

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

Syllabus of Diploma in Engineering (Electrical & Electronics)

(Semester VI)

**COURSE STRUCTURE**  
**(W.E.F. 2011 Batch Students)**  
**(Total Unit 7.0)**

<b>Course Code</b>	<b>Theory</b>	<b>Unit</b>	<b>Course Code</b>	<b>Sessional</b>	<b>Unit</b>
DEE 6001	Control System	1.0	DEE 6002	Control System Lab.	0.5
DEE 6003	Electrical Installation, Commissioning and Maintenance	1.0	DEE 6004	Electrical Drawing & CAD Lab.	0.5
MBA 6003	Total Quality Management	1.0	DEE 6010	Electrical Workshop – II	0.5
DEE 6005 DEE 6007	Elective Papers : (i) Industrial Instrumentation OR (ii) Non-conventional Energy Sources	1.0	DEE 6006 DEE 6008	Elective Lab. : (i) Industrial Instrumentation Lab. OR (ii) Non-conventional Energy Sources Lab.	0.5
			DEE 6012	Project	1.0
		<b>4.0</b>			<b>3.0</b>
				Seminar/Industrial Visits (Non-Credit)	

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**SUBJECT : CONTROL SYSTEMS**

**Course Code : DEE 6001**

**Module – 1**

**Laplace Transform** : Introduction to Laplace Transform of different function, Inverse Laplace Transform. Use of Laplace transform to solve differential equation. Simple R-L, R-C and R-L-C circuit and their analysis using Laplace transform.

(6)

**Module – 2**

**Introduction to Control System** : Open loop and closed loop system with suitable examples. Mathematical modelling of physical systems.

**System and Transfer Function** : Definition of Transfer function, Different types of transfer function, Transfer function of Electrical systems. Transfer function of single input & single output system, Block diagram representation and reduction techniques.

(6)

**Module – 3**

**Control System Components** : Principle of working, Transfer Function and Application of following components : D.C. Servomotor, A.C. Servomotor, Synchro, Potentiometer, AC Tachometer, A.C. and D.C. position control system, Stepper motors.

(5)

**Module – 4**

**Time Domain Analysis of a System** : Standard test signals. Concept of Impulse response. Response of first and second order system to step input. Time response specification with derivations. Types of systems. Steady state error and error constants for step, ramp and acceleration input.

(6)

**Module – 5**

**Concept of Stability** : Definition of stable, Unstable and limitedly stable system. Response terms of various natures of roots. Relative stability. Routh stability criterion and its application for feed back systems.

**Frequency Response** : Frequency response and frequency specification. Correlation between time response and frequency response. Bode plot, Gain Margin and Phase Margin, Polar plots.

(6)

**Module – 6**

**Nyquist stability criterion** : Principle of Argument. Conformal mapping, Nyquist stability criterion, Application of Nyquist criterion for first three types of transfer function. Relative stability using Nyquist criterion. Gain Margin and Phase Margin.

(5)

**Module – 7**

**Controllers** : Pneumatic and electronic controller – P, PD, and PID controllers. Pressure controller, Hydraulic controller, Controller, Controller tuning. Control elements – Pneumatic control valve and actuator, Electro pneumatic actuator. Solenoid valve.

Basic idea of digital and advance control strategy.

(6)

**Books Recommended :**

1. Control System Engineering by Nagrath & Gopal
2. Control System Engineering by Sushil Dasgupta
3. Modern Control Engineering by Ogata

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**Subject : Electrical Installation, Commissioning and Maintenance**

**Course Code : DEE 6003**

**Module – 1**

Safety procedure in electrical work including fire safety in building and electrical installation. (5)

**Module – 2**

Introduction to installation, commissioning and maintenance, location and layout, positioning of machine, foundation, levelling and alignment, grouting final alignment, Electrical installation requirement, testing of machine before commissioning, commissioning, preventive maintenance, breakdown maintenance and maintenance schedule. (6)

**Module – 3**

Earthing : Installation of different types of earthing. Testing and maintenance. (5)

**Module – 4**

Installation, commissioning and maintenance of transformer, delivery, handling and Inspection at site, civil work. Test before commissioning. (6)

**Module – 5**

Installation, commissioning and maintenance of rotating machine, delivery, handling and inspection at site, civil work, test before commissioning. (6)

**Module – 6**

Lighting installation, commissioning and maintenance, norms of illumination as per IS code. Building lighting, shop lighting, factory lighting and street lighting. (6)

**Module – 7**

Maintenance of small domestic and industrial equipments like fans, heater, refrigerator, motor, man cooler, air conditioner welding machine, compressor motor etc. (6)

**Books Recommended :**

1. Installation, commissioning and maintenance of electrical equipment by Tarlok Singh
2. Maintenance of Electrical Equipment by J. B. Gupta.

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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 : INDUSTRIAL INSTRUMENTATION**

**Course Code : DEE 6005**

**Module – 1**

**Introduction** : Types of measurement, application, computer aided machines and processes, Functional elements of an instrument, Performance, characteristics of instruments – static and dynamic characteristics. (6)

**Module – 2**

**Transducers** : Classification and types of transducer, Primary and Secondary transducers, Mechanical and electrical primary sensing elements. (5)

**Module – 3**

**Motion and Dimensional Measurement** : Introduction, Fundamental standards, Relative displacement measurement, translational and rotational displacement, Relative velocity, measurement and Acceleration measurement. (6)

**Module – 4**

**Measurement of force, Torque and Shaft Power** : Standards and calibration, Basic methods of measurements, characteristics of elastic force transducers, Measurement of torque and shaft power. (5)

**Module – 5**

**Pressure and Flow Measurement** : Standards and calibration, Basic methods of pressure measurement, low and high pressure measurement, Measurement of local flow velocity, magnitude and direction, gross volume flow rate. (6)

**Module – 6**

**Temperature Measurement** : Standard and calibration, thermal expansion method, thermo-electric sensors, radiation methods and digital thermometers. (5)

**Module – 7**

**Data Transmission and Signal Conditioning** : Cable transmission of analog voltage and current signal, digital data transmission via cable, fiber-optic data transmission, Pneumatic transmission, Instrumentation amplifiers, Operational amplifiers, Noise problem, Shielding and Grounding. (7)

**Books Recommended :**

1. Industrial Instrumentation – K. Krishnaswami & S. Vijay Chitra
2. Measurement Systems – E.O. Deobeins & D.N. Manik

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**SUBJECT : NON CONVENTIONAL ENERGY SOURCES**

**Course Code : DEE 6007**

**Module – 1**

**Introduction** : Energy needs and energy supply sources; conversions and thermo dynamical needs and systems, contribution of non conventional energy.

**Solar Energy** : Solar radiation characteristics and estimation, solar collectors; flat plate and concentrating types, their comparative study; design and material selection, efficiency, selective points and surfaces.

(8)

**Module – 2**

Heating of air and water for building and other uses, Thermal storages, Solar ponds, Solar pumps, Solar power, Solar cookers etc. Direct conversion of solar energy to electricity and its various uses, materials, limitations and costs.

(6)

**Module – 3**

**Bio-Conversion** : Photosynthesis and generation of bio-gas, digasters and their design, selection of material; feed and digester, pyrolytic gasification, production of hydrogen, algae production and their uses.

(6)

**Module – 4**

**Wind Energy** : Availability, site selection , different types of wind turbines, design criteria and material selection, economics.

(4)

**Module – 5**

**Geo-Thermal Energy** : Sites, potentiality and limitation, study of different conversion systems and other uses of geo thermal sources.

(6)

**Module – 6**

**Tidal Energy**: Sites, potentiality and possibility of harnessing from site, limitations different methods of using tidal power.

(5)

**Module – 7**

Ocean Thermal Energy

Principle of utilization and its limitations, description of few systems.

Other Non-conventional Energy Sources

Fluidized bed combustion, heat from waste and other sources.

(5)

**Book Recommended :**

1. Non Conventional Energy Sources by G.D. Rai (Khanna Publishers).
2. Solar Energy Utilization by G.D. Rai
3. Solar Heating and Cooling by Duffie and Bakeman