



UNIVERSITY OF SARGODHA SARGODHA

Registrar's Office

Phone: 048-9230811-15 Ext: 517

No.UOS/Acad/1894

Dated: 19/11/2014

The Principal
University College of Engineering & Technology
University of Sargodha

Subject: **SCHEME OF STUDIES / COURSE OUTLINES FOR BS CIVIL,
ELECTRICAL & MECHANICAL TECHNOLOGIES PROGRAM**

Dear Sir,

I am directed to refer to the minutes of the meeting of Academic Council held on 10.07.2014 (Item No.38) and request you to kindly process the curriculum / curricula at the earliest.

2. The curriculum shall be notified after vetting of the committee constituted by the Academic Council to review the course code / basic template of schemes of studies.

3. Please refer to annexed notification of the committee for the said purpose.

Yours faithfully


(Ch. FAROOQ AHMAD)
Assistant Registrar (Acad)
for Registrar

Encl: As Above (Curricula in original)

C.C:

- Prof. Dr. Mian Ghulam Yasin
Dean, Faculty of Social & Behavioral Sciences
University of Sargodha
- Secretary to the Vice-Chancellor
- P.A to Registrar

Copy to Dr. Waheed Y/S 25/11

Scheme of study for BS MECHANICAL TECHNOLOGY

Semester-I

Code	Subject	Credit Hours		Contact Hours
		T	P	
HU-111	Applied Mathematics-I ✓	3	0	3
CS-112	Computer Applications ✓	1	2	7
HU-113	Communication Skills-1 ✓	3	0	2
MT-114	Machining Processes ✓	1	2	7
MT-115	Engineering Drawing	1	1	4
Total		8	5	23

Semester-II

Code	Subject	Credit Hours		Contact Hours
		T	P	
GS-121	Applied Physics	2	1	5
MT-122	Computer Aided Drafting	1	1	4
HU-123	Applied Mathematics-II	3	0	3
MT-124	Industrial Materials	3	0	3
HU-125	Pakistan Studies	2	0	2
MT-213	Applied Mechanics	3	1	6
Total		14	3	17

Semester-III

Code	Subject	Credit Hours		Contact Hours
		T	P	
MT-211	Mechanics of Materials	3	1	6
MT-212	Applied Thermodynamics	3	1	6
MT-214	Basic Electrical Technology	3	1	6
HU-215	Communication Skills-II	2	0	2
HU-216	Islamic Studies	2	0	2
Total		13	3	22

Semester-IV

Code	Subject	Credit Hours		Contact Hours
		T	P	
MT-221	Machine Design	3	1	6
MT-222	Manufacturing Processes	2	2	8
MT-223	Production Planning and Control	2	0	2

Scheme of Studies: BS Mechanical Technology

MT-224	Fluid Mechanics	3	1	6
	Total	10	4	22

Semester-V

Code	Subject	Credit Hours		Contact Hours
		T	P	
MT-311	I.C Engine	2	1	5
MT-312	Plant Maintenance	2	0	2
MT-313	Mechanical Vibrations	3	1	6
MT-314	Instrumentation and Control	2	1	5
MT-315	Material Handling	2	0	2
MT-316	Total Quality Management	2	0	2
	Total	13	3	22

Semester-VI

Code	Subject	Credit Hours		Contact Hours
		T	P	
MT-321	Production Automation	2	1	5
MT-322	Energy & Environmental Technologies	2	0	2
MT-323	Metrology & Gauging	2	1	5
MT-324	Refrigeration and Air Conditioning	2	1	5
MT-325	Project Management	2	0	2
MT-326	Renewable Energy Technology	1	1	4
	Total	11	4	23

Semester-VII

Code	Subject	Credit Hours		Contact Hours
		T	P	
MT-411	Industrial and Environmental Safety	2	0	2
MT-412	Technical Project	0	6	18
	Total	2	6	20

Semester-VIII

Code	Subject	Credit Hours		Contact Hours
		T	P	
MT-421	Supervised Industrial Training	0	36	108
	Total	0	36	108

Total Credit Hours =136

Scheme of Studies: BS Mechanical Technology

Course Outlines

BS MECHANICAL TECHNOLOGY

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Course Curriculum BS Mechanical TECHNOLOGY



Fall 2014

UNIVERSITY OF SARGODHA

University College of Engineering and Technology

Department of Technical Education

Applied Mathematics-I

Course Code: HU-111

Credit Hours: 3

Objectives:

1. To review the knowledge and practice the skills acquired in diploma Courses
2. To understand the concept and use of differential equations
3. To learn different methods to solve differential equations
4. To understand the concept of complex numbers and their applications

Course Outlines:

1. **Review of the following:** Integral Calculus, Differential Calculus Matrices and Determinant, Vector Algebra and Analytical Geometry
2. **Introduction to Differential Equations Basic Concepts:** Geometric Interpretations, Separable Equations, Exact Differential Equations, Linear First Order Differential Equations, Bernoulli's Differential Equations, Families of Curves, Applications
3. **Higher Order Differential Equations:** Homogeneous Linear Equations of Second Order, Non- Homogeneous equations, Application of Higher Linear Differential Equations
4. **Partial Differential Equations:** Basic Concepts, Solution by Separable Variables, Classification
5. **Complex Numbers:** Invented Number Systems, The Argand Diagram, Complex Variables, Derivatives, Complex Series, Applications

Text Book:

1. Thomas G. B. and Finney R. L. "Calculus and Analytic Geometry"
(latest edition)

Reference Books:

1. Kreyszig E. "Advanced Engineering Mathematics", John Wiley and Sons, USA (latest edition)
2. Cohen H. L. "Mathematics for Scientists and Engineers", Prentice-Hall, UK (latest edition)

Computer Applications

Course Code: CS-112

Credit Hours: 1 + 2

Objectives:

1. To review the knowledge and practice the skills acquired in diploma Courses
2. To practice the use of BASIC language and Spreadsheet software in different applications
3. To learn the concept of CAD/CAM and related applications
4. Familiarization with commercially available softwares in the relevant field

Course Outlines:

Department of Technical Education, BS Mechanical Technology

1. Review of the following knowledge/skill: Electronic Data Processing, Operating System, BASIC language
2. Practice in using Word Processing Software: Character and Paragraph Formatting, Tables and Columns, Page Setup and Print Setup, Inserting Objects Styles, Index and TOC Customization
3. Practice in using Spreadsheet Software: Data Types, Entering and Editing data General Calculations, Statistical Analysis, Graphics
4. CAD/CAM Applications (Technology Related)
5. Familiarization with Commercially available Softwares In the relevant field

Text Book:

1. Gottfried R. S., "Programming with Basic", Schaum's Outline Series (Latest Edition)
2. User's Manuals for Word Processing Software, Spreadsheet Software and Technology Specific Softwares

Reference Books:

1. Tucker A. B., Bernat A., Cupper R. D. and Scragg G. W., "Fundamentals of Computing", McGraw Hill Book Company (Latest Edition)
2. IBM Dictionary of Computing (Latest Edition).
3. Bradley J. C., "QUICK BASIC", Wm. C. Brown Publishers, USA (Latest Edition)

Communication Skills-I

Course Code: HU-113

Credit Hours: 3

Objectives:

1. To understand the importance and basic concepts of communication
2. To enhance the listening skills and to become active listener
3. To enhance the reading skills and to become active reader
4. To improve the writing skills in general

Course Outlines:

1. **Introduction to Communication**
Importance, Theories, Barriers, Components
2. **The Seven C's for Effective Communication**
3. **Listening Skills**
Blocks, Thinking and Feeling Notes Taking, Giving Feedback
4. **Reading Skills**
Active Reading Techniques, Skimming, General Reading and Careful Reading
5. **Introduction to Writing Skills**
Planning, Drafting and Editing Emphasis and Connections
6. **Grammar and Vocabulary**
Technical and Business Vocabulary, Constructing Formal Sentences

Text Book:

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P., "Effective Business Communications", McGraw-Hill, USA (Latest Edition).

Reference Books:

1. T Norman S., "We're in Business", Longman Group Ltd., UK (Latest Edition)
2. Thomson A. J. and Martinet A. V., "A Practical English Grammar", Oxford University Press, UK (Latest Edition)

Machining Processes

Course Code: MT-114

Credit Hours: 1 + 2

Objectives:

To enable the student to understand:-

1. Mechanism of Chip formation.
2. Cutting tool materials and cutting fluids.
3. Lathe operations, milling operations, planning.
4. Shaping and broaching operations.

Course Outlines:

Cutting Tool Materials and Cutting fluids: Steels, Carbides, Carbides Coated Tools, Ceramics, Diamond tools, abrasives, stellites, Cutting Fluids properties, purposes and their types

Lathe Operations: Turning parameters, further work on lathe machines i.e. eccentric and form turning, under cutting, centre hole, Calculation of MMR, Power and Cutting Time, High Precision Machining, Hard Turning, Cutting Screw Threads (single, double and triple start), Lathe accessories and attachments, Semi-Automatics and automatics. Milling Operations, Milling parameters, Calculations of MMR, power and Cutting Time, Milling attachments, Accessories, Copy Milling, Die Sinking, Index Milling

Planning, Shaping and Broaching Operations: Principle, Tools, applications

Gear Manufacturing: Machining, Form Cutting, Shaping, Hobbing

Finishing Operations: Grinding, Honing, Lapping, Polishing and Buffing

List of Practicals:

1. Familiarization with types of cutting tools and tool holders used with a standard center lathe machine.
2. To perform alignment tests for a lathe machine
3. To produce external threads on components using different methods
4. Practice of boring operation on the lathe machine
5. To produce internal threads on components using different methods
6. Identification and familiarization of various types of milling cutters.
7. Familiarization with the parts and accessories of a universal milling machine.
8. To perform alignment tests for a milling machine

9. To manufacture a given component for the practice of side milling, end milling, slot milling and engraving on a universal milling machine.
10. To manufacture a given component for the practice of copy milling, index milling and die sinking on a universal milling machine.
11. Familiarization with the parts, accessories and cutting tools of a gear hobbing machine.
12. Practice of spur gear cutting on a gear hobbing machine.
13. Familiarization with the parts, accessories and cutting tools of a shaper.
14. Manufacturing a given component on shaper.
15. Practice on cutting a key way with a broach using an arbor press.

Recommended Books:

1. W A J Chapman, "Workshop Technology" (Part I, II, III)
2. SK Hajra Choudhury, "Elements of Workshop Technology(Vol II)-Machine Tools"

Reference Books:

1. Genevro W A J and Heineman S S "Machine Tools: Processes and Applications", Prentice Hall UK
2. Kibbe R R Neely J E Neyer R O and White W T, "Machine Tool Practice" Prentice Hall UK

Engineering Drawing

Course Code: MT-115

Credit Hours: 1 + 1

Course Outlines:

Introduction: Types of lines, lettering, dimensioning, use of pencil and drawing instruments, planning of drawing sheet

Projections: Types of projections, orthographic projections, plane of projections, four quadrants, projection of points, projection of straight lines, examples with different quadrants, traces of a line, true length of a line, inclination to both the planes, projection of oblique and auxiliary planes.

Loci of Points and Generated Curves: Loci of points and straight lines. Cycloid, epicycloid, involute, archmedian spiral

Development of Solids: Types of solids, polyhedra, solids of revolution, prism, pyramid, cylinder, cone, sphere

Intersection of Surfaces: Intersection of cylinder and cylinder, cone and cylinder, cone and cone, cone and prism

Projection of Solids: Projection of various solids in simple position and inclined positions

Section of Solids: True shape of section on auxiliary plane of various solids.

Isometric and pictorial projections of solids/machine parts, making of freehand sketches from solid objects and from orthographic projections. Sections of joints, screw thread systems, nuts and bolts, keys and cotter, coupling and simple bearings, pipe connections and engine details, preparation of assembly drawings. Introduction to computer aided engineering drawing and use of software/package.

Recommended Books:

1. Bertoline Wiebe, Miller, Mohler, Irwin, "Technical Graphics Communication", McGraw-Hill 1997
2. Abbot, "Practical Geometry & Engineering Graphics"
3. Craft, Meyers & Boyer, "Engineering Graphics"
4. Gary R. Bertoline and Eric N. Wiebe, "Technical Graphics Communication, 3rd Edition", McGraw-Hill 19
5. D.F. Rogers and J.A. Adams, "Mathematical Elements for Computer Graphics", McGraw-Hill 1976

Applied Physics

Course Code: GS-121

Credit Hours: 2 + 1

Objectives:

Scientific notation and significant figures. Unit in different systems

Course Outlines:

Vectors: Review of vectors, Vector derivatives, Line and surface integrals, Gradient of scalar.

Mechanics: Coordinate systems. Motion under constant acceleration, Newton laws and their applications, Uniform circular motion. Vortex Motion, Frictional forces. Work and energy. Potential energy, energy conservation, energy and our environment.

Electrostatic and magnetism: Coulombs law. Gauss's law. Electric field around conductors. Dielectrics. Magnetic fields. Magnetic force on current.

Semiconductor Physics: Energy levels in a semiconductor. Hole concept. Intrinsic and extrinsic regions. Law of mass action. P-N junction. Transistor.

Waves and Oscillation: Free oscillation of systems with one degree of freedom. Classical wave equation. Transverse modes for continuous string. Standing waves. Dispersion relation for waves.

Optics and Laser: Basic introduction to Optics and Laser. Diffraction grating. Lasers, population inversion. Resonant cavities. Quantum efficiency. He-Ne, Ruby and CO₂ lasers. Doppler effect and sonic boom.

Modern Physics: Photoelectric effect, Compton effect. Bohr theory of hydrogen atom, atomic spectra, reduce mass, De-broglie hypothesis braggs law, electron microscope, zeeman effect, atomic nucleus, mass energy relation, binding energy, nuclear forces and fundamental forces. Exponential decay and half-life

Recommended Books:

David Halliday, R. Resnick. "Physics" (Latest Edition)

Computer Aided Drafting

Course Code: MT-122

Credit Hours: 1 + 1

Objective:

After completion of the subject the student will be able to understand different techniques used for drawing in 2D and 3D Auto Cad.

Course Outline:

1. Introduction to AutoCAD (Latest version available), AutoCAD interface, toolbars, Menus, Coordinate System, and AutoCAD commands uses for creating organizing modifying saving & plotting 2D drawings
2. Drawing in layers, object properties, hatching, text dimensioning, blocks, attributes, external reference, auto cad design center
3. Introduction to 3D modeling, solid modeling, surface modeling & wire frame modeling. Extrude, Revolve, Union, Subtract, Intersect & other 3D commands, 3D view, view ports, model space, paper space & layouts
4. Introduction to product design. Basic concepts in product designing using pro engineering software (feature – based) parametric solid modeling
5. Creating simple mechanical parts
6. Assembling simple mechanical parts
7. Generating 2D drawings of the parts & assemblies

List of Practicals

Practice of the above course outline in lab

Recommended Books:

1. Auto Desk, "AutoCAD user guide"
2. Auto Desk, "AutoCAD command reference"
3. George Omura, "Mastering AutoCAD"

APPLIED MATHEMATICS –II

Course Code: HU-123

Credit Hours: 3

Course Outlines:

Differential equation; basic concepts and ideas; geometrical interpretation of first and second order differential equations; separable equations, equations reducible to separable form, exact differential equations, integrated factors. Linear first order differential equations, Bernoulli's differential equation. Families of curves, orthogonal trajectories and applications of differential equations of first order to relevant engineering systems. Homogeneous linear differential equations of second order, homogeneous equations with constant coefficients, the general solutions, initial and boundary value problems, D-operator, complementary functions and particular integrals. Real, complex and repeated roots of characteristics equations. Cauchy equation, non-homogeneous linear equations. Applications of higher order linear differential

equations. Ordinary and regular points and corresponding series solutions; introduction to Laplace transformation

Recommended Books:

1. C.R. Wylie, "Advanced Engineering Mathematics 5th Edition", McGraw-Hill Education
2. Erwin Kreyszig, "Advanced Engineering Mathematics 8th Edition", John Wiley & Sons

Industrial Materials

Course Code: MT-124

Credit Hours: 3

Objective:

Enable the student to comprehend:

- a. The concept of crystal geometry. BCC, FCC and HCP
- b. The material composition, composite materials
- c. Materials properties and material substitution
- d. The basic heat treatment process
- e. The effect of alloying elements on mechanical properties of steel
- f. Common heat treatment processes of non - ferrous metals
- g. Concept of non-metallic materials. application of plastics, ceramics glass and rubber

Course Outline:

Concept of crystal geometry, Crystalline structure of metals, BCC, FCC and HCP structure, formation of alloys, binary alloys, phase diagram of binary alloys, cooling curves, solid solution, eutectic alloy, intermediate compounds, iron-iron carbide equilibrium diagram, micro structure of plain carbon steels, effect of carbon percentage and rate of cooling on micro structure and properties of plain carbon steel.

Heat treatment processes, Annealing, Normalizing, Hardening, Tempering, Harden ability, Case-hardening, Carburizing, Nitriding, Cyaniding, Flame & induction Hardening, Effect of alloying elements on mechanical properties of steel. Cast Irons, Gray Cast iron. White Cast Iron and Malleable cast Iron, Non-ferrous Metals and alloys. Mechanical properties of copper and aluminum, copper zinc and copper tin alloys. Composite Materials and their applications, Polymers and its types, polymerization applications, additives to polymers etc

Recommended Books:

1. V John, "Introduction to Engineering Materials"
2. Degarmo Black & Kohser Amstead, "Materials and Processes in Manufacturing" (latest Edition)
3. Ostwald & Begeman, "Manufacturing Process (8th Edition)"
4. Avner, "Introduction to Physical metallurgy"

Pakistan Studies

Course Code: HU-125

Credit Hours: 2

Objective:

1. Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
2. Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Outline:

1. Historical Perspective
 - a) Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah
 - b) Factors leading to Muslim separatism
 - c) People and Land
 - i. Indus Civilization
 - ii. Muslim advent
 - iii. Location and geo-physical features.
2. Government and Politics in Pakistan Political and constitutional phases:
 - a) 1947-58
 - b) 1958-71
 - c) 1971-77
 - d) 1977-88
 - e) 1988-99
 - f) 1999 onward
3. Contemporary Pakistan
 - a) Economic institutions and issues
 - b) Society and social structure
 - c) Ethnicity
 - d) Foreign policy of Pakistan and challenges
 - e) Futuristic outlook of Pakistan

Recommended Books:

1. Burki, Shahid Javed. State & Society in Pakistan, The Macmillian Press Ltd 1980.
2. Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. Pakistan Political Roots & Development. Lahore, 1994.
5. Wilcox, Wayne. The Emergence of Banglades., Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. Pakistan Kayyun Toota, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. Ethno - National Movement in Pakistan, Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. Enigma of Political Development. Kent England: WmDawson & sons Ltd, 1980.
9. Zahid, Ansar. History & Culture of Sindh. Karachi: Royal Book Company,

- 1980.
9. Afzal, M. Rafique. Political Parties in Pakistan, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
 10. Sayeed, Khalid Bin. The Political System of Pakistan. Boston: Houghton Mifflin, 1967.
 11. Aziz, K.K. Party, Politics in Pakistan, Islamabad: National Commission on Historical and Cultural Research, 1976.
 12. Muhammad Waseem, Pakistan Under Martial Law, Lahore: Vanguard, 1987. Haq Noor ul. Making of Pakistan: The Military Perspective. Islamabad: National Commission on Historical and Cultural Research, 1993.

Applied Mechanics

Course Code: MT-213

Credit Hours: 3 + 1

Course Outline:

INTRODUCTION TO STATICS: Mechanics: Basic concepts; Scalar and vector; Vector addition, subtraction and product, concept and unit of measurements of mass, force, time, space

FORCE SYSTEM: Force: Introduction; Two-dimensional force system; Rectangular components; Law of triangle, parallelogram, moment, couple, resultants; solution of problems

EQUILIBRIUM: Equilibrium in two dimensions; Equilibrium conditions; Free body diagram; solution of problems.

BEAMS: Definition; Types of beams; Bending moment and shearing force in simply supported beams and cantilevers; Solution of problems.

GEOMETRICAL PROPERTIES OF PLANE AREA: Introduction; Center of gravity and centroid; Moment of inertia for an area; Parallel – Axis theorem for an area; Radius of gyration of an area; Solution of problems

KINEMATICS OF RECTILINEAR AND CURVILINEAR MOTION: Introduction; Displacement; Types of motion; Speed, velocity, acceleration; Equation of motion under uniform acceleration; Normal and tangent acceleration. Solution of problems

FRICTION: Introduction; Types of friction; Laws of solid friction; Co-efficient of friction; Solution of problems

WORK AND ENERGY: Work, Energy, Power, Impulse; Momentum; Simple harmonic motion and free vibration. Introduction to simple trusses and cables. Solution of problems

List of Practicals:

1. To determine the resultant of forces
2. To study the law of moment and equilibrium conditions
3. To determine the reaction of a simply supported beam
4. To determine the tension in the simple cable
5. To determine the forces in the member of the truss
6. To draw the shear force and bending moment diagram for one, two and three point load given in experiment no.3

7. To study the projectile motion

Recommended Books:

Hibler, RC, "Engineering Mechanics", Prentice Hall.

Mechanics of Materials

Course Code: MT-211

Credit Hours: 3 + 1

Objective:

Enable the students to understand application of forces & their effects on different mechanical & structural members in statics & Dynamics.

Course Outline:

Mechanical properties of Materials, tensile, compression and shear stress & shear strain, Elastic constants & their relationships, compound bars, thermal stresses, Moments of inertia, shearing force and bending Moment, torsion of circular bars, hollow circular shafts, strain Energy.

List of Practicals:

Study of Material testing Lab
Study of universal testing m/c
Tensile test on UTM for a mild steel specimen
Compression test on cement mortar cube
Shear test on mild steel specimen
Torsion test on ductile steel, Cast iron & brass

Recommended Books:

F.P Beer & ER Johnston, "Mechanics of Materials"
FV Warnock P.P Benham & R.J Crawford, "Mechanics of Engg Materials"
F.Singar, "Strength of Materials"

Applied Thermodynamics

Course Code: MT-212

Credit Hours: 3 + 1

Objective:

Enable the student to comprehend:

- a. The laws of Thermodynamic and their application to engineering thermodynamic systems. IC Engines, Air Compressors, Steam Engines
- b. Entropy, irreversibility application to heat engine
- c. Turbines, Air standard Efficiency, Thermal and mechanical efficiency.
- d. Air fuel ratio, octane number and cetane number

Course Outline:

Basic concepts of thermodynamics: Thermodynamics and energy, Closed and open system, Properties of a system, State and equilibrium, Processes and cycles, Pressure and its measuring instruments

Properties of Pure Substances: Pure substance and its phase change processes, Property diagram, Specific heats, Internal energy, enthalpy and specific heats of ideal gases, liquids and solids

Energy Transfer by Heat, Work and Mass: Energy transfer by work, Flow work and energy of the flowing fluid, Modes of heat transfer

Laws of Thermodynamics: First law of thermodynamics, Energy balance for closed systems and for steady flow systems, Energy balance for closed systems and for unsteady flow systems, Second law of thermodynamics, Explanation of the second law, Heat engines, refrigeration and heat pumps, Carnot cycle and its principles, Perpetual motion machines, Reversible and Irreversible processes

Entropy: Definition and description of entropy, Increase of entropy principle, Entropy change of pure substances, Isentropic processes, T-S relations, Isentropic efficiencies of steady flow devices

List of Practicals:

1. To measure a regular and irregular shaped area with the help of Planimeter / Mechanical Integrator
2. To measure area of indicated PV diagram; with the help of Planimeter / Mechanical Integrator.
3. To analyze the thermodynamic systems and its properties
4. Study of working principle of external combustion engine
5. Study of working principle of internal combustion engine
6. To study and analyze the erecting, installation, maintenance and working principles of water tube and fire tube boilers

Recommended Books:

1. Rayner Joel, "Basic engineering Thermodynamic"
2. Youns A Cengel and Michael A Boles, "Thermodynamics an Engg Approach" (latest edition)

Basic Electrical Technology

Course Code: MT-214

Credit Hours: 3 + 1

Objective:

Enable the students to understand the basics of electronics and different electronic components used in industries

Course Outline:

Insulators, semiconductors and metals; PN junction diod, characteristics and analysis, power supplies, rectifier circuits; transistors, constructions and characteristics of bipolar junction transistor (BJT); construction and characteristics of FET; amplifiers; basic principles, static and dynamic load

lines, classification, frequency response; integrated circuits; monolithic and hybrid integrated circuits; integrated circuits for industrial controls; transducers, displacements sensing, load cells, velocity sensing, force sensing, photo sensors, laser devices; construction and working of digital multi-meters, oscilloscopes, signal generators; number system, Boolean algebra, logic gates, combinational logic design; sequential circuits and logic design, introduction to microprocessors and micro controllers, I/O devices, interfacing to memory and I/O devices.

List of Practicals:

1. To study the V-I characteristics of a Semiconductor Diode
2. To demonstrate the use of a Semiconductor Diode as a half-wave and full wave rectifier
3. To demonstrate operation and characteristics of BJT.
4. To demonstrate operation and characteristics of FET.
5. To demonstrate operation of single stage transistor amplifier
6. To demonstrate the design and operation of integrated circuits.
7. Transistor familiarization and function behavior.
8. To demonstrate the design and operation of Analog type Integrated Circuits.
9. To demonstrate the design and operation of Potentiometer Sensor
10. To demonstrate the design and operation of strain-gage load cell
11. To demonstrate the design and operation of Digital Multimeters

Recommended Books:

1. Floyd, "Electronic Devices"
2. R. Tobin, "Microprocessor Fundamentals"
3. Floyd, "Digital Electronics"
4. Chute, "Electronics in Industry", McGraw Hill, UK

Communication Skills-II

Course Code: HU-215

Credit Hours: 2

Course Outline:

Communication Environment: Organizational Structure, International Communication, Nondiscriminatory Communication, Communication Channels.

Communication and Technology: Presentation Graphics and Word Processing, Fax, E-mail, Internet and Voice Mail, CD-ROM and Online Databases, Teleconferencing, Audio Visual Aids.

Presentation Skills: Defining objective, audience analysis, style and tone, credibility, opening, closing and main ideas, use of Audio Visual Aids.

Meetings and Interviews: Participating in Meetings, Chairing a Meeting, Asking and Answering Questions in Meetings, Preparing Resumes, Preparing for Interviews, Asking and Answering Questions in Interviews.

Letters and Memos: Formats, Positive and Negative Messages, Persuasive Communication, Requests.

Technical Report Writing: Introduction and Importance, General Formats, Short and Long Reports, Proposals, Quoting References.

Recommended Books:

1. Murphy H. A., Hildebrandt, H. W. and Thomas J.P., "Effective Business Communications", McGraw Hill USA
2. Morrissey G.L., Sechrest T.L. and Warman W.B., "LOUD AND CLEAR", Addison-Wesley Publishing Company, USA
3. Beebe S.A. and Beebe S.J., "PUBLIC SPEAKING", Allyn and Bacon, USA.

ISLAMIC STUDIES

Course Code: HU-216

Credit Hours: 2

Objectives:

1. To provide Basic information about Islamic Studies
2. To enhance understanding of the students regarding Islamic Civilization
3. To improve Students skill to perform prayers and other worships
4. To enhance the skill of the students for understanding of issues related to faith and religious life

Detail of Courses:

1. **Introduction to Quranic Studies:** Basic Concepts of Quran, History of Quran, Uloom-ul-Quran
2. **Study of Selected Text of Holly Quran:** Verses of Surah Al-Baqra Related to Faith (Verse No-284-286), Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18), Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11), Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77), Verses of Surah Al-Inam Related to ihkam (Verse No-152-154)
3. **Study of Selected Text of Holly Quran:** Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.), Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment, Verses of Surah Al-Saf Related to Tafakar, Tadabar (Verse No-1,14)
4. **Seerat of Holy Prophet (S.A.W) -I:** Life of Muhammad Bin Abdullah (Before Prophet Hood), Life of Holy Prophet (S.A.W) in Makkah, Important Lessons Derived from the life of Holy Prophet in Makkah
5. **Seerat of Holy Prophet (S.A.W) -II:** Life of Holy Prophet (S.A.W) in Madina, Important Events of Life Holy Prophet in Madina. Important Lessons Derived from the life of Holy Prophet in Madina
6. **Introduction To Sunnah:** Basic Concepts of Hadith, History of Hadith, Kinds of Hadith, Uloom -ul-Hadith, Sunnah & Hadith, Legal Position of Sunnah
7. **Selected Study from Text of Hadith Introduction To Islamic Law & Jurisprudence:** Basic Concepts of Islamic Law & Jurisprudence, History &

- Importance of Islamic Law & Jurisprudence, Sources of Islamic Law & Jurisprudence, Nature of Differences in Islamic Law, Islam and Sectarianism
8. **Islamic Culture & Civilization:** Basic Concepts of Islamic Culture & Civilization, Historical Development of Islamic Culture & Civilization, Characteristics of Islamic Culture & Civilization, Islamic Culture & Civilization and Contemporary Issues
 9. **Islam & Science:** Basic Concepts of Islam & Science, Contributions of Muslims in the Development of Science, Quranic & Science
 10. **Islamic Economic System:** Basic Concepts of Islamic Economic System, Means of Distribution of wealth in Islamic Economics, Islamic Concept of Riba, Islamic Ways of Trade & Commerce
 11. **Political System of Islam:** Basic Concepts of Islamic Political System, Islamic Concept of Sovereignty, Basic Institutions of Govt. in Islam
 12. **Islamic History:** Period of Khlaft-E-Rashida, Period of Ummayyads, Period of Abbasids
 13. **Social System of Islam:** Basic Concepts of Social System of Islam, Elements of Family, Ethical Values of Islam

Reference Books:

1. Hameed ullah Muhammad, "Emergence of Islam", IRI, Islamabad
2. Hameed ullah Muhammad, "Muslim Conduct of State"
3. Hameed ullah Muhammad, "Introduction to Islam"
4. Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law", leaf Publication Islamabad, Pakistan.
5. Ahmad Hasan, "Principles of Islamic Jurisprudence", Islamic Research Institute, International Islamic University, Islamabad (1993)
6. Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes", Islamic Book Service (1982)
7. H.S. Bhatia, "Studies in Islamic Law, Religion and Society", Deep & Deep Publications New Delhi (1989)
8. Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia", Allama Iqbal Open University, Islamabad (2001)

Machine Design

Course Code: MT-221

Credit Hours: 3 + 1

Objective:

Enable the student to comprehend:

1. Acquire Practice in analyzing Stresses setup in machine parts subjected to loads/sources
2. Calculate diameters of solid and hollow shafts subjected to combined bending and twisting moments
3. Practice design of Coupling, types and calculation of proportional sizes of flange couplings
4. Design of belts and ropes
5. Design of welded and riveted joints subjected to static loading
6. Design of helical springs, conical and volute springs, torsion springs, leaf

springs and spiral springs, gear terminology and application of different types of gears

7. Different types of modeling like Wire Frame Modeling, Solid Modeling and Surface Modeling
8. Selection of Ball and Rolling bearings

Course Outline:

Introduction to design, design consideration, basic concepts in designing machine parts, design of solid and hollow shafts subjected to combined twisting and bending moment, flange couplings and proportional sizes, Calculation of stresses due to static loading, design of belts and ropes for given power transmission, design of helical spring, conical and volute springs, torsion spring, leaf spring spiral springs, Gear terminology and design of spur gear, selection of ball and roller bearings.

List of Practicals:

Introduction to 3D modeling, Wire Frame Modeling, Solid Modeling, Surface Modeling, Development of solid modeling for Engineering Analysis. Introduction to different solid modeling, soft ware (Uni graphic, solid edge), pro-E, CATIA, Solid works, comparison of different commands

Recommended Books:

1. I.E. Shigley, "Mechanical Engineering Design"
2. R.C. Juvinall & K.M. Marsak, "Fundamentals of Machine Component Design"
3. Manual of CAD Soft Ware Package

Manufacturing Processes

Course Code: MT-222

Credit Hours: 2 + 2

Objective:

Enable the student to know about different types of machine tools used in production/manufacturing

Course Outline:

Material Removal: Mechanics of chips formation, Types of chips produced, Chip breakers, Orthogonal & Oblique cutting, Cutting forces in conventional turning, Friction & heat sources in cutting, surface finishing processes, Lapping, Honing, Super finishing, Polishing, Buffing, Electroplating, Galvanizing, Metal Spraying

Cutting Tools: Single point tool Geometry, Multi point tools, Tool life & wear, Tool failure, Factors affecting tool life, Measuring tool life, Tool material & its characteristics, Cutting fluids, Purposes, Types & properties of cutting fluids

Machining Processes: Broaching & broaching machines, Press machine, Types of Press machines, Press work operations

Sheet Metal Forming: Sheet metal characteristics, Formability of sheet metals, Bending sheet & plate, Tube bending & forming, Deep drawing, Super plastic forming

Jigs & Fixtures: General Design principle, Elements of Jig, Locating Devices & Clamping Devices

Non-Conventional Machining Processes: Ultrasonic machining, Abrasive-jet machining, Water-jet machining, Electrical discharge machining (EDM), electromechanical machining & grinding, Laser beam machining, Electron beam machining, Chemical milling, Chemical Blanking, Chemical Engraving

List of Practicals:

1. Study of Broaching machine.
2. Study of Press machine.
3. Practice on press machines to make different shapes.
4. Study of bending machine.
5. Bending Sheet metals of different thickness.
6. Practice on making of simple jigs and clamping & locating devices.
7. Mini Project on making a simple Jig or Fixture.

Recommended Books:

1. SK Hajra Choudry, "Elements of Workshop Technology Vol. II"
2. BH Amstead & PF Ostwald, "Manufacturing Processes"

Production Planning and Control

Course Code: MT-223

Credit Hours: 2

Objective:

Enable the students to understand skills in forecasting, inventory control, JIT and new concepts in production planning

Course Outline:

1. **Forecasting:** Introduction, Forecasting Approaches, Time Series Forecasting Techniques, Casual Forecasting Techniques, Role of Computer in Forecasting
2. **Inventory Management:** Inventory Systems, Economic Lot Size, Quantity Discounts, Safety Stock Level
3. **Just-in-Time Systems:** JIT Production, Kanban
4. **Supply-Chain Management:** Significance, Purchasing Strategies, Purchasing Management, Materials Management
5. **MRP and MRP-11:** Master Production Schedule, Bill of Materials, Resource Requirements, MRP Management
6. **Short Term Scheduling Tactics:** Job Shop Scheduling, Shop Loading, Sequencing, Line Balancing
7. **Queuing Theory:** Introduction, Queue Characteristics, Queuing Models, Introduction to Simulation

Books Recommended:

Department of Technical Education, BS Mechanical Technology

1. Render B and Heizer J, "PRINCIPLES OF OPERATIONS MANAGEMENT", Prentice-Hall, Inc. USA
2. Littlechild S., "OPERATIONS RESEARCH IN MANAGEMENT", Prentice Hall, UK.
3. Tersine R J., "PRINCIPLES OF INVENTORY AND MATERIALS MANAGEMENT", Prentice Hall, UK.
4. Adam E E and Eber R J., "PRODUCTION AND OPERATIONS MANAGEMENT", Prentice Hall, UK

Fluid Mechanics

Course Code: MT-224

Credit Hours: 3 + 1

Objective:

Enable the students to understand different properties of fluids in statics and kinematics and also will be familiar with flow and pressure measuring instruments.

Course Outline:

Introduction: Development of fluid dynamics, distinction between solid and fluid, gas and liquid, properties of fluids, Density, specific weight, specific volume, specific gravity, compressible and incompressible fluids, ideal fluids, viscosity and its units, surface tensions, vapor pressure of liquids etc.

Fluid Statics: Pressure, variation of pressure in a static fluid, pressure head, review of types of pressures, pressure measurement gauges, Force on plane area, center of pressure, force on curved surface, Buoyancy and stability of submerged and floating bodies.

Kinematics of Fluid Flow: Types of flow, flow rate and mean velocity, equation of continuity, flow net, velocity and acceleration in steady and unsteady flow.

Measurement of flow rate velocity: Energy Consideration in Steady Flow: Kinetic energy of a flowing fluid, potential energy, internal energy, general equation for steady flow of any fluid, energy equation for steady flow of incompressible fluids. Bernoulli's theorem, Head, Power consideration in fluid flow cavitations, energy equation for steady flow of compressed fluids, equation of steady motion along a stream line for ideal fluid and Euler's equation, equation of steady motion along a stream line for real fluid, Hydraulic gradient, energy line, problems, Pressure in fluid flow and its measurement, set trajectory, flow in a curved path, vortex, types of vortex.

Similitude and Dimensional analysis: Definition and importance, geometrical, kinematic and dynamic similarity, dimensionless ratios, scale ratios, dimensional analysis.

Steady & Incompressible Flow in Pressure conduits: Laminar and Turbulent flow, critical Reynold's number, hydraulic radius, general equation for friction, Darcy-Weisbach pipe friction equation, laminar flow in circular pipes, turbulent flow in circular pipes, pipe roughness, chart for friction factor, fluid friction in non-circular conduits, empirical equations for pipe flow. Flow measurements, Pitot tubes, venturimeter, orifices, nozzles.

List of Practicals:

1. Study of Hydraulic Bench
2. To determine the co-efficient of Venturimeter & discuss its application.
3. To calibrate the given rectangular notch and discuss its application.
4. To calibrate a triangular notch and discuss its application.
5. To find the co-efficient of discharge
6. To calibrate the given pressure gauge & discuss its application.

Recommended Books:

1. Daugherty and Franzini, "Fluid Mechanics with Engg. Application"
2. Victor L. Streeter, "Fluid Mechanics", McGraw Hill
3. K R Arora, "Fluid Mechanics and Hydraulic Machinery", Standard Publisher India

I.C Engines

Course Code: MT-311

Credit Hours: 2 + 1

Objective:

1. Understand Engine classification.
2. Understand working cycles of I.C. Engines.
3. Understand Systems of I.C. engines.
4. Understand servicing and overhauling of I.C. Engines.

Course Outline:

1. **Introduction:** History and development of I.C. Engines
2. **Classification of I.C. Engines:** Spark ignition Engines, Compression ignition Engines, Fundamental difference between SI and CI Engines
3. **Working Cycles:** Four stroke petrol engine, Two Stroke petrol engine, Four Stroke Diesel engine, Two stroke Diesel engine, Comparison of petrol and diesel engines, Comparison of 4-stroke and 2~stroke engines
4. **Fuel air mixing:** SI engines and CI engines
5. **Carburetion:** Construction of simple carburetor, Types of carburetors
6. **Carburetion performance:** Full range of load, Full range of speed
7. **Fuel injection in CI engines:** Air injection system, Solid injection system and Their merits and demerits
8. **Fuel injection system performance:** Full Range of load, Full range of speed
9. **Spark ignition systems:** Battery ignition system, Magneto ignition system, Electronic ignition system
10. **Ignition advance and ignition retard:** Their effect on the output of reciprocating engines
11. **Engine cooling and lubrication:** Necessity of cooling, Types of cooling system, Necessity of Lubrication, Types of lubrication system
12. **Turbocharged engines:** Installed in road vehicles, Installed in industry
13. **Servicing and overhauling:** Vehicle engine, Industrial engines

Lab Outline:

1. Measurement of cylinder pressure variation as function of time

2. Measurement of cylinder temperature as function of time
3. Engine performance variation with ignition retard
4. Engine performance variation with ignition advance
5. Performance comparison of a petrol engine with and without fuel injection
6. Effect of fuel injection pressure variation on performance of petrol engine
7. Performance of diesel engine at different injection pressure
8. Measurement of ignition delay in petrol engine
9. Measurement of ignition delay in diesel engine
10. Effect of intake change pressure on performance of diesel engine
11. Effect of intake change pressure on performance of petrol engine

Recommended Books:

1. C.I Tayler, "I.C. engines"
2. J.B Heywood, "I.C. Engines Fundamentals"
3. Richard stone, "Introduction to I.C. engines"
4. Dr. R.K signal, "Internal combustion engines"

Plant Maintenance

Course Code: MT-312

Credit Hours: 2

Objective:

List of Practicals Enable the students to comprehend different types of maintenance, cost control & maintenance and the application of computer in maintenance

Course Outline:

Equipment Installation: Selection of Appropriate Location for Installation. Design and Preparation of Foundation for Equipment. Provision of Supplies and Services. Transportation, Unpacking and checking the equipment as per specifications Checklist of Precautions to be observed. Commissioning of the Equipment

Organization and Management of Maintenance function: Introduction to the Theory and practice of maintenance. Operating policies Operating practices to reduce maintenance control. Reports from maintenance deptt. Area and Centralized Maintenance control. Considerations in using outside contractors. Incentive payment for maintenance workers. Human factors in maintenance

Establishing the Costs and Controls of Maintenance: Work measurement. Work authorization and control. Rating and evaluating maintenance. Work simplification in maintenance. Estimating repair and maintenance costs. Cost control for effective operation. Small plant maintenance control. Maintenance Control and inventory control. Maintenance storerooms

Applying the computer to maintenance management and control: An introduction to computers in maintenance. Automating maintenance

information by computer. Computerized planning and scheduling Computer terminology defined.

Maintenance of plant facilities and housekeeping: Industrial Housekeeping. Painting and protective coatings. Maintenance of elevators and special lifts

Maintenance of mechanical equipment: Plain and rolling bearings. Flexible couplings and chains for power transmission, Overhead and Gantry Cranes. Chain hoists Drives

Maintenance of service equipment: Air-conditioning equipment. Ventilating fans and exhaust systems. Dust collecting equipment. Centrifugal Pumps, Reciprocating Air Compressors Valves, Piping, Scaffolds and Ladders.

Lubrication: Lubricants. Lubrication Systems, Devices and Procedures

Preventive and predictive Maintenance, expose factor

Recommended Books:

1. Higgins L.R., "Maintenance Engineering Handbook", McGraw Hill Book Company, UK.
2. Weaver R, "Manger"s Guide to Machinery Maintenance", Prentice Hall, UK.
3. Pertocelly K and Press F, "Commercial and Institutional Maintenance Management", Prentice Hall, UK
4. Lamb R. G, "Availability Engineering and Management for Manufacturing plant performance", Prentice Hall, UK.

Mechanical Vibrations

Course Code: MT-313
Credit Hours: 3 + 1

Objective:

Enable the students to comprehend the basic concepts and terminologies in Mechanical Vibration, vibration in different mechanical systems & methods to remove/reduce vibration.

Course Outline:

Vibration: Introduction, types of vibration, basic concepts and terminologies

Revision of matrix algebra: Characteristic equations, solution methods, free vibration, equation of motion, energy methods, series and parallel combination, viscously damped free vibration, logarithmic decrement, coulomb damping.

Harmonically excited vibration: Forced harmonic vibration, rotating unbalanced, and vibration measuring instruments.

Mechanical system: Gravity pendulum, spring-mass vibrating system, compound gravity pendulum, stiffness, potential energy, stability, torsional pendulum, free vibration and resonance.

Physical stiffness of elements: Rods, beams, stiffness coefficients as matrix elements.

Eigen value analysis: Two degree of freedom problems, three degree of freedom problems, determination of modes of vibration.
Rayleigh's method and its applications

List of Practicals:

1. Demonstration on simple spring mass system and related calculation
2. Demonstration simulation of beams and rod vibration
3. Demonstration on damped vibration and analysis
4. Computer simulation of whole range of vibrating components
5. Application of computer for solving set of equations

Recommended Books:

1. William, T. and Thompson, "Vibration theory and applications"
2. Kelly, "Fundamentals of mechanical vibrations"
3. S S Rao, "Mechanical Vibration"

Instrumentation and Control

Course Code: MT-314

Credit Hours: 2 + 1

Objective:

Enable the students to know about basics of control system & measuring instruments.

Course Outline:

Introduction to control system, input & output, open loop, closed loop control system & feedback control system, Elements of a general control system & their examples, transfer function.

Transducers, classification of Transducers

Study of different indicating, measuring & recording instruments for length force, torque, frequency, pressure, flow & temperature

Free body Diagram and Newton's law of motion, operational notation, grounded chair representation, series & parallel laws. Equation of motion for a spring mass & damper system, Electrical & Mechanical analogous circuits.

Stability:- Concept, routh criterion & root locus method for stability measurements.

List of Practicals:

1. Experimental Determination of Transfer function of a given mechanical system
2. Experimental study of different types of pressure measuring devices
3. Experimental study of different types of temperature measuring devices
4. Use of oscilloscopes

Recommended Books:

1. Francis H Raven, "Automatic control"
2. Richard C dorf, "Modern control system"
3. J.J Distofanoef, "Automatic control"

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Material Handling

Course Code: MT-315

Credit Hours: 2

Objective:

After going through this subject the student will be able to know about the various types of conventional material handling equipments along with modern and latest equipment and devices e.g: AGVs, Robots, Pallet trucks, different types of electronic sensor using devices etc

Course Outline:

1. **The material-handling problem:** Introduction, Material Handling Equipment Marketing, Principles of material handling, factors affecting material handling
2. **Bulk-Material-Handling Equipment:** Belt Conveyers, Bucket Elevators and Bucket Conveyers, Screw, Conveyers, Vibratory Conveyers, Feeders and Screws, Vehicle Bulk Handling Systems, Marine Bulk-Material Handling
3. **Packaged-Material-Handling Equipment:** Pallets and Palletizing Operations, Package and Unit Conveyor Systems, Belt Package Conveyor Power Roller conveyor, Conveyor Turns and Switches, Conveyor Sortation and Accumulation Systems, Pallet Conveyers.
4. **Monorail conveyor Systems:** Light Duty Chain and Cable System, Heavy Duty Systems, Power-and Free Systems, Powered-Carrier Monorail Systems
5. **Counterbalanced Forklift Trucks:** Reach-Type Non-Aisle Forklift Trucks, Narrow-Aisle Turret-Type Forklift Trucks, Side-Loading Forklift Trucks,
6. **Miscellaneous Material Handling Equipment:** Vehicular Unit Handling equipment, Pallet Transporters and Material Handling Tools. Towline Systems, Tractor-Trailer Trains.
7. **Integrated Material Handling Systems:** Automated Guided Vehicles and Their Applications, Use of Robots

Recommended Books:

1. Sims Jr. E.R, "PLANNING AND MANAGING INDUSTRIAL LOGISTICS SYSTEMS", Elsevier, Amsterdam.
2. Maynard's, "INDUSTRIAL ENGINEERING HANDBOOK", McGraw Hill, UK.
3. Langford J. W, "LOGISTICS PRINCIPLES AND APPLICATIONS", McGraw Hill, UK.
- 4.

Total Quality Management

Course Code: MT-316

Credit Hours: 2

Objective:

Enable the student:

- 1 To know about the importance of quality & its basic concepts
- 2 To understand the principles of TQM.

Handwritten signature and scribbles

3. To learn the tools & techniques for quality improvements
4. Familiarization with quality management & environmental management systems.

Course Outline:

Quality: Introduction, quality concepts, significance of quality, Total quality, concept of TQM, Principles of TQM

Commitment and Leadership: Introduction, Commitment & policy, creating or changing the management culture, Effective leadership.

Charting/Planning: Introduction, Operation, Process/Flow charting (including some advance diagrams or charts etc.), Chart symbols, Purchasing parameters, Planning for JIT

Design for quality: Introduction, Innovation, Quality function development and the house of quality

Quality related costs: Prevention, Appraisal & failure costs, Models for quality costing

Quality measurements: Significance, inspection planning, Gauging, Measurements

Implementing TQM: TQM & Management of change, planning, The implementation of TQM, Sustained improvement

Quality Management System (ISO 9000 series): Significance, Documentation, Implementation & certification, Audits, Expected problems

Environmental Management System (ISO 14000 series): Significance, Documentation, Implementation & certification, Audits, Expected problems

Books Recommended:

1. A.V Feigenbaum, "Total quality control"
2. Oakland J.S, "Total quality Management"
3. ISO 9000 series of standards & ISO 14000 series of standards.
4. Lucy C. Morse, Daniel L. Babcock, "Managing Engineering & Technology 4th Ed."
5. Banga & Sharma, "Industrial Organization & Management."
6. Gitlow H.S & Gitlow S.J, "Total Quality Management in action", Musa K ISO 9000 Ibrahim Publisher Lahore.
7. Kuhre W.L, "A Practical Guide for obtaining ISO 14000 certification"

Production Automation

Course Code: MT-321

Credit Hours: 2 + 1

Objective:

Enable the students to understand basics of automation & CNC machines and apply new techniques in production engineering.

Course Outline:

1. **Automation:** Introduction, Economics of Automation, Flow lines, Mathematical models, Storage Buffers, Partial Automation, Balancing, Group Technology and Flexible manufacturing.
2. **Hardware of Automation:**
 - a. **Introduction:** Building Blocks of Automation, Robotics Geometry, Kinematics, Drives and Motion Control, Uses of CNC Machines, Advantages, Machine Control, Machine Codes, Programming
 - b. **CNC Machines:** General information, Operation, Control panel description, Tool function, Practical application of tool wear offset, feed function, spindle function, programming of CNC in absolute & incremental system, program creation, preparatory function, CAD/CAM approach to part programming, CAD/CAM application (turning problem, surface milling, machining of curved surfaces.)
 - c. **Programmable Logic Controllers:** Introduction to PLCs, Advantages of PLCs, Ladder Logic Diagrams, Switching Logics, Components of PLC, PLC Operating Cycle, PLC Connection, PLC operation, PLC Applications.

List of Practicals:

1. Practice on manual Lathe machine to make & perform operation like facing, turning, drilling, threading etc.
2. Practice on manual milling machine to make & perform operation like grooving facing, milling etc.
3. Drawing & Production of parts using CAM software for CNC lathe.
4. Drawing & Production of parts using CAM software for CNC milling.
5. Introduction to programming G & M codes, CNC simulators.
6. Linear interpolation & rapid traverse.
7. Absolute vs. incremental coordinate programming.
8. Turning & facing of a stepped shaft.
9. Circular interpolation & roughing cuts with a tool change.
10. Canned cycle – Facing & Rough Turning.
11. Canned cycle – Grooving external threading.

Recommended Books:

1. MR Groover, "Automation, Production System, & CAM", Prentice Hall
2. C.R. Asfahl, "Robotics & Manufacturing Automation (2nd Ed.)", John Wiley
3. Bollinger & Duffie, "Computer Control of machines & Processes"
4. G.Salvendy, "Handbook of Industrial Engineering (2nd Ed.)", John Wiley

ENERGY AND ENVIRONMENTAL TECHNOLOGIES

Course Code: MT-322

Credit Hours: 2

Objective:

Enable the students to comprehend energy resources, alternative energy resources, environmental pollution and its remedies.

Course Outline:

1. **Energy Resources:** Fossil fuel resources, coal, oil and gas, resources of energy, supply and demand.
2. **Alternative energy resources:** Nuclear, Solar, Wind, Ocean, Tidal and geo thermal.
3. **Steam power plants:** Modern steam plants, reheat and regenerative Turbines, flow through steam nozzles, Impulse and reaction turbines, pressure compounding, Velocity compounding, extraction and back pressure turbines. Boiler makeup and treatment.
4. **Gas Turbine Power Plants:** Practical Gas turbine cycle. Isentropic efficiency of compressor and turbines, intercooling and reheating.
5. **Combine Cycle Power Plants:** General-combined cycle with heat recovery boilers.
6. **Jet Propulsion Plant:** Aircraft Jet engine, efficiency and performance of turbojet plant, ram jet, comparison of plants for subsonic and supersonic flights.
7. **Nuclear Power Plant:** Introduction, power from nuclear energy, nuclear fusion and fission, Radioactivity, Decay rates and half life, converting mass into energy by fission. Thermal-Fission Reactors and Power Plants, Pressurized water reactor (PWR), The boiling water reactor (BWR)
8. **Environmental pollution:** Introduction, Importance of environment. Scale of environmental pollution.
 - (a) **Atmospheric Pollution:** Types of atmospheric pollution, their causes and effects on human health. Available technologies for controlling pollution.
 - (b) **Industrial Waste:** Solid waste, effluents and waste gases produced by various industries. Available technologies for the treatment of industrial waste.
 - (c) **Water pollution:** causes, types and its remedies
 - (d) **Noise pollution:** Measurement of noise level. Effect of excessive noise on human health. Remedial measures.

Books Recommended:

1. Eastop and McConkey, "Applied Thermodynamics for Engg Technologists"
2. M. M. El-Wakil, "Power Plant Technology"

Metrology & Gauging

Course Code: MT-323

Credit Hours: 2 + 1

Objective:

Enable the students to understand the type and use of measuring and inspection tools in production.

Course Outline:

1. Standards and Measurement Krypton 86 as Measurement Standard, Methods of Interferometry, Principle and Use of Optical Flat, Laser Beam as Measurement Standard
2. System of Limits and Fits, Basic Terminology, Unilateral and Bilateral Tolerance Systems, Geometrical Tolerances. Standard Tolerances, Classes of Standard Fits, Hole Based and Shaft Based Systems, Grades of Fits.
3. Linear Measurement, Line and End Standards, Use of Slip Gauges, Dial Indicators and Surface Plates, Vernier Calipers, Micrometers and Height Gauges, Laser Based Equipments, Comparators.
4. Angular Measurements: Protractors, Sine Bars, Angle Gauges, Levels, Clinometers, Autocollimators, Taper Gauges, Surface Texture
5. Introduction and Units, Measurement with Light Wave interference, Mechanical Methods of Measurement, Waviness and Lay, Roughness, Value and Cutoff, Surface Texture Symbols, Preferred Roughness, Average Values.
6. Gauges and Gauging: Introduction to Fixed Limit Gauges, Basic Terminology, Types, Gauge, Tolerance, Gauging Systems, Screw Thread and Pipe Thread Gauges, Mechanical Amplification Gauge Systems, Pneumatic Gauges, Electric and Electronic Gauges,
7. Coordinate Measuring Machines: Introduction, Working Principles, Types, Applications, Advantages, Economic Consideration,

List of Practicals

1. Familiarization with the use of vernier calipers, inside and outside micrometers, height gauges, dial indicators and surface plates.
2. Calibration of vernier calipers, micrometers, height gauges and dial indicators with the help of slip gauges.
3. Familiarization with various types of comparators.
4. To practice the use of comparators.
5. To learn and practice the use of angle measuring devices (Protractors, sine bars, angle gauges, levels, clinometers and taper gauges).
6. To inspect the surface texture of given specimens using Auto Collimators.
7. Familiarization with the function of an interferometer and Inspect the given specimen with the help of interferometry.
8. To inspect the surface texture of given specimens using optical flats.
9. Familiarization with various types of fixed limit gauges and to learn their use
10. To inspect different types of threads with the help of thread gauges.
11. To learn the use of various types of electric and electronic gauges.
12. To learn the use of various types of pneumatic gauges.

13. Familiarization with the parts and working of a Coordinate Measurement Machine.
14. To measure three-dimensional non-regular profiles of the given specimens and to define the profile characteristics.
15. Familiarization with the parts and use of toolmaker's microscope.
16. To prepare sketches of small parts with the help of toolmaker's microscope.

Recommended Books:

1. Hume K.J, "ENGINEERING METROLOGY", Macdonald and Company, London,
2. Galyer J and Shotbolt C, "METROLOGY FOR ENGINEERS", Cassell Ltd, London,
3. Morris A, "MEASUREMENT AND CALIBERATION FOR QUALITY ASSURANCE", Prentice Hall, UK

Refrigeration and Air Conditioning

Course Code: MT-324

Credit Hours: 2 + 1

Objective:

Enable the student to be familiar with the mechanism of refrigeration & air conditioning and also make estimates of load of refrigeration or air conditioning

Course Outline:

List of Practicals Refrigeration and Heat pump Cycles: Properties of refrigerants and brine. Carnot and Joule reverse cycles, Vapour-compression and vapour absorption cycles, Coefficient of performance, Efficiencies. Refrigeration Machines: Cold air, vapour-compression, Steam-jet and absorption types Heat pumps, Domestic type, Auxiliaries and controls. Application of Refrigeration: Cold storage, Ice-making, Dairying, Quick freezing air-conditioning, Layouts, Load calculation and performance. Air-conditioning and Ventilation: Use of the psychrometric charts, Calculation of heat to be removed by an air-conditioning plant, Air-conditioning requirements for comfort and industrial processes. Air conditioning equipments: window type, split type, package type, cooling towers, air washers, chillers, duct layout.

List of Experiments:

1. Find the C.O.P. of refrigerator.
2. Effect of condensing temperature on the performance of a refrigerator.
3. Efficiency of a refrigerator
4. Construction of pressure enthalpy diagram for vapor compression system refrigeration and its performance measurement.
5. To check the performance of a vapor compression system refrigerator by varying the heat input to the evaporator.
6. Representation of Properties of air on Psychrometric charts
7. Air conditioning cycle on charts.

8. Demonstration of domestic refrigerator
9. Demonstration of cooling tower
10. Demonstration of window type air conditioner
11. Demonstration of chiller AC plant.

Recommended Books:

1. R. J. Dosset, "Principles of Refrigeration"
2. Jordan and Priester, "Refrigeration and Air Conditioning"
3. W.F. Stocker, "Refrigeration and Air Conditioning"
4. CP Arora, "Refrigeration and Air Conditioning"

Project Management

Course Code: MT-325

Credit Hours: 2

Objective:

Enable the students to develop Managerial skills, get acquainted with the principles of management & human relations

Course Outline:

Management

- a) **Industrial Management:** Introduction, Management as science or art, history of management, management functions
 - b) **Organization:** Introduction, organizational structure, types, their advantages & disadvantages
 - c) **Foremanship & leadership:** Introduction, duties of foreman, essential qualifications of a foreman, types of leaders, acceptance of administration, leadership, qualities of leadership
 - d) **Inventory control:** Introduction, types of inventory, Need of inventory control, The maximum stores, minimum stores, The standard order, The ordering point, lead & procurement time, Economic ordering quantity (EOQ), Use of computer
- Production:** Introduction, method of production, advantages & disadvantages, planning & scheduling, introduction to CPM & PERT
- Inspection:** Definition, objectives, function of inspection dept., qualities of inspector, major principles, standard of inspection, kind of inspection, advantages & disadvantages
- Human Resource Management:** Management styles, psychological types, recruitment and training, job evaluation, performance appraisal, motivation and incentives.

Recommended Books:

1. Babcock D.L, "Managing Engineering & Tech" Prentice UK
2. Banga & Sharma, "Industrial Management"

Industrial and Environmental Safety

Course Code: MT-411

Credit Hours: 2

Objective:

Enable the students to know and apply safety standards rules etc in industry in preventing accidents etc.

Course Outline:

Classification of Health hazards: Physical, chemical, biological

Sources of risk: Machinery Noise, Electrical failure, ventilation, lighting, radiation

Dangerous substances: Classification, Entry & Exit routes, safe handling, Health & safety, regulation & policy

Safety Machining & Guarding: Preventing Machining accidents, Machine guarding

Equipment & Machine handling: Mechanical & Manual Handling, Access equipment, Transport, Electricity & Electrical Equipment.

Fire: Classification, fire protection, means of Escape, Actions to be taken.

Chemical safety

Personal protection

Safety Management: Accident prevention, health & safety training, communicating safety measures

Recommended Books:

1. Holt A.S.J, "Principle of Health & safety at work", The institution of occupational safety & health. The caverdisk press Limited. UK 1999
2. Patty F.A, "Industrial Hygiene & Toxicology Vol-1 General Principles", Inter science Publishers New York.

Technical Project

Course Code: MT-412

Credit Hours: 0 + 6

Objective:

To develop the ability of exercising the B-Technology program in the analysis and design of projects

Supervised Industrial Training

Course Code: MT-421

Credit Hours: 0 + 36

Guidelines:

The students shall undergo Supervised Industrial Training (minimum duration of 36 Credit Hours)

The students are required to submit monthly Progress Report to the institute duly verified by their Industrial supervisor.

The institute is responsible to contact with all industrial supervisors to check the student's performance

At the end of the training, the students are required to submit a detailed report to the institute and undergo viva-voce examinations

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