National Diploma in Technology

Curriculum

Civil Engineering Technology

Institute of Technology
University of Moratuwa

August 2004

First Year Syllabi

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Second Year Syllabi

1. DCE 101 Building Construction & Draughtsmanship

Subject Code : DCE 101			Division : Civil Engineering Technology		
Title : Building Construction & Draughtsmanship					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**-**	**90**	**2**	**-**	**3**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

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

- introduce the processes commonly practised in the Construction Industry with specific reference to practical applications in the field and requirements for Quantity Surveying.
- develop an understanding on the preliminary and ancillary works associated with the processes concerned.
- develop an understanding of the construction materials in relation to functional requirements and strength.
- develop a basic familiarity with the sketches and free-hand drawings extensively used in construction activities as a means of communication.
- develop skills in presenting drawings of components of the building through manual and computer aided draughtsmanship.

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Site Works	04	-
2.	Foundations	06	09
3.	Trench Excavation & Supports	02	03
4.	Wall Construction	12	18
5.	Prevention of Dampness	02	-
6.	Ground Floor Construction	02	-
7.	Roof Construction	12	21
8.	Opening of Walls	12	21
9.	Scaffolding	02	-
10.	Building Materials	06	-
11.	Introduction to Draughtsmanship	-	18
	Total	**60**	**90**

*** Practicals** – Drawing Office Practice

Summary Syllabus

1. **Site Works (04 hours)**
   - Investigations and preparations involved in the selection of sites for construction of buildings.
2. **Introduction to Foundations (06 hours)**
   - Functional requirements of foundations and the process employed in achieving them.
3. **Trench Excavation & Supports (02 hours)**
   - Understand the process of trench excavations and problems arising from ground and weather conditions along with the suitable supports that are to be provided.
4. **Wall Construction (12 hours)**
   - Functional requirements of external internal and partition walls.
   - Process of brick and block wall construction and the related laying techniques.
   - Use of stone masonry.
5. **Prevention of Dampness (02 hours)**
   - Problems created by dampness in buildings, the causes and measures adopted for prevention of dampness:
6. **Ground Floor Construction (02 hours)**
   - Methods of ground floor construction. .
7. **Roof Construction (12 hours)**
   - Functional requirements expected from roofs as the upper member of the external envelope of a building.
   - General methods of construction of pitched roofs using timber and steel.
8. **Opening of Walls (12 hours)**
   - Openings in walls and the use of framed openings.
   - Use of arches and their construction process.
9. **Scaffolding (02 hours)**
   - Use of scaffolding in the construction industry.
10. **Building Materials (06 hours)**
    - Manufacture the important materials for construction.

List of Practicals (Drawing Office Practice) : (90 hours)

Understand the use of instruments, preparation of detail drawings and proper draughtsmanship practices.

1. Practice of lettering and dimensioning
2. Earthwork supports
3. Foundations
4. Floors
5. Walls
6. Doors and Windows
7. Roofs
8. Rainwater goods
9. Timber joinery

Recommended Text Books :

1. Building Technology; Ivor H Seeley
2. Building Construction (Volumes 1 to 4); W B MacKay
3. Building Technology (Volumes 1 to 3); Ian Chandler
4. Construction Technology (Volumes 1 to 4); R Chudley

2. 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

3. 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)

4. DEE 101 Electro Technology

Subject Code : DEE 101			Division : Electrical & Electronic Engineering Technology		
Title : Electro Technology					
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 & Electronics
- develop a basis for specialist studies to undertaken in the 2nd Year.

No	Subject Outlines	Lecture (hr.)	Practical (hr.)
01	**Basic Electricity** Electric Circuits	04	05
02	Fundamental Laws of Electricity	06	05
03	Electric Power & Energy	06	05
04	Electrostatics	04	05
05	Electromagnetic Induction	04	-
06	Alternating Voltages and Currents	06	05
07	Electrical Installations	04	-
08	**Basic Electronics** Semi-Conductor Materials	04	-
09	Transistor and its Applications	08	05
10	Analogue and Digital Systems	08	-
11	Transducers	06	-
	Total	**60**	**30**

Summary Syllabus

Basic Electricity

1. Electric Circuits (04 hours)

- Electricity, DC and AC current
- Conductors, semi conductors and insulators
- Cells, temperature coefficient of resistance

2. Fundamental Laws of Electricity (06 hours)

- Coulomb, Ampere, Volt, Joule and watt
- Ohm's law, resistivity, conductivity and their units
- Series and parallel circuits, Kirchoff's laws
- Ideal source (voltage and current)
- DC distribution systems

3. Electric Power and Energy (06 hours)

- Energy conversion, heating effects of electricity, heat sink and fuses

4. Electrostatics (04 hours)

- Static electricity, Coulombs law, capacitor (parallel plate)
- Charge and voltage, parallel plate capacitor with composite dielectrics
- Parallel/series connected capacitance, Electric force, Electric flux density
- Potential gradient

5. Electromagnetic Induction (04 hours)

- Magnetic field, direction of the field, magnetic flux
- Right hand grip rule/cork screw rule
- Solenoid, toroid, induced emf, Flemming's right hand rule and Lenz's law
- Composite magnetic circuits, B-H curve, Hysterisis laws on magnetic circuits

6. Alternating Voltages and Currents (06 hours)

- Generation of an Alternating emf (single phase)
- Magnetic coil, frequency, speed and no. of pole pairs
- Average, peak and rms values of an ac current
- Rotating vector concept, sinusoidal AC quantities
- Single phase circuits, LRC circuits, phasor diagrams

7. Electrical Installation (04 hours)

- Wiring regulations, Domestic wiring installation ,two way switch, ring circuits, radial circuit of socket outlets

Basic Electronics

8. Semiconductor Materials (04 hours)

- Semiconductor categorization
- n-type and p-type semi conductors
- p-n junction, forward bias and reverse bias
- Diodes characteristics, half /full wave rectification
- Voltage clipping/clamping circuits
- Zener diode

9. Transistor and its Applications (08 hours)

- Transistors types, transistor characteristics
- Biasing & amplification

10. Analogue and Digital Systems (08 hours)

- Analogue circuits, digital circuits, set theory, combinational logics

11. Transducers (06 hours)

- Temperature, pressure and position transducers

List of Practicals: (30 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. Familiarisation of electronic computers
6. Diode applications
7. Transistor characteristics

Recommended Texts :

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; JE Holding & MR Garvin
9. Digital Systems; RJ Tocci, Prentice Hall International
10. Pulse & Digital Circuits; Milman & Taub, Mcgraw Hill
11. 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.)
	Applied Thermodynamics		
1.	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
	Fluid Mechanics		
1.	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. DCE 201 Building Construction

Subject Code: DCE 201			Division : Civil Engineering Technology		
Title : Building Construction					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**-**	**3x 30**	**2**	**-**	**3**
Method of Assessment :- 3 Hrs Question Paper & Course Work					

General Objectives

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

- develop an understanding of construction process of building.
- acquire knowledge of the quality of materials used for construction.
- gain experience in drawing office practice, sketching and interpreting of plans of buildings.

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Foundations & Sub-Structure	06	-
2.	Roofs	04	-
3.	Stairs	06	-
4.	Concrete Construction	14	-
5.	Ceilings	04	-
6.	Framed Buildings	06	-
7.	Aluminium Fabrications	04	-
8.	Natural & Applied Finishes	06	-
9.	Shoring & Underpinning	02	-
10.	Electrical & Plumbing Work	04	-
11.	Planning of Buildings	04	-
*	Drawing Office & Auto-CAD Work	-	90
	Total	**60**	**90**

***** Drawing Office Practice and 'Auto-Cad' Applications

Summary Syllabus

1. Foundations & Sub-Structure (06 hours)

Types of foundations used in buildings and selecting of such foundations to suit site conditions.
Construction of basements and the general techniques employed in basement construction

2. Roofs (04 hours)

Roofs of houses with large spans and industrial buildings
Selection of roof systems.

3. Stairs (06 hours)

Introduction of access to upper floors using ramps, escalators and stairs
Rules and dimensions that are to be used when deterrnining the stair to be used.
Construction process of stairs.

4. Concrete Construction (14 hours)

Concrete as the main structural material.
The process of mixing, transporting, laying and vibrating concrete to suit various needs and curing of concrete
Use of steel as reinforcement.
Pre-stressed and precast concrete.
Provision for accommodating services such as electricity and power

5. Ceilings (04 hours)

Need for ceilings
The construction process of ceiling using different materials and the finishes applied.

6. Framed Buildings (06 hours)

Use of in-situ reinforced concrete, precast reinforced concrete and structural steel.
The construction process of framed buildings.

7. Aluminum Fabrications (04 hours)

Aluminium as a building material.
Use of aluminium for the making of partitions, doors & windows and ceiling

8. Natural & Applied Finishes (04 hours)

Materials used as finishes
The process of application of finishes to walls using different types of plasters, paints and tiling
The process of application of finishes to floors using cement rendering, concrete, timber, terrazzo and tiling.
The process of application of finishes to Door and Windows using paints and varnishes.

9. Shoring & Underpinning (02 hours)

Introduction to the necessity for shoring and the different types of shores used for varying conditions.
Introduction to the necessity of underpinning foundations.

10. Electrical & Plumbing Work (04 hours)

Introduction to electricity supply & distribution, lighting and power circuit and wiring of buildings

Introduction to water supply distribution, plumbing and waste water disposal from buildings.

11. Planning of Buildings (04 hours)

Rules and regulations pertaining to planning of buildings as laid down by the Local Authorities and the UDA

Layout of rooms, principles of proper ventilation and lighting and aesthetics when planning buildings.

List of Practicals: (90 hours)

Drawing Office & Auto-CAD Work

- Preparation of layout plans for single and two storey buildings.
- Preparation of detail plans reinforcement details for beams, slabs, columns and stairs.
- Preparation of schedules for roof carcassing, ceiling framework, openings and reinforcement details
- Practice the understanding of reading detailed plans.
- Practice the use of Auto- CAD for preparation of plans of buildings.

Recommended Text Books :

1. Building Construction (Volumes 1 to 4); W B McKay
2. Construction Technology (Volumes 1 to 4); R C Chudley
3. The Construction of Buildings (Volumes 1 to 5); Barry
4. Building Technology (Volumes 1 & 2): Ian Candler
5. Building Technology; Peter Brett
6. Materials for Construction; G D Taylor.
7. Building Construction in Warm Climates; R L Fullerton.
8. Advanced Construction Technology; R Chudley.
9. Building Construction Handbook; R Chudley & R Greeno.
10. Recommended Practice for Building Drawing; National Metric Conversion Authority.
11. Construction and Planning; J R Illingworth.
12. Reinforced Concrete Detailer's Manual;Brian Boughton.

12. DEC 202 Industrial Management in Civil Engineering Technology

Subject Code : DEC 202			**Division: Civil Eng. Technology**		
Title: Industrial Management in Civil Engineering Technology					
Annual Work Load			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**-**	**-**	**02**	**-**	**-**
Method of assessment :- 3 Hour Question Paper					

General Objectives

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

- understand basic principles of management and develop managerial and decision making skills.
- possess understanding in construction planning, site management and safety.
- handle resources in an appropriate manner.

No.	**Subject Outline**	**Lecture (Hs.)**	**Practicals (HS.)**
1.	Principles of Management & Organisational Behaviors	12	-
2.	Principles of Economics	06	-
3.	Financial & Cost Accounting	12	-
4.	Introduction to Planning of Projects	06	-
5.	Construction Site Management & Safety	08	-
6.	Materials Management in Constructions	04	-
7.	Introduction to Construction Machinery & Equipment	04	-
8.	Introduction to Human Resources Management	04	-
9.	Construction Contracts	04	-
	Total	**60**	**00**

Summary Syllabus

1. Principles of Management & Organisational Behavior (12 hours)

- Introduction to Management
- Organisational Theory
- Line and Staff Organization
- Span of control, Authority, Responsibility, Power and Accountability

2. Principals of Economics (06 hours)

- Basic Elements
- Demand and Supply
- Market competition
- Economy of Sri Lanka

3. Financial & Cost Accounting (12 hours)

- Business transactions
- Book keeping procedures
- Balance Sheet
- Final Accounts
- Financial Statements
- Cost Components
- Application of costing procedures
- Depreciation
- Break-Evan analysis and its applications

4. Introduction to Planning of Projects (06 hours)

- Network Diagrams
- Critical path analysis
- Gantt charts

5. Construction Site Management & Safety (08 hours)

- Site Planning
- Site preparation and services
- safety
- Site layout for materials and Equipment
- Industrial

6. Materials Management in Constructions (04 hours)

- Organisation of stores
- Economic order quantity
- Quality control

7. Introduction to Construction Machinery and Equipment (04 hours)

- Construction Machinery & Equipment
- Handling of Machinery and equipment
- Maintenance of Machinery & Equipment

8. Introduction to Human Resources Management (04 hours)

- Job Analysis
- Performance standards, incentive schemes
- Labour regulations

9. Construction Contracts (04 hours)

- Formation of contracts
- Conditions of contracts
- Termination of contracts

Recommended Text Books:

1. Management; Don Hellriegel & John W Slocum
2. Organisatonal Behavior and Human Behavior at Work; John W Newstrone & Keith Davis
3. Advanced Accountancy; RL Gupta & M Radhaswamy
4. Introduction to Economics; Carin Cross & Sinclair
5. Construction Planning Equipments and Methods

13. DCE 203 Highway Construction and Maintenance

Subject Code: DCE 203			Division : Civil Engineering Technology		
Title : Highway Construction and Maintenance					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**3 x 10**	**-**	**2**	**3/3**	**-**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

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

- understand the fundamentals of traffic studies
- understand the basic principles of soil mechanics related to highway construction
- process the theoretical knowledge in highway construction materials, highway construction and maintenance techniques
- understand the fundamentals of highway structures

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Traffic Studies	10	03
2.	Highway Construction Materials	16	12
3.	Highway Construction	16	06
4.	Highway Maintenance	12	06
5.	Highway Structures	06	03
	Total	**60**	**30**

*** Practical -** Tutorials

Summary Syllabus

1. Traffic Studies (10 hours)

Introduction to traffic studies
Speed, flow and density relationships
Measurement of speed
Measurement of traffic flow and density
Traffic surveys
Road accidents and remedial measures

2. Highway Construction Materials (16 hours)

Soil as a sub grade material
Compaction of soil
Road aggregates and testing
Bitumen and testing

3. Highway Construction (16 hours)

Typical cross section of a flexible and rigid pavements
Determination of pavement layer thickness
Sub grade construction
Soil compacting equipment and their applications in highway construction
Base and sub base construction
Surface layer construction
Road curves
Street lighting
Highway drainage

4. Highway Maintenance (12 hours)

Identification of defects on road pavements
Treatment of surface defects
Routine and periodic maintenance

5. Highway Structures (06 hours)

Culverts
Bridges
Retaining walls

Practical List:

1. Current Standards, Specifications & Quality Controlling of Highways
2. Suitability of soil a s a highway material and compaction
3. CBR Test
4. Production of premixed bituminous materials
5. Determination of thickness of pavement layers
6. Superelevation of a road curve
7. Surface drainage of highways
8. Maintenance of gravel roads
9. Protection of slopes

Recommended Text Books :

Highway Traffic Analysis & Design; R. J Salter
Soil Mechanics in Highway Engineering; Rodrigue , Alfonso Rico et. al.
Principles and Practice of Highway Engineering; Dr. L R Kadiyali

14. DCE 204 Irrigation Engineering

Subject Code: DCE 204		Division: Civil Engineering Technology			
Title: Irrigation Engineering					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**-**	**3 x 10**	**2**	**-**	**3/3**
Method of Assessment:- 3 Hour Question Paper & Course Works					

General Objectives

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

- understand and appreciate the importance of irrigation works and the development of irrigation schemes in Sri Lanka
- understand the components of Irrigation systems and will be able to make preliminary designs for **minor irrigation works**.
- understand major components of hydrologic cycle and the methods of measurements
- estimate crop water requirement at different stages of crop growth and determine irrigation water requirement at different level (on-farm, Field canal, Distributory canal and main system) for better water management
- understand the different types of field irrigation methods
- perform necessary calculations required for economic evaluations of irrigation works.

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Introduction to Irrigation Engineering	04	03
2.	Rainfall and Runoff	10	06
3.	Irrigation in Sri Lanka	06	03
4.	Minor Irrigation Reservoirs	12	06
5.	Water Management	06	03
6.	Conveyance Systems	06	03
7.	Irrigation Structures	06	03
8.	Field Irrigation Methods	04	-
9.	Land Drainage	02	-
10.	Economic Evaluation of Irrigation Projects	04	03
		60	**30**

Note: Students are required to make site visits to familiarize with the practical aspects of the subject.

*** Practical** – Tutorials, short site visit / video, group work etc.

Summary Syllabus

1. Introduction to Irrigation Engineering (04 hours)

Definition and purpose of irrigation,
Introduction to terminology,
Economic, social and environmental impacts of irrigation.
Gravity and lift irrigation.

2. Rainfall and Runoff (10 hours)

Sources of water
Hydrological cycle
Precipitation: measurement of rainfall, mean rainfall on catchments
Runoff: measurement; velocity-area method. Stream gauging, chemical methods
Surface runoff hydrograph and unit hydrograph,

3. Irrigation in Sri Lanka (06 hours)

History and recent developments of irrigation in Sri Lanka
Major types of irrigation systems and examples
Specific local techniques.

4. Minor Irrigation Works (12 hours)

Yield computations
Requirement of reservoirs (Tanks) and diversion works (Anicuts)
Area-capacity studies
Water Balance Study
Design consideration of tank bunds, Spillways, Sluices,
Feasibility studies.

5. Water Management (06 hours)

Evapotranspiration, Potential evapotranspiration, measurement and estimation.
Crop water requirements: crop factors, growth stages.
Soils of Sri Lanka: properties related to Agriculture and Irrigation
Soil moisture calculations : FC, PWP, AM, Allowable Depletion
Irrigation requirements: farm losses, conveyance losses, effective rainfall, distribution efficiency, conveyance efficiency, overall efficiency,

6. Conveyance System (06 hours)

Canal networks :Types of canals, alignment of canals,
Canal capacity: velocity estimation, limiting velocities
Design of canal cross-sections, lining of canals
Back water effects of regulators and weirs
Design of canal longitudinal-sections
Maintenance works

7. Irrigation Structures (06 hours)

Head works Structures: Storage and diversion schemes
Conveyance structures: drops, escapes (canal spill) aqueducts, troughs, siphons, level crossings etc.
Regulating structures: cross regulators (vertical or Radial gates), weir regulators etc.
Delivery Structures: turnouts (offtakes, Farm turnouts etc.
Measurement structures: flumes (Parshall, Cutthtoat, BCW), Weirs and other related structures

8. Field Irrigation Methods (04 hours)

Surface irrigation: Basin, Furrow, Boarder irrigation, Drip irrigation etc.
Overhead irrigation: sprinkler irrigation
Sub-surface irrigation

9. Land Drainage (02 hours)

Drainage of irrigated lands: definition and purpose
Drainage problems: water logging, salinity etc.
Corrective measures.

10. Economic Evaluation of Irrigation Projects (04 hours)

Identification of costs and benefits
Cash flow diagrams
Benefit cost ratio

List of Practicals :

Video presentation & Field visit to identify components of Irrigation works (06 hours)
Mean rainfall estimations of Catchments (03 hours)
Area – Capacity diagram & component drawings (06 hours)
Water Management (03 hours)
Canal Design (06 hours)
Economics of Irrigation projects (03 hours)
Hydrographs(03 hours)

Recommended Text Books :

1. Technical Guidelines for Irrigation Works; A J P Ponrajah (Irrigation Dept. Sri Lanka -1988)
2. Elementary Irrigation Engineering; Santosh Kumar Garg & Rajeshwari Garg.

15. DCE 205 Quantity Surveying

Subject Code: DCE 205			Division : Civil Engineering Technology		
Title : Quantity Surveying					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**3 x 10**	**-**	**2**	**3/3**	**-**
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

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

- understand and apply the relevant sections of the current edition of the appropriate SMM of building works.
- comprehend the analysis of unit rates for typical items.
- comprehend the construction contracts and approximate estimation

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Introduction	02	-
2.	Introduction to SMM of Building Work	26	-
3.	Preparation of Bill of Quantities	04	-
4.	Estimation and Analysis of Rates	10	-
5.	Methods of Approximate Estimating	02	-
6.	Tender Procedures	16	-
*	Tutorials	-	30
	Total	**60**	**30**

*** Practical -**Tutorial

Summary Syllabus

1. Introduction (02 hours)

Historical background to quantity surveying
Standard method of measurement of building works

2. Introduction to SMM of Building Work (26 hours)

Measure from drawings with reference to specification for the following

- Excavation and foundation up to DPC level including DPC
- Concrete ground floors and brick paved ground floors
- External and internal walls in brick and block work
- Roofs- Timber pitched roofs covered with tiles or sheeting including hips and valleys, valance boards barge boards rain water goods
- Internal and external finishing to walls, floors and ceiling including decorations
- Windows and doors including adjustments for opening
- Reinforced concrete columns, beams and suspended slabs
- Drainage works including manholes
- Pluming installations- Cold water services and sanitary installations

3. Prepare Bill of Quantities (04 hours)

Process measurements, prepare abstract and write draft B.O.Q
Write preliminary items
Write preamble clauses
Prepare general summary
Purpose of B.O.Q and methods of preparation

4. Estimation and Analysis of Rates (10 hours)

Analysis of unit rates for typical items in B.O.Q

5. Methods of Approximate Estimating (02 hours)

Approximate quantities
Units
Cube (cost per cu.m)
Superficial (Cost per sq.m.)

6. Tender Procedures (16 hours)

Construction Contracts - ICTAD
Tendering methods
Bidding stage
Valuation and Payments

List of Tutorials: (30 hours)

1. Practice the application of relevant section of current SMM to take measurements for a small building
2. Calculate unit rate for the above mentioned building
3. Prepare a Bill of Quantities for that building

Recommended Text Books :

1. Elements of Quantity Surveying; Chirstoper J Willis and Don Newman
2. Building Quantities Explained; Ivor H Seeley
3. Contract Practice for Quantity Surveyors; J W Ramus
4. Estimating and Tendering for Building Work; R C Smith

16. DCE 206 Strength of Materials, Hydraulics & Soil Mechanics

Subject Code: DCE 206			Division : Civil Engineering Technology		
Title : Strength of Materials, Hydraulics & Soil Mechanics					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
3 x 30	**-**	**3 x 20**	**3**	**-**	**3 X 2/3**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

Section A – Strength of Materials

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

- acquire the theoretical knowledge to analyse (understand) the effects (internal forces & deformations) of external applied loads on structural members.

Section B - Hydraulics

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

- understand the principles governing the fluid flow through branched pipes.
- understand the basic principles of water flow under gravity
- understand the basic principles of water flow through ground.
- understand the basic principles of pumps and turbines as hydraulic machinery

Section C – Soil Mechanics

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

- understand the basic principles of soil mechanics and their applications in Civil Engineering.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Bending Stresses in Beams	08	06
2.	Shear Stresses in Beams	06	
3.	Deflection of Beams	08	
4.	Buckling of Struts	06	03
5.	Complex Stresses	02	06
6.	Flow through Branched Pipes	06	
7.	Open Channel Hydraulics	06	12
8.	Hydraulic Machinery	08	
9.	Ground Water Hydraulics	06	06
10.	Basic Properties of Soil	06	12
11.	Flow of Water through Soils	08	
12.	Strength and Compressibility of Soils	10	
13.	Applications in Civil Engineering	06	
	Total	**90**	**60**

Summary Syllabus

Section A - Strength of Materials

1. Bending Stresses in Beams (08 hours)

Bending formula
Composite beams
Bending and Axial Stresses
Plastic bending of beam sections

2. Shear Stresses in Beams (06 hours)

Shear stress distribution in symmetrical sections

3. Deflection of Beams (08 hours)

Deflection of statistically determinate beams
Analysis of statistically indeterminate beams

4. Buckling of Struts (06 hours)

Euler's theory of slender columns
Empirical formulae for buckling

5. Complex Stresses (02 hours)

Stresses at a joint on an inclined plane
Mohr's Circle of stress
Principle stresses & planes

Section B Hydraulics

6. Flow through Branched Pipes (06 hours)

3 reservoir problems
Use of electrical analogy for the analysis of flow through branched pipes
Introduction to Hardy cross method for the analysis of flow through branched pipes

7. Open Channel Hydraulics (06 hours)

Types of open channel flow – steady flow , unsteady flow, Uniform flow & Non uniform flow etc.
Discharge formulae for open channels – Chezy's ,Manning's etc.
Design of channels – Condition for most economical section for Rectangular & Trapezoidal shapes.
Flow measurement in open channels

- Variation of velocity over the cross section
- Measurement of flow in irregular channels.
- Specific energy in open channel flow
    a. Critical , Sub critical & Super critical flow & the criteria for identification.
    b. Critical depth, critical condition
    c. Criteria for critical condition – Reynold's number & Froud Number.etc.
    d. Hydraulic jump & its implications.
    e. Venturi flume - Discharge formulae etc.

8. Hydraulic Machinery (08 hours)

Working principle of a pump
Classification of pumps
Centrifugal pump: Characteristic curves, Determination of power, uses.
Reciprocating pump: working mechanism, Terminology used in analysis, Calculations to find slip, discharge & Power, Action of SVP & the determination of maximum speed. Use of air vessels
Turbines
Features of a typical Hydro Electric scheme

9. Ground Water Hydraulics (06 hours)

Darcy's law
Well discharge: Draw down curves – Determination of maximum & optimum discharge
Ground water flow measurements.- Flow nets

Section C - Soil Mechanics

10. Basic Properties of Soil (06 hours)

Formation of soils
Types of soils
Nature of soils
Basic index properties and their determination
Density, void ratio and other basic properties
Classification of soils

11. Flow of Water through Soils (08 hours)

Presence of water in soils
Pore water pressure
Static water and moving water
Concept of permeability
Determination of permeability in the laboratory and field
Applications (Dams, dewatering excavations, etc.) concept of measurement

12. Strength and Compressibility of Soils (10 hours)

Importance of shear strength
Shear strength parameters, Mohr Coulomb theory
Time dependent behaviour
Concept of consolidation
Determination of shear strength in the laboratory
Direct and indirect methods of shear strength determination in field

13. Applications in Civil Engineering (06 hours)

Compaction control in the field
Foundations for buildings
Slope stability
Excavation support
Earth retaining structures

List of Practicals: (60 hours)

Strength of Materials (15 hours)

1. Deflection of Beams
2. Buckling of struts
3. Testing of concrete
4. Testing of steel

Hydraulics (18 hours)

1. Verification of discharge formulae in open channels
2. Calibration of a current meter.
3. Discharge measurement using a current meter.
4. Flow through soil media – Verification of Darcy's law.
5. Determination of transmissivity of soil

Soil Mechanics (12 hours)

1. Particle size distribution test
2. Atterberg limits test
3. Proctor compaction test
4. Insitu density test

Recommended Text Books :

Strength of Materials

1. Strength of Materials for Civil Engineers; T H G Megson

Hydraulics

1. Fluid Mechanics; Dr. A K Jain, Khanna publications, Delhi
2. A text Book of Hydraulics;By K N Karna. Khanna Publishers, Delhi.
3. A Text Book of Hydraulics;R S. Khurmi, S. Chand & Co. Ltd. Ram Nagar, New Delhi.
4. Elementary Fluid Mechanics; J K. Vennard, Toppan Printing Co. Ltd. Japan.
5. Fluid Mechanics; JF Douglas; J M Gasiorec : J A Swaffield, ELBS Series

Soil Mechanics

1. Soil mechanics; R F Craig
2. Elements of Soil mechanics for Civil and Mining Engineers; G N Smith

17. DCE 207 Surveying and Levelling

Subject Code: DCE 207			Division : Civil Engineering Technology		
Title : Surveying and Levelling					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**-**	**6 x 30**	**2**	**-**	**6**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

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

- understand the basic principles of Surveying and Levelling
- apply the basic principles of Surveying and Levelling on Civil Engineering constructions.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction	03	-
2.	Linear Measurements	03	09
3.	Chain Surveying	04	18
4.	Levelling	12	42
5.	Compass Surveying	02	12
6.	Theodolite Traversing	09	39
7.	Contouring	06	27
8.	Plane Table Surveying	02	21
9.	Areas and Volumes	06	12
10.	Setting Out	06	-
11.	Setting out of Horizontal Circular Curves	02	-
12.	Electronic Distance Measurements	02	-
13.	Introduction to Remote Sensing & Geographical Information Systems	03	-
	Total	**60**	**180**

Note: A comprehensive Survey Camp of two weeks duration will be held in addition to the above allocated time schedule.

Summary Syllabus

1. Introduction (03 hours)

Definitions of surveying and levelling
Branches and classification of surveying
Principles of surveying
Accuracy and precision

2. Linear Measurements (03 hours)

Instruments, methods of measurements; on level ground, on slope and across obstacles
Setting out parallels and perpendiculars
Errors, mistakes and corrections in linear measurements.

3. Chain Surveying (04 hours)

Introduction, Principle and purpose of chain surveying
Field work and plotting work procedures
Accuracy in chain surveying

4. Levelling (12 hours)

Definition of levelling
Principles of ordinary levelling and terms used in levelling
Equipment used in levelling and Types of levels
Temporary and Permanent adjustments
Series/Reciprocal levelling & flying levels
Methods of booking levels
Use of levelling and Setting out of levels in construction work
Errors in levelling
Effects of Curvature and Refraction

5. Compass Surveying (02 hours)

Systems of designating bearings
Compass and its parts
Open and closed traverses
Compass traverse: field work and office work procedures
Accuracy of compass traversing

6. Theodolite Traversing (09 hours)

Introduction to Theodolite
Classification of Theodolites
Parts of the Theodolite and temporary adjustments
Permanent adjustments of Theodolite
Measurements of horizontal and vertical angles
Methods of Traversing
Traverse computations
Adjustments of traversing by Bowditch's method
Errors in Traversing and Precautions

7. Contouring (06 hours)

Characteristics of contours
Use of contour maps
Methods of contouring
Tacheometry

- Derivation of formula for horizontal and inclined heights
- Determination of Tacheometric constants
- Accuracy of stadia Tacheometry

8. Plane Table Surveying (02 hours)

Plane table and accessories
Methods of plane table surveying: Radiation, intersection, traversing, resection
Contouring with Indian clinometers
Uses of Plane table surveying, Advantages & Disadvantages of Plane table surveying
Errors in Plane table surveying

9. Areas and Volumes (06 hours)

Computation of areas from plotted plan
Computation of areas from field notes
Volumes of a prismoid by Trapezoidal and Simpson's rule
Computation of volumes using cross sections, spot heights and contours
Mass haul diagram and its uses

10. Setting Out (06 hours)

Aims and principles of setting out
Setting out of traditional buildings and frame buildings
Control of Excavation level and inclined excavation by sight rails
Control for man holes
Transfer of horizontal & vertical controls to higher floors
Checking the verticality of multi-storey structures
Controlling side slopes for embankments and cutting

11. Setting out of Horizontal Circular Curves (02 hours)

Simple, Compound and Reverse Curves

12. Electronic Distance Measurements (02 hours)

Basic concept of measurement
Properties of signals
Principle of Distance measurement
Introduction to EDM, Total station and GPS instruments in surveying

13. Introduction to Remote Sensing & Geographical Information Systems - (03 hours)

Introduction
Uses and applications

List of Practicals: (180 hours)

1. Linear measurements
2. Chain surveying
3. Levelling
4. Compass surveying
   Theodolite traversing
   Contouring
5. Setting out
6. Plane table surveying

Recommended Text Books :

10. Surveying Vol. 1 and Vol. 2; Dr. B C Punmia
11. Engineering Surveying; Bannister and Raymond

18. DCE 208 Theory and Design of Structures

Subject Code: DCE 208			Division : Civil Engineering Technology		
Title : Theory and Design of Structures					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**3 x 30**	**-**	**2**	**3**	**-**
Method of Assessment : 3 Hour Question Paper & Course Works					

General Objectives

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

- analyse statically determinate and indeterminate structures.
- understand fundamentals of design of reinforced concrete and steel elements

No.	Subject Outline	Lectures (hr.)	Practicals* (hr.)
1.	Statically Determinate Frames	02	06
2.	Continuous Beams	04	09
3.	Masonry and Mass Concrete Structures	06	06
4.	Earth Pressures	04	06
5.	Reinforced Concrete Design	28	45
6.	Steel Structures	10	12
7.	Introduction to Timber Structures	02	03
8.	Introduction to Pre-stressed Concrete	04	02
	Total	**60**	**90**

*** Practical –** Tutorials & Design Office Work

Summary Syllabus

Theory of Structures

1. Statically Determinate Frames (02 hours)

Determination of force in different types of determinate frames.

2. Continuous Beams (04 hours)

Three Moment Theorem
Shear force and Bending moment using coefficients

3. Masonry and Mass Concrete Structures (06 hours)

General conditions of stability
Middle third rule
Distribution of pressure intensities on bases

4. Earth Pressures (04 hours)

Rankine's and Coulomb's theories of earth pressures.
Application to simple cases of design of retaining walls

Design of Structure

5. Reinforced Concrete Design (28 hours)

General principles of design of reinforced concrete structures
Design of simple rectangular, T and L beams
Design of slabs with one way and two way reinforcement
Design of short R.C. columns
Reinforced concrete staircases

6. Steel Structures (10 hours)

Properties of rolled steel sections
Design of tension and compression members
Design of simply supported beams
Design of simple roof trusses

6. Introduction to Timber Structures (02 hours)

Strength properties and working stresses of structural timbers

7. Introduction to Pre-stressed Concrete (04 hours)

Uses, methods of pre-stressing and losses in pre-stressed concrete

List of Practicals: (90 hours)

1. Construction of Design Charts for beams.
2. Design of a L Beam for a foot bridge.
3. Design of a Continuous beam
4. Design of a one way slab.
5. Design of a steel roof truss.

Recommended Text Books :

1. Reinforced Concrete - Theory & examples; T J Mac Ginley
2. Structural steel work; T J Mac Ginley.

19. DCE 209 Water and Wastewater Engineering

Subject Code: DCE 209			Division : Civil Engineering Technology		
Title : Water and Wastewater Engineering					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**3 x 10**	**-**	**2**	**3/3**	**-**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

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

- understand water availability and usage of safe water.
- understand the nature & characteristics of wastewater and designing of sewerage systems
- understand the processes in disposal of sewage.

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
	Section A - Water Supply and Treatment		
1.	Introduction to Public Water Supply	04	03
2.	Sources of Water and Their Characteristics	06	03
3.	Basic Water Quality Parameters of Drinking Water and Their Assessment	06	06
4.	Water Supply and Treatment	14	03
5.	Transmission and Distribution of Water	06	03
	Section B - Wastewater Treatment and Sludge Disposal		
6.	Wastewater and Combined Systems	06	03
7.	Treatment of Domestic Wastewater and Sludge Disposal Techniques	10	
8.	Introduction to Solid Waste Management	02	-
9.	Introduction to Environmental Legislation	04	-
10.	Environmental Management Systems	02	-
	Group Presentations and Assessments	-	09
	Total	**60**	**30**

Note: Two field visits to water & wastewater treatment plants will be arranged in addition to above time allocated.

*** Practical –** Tutorials, Designs & Laboratory Practicals

Summary Syllabus

Section A - Water Supply and Treatment

1. Introduction to Public Water Supply (04 hours)

Movement of water in nature
Water consumption for different purposes
Variation in demand from average
Provision for growth in population
Factors affecting per capita demand

2. Sources of Water and Their Characteristics (06 hours)

Surface sources
Location of reservoirs and intakes
Capacity of reservoirs
Ground water sources

3. Basic Water Quality Parameters of Drinking Water and Their Assessment (06 hours)

Physical and chemical characteristics of water.
Introduction to sanitary microbiology.
Water sampling and interpretation of test results.
WHO standards for portable water.

4. Water Supply and Treatment (14 hours)

Natural purification in reservoirs.
Aeration
Coagulation, flocculation and sedimentation
Types of sedimentation tanks and design of sedimentation tanks.
Filtration.
Filter troubles.
Softening process.
Disinfections.

5. Transmission and Distribution of Water (06 hours)

Distribution systems, service reservoirs and clear water reservoirs.
Types of materials used for pipes.
Types of pipe joints.
Water meters, valves and other fittings.
" Loop" software for water distribution systems and its applications.

Section B - Wastewater Treatment and Sludge Disposal

6. Wastewater and Combined Systems (06 hours)

Definitions and purposes, Quantity of wastewater and storm water.
Sizes and slopes of wastewater pipes and drains
Maximum and minimum velocities of flow.
Materials and shapes of wastewater pipes, manholes, catch basins, building connections
Sewerage systems.

7. Treatment of Domestic Wastewater and Sludge Disposal Techniques (10 hours)

Characteristics of wastewater.
Introduction to wastewater treatment.
Wastewater treatment plants based on activated sludge process and Trickling filter.
Low cost wastewater treatment methods in hot climates.
Soakage pits and septic tank design.

8. Introduction to Solid Waste Management (02 hours)

Definitions of solid wastes.
Handling and disposing of solid wastes.
Collection of solid waste.
Principles of treatment and final disposal

9. Introduction to Environmental Legislation (04 hours)

National Environmental Act
Recommendation on Ambient Air Quality
Requirement on noise level
Standards on emission levels of wastewaters from industries.
Interim standards on vibrations

10. Environmental Management Systems (02 hours)

Cleaner production
ISO certification

List of Practicals: (30 hours)

1. Laboratory work on Water quality analysis
2. Group Presentations
3. Public water supply
4. Purification of water
5. Wastewater
6. Design of Septic tanks
7. Computer applications for water supply & sewerage

Recommended Text Books :

1. Water and Wastewater Technology. (SI Version); Mark. J Hammer.
2. Water Supply & Sewerage; Ernest .W. Steel
3. Environmental Engineering (Vol. 01 & 02); Santhosh Kumar Garg
4. Water Supply & Sewerage; Steel
5. Sewerage Treatment in hot climates; Duncan Mara