithy	-	21
14.	Machining	-	24
15.	Fitting	-	24
	Total	**30**	**90**

Note:- Engineering Safety will be covered in relevant practical classes.

Summary Syllabus

1. **Introduction to Workshop Technology and Practice (01 hour)**
   - Techniques of manufacturing
2. **Safety (01 hour)**
   - Causes of accidents, precautions to be taken and safety practices
3. **Introduction to Engineering Materials (04 hours)**
   - Metals, non-metals, composites and their applications
   - Ferrous metals : Cast iron, plain carbon steels, alloy steels
   - Non-ferrous metals and alloys
4. **Production of Pig Iron, Cast Iron and Steels (04 hours)**
   - Constructional details and operation of Blast furnace, Cupola, Electric arc furnace and other common furnaces
5. **Mechanical Properties of Materials (04 hours)**
   - Tensile, compressive and shear forces
   - Elasticity, plasticity, malleability, ductility, hardness, brittleness and toughness
   - Stress – strain curve, ultimate tensile strength, yield strength.
6. **Heat Treatment of Metals (04 hours)**
   - Iron – carbon diagram
   - Heat treatment and surface treatment processes of metals
7. **Classification of Manufacturing Processes (02 hours)**
   - Classification of manufacturing processes
   - Casting, forging, bending, rolling, drawing, extruding and shaping by cutting
8. **Metal Cutting (03 hours)**
   - Cutting tool materials, characteristics of cutting tools, cutting tool geometry, tool life, machinability
   - Gas and electric arc cutting processes
9. **Screw Threads (01 hour)**
   - Elements, forms, uses, production and thread cutting calculations.
   - Types and uses of tapers and production methods.
10. **Introduction to Machine Tools (04 hours)**
    - Lathe and classification of lathes, components and their functions
    - Holding and supporting the work piece and the cutting tool
    - Grinding machines, abrasives, bond types and wheel classification.
    - Drilling machines, drills and drilling operations.
11. **Joining of Materials (02 hours)**
    - Joining by deformation
    - Soldering, Brazing and Welding
    - Adhesives

List of Practicals : (90 hours)

1. Carpentry & Joints
   - Construction of ten different joints

2. Sheet Metal, Welding, Smithy and Casting
   - Construction of Funnel and Gauge
   - Arc and Gas welding practices
   - Construction of Chisel and Mild Steel Ring

3. Machining
   - Turning, Thread cutting, Taper Turning and Knurling

4. Fitting
   - Construction of a Cube, Nut & Bolts

Recommended Text Books :

1. Workshop Technology Part I, Part II and Part III; W A Chapman
2. Production Technology , Processes Materials and Planning; W Bolton

11. DEE 202 Electrical Machines

Subject Code : DEE 202		Division : Electrical & Electonic Eng. Technology			
Title : Electrical Machines					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**45**	**2**	**1**	**3/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will be able to:

- possess the fundamental knowledge of Electrical Machines, ie. the construction & operation
- acquire an overview of their applications in industry.
- form a basis for advanced studies to be undertaken in Electrical Machines and in particular their designs.

No	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Direct-Current Machines	12	18
2.	Transformers	12	12
3.	Three-phase Synchronous Machines	14	-
4.	Three-phase Induction motor.	16	15
5.	Fractional horse-power motor.	06	-
	Total	**60**	**45**

Summary Syllabus

1. Direct-Current Machines (12 hours)

Essential components (of d.c. machines) & their functions
D.C. Armature Windings.
Open-circuit characteristic and load characteristics of D.C. generators.
Torque/Armature Current; Speed/Armature Current; Torque/Speed characteristics of D.C. motors.
Starting of D.C. motors.
Speed control methods.

2. Transformers (12 hours)

Constructional and winding arrangement of transformers.
Voltage-ratio; current-ratio.
Equivalent-circuit.
Tests on transformers.
3-phase transformer connections.
Parallel operation of transformers.

3. Three-phase Synchronous Machines (14 hours)

Constructional arrangement.
Armature windings.
Production of rotating-field
by armature current.
Expression for generated emf and per phase equivalent circuit.
Methods of starting synchronous motors.
Speed control methods.

4. Three-phase Induction Motor (16 hours)

Principle of 3 – phase motors
Equivalent-circuit.
Torque expression; Torque/speed characteristics.
Starting methods.
Speed control methods.

5. Fractional Horse-power Motor (06 hours)

Single-phase induction motors.
Single phase repulsion, reluctance,
hysteresis, universal motors.

List of Practicals: (45 hours)

1. Parallel operation of transformers
2. Starting methods of 3 phase Induction motors
3. Study of DC machines
4. Test on a single phase transformer
5. Single phase induction motors
6. Test on a DC series motor
7. Speed control of DC machines

Recommended Text Books :

1. Alternating Current Machines; H Cotton, Cleaver Hume Press, London
2. Alternating Current Machines; E Hughes
3. Electrical Machinery; A E Fitzgerald
4. Textbooks of Electrical Machines; P P Ramlley & M P Mittal

12. DEE 204 Power Controls and Electronics

Subject Code : DEE 204			Division : Electrical & Electronics Engineering Technology		
Title : Power Controls and Electronics					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**45**	**2**	**1**	**3/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will possess the fundamental knowledge of Power Electronics & Controls. It will also form a basis for advanced studies to be undertaken in Power Electronics & Controls.

No	Course Outline	Lecture (hr.)	Practical (hr.)
1.	**General Principles of Controls** Basic controlling devices and circuits	04	-
2.	Semiconductor switches and circuits	08	06
3.	Open loop and closed loop control systems	04	-
4.	**AC and DC Power Controls** AC power controls	07	09
5.	DC power controls	07	09
6.	Power supplies	06	06
7.	Trigger circuits	04	03
8.	**Computer Controls** Computer based control systems & Basic interface devices	04	-
9.	Programmable logic controllers	08	06
10.	Numerical controls	08	06
	Total	**60**	**45**

Summary Syllabus

General principles of controls

1. Basic controlling devices and circuits (04 hours)

Manual controls – SPLT, DPST, SPDT, DPDT, selector switch etc.,
Remote and automatic controls - push button switch, float, pressure switch, limit switch, thermostat switch, , time switch, contactors, actuators etc.,
Relays – electromagnetic relays, timing relays, reed relays
Lamp control circuit

2. Semiconductor switches and circuits (08 hours)

Semiconductor switching devices – power diodes, power transistors, thyristors, triacs, diacs, UJT, MOSFET, IGBT, CMOS, Opto-couplers etc.,
AC to DC Converters
AC to AC converters
DC to DC converters
DC to AC inverters

3. Open loop and closed loop controlled systems (04 hours)

Principle of open loop control
Principle of closed loop control
Industrial applications of open loop control & closed loop control

AC and DC power controls

4. AC Power controls (07 hours)

Automatic temperature control and regulation circuits using triacs and diacs
Induction and industrial Heat control circuits
Light dimmer control and emergency light system
AC motor speed control

5. DC Power controls (07 hours)

Time delay relay circuits using SCR, UJT and transistors,
DC motor speed control
Lamp dimmer circuits
Bell/buzzer alarm circuits
Water, light and heat alarm circuits

6. Power supplies (06 hours)

DC power supplies
AC power supplies

7. Trigger circuits (04 hours)

Opto-coupler DC triggering
Transistor aided DC triggering
UJT triggering

Computer controls

8. Computer based control systems (04 hours)

Basic interface devices
Input/output interfacing
Memory interfacing

9. Programmable logic controllers (08 hours)

Block diagram of a PLC
Typical motor control circuit
Ladder diagram and language
Application of a PLC

10. Numerical Controls (08 hours)

NC machines, applications, advantages
Recent development of NC machines; Computer Numerical Control(CNC), Direct Numerical Control(DNC)
Construction details of CNC machines and PART programming

List of Practicals : (45 hours)

1. Motor Controls
2. Phase controlled rectifiers
3. Inverter
4. AC motor speed control
5. DC motor speed control
6. Trigger circuit
7. Regulated power supplies
8. Programmable Logic Controller

Recommended Text Books :

1. Power Electronics & Controls; Samir K Datta
2. Power Control Circuits Manual; R M Marston
3. Power and Industrial Electronics; R K Khadse

13. DEE 205 Power Systems

Subject Code : DEE 205			Division : Electrical & Electronic Engineering Technology		
Title : Power Systems					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**45**	**2**	**1**	**3/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will be able to:

- possess the fundamental knowledge of Electrical Power Systems ie. the construction, operation & maintenance of Power generation, Transmission & distribution Systems and areas of protection & Utilization of Electrical Power.
- form a basis for advanced studies to be undertaken in Electrical Power System Designs.

No	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Power Generation	16	-
2.	Transmission and Distribution	16	15
3.	Switch Gears	06	-
4.	Protection	10	15
5.	Substation	06	-
6.	Utilization	06	15
	Total	**60**	**45**

Summary Syllabus

1. Power Generation (16 hours)

Introduction to Power, generation; Generation of electrical energy, Source of energy, Brief introduction of water power, nuclear power, solar power, wind power, tidal power etc.
Generation stations; Hydro power station, Thermal power station, Diesel power station, Nuclear power station.
Setting and layout of generating stations, capacity of power stations, major components and their functions, advantages and disadvantages, comparison of power plants.
Economic load curves, diversity factor, tariff systems, cost of power generation
Station auxiliaries, power station practice

2. Transmission and Distribution (16 hours)

Resistance, Inductance and Capacitance of transmission lines, normal T and Π representations, concept of long lines.
Economic of transmission, voltage regulation, corona
Transmission towers, sag and span
Insulators, and insulator strings, Dampers
Radial, ring and interconnected systems
Insulated cables for single-phase and three phase operations

3. Switch Gears (06 hours)

Metal clad, open indoor and open outdoor types.
Low oil, bulk oil, air blast and SF_6 circuit breakers
Arc control.
Switch gear rating.

4. Protection (10 hours)

Principles; types of relays and their construction
Protection of generators, transformers, lines and motors.
Layout of high voltage and low voltage distribution systems and substations.
Grounding methods of power system

5. Substation (06 hours)

Layout of high voltage and low voltage distribution systems
Substations equipments
Types of substation

6. Utilization (06 hours)

Types of loads; salient features of power requirements of various industries.
Power factor and power factor improvements

List of Practicals: (45 hours)

1. Distribution System
2. Load and Diversity Factor
3. Transmission Line 1
4. Peterson Coil
5. Measurement of earth Resistance
6. A.C. energy meter
7. Synchronization Procedure
8. Differential relay
9. A study of over current relay
10. Study of Corona
11. Study of Transmission line insulators

Recommended Text Books :

1. Principles of Power Systems; V K Mehta
2. The Transmission and Distribution of Electrical Energy, 3rd Edition; H Cotton, H Barber
3. Electric Energy Conservation and Transmission; Nasar
4. Electrical Power System, 4^{th} edition; Weedy Cary
5. Electrical Power; Dr. S L Uppal
6. Elements of Power Systems Analysis; Stephenson, MacGrawHill
7. Electric Power Utilization; N N Hancock, Allahabad: Wheeler

14. DEE 206 Wiring Diagrams & Electrical Constructions

Subject Code : DEE 206			Division : Electrical & Electronics Engineering Technology		
Title : Wiring Diagrams & Electrical Constructions					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**30**	**2**	**1**	**2/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will be able to:

understand and appreciate the fundamental knowledge of the electrical wiring and electrical constructions as applied to domestic electrical wiring.

acquire a comprehensive knowledge of the IEE regulations covering electrical wiring and safety issues.

form a basis for advanced studies needed for industrial wiring and construction.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Materials used in Electrical Constructions	07	03
2.	Electrical Safety (As per IEE regulations)	04	03
3.	Electrical Construction in Building Services	08	03
4.	Cables	06	-
5.	Layout Design for Different Types of Buildings	10	06
6.	Electrical Installation	06	03
7.	Distribution Boards	06	03
8.	Final Circuit Wiring	03	03
9.	Earthing & Lightning Protection Systems	04	03
10.	Testing and Commissioning of Electrical Installations	06	03
	Total	**60**	**30**

Summary Syllabus

1. Materials used in Electrical Constructions (07 hours)

Composition, physical properties and uses of magnetic materials
Insulating materials such as ceramics, glass, plastics, PVC, gases and oil and their applications
Causes of deterioration such as age, environment, voltage, heat, and rough uasage
IP (Index of Protection) value of different material products

2. Electrical Safety (As per IEE regulations) (04 hours)

3. Electrical Construction in Building Services (08 hours)

Classification of buildings (e.g. Commercial, factories, hotels, small industries and households)
Reading architectural plans: grid numbering, marking of elevation, correlation of the cross sections.
Methods of obtaining power supply from authorities (bulk supply with/without transformer, 30A single/three phase)
Standby generators and their installations

4. Cables (06 hours)

Different type of cables, price differences and other advantages/disadvantages
Short circuit rating of a cable
Cables & Tables
Selection of cables for different types of applications
Methods of laying, bending, jointing, glanding, termination and earthing of cables

5. Layout Design for Different Types of Buildings (10 hours)

Understanding the requirement of the client
Bill of Quantities
Preliminary layout preparation
Final layout preparation
Single line diagram for a building
Single line diagram of distribution boards (more details in 3.5)
Identification of materials for a particular construction
Tendering: Co-ordination between client-consultant- contractor

6. Electrical Installation (06 hours)

Main feeding system (busbar risers or cables) for commercial buildings & high-risers
Busbar risers : advantages, different ratings, installation, tapings and other connection accessories (elbows, flanges, caps etc.), difficulties encountered in installation (e.g. insufficient space for tap off units, piece to piece connection problems)
Cable risers: Installation (cable pulling, cable safety), tappings
Factory installations, electrical installation for motor control centers, DOL, delta/star, soft starter wiring

7. Distribution Boards (06 hours)

Household distribution boards: Components and their mounting methods, different types of enclosures (metal recessed or surface) , selection of the size, internal wiring

Large scale distribution Boards; EFR, PFR, OCR etc.; MCCCB; ACB; MCB; RCCB; Isolators; Floor mounted enclosures etc.

8. Final Circuit Wiring (03 hours)

Selecting size of cables

Wiring of lamp points, power points & cokker points according to IEE regulations

Ring or radial circuits: use of cables for ring/radial wiring

Lamp fittings : types of fittings, calculation of luminar number in a close premises

9. Earthing & Lightning Protection Systems (04 hours)

Earthing for domestic wiring

Earthing of commercial buidings and factories; equipment bonding

Lightning protection of high riser buildings; components in a lightning protection system

10. Testing and Commissioning of Electrical Installations (06 hours)

Cable insulation resistance measurement

Bus duct insulation resistance; megger test

Bus duct insulation resistance; pressure test

Earth resistance test and Earth loop resisteance.

Handing over

List of Practicals: (30 hours)

1. a) Lamp Control using a single switch
   b) Lamp control using 2 lamps & 2 switches
   c) Lamp control 2 lamps, 2 switches & ceiling rose.
   d) Two way switch system
2. a) Wiring of two florescent lamps
   b) demonstration on an indicator board
3. Wiring of mercury lamp
4. Construction of ring circuit
5. Demonstration on the layout of a Domestic DB
6. Study & Demonstration of wiring regulations as applied to Domestic House Wiring
7. Stydy of wiring installation of a particular laboratory in the institute premises..

Recommended Text Books :

1. IEE Wiring Regulations
2. BS & SL standards
3. Utilization of Electrical Energy by E O Taylor , LUP (London)

15. DEN 202 Electronics & Telecommunications

Title : Electronics & Telecommunications					
Subject Code : DEN 202		Division : Electrical & Electronics Engineering Technology			
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	45	2	1	3/2
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

On the completion of this module the student will be able to:

- possess the fundamental knowledge of Electronics & Telecommunications.
- gain a brief introduction into the applications in industry.
- form a basis for advanced studies to be undertaken in Electronics & Telecommunications Technology.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
	Electronics		
01.	Power Supplies	04	-
02.	Small Signal Amplifiers	02	03
03.	Power Amplifiers	02	03
04.	Feed Back & Stability	04	03
05.	Operational Amplifier	04	03
06.	Oscillators (Analog)	04	03
07.	Relaxation Oscillators/ Multi vibrators	04	03
	Telecommunications		
08.	Modulation and Demodulation	04	03
09.	Radio Receiver	02	03
10.	Television	04	06
11.	Radio Wave Propagation	02	-
12.	Telephony & Telex	06	-
13.	Voice Transmission systems	06	03
14.	Data / Graphics Transmission	04	-
15.	Number Systems	02	03
16.	Boolean Operations & Logic Gates	02	03
17.	Combinational/ Sequential Logic Systems	02	06
18.	Discussion on a Model Paper on Electronics & Telecommunications	02	-
	Total	**60**	**45**

Summary Syllabus

Section A - Electronics

1. Power Supplies (04 hours)

Linear & Switch mode PSU
Operation, Maintenance & trouble shooting of PSU ccts.
Typical applications & also specification
Trouble shooting procedures in PSU's

2. Small Signal Amplifiers (02 hours)

Review of operating point, gain, & frequency response
Input impedance, output impedance & frequency response

3. Power Amplifiers (02 hours)

Class A amplifiers, Theory of Operation & maintenance & specifications
Class B,AB & C amplifiers, Theory of Operation & maintenance
Specifications of Manufacturers
Trouble shooting procedures in amplifiers

4. Feed Back & Stability (04 hours)

Linear/Digital control systems, Nyquist & Rouths criteria of Stability
Linear/Digital control systems - Theory of Operation & maintenance

5. Operational Amplifier (04 hours)

Theory of Operation, Characteristics, Parameters of the OP-AMP
Applications & maintenance,
Manufacturers specifications

6. Oscillators (Analog) (04 hours)

Sinusoidal & non-sinusoidal Oscillators :
Theory of Operation and Maintenance
Also typical applications
Manufacturers Specifications

7. Relaxation Oscillators/ Multi vibrators (04 hours)

A-stable, Bi-stable, & Mono-stable Circuits
Theory of Operation & typical applications in digital circuits

Section B - Telecommunications

8. Modulation / Demodulation (04 hours)

AM, FM, SSB, DSB-SC, Delta Modulation
Theory of Operation & maintenance of typical applications

9. Radio Receiver (02 hours)

TRF and Super heterodyne radio receiver
Theory of operation & maintenance
Typical applications using their circuit diagram

10. Television (04 hours)

Monochrome & color TV
Theory of operation using Block diagrams
Trouble shooting procedures

11. Radio Wave Propagation (02 hours)

Radio Spectrum, LW, MW, SW , VHF, UHF
Practical antennas

12. Telephony & Telex (06 hours)

Telephone Instrument, Telex terminal, External plant line signaling
Exchange hierarchy ,PSTN,
R2 & C7 signaling
Trouble shooting procedures in telephone switches

13. Voice Transmission Systems (06 hours)

FDM & PCM ,
Analog & digital hierarchy (sub-grouping)

14. Data/Video/Graphics Transmission (04 hours)

Serial & parallel Tx.
Data validation (Error detection/correction)
Transmission protocols,
Simplex, Half Duplex, Full Duplex.
PSK, FSK , QPSK Techniques

15. Number Systems (02 hours)

Binary, Octal, Hexadecimal, BCD
Efficient Coding Systems,
ASCII and ANSI standards

16. Boolean Operations & Logic Gates (02 hours)

Logic functions, TTL,ECL,CMOS,
Integrated Circuits - SSI, MSI, LSI & VLSI

17. Combinational / Sequential Logic Systems (02 hours)

Truth tables & Minimization techniques
State diagrams,
Realization of logic functions with Logic Circuits

18. Discussion on a Model Paper on Electronics & Telecommunications (02 hours)

List of Practicals : (45 hours)

1. Transistor amplifier Testing
2. RC & LC Oscillators
3. Feedback Systems
4. Filter Circuits
5. Frequency Modulations
6. Combinational Logic Circuits
7. Counters & Registers
8. Monochromatic TV receiver
9. Colour T.V. Receiver
10. Power Amplifier

Recommended Text Books :

1. Electrical Fundamentals; John Ryder, Prentice Hall International
2. Electrical Measurements & Measuring Instruments; E W Golding
3. Electronic Principles; Gray & Searle - Wily International Electrical Engineering
4. Electrical Engineering; G Hughes
5. Electrical Technology; H Cotton
6. Electronic Engineering; Schelling & Belove
7. Electronic Circuits; Milman & Haukias
8. Principles of Electronics; J E Holding & M R Garvin
9. Digital Systems; RJ Tocci - Prentice Hall International
10. Pulse & Digital circuits; Milman & Taub – Mcgraw Hill
11. Electrical Technology; Schaum Series

16. DEN 203 Industrial Electronics & Measurements

Title : Industrial Electronics & Measurements					
Subject Code : DEN 203		Division : Electrical & Electronics Engineering Technology			
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	45	2	1	3/2
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will be able to:

acquire the fundamental knowledge of Industrial Electronics & Measurements.
gain an overview of the Electronic Systems & applications in industry.
form a basis for advanced studies to be undertake in Industrial Electronics & Measurements.

No.	Course Outline	Lecture (hr.)	Practical (hr.)
1.	AC Principles	08	-
2.	Basic Electrical Measurements	10	09
3.	Electronic Measuring Instruments	08	12
4.	Transducers	06	06
5.	Power Supplies	06	03
6.	Industrial Control Systems	06	06
7.	Power Control	06	03
8.	Computer Controlled Instrumentation	10	06
	Total	**60**	**45**

Summary Syllabus

2. Basic Electrical Measurements (10 hours)

AC bridges. Cable fault Location
Measurement of power, Power factor, frequency and energy in polyphase system and familiarization of Power analyzer instrument.
Instrument transformers and Introduction of measurements on high voltage system.

3. Electronic Measuring Instruments (08 hours)

Analog and digital multi-meters, Logic probes, Logic analyzers, LCR meters.
Cathode ray Oscilloscope, Cathode ray tube, Time base, measurements
using the CRO, special CRO types, CRO probes
Frequency counters, frequency ratio and period counters.

4. Transducers (10 hours)

Measurement of non electrical quantities such as Strain, Temperature, pressure, force, speed, flow, humidity, sound, etc.
Optical sources and sensors.
Application of transducers in measurement and control
Bio medical engineering devices and instruments

5. Power Supplies (10 hours)

AC power supplies, Inverters, dc to dc converters, regulated power supplies, uninterruptible power supplies,
Solar panels

6. Industrial Control Systems (06 hours)

Introduction to control systems, open loop and closed loop, analog and digital.
Basic control devices, Switches, Relays, Contactors, Actuators, circuit
Breakers, timers and counters, panel meters.

7. Power Control (06 hours)

Power electronic devices, SCR, Triac, UJT etc.,
Application of power electronic devices in motor control and in industrial control.

8. Computer Controlled Instrumentation (10 hours)

Introduction to computer based instrumentation and control.
Basic interfacing techniques, A/D and D/A conversion, Digital I/O
Programmable controllers, PLC

List of Practicals : (45 hours)

1. Measurement with digital & analogue multimeters
2. Cathode ray Oscilloscope
3. Op-Amp Application in industrial measurements
4. Trouble shooting of a single transistor circuit
5. Power Electronic devices
6. Regulator circuits
7. Opto-Electronic devices and their uses
8. Measurement of Polyphase power and familiarization of power analyzer instrument.
9. Industrial application of thyristors
10. Power supplies
2. Transducers
3. Programmable logic devices (PLA & PLC)

Recommended Text Books :

1. A course in Electronic and Electrical Measurement and Instrumentation, 12th edition; J B Guptha
2. Electrical Measurement and Measuring Instruments, 5th edition; Goding & Widdis
3. Electronic Instrument Handbook, 2nd edition; Comb
4. Introduction to power electronics, 2nd edition; Bird King, Pedder
5. Mechatronics

17. DIS 202 Mathematics

Subject Code: DIS 202			Division : Interdisciplinary Studies		
Title : Mathematics					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**-**	**2**	**1**	**-**
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- Understand the basic concepts of mathematics
- Develop rational thinking in formulating engineering problems
- Use mathematical symbols and formulae
- Apply mathematical knowledge in solving practical problems
- Appreciate tidiness and orderliness

No.	Subject Outline	Lecture (hr.)
1.	Fourier Series and Laplase Transformations	10
2.	Integrals	05
3.	Statistics	20
4.	Vector Calculus	10
5.	Differential Equations	14
	Total	**60**

Summary Syllabus

1. Fourier Series and Laplase Transformations (10 hours)

Periodic functions,
Fourier expansion of a periodic function,
Odd and even functions,
Half range Fourier series,
Complex notation for Fourier series.
Laplase transform of elementary functions and basic theorems

2. Integrals (05 hours)

Brief introduction to improper integral,
Differential of integral,
Functions of two or three variables,
Multiple integrals,
Constraint maxima and minima,
Langrange multipliers,
Introduction to Fourier series.

3. Statistics (20 hours)

Techniques and methods of statistics with practical applications,
Description and handling of numerical data,
Sampling theory
Estimation theory
Hypothesis testing,
Correlation and regression,
Non-parametric methods.

4. Vector Calculus (10 hours)

Vector differentiation and differential operators,
Space curves and line integral,
Surface and surface integrals,
Divergence theorem, Stroke's theorem, Green's theorem in a plane and their basic applications.

5. Differential Equations (15 hours)

Ordinary linear differential equations with variable coefficients,
Bessel, Legendre special functions, singular points, existence and uniqueness of the solution.
Laplase transform of elementary functions and basic theorems,
Application to solution of differential equations and their systems,
Transfer functions, convolution theorem, concepts of stability and controllability.

Recommended Text Books :

1. Advanced Calculus; Murray R Spiegel, Schaum's Outline Series
2. College Algebra; Murray R Spiegel, Schaum's Outline Series
3. Fourier Series; Murray R Spiegel, Schaum's Outline Series
4. Laplase Transforms; Murray R Spiegel, Schaum's Outline Series
5. Probality and Statistics; Murray R Spiegel, Schaum's Outline Series
6. !st Year College Mathematics; Frank Ayres, Schaum's Outline Series
7. Calculus; Frank Ayres**,** Schaum's Outline Series
8. Differential Equations; Frank Ayres, Schaum's Outline Series
9. Matrices; Frank Ayres, Schaum's Outline Series
10. Engineering Mathematics; K A Stroud, Macmillan
11. Introduction to University Mathematics; J L Smyrl, Hodder and Stoughton
12. Intermediate Mathematics; Blakey, Oxford Press

18. DME 204 Industrial Management

Subject Code: DME 204			Division : Mech. Eng. Tech. & Maritime Studies		
Title : Industrial Management					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**-**	**-**	**2**	**-**	**-**
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- understand and appreciate management theory and develop management skills.
- develop decision making skills.
- handle resources in a most appropriate manner.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Principles of Economics	06	-
2.	Principles of Management	08	-
3.	Financial Accounting	08	-
4.	Cost Accounting	08	-
5.	Materials Management	04	-
6.	Planning of Projects	09	-
7.	Work Improvement and Work Measurement	08	-
8.	Introduction to Maintenance Management	02	-
9.	Organisational Behaviour	06	-
10.	Law of Contract	08	-
11.	Management Case Study Discussions	02	-
	Total	**60**	**--**

Summary Syllabus

1. Principles of Economics (06 hours)

Basic elements.
Demand and supply.
Market competition.
Economy of Sri Lanka.

2. Principles of Management (08 hours)

Organisational Chart.
Design of an organization.
Scientific management thought.
Line and staff organization.
Span of control, authority, responsibility, power and accountability.

3. Financial Accounting (08 hours)

Business transactions.
Book-keeping procedures.
Balance sheet.
Final accounts.
Financial statements
Manufacturing accounts.

4. Cost Accounting (08 hours)

Cost components.
Application of costing procedures, depreciation.
Break-even analysis and its application.

5. Materials Management (04 hours)

Organisation of stores.
Economic order quantity.
Quality control.

6. Planning of Projects (09 hours)

Network diagrams.
Critical path analysis.
Gantt charts.
Resource allocation.

7. Work Improvement and Work Measurement (08 hours)

Job analysis.
Job evaluation.
Work study.
Performance standards, incentive scheme.
Labour regulations.
Industrial safety.

8. Introduction to Maintenance Management (02 hours)

Preventive and break-down maintenance.
Replacement policies.

9. Organisational Behaviour (06 hours)

Formation of groups in organizations.
Group behaviour and group dynamics.
Basic concepts in 'motivation'.
Organisational politics.
Introduction to leadership concept.

10. Law of Contract (08 hours)

How a contract is formed. 'offer' and 'acceptance'.
Conditions affect a contract.
Termination of a contract.

11. Management Case Study Discussions (02 hours)

List of Practicals:

Nil

Recommended Text Books :

1. Management – Don Hellriegel & John W Slocum
2. Advanced Accountancy – RL Gupta & M Radhaswamy
3. Organisational Behaviour and Human Behaviour at Work – John W Newstrone & Keith Davis
4. Introduction to Economics – Carin Cross & Sinclair
5. Production Planning Control and Industrial Management – K C Jain

19. DME 208 Power Hydraulics & Fluid Machinery

Subject Code : DME 208		Division : Mech. Eng. Tech. & Maritime Studies			
Subject : Power Hydraulics & Fluid Machinery					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**-**	**15**	**2**	**-**	**3/6**
Method of Assessment :- 03 Hour Question Paper & Course Works					

General Objectives

On completion of this module students will be able to:

- posses fundamental understanding of the basics and principles of hydraulic power engineering
- posses fundamental understanding the function of various components within a hydraulic system, basic system design, schematic symbols and troubleshooting sequences.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Advantage of Hydraulics	02	-
2.	Pumps, Actuators, Motors and Directional Valves	08	-
3.	Pressure and Flow Control Valves	08	-
4.	Hydraulic Auxiliaries	06	-
5.	Hydraulic System Designs	12	-
6.	Closed Loop Electro-hydraulic Control	06	-
7.	Hydraulic Machines	08	-
8.	Fluid Machinery	10	-
9.	Laboratory Practicals		15
	Total	**60**	**15**

Summary Syllabus

1. Advantage of Hydraulics (02 hours)

- Basic physics and principles of hydraulic fluids

2. Pumps, Actuators, Motors and Directional Valves (08 hours)

- Types of Pumps
- Single and double acting cylinders
- Hydraulic motors
- Directional valves
- Introduction to proportional and servo valves
- Relief valve and pressure regulating valves
- Pilot operated valve

3. Pressure and Flow Control Valves (08 hours)

- Types of valves
- Meter (in, out and bypass)

4. Hydraulic Auxiliaries (06 hours)

- Reservoirs, filters, accumulators, strainers, pipe/tube and hoses etc.,

5. Hydraulic System Designs (12 hours)

- Schematic symbols
- Blueprint reading
- Hydraulic circuit design and analysis
- Troubleshooting sequences
- Safety

6. Closed Loop Electro-hydraulic Control (06 hours)

- Introduction to control theory
- Electronic regulators
- Electro-hydraulic control systems

7. Hydraulic Machines (08 hours)

- Log Splitters
- Large Hydraulic Machines
- Skid/Loaders
- Dump Trucks
- Putting gears to work
- Gear ratio
- Gear trains

8. Fluid Machinery (10 hours)

- Centrifugal pumps
- Reciprocating pumps and their operation
- Turbines; Axial and radial

List of Practicals : (15 hours)

Four practicals relevant to the syllabus

Recommended Text Books :
List to be added