

UNIVERSITY POLYTECHNIC
B.I.T., MESRA, RANCHI

Syllabus of Diploma in Engineering (Mechanical)

(Semester VI)

COURSE STRUCTURE
(Total Unit 7.0)

Course Code	Theory	Unit	Course Code	Sessional	Unit
DMM 6001	Hydraulic & Pneumatic Controls	1.0	DMM 6002	Hydraulic and Pneumatic Control Lab.	0.5
DMM 6003	Power Plant Engineering	1.0	DMM 6012	Project	1.0
DMM 6005	Machine Design	1.0			
MBA 6003	Total Quality Management	1.0			
DMM 6007	Elective : (i) Refrigeration & Airconditioning	1.0	DMM 6008	Elective : (i) Refrigeration & Airconditioning Lab.	0.5
DMM 6009	OR (ii) Non-Conventional Energy sources		DMM 6010	OR (ii) Non-Conventional Energy sources Lab.	
				Seminar/ Industrial Visit (Non- Credit)	
	TOTAL	5.0			2.0

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SUBJECT : HYDRAULIC AND PNEUMATIC CONTROLS

Course Code: DMM 6001

Module 1

1. Introduction to Hydraulic system, Advantage of Hydraulic system, Properties of Hydraulic fluid. Hydraulic power supply: Pump, By pass regulated and stroke regulated Hydraulic power supply. (6 Lectures)

Module 2

2. Control components of Hydraulic system: Directional control valve, pressure control valve, Flow control valve. (6 Lectures)

Module 3

3. Valves and their characteristics. Flow forces in spool. Servovalves: Mechanical, Torque motor, Electro hydraulic valve. (5 Lectures)

Module 4

4. Linear and Rotary Actuators, Pumps and valve controlled Motor. (5 Lectures)

Module 5

5. Hydraulic circuit Analysis: control of single acting and double acting cylinder, regenerative circuit, Double pump hydraulic system. Hydraulic cylinder sequencing circuit, Automatic cylinder reciprocating, cylinder synchronizing circuit. Reservoir, filters, Accumulator, seals and tubing. (6 Lectures)

Module 6

6. Pneumatic System, compressor & pumps, Pneumatic cylinder, motors, Actuators, control valve. (6 Lectures)

Module 7

7. Air preparation and distribution. Logic control system, AND , OR, NOT, NAND, NOR. Will dependent, Time dependent & Travel dependent control. (6 Lectures)

Text Books:

1. Introduction to fluid power – James L. Johnson.
2. Hydraulic Control System – H.E. Merritt.
3. Fluid Power with Application – Antony Esposito
4. Pneumatic Control - Werner Deppert and Kurt Stoll.

Reference Books:

1. Power Hydraulics – Michael J. Pinches & John G. Aohby
2. Hydraulic & Pneumatic – Andrew Parr

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SUBJECT : POWER PLANT ENGINEERING

Course Code: DMM 6003

Module 1: Introduction: Principal types of power plants, special feature, application and future trend of developments. (5 Lectures)

Module 2: Steam Power Plants: Major components of power plant, fuels and their properties, storage, preparation, handling and burning, Ash handling and dust collection, Feed water treatment plants, cooling towers. (7 Lectures)

Module 3: Nuclear Power Plants: Principle of power generation by nuclear fission fuels for nuclear power plants, preparation and care, fertile materials and breeding. (5 Lectures)

Module 4: Diesel and Gas Turbine Power Plants: Introduction, field of use, air supply, and cleaning system, fuel storage and supply systems, cooling systems, lubricating and starting systems, comparative study of diesel and gas turbine plants. (6 Lectures)

Module 5: Hydraulic Power Plants: Different types of hydraulic power plants, rain fall and run-off measurements and plotting of various curves for estimating power available with or without storage. (7 Lectures)

Module 6: Energy Storage Methods: Compressed air, Energy Storage flywheel, electrochemical energy storage, thermal energy storage. (5 Lectures)

Module 7: Site selection and Economics of Power Plants: Criterion for site selection of different types of power plants, cost consideration of different types of power plants, tariff of power. (5 Lectures)

Books:

1. Power Plant Technology: by M.M.E. Wakil, McGraw Hill Publication.
2. Power Plant Engineering: by N.K.Nag, T.M. H. Publication
3. Power Plant Engineering: by Arora & Domkundwar, Dhanpatrai Publication
4. Power Plant Engineering: by Black & Veatch, CBS Publication.
5. Power Plant Engineering: by F.T. Morse.

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SUBJECT : MACHINE DESIGN

Course Code : DMM 6005

Module -1.	Principles of Machine Design, standardization, designation and selection of materials, aesthetic and ergonomic considerations in design, Preferred numbers, Tolerances. (5 Lectures)	
Module -2.	Design against static and fluctuating loads.	(5 Lectures)
Module -3.	Threaded Joints, Cotter and Knuckle joints.	(6 Lectures)
Module –4	Riveted and Welded Joints.	(6 Lectures)
Module –5	Shafts, keys, couplings, Belt, Rope and chain drives	(7 Lectures)
Module – 6	Power screws, Screw Jack, Helical and leaf springs.	(6 Lectures)
Module – 7	Clutches and Brakes	(5 Lectures)

Text Books:

1. Machine Design by Maleev and Hatman, CBS Publisher & Distributor, New Delhi, 1983.
2. Mechanical Engineering Design by J.F. Shigley, McGraw Hill Book 3. Company, U.S.A., 1986.

Reference Books:

1. Design of Machine by Khurmi and Gupta, S. Chand and Company Ltd., New Delhi, 2000.
2. Machine Design, Sharma and Agarwal, S.K. Kataria and Sons, New Delhi, 2001.
3. Design of Machine Elements, VB Bhandari, Tata McGraw Hill, New Delhi 1999.
4. Hand book of Properties of Engineering Materials and Design Data for Machine Elements, Abdulla Shariff, Dhanpat Rai & Sons, New Delhi – 2001.

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Subject : Total Quality Management

Course code : MBA 6003

Module 1

Introduction : Concept of Total Quality Management, Objective of TQM, Scope of TQM, Components of TQM, Evolution of TQM, Definition of Quality and its important. (4)

Module 2

Components of Total Quality Management : Customer Supplier Relationship in TQM System, Management, Leaders in TQM System, Managerial Role in TQM. (6)

Module 3

Practices for TQM : TQM and Human Resource Development, Need and Significance of TQM, Process of TQM. (6)

Module 4

Quality Systems : Need for ISO 9000 and other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, ISO 14000 – Concept, Requirement and Benefits. (6)

Module 5

Benchmarking : Reasons to Benchmark, Benchmarking Process, Quality Function Development (QFD) – Cost of Quality, QFD Process, Six Sigma. (6)

Module 6

Quality Circle : Purpose, Benefits, Problem in implementation of quality circles, Requirements of Elective Circle. (6)

Module 7

Statistical Tools and Techniques : Role of Statistics in Business, Common Statistical Tools, Flow Diagram, Check Sheets, Correlation or Scatter Diagram. (6)

BOOKS:

1. Feigenbaum A.V. “Total Quality Management, McGraw-Hill, 1991.
2. Total Quality Management, Principles & Practice – S. K. Mandal, Vikas Publishing House, Pvt. Ltd.
3. Oakland J.S. “Total Quality Management Butterworth – Heinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International, 1996.
5. Zeiri, “Total Quality Management for Engineers Wood Head Publishers, 1991.

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SUBJECT : REFRIGERATION AND AIR CONDITIONING

Course Code: DMM 6007

Module- 1. Definition of Refrigeration and Air-conditioning, Introduction and Basic concepts. Air-cycle Refrigeration, its application in air-craft refrigeration Evaporative cooling system, Boot strap cooling system, Regenerative cooling system, Reduced Ambient system. (6 Lectures)

Module-2. Simple vapour compression Refrigeration systems, Compound vapour compression Refrigeration systems and its applications. (5 Lectures)

Module-3 Vapour Absorption Refrigeration system and its applications. Thermo-electric Refrigeration systems, Steam jet Refrigeration system. (6 Lectures)

Module-4 Function and classification of compressors, construction and working of reciprocating compressors, Work done and volumetric efficiency. Multi-stage compression and their advantages Centrifugal and Rotary Compressors. (8 Lectures)

Module-5 Properties of Refrigerants and eco-friendly refrigerants. Low Temperature Refrigeration and its applications. (6 Lectures)

Module-6 Psychrometry, Cooling load calculation and Air-conditioning, systems and accessories. (7 Lectures)

Module-7 Cooling Towers & Cooling Ponds. (2 Lectures)

Text Books:

1. A Text book of Refrigeration & Air-conditioning – R.S. Khurmi & J.K. Gupta.
2. Refrigeration & Air-conditioning – Arora & Domukndwar
3. Refrigeration & Air-conditioning – C.P. Arora.

Reference books:

1. Refrigeration & Air-conditioning – R.C. Jordan & G.B. Priester.
2. Refrigeration & Air-conditioning – Manohar Prasad

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NON CONVENTIONAL ENERGY RESOURCES

Course Code: DMM 6009

Module 1:

Introduction: Energy needs and energy supply, conventional & non-conventional energy sources. Present energy scenario.

Wind Energy: Availability, site selection, different types of wind turbines, design criteria and material selection. (8 Lectures)

Module 2:

Solar energy: Solar geometry, Characteristics & estimation of solar radiation. Collector – flat plate & concentrating types. Collector efficiency calculation, Selective paints & surfaces for them. (5 Lectures)

Module 3:

Thermal Storages and Solar ponds – principle & its uses.

Solar Application: Heating of air & water for building and other uses. Solar pumps, solar power plant, solar cookers, solar refrigeration & air conditioning solar cookers, solar furnaces etc. (7 Lectures)

Module 4:

Bio-conversion: Photosynthesis & generation of bio-gas, digester and their design, selection of material, feed of digester, pyrolytic gasification. (5 Lectures)

Module 5:

Geo-thermal Energy: Sites, potentiality and limitation, study of different conversion system and other uses of geo-thermal sources. (3 Lectures)

Module 6:

Tidal Energy: Sites, potentiality and possibility of harnessing from site, limitation. Different method of using tidal power. (3 Lectures)

Module 7:

Ocean Thermal Energy: Principle of utilization and its limitation description of few system. Other Non-Conventional Sources: Hydrogen energy, its production and applications. (5 Lectures)

Books:

1. Non-conventional Energy Sources – G.D. Rai
2. Solar Energy –Garg and Prakash
3. Solar Energy Utilization – G.D. Rai
4. Solar Thermal energy – Peter J. Lunde