SYLLABUS

SEMESTER-III

Diploma in Manufacturing Engineering

(wef 2018 batch)

Course Structure
Diploma in Manufacturing Engineering
Third Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DMA 3101	Applied Mathematics	3	0	0	3
DMM 3101	Thermal Engineering	3	1	0	4
DME 3105	Manufacturing Process-I	3	0	0	3
DMM 3005	Mechanical Engineering Materials	3	0	0	3
DMM 3003	Applied Mechanics	3	1	0	4
DMM 3006	Machine Drawing	0	1	2	2
DME 3106	Manufacturing Process Lab.-I	0	0	2	1
DMM 3004	Applied Mechanics Lab.	0	0	2	1
DMM 3102	Thermal Engineering Lab.	0	0	2	1
DHU 3002	Professional Practices-II	0	0	2	1
DGA 3002/04/06/08	PT and Games/NSS/NCC/CA	0	0	2	1
	Periods per week	**15**	**3**	**12**	-
	Total credits	-	-	-	**24**
	Total Periods per week	-	-	-	**30**

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMA 3101 APPLIED MATHEMATICS

Objective: Students will be able to

1. Develop the essential skills of using Partial Differentiation and Multiple Integrals for applications in engineering.
2. Learn and apply Vector Analysis to solve technical problems.
3. Learn to use First order ODEs necessary for modelling engineering problems.
4. Acquire necessary ability to use Second order ODEs to design engineering models.
5. Learn and appreciate basic probability and statistical methods.

Module-I: Partial Differentiation and Multiple Integrals

1.1 Functions of two or more variables. Partial derivatives of first and higher order.
1.2 Differentiation of composite functions. Jacobians and its properties.
1.3 Evaluation of double integral. Change of order of integration.
1.4 Finding area and volume using double integration. Change of variables from Cartesian to polar.

Module-II: Vector Calculus

2.1 Definition Vector functions and its derivative. Velocity and acceleration.
2.2 Concepts of Scalar and Vector Fields. Gradient of scalar field. Directional Derivative and its geometrical interpretation. Properties of Gradient.
2.3 Divergence and Curl of a vector function and their properties. Physical interpretation of divergence and curl.
2.4 Integration of vector functions. Concept of line integral. Work done by a force. Surface and volume integral.

Module-III: Ordinary Differential Equations (ODE) of First Order

3.1. Definitions of ODE and meaning of solution of ODE. Formation of ODE.
3.2. Solution of ODE of first order and first degree: Variable separable method, Homogenous equations, Equations reducible to homogenous form, Exact equations, Linear equations, Bernoulli equations.

Module-VI: Linear Differential Equations of Second and Higher Order

4.1. Definition of linear ODE. The operator 'D'. Auxiliary Equations (A.E.) and rules of finding Complementary Function (C.F.).
4.2. The inverse Operator $\frac{1}{f(D)}$. Rules for finding the Particular Integral (P.E.).

Module-V: Statistics and Probability

5.1 Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution.
5.2 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation.
5.3 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely). Definition of Probability, addition and multiplication theorems of Probability.

Text Books:

1. N.P. Bali and Manish Goyal. "A Textbook of Engineering Mathematics". Laxmi Publications Pvt. Ltd.

Reference Books:

1. B. S. Grewal. Higher Engineering Mathematics. Khanna Publication, New Dehli.
2. Erwin Kreyszig. Advanced Engineering Mathematics. John Wiley & Sons, Inc.
3. Murray R Spiegel. Vector Analysis and an Introduction to Tensor Analysis. Schaum's Outline series. McGraw-Hill.

DMM 3101 THERMAL ENGINEERING

Objective: Students will be able to

1. Know basic concepts of thermal engineering.
2. Significance of thermodynamic properties in order to analyse a thermodynamic system from macroscopic view point.
3. Computing work and heat transfers across system boundaries.
4. Applying first and second law of thermodynamics in closed and open systems involving steady flow.
5. Know about different laws and processes.
6. Learn about turbine, nozzle and compressor.

Module –I:

Concepts and Terminology:

Basic Concepts, Zeroth law of Thermodynamics and its significance, Concept of heat and work. Properties of steam, Properties of Ideal gas. Macroscopic and microscopic views of study, concept of continuum Thermodynamic properties of a system (Pressure, volume, temperature and units of measurement) Intensive and extensive properties, State and Process Thermodynamic equilibrium.

Energy and Work Transfer:

Conceptual explanation of energy, work and heat, work transfer Path and point Function, Displacement work, forms of work transfer, Modes of Heat Transfer, introductory concepts of Conduction convection and Radiation, Sensible and latent heat, Specific heat, energy and its resources. Quasi static process.

Module –II:

First Law of Thermodynamics:

First Law of thermodynamics Energy as system property, forms of stored energy First law for a closed system undergoing a cyclic process First law for a closed system undergoing change of state Concept of Enthalpy, First law applied to steady flow processes, Steady Flow Energy Equation and its application to nozzle, turbine and compressor, Perpetual motion machine of first kind.

Module –III:

Second law of Thermodynamics:

Limitations of first law Thermal reservoir Concept of heat engine, heat pump and refrigerator Statement of Second law of thermodynamics (Clausius and Kelvin Planck), Perpetual motion machine of second kind, Carnot cycle Application of second law in heat engine, heat pump, refrigerator and determination of Efficiencies and C.O.P, Elementary knowledge of Entropy and Enthalpy and Third law of Thermodynamics.

Module –IV:

Principles of Steam Turbine and Nozzle:

Types of nozzle flow of steam through nozzles, steady flow energy equation in nozzles, principle of operation of steam turbine, types of steam turbine, difference between steam turbine and steam engine, difference between impulse turbine and reaction turbine.

Module-V:

Thermodynamic Cycles and Air Compressor:

Otto-cycle, Diesel-cycle, Joule/Brayton-cycle.

Introduction, classification, application, construction and working of single stage compressor, calculation of power.

Text Books:

1. An Introduction to Thermodynamics	P.K. Nag
2. Engineering Thermodynamics	R.K. Rajput.
3. Thermal Engineering	P.L. Ballaney.

Reference Books:

1. Engineering Thermodynamics	Arora & Domkundwar
2. Engineering. Thermodynamics	Dr. D. S. Kumar

DME 3105 MANUFACTURING PROCESS – I

Objective: Students will be able to

1. Learn basic ideas about foundry, pattern and its kinds.
2. Understand various sands, their properties, gating system.
3. Basic idea about different melting furnaces like cupola, electric arc furnace.
4. Will be able to know about special casting processes other than conventional methods.
5. Know the safety practices while working in workshop.

Module - I:

Foundry: Introduction to foundry, advantages and disadvantages, Pattern: pattern making, Type of patterns, pattern materials, pattern allowances, pattern making tools, materials and colour codes.

Module- II:

Sand Moulding & Core making : Introduction, mould material, sand grains, types of sand, sand properties, sand preparation, testing of moulding sand, types of mould, sand moulding techniques, conventional sand moulding, CO_2 moulding and Shell moulding, Machine moulding, Pit Moulding, Moulding materials, Cores: Core making materials, types of cores, Core prints. Gating System – Parts of the gating system – pouring basin, sprue, runner, riser

Module- III:

Melting furnaces: Arc furnace: types, operational features, advantages and disadvantages, Cupola: construction, different zones, working principle, advantages and disadvantages and efficiency of cupola.

Module-IV:

Special Casting processes: Introduction, Permanent mould casting: mould construction, stages in casting, advantages and limitations, Die casting: types of die casting machines, advantages and disadvantages, Centrifugal casting: true centrifugal casting, semi centrifugal casting, centrifuging, Investment casting: die making, making wax pattern, assembling wax pattern, investing or pour method, removal of wax pattern, advantages and disadvantages. Cleaning of casting, Casting defects & Remedies, Casting of complicated shapes: automotive components, casting of light alloys

Module-V:

Welding processes:

Concepts, principle, application, advantages and disadvantage of Oxy-acetylene gas welding, Shielded metal arc welding, submerged arc welding, MIG and TIG welding processes. Electric resistance welding, Spot, Seam, Projection and Butt welding. Thermit welding, defects in welding. Concept of Brazing and Soldering.

Text Books :

1. Elements of Workshop Technology, Vol. I & II - Hazra S. K. and Chaudhary
2. Workshop Technology by Raghuwanshi B. S.

Reference Books:

1. Workshop Technology Vol. I & II by Gupta K. N. and Kaushin J. P.
2. Workshop Practice Vol. I & V by Atherton W. H.
3. Principle of Foundry Technology – K. P. Sinha
4. Manufacturing Technology Vol. I & II – O. P. Khanna
5. Welding Technology – O.P. Khanna
6. Production Technology – R. K. Jain
7. Workshop Technology-S.K.Garg

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 3005 MECHANICAL ENGINEERING MATERIALS

OBJECTIVES: Students will be able to

1. Understand the properties of engineering materials like metals and non-metals, ferrous and non - ferrous metals.
2. Know the phase diagram to find temperatures for heat treatment process.
3. Understand heat treatment process and its applications.
4. Learn non- destructive testing methods.
5. Know powder metallurgy methods and its applications.

Module-I:

Engineering materials and their properties:

Material classification into ferrous and non- ferrous category and alloys, Properties of Materials: Physical and Chemical Performance requirements Material reliability and safety, Elementary description of Nano Materials, Smart materials, polymer, Composite and Polymer materials.

Module-II:

Crystal imperfections:

Crystal defines, classification of crystals, ideal crystal and crystal imperfections, Classification of imperfection: Point defects, line defects, surface defects and volume defects, Types and causes of point defects: Vacancies, Interstitials and impurities, Types and causes of line defects: Edge dislocation and screw dislocation, Effect of imperfection on material properties, Deformation by slip and twinning, Effect of deformation on material properties

Module-III:

Ferrous and Non Ferrous Materials and alloys

Characteristics and application of ferrous materials Classification, composition and application of low carbon steel, medium carbon steel and High carbon steel Alloy steel: Low alloy steel, high alloy steel, tool steel and stainless steel Tool steel: Effect of various alloying elements such as Cr, Mn, Ni, V, Mo, W. Properties, applications and chemical composition of Copper alloys (naval brass, muntz metal, gun metal and bronze), Aluminum alloys (Y-alloy and duralumin).

Module-IV:

Iron – Carbon system, Concept of phase diagram and cooling curves Features of Iron-Carbon diagram with salient micro-constituents of Iron and Steel, Bearing and spring materials, Introduction to Corrosion, types of Corrosion, Corrosion resisting, Special Cutting Tool Materials – High speed steel, Diamond, Stellates & Tungsten Carbide

Module-V:

Heat Treatment:

Introduction to heat treatment process such as Annealing, normalizing, hardening, tampering- their principle, applications, advantages and limitations. Surface hardening: Different methods like case hardening, flame hardening, induction hardening, carburizing and nitriding- their principle, applications, advantages and limitations. Effect of heat treatment on properties of steel Hardenability of steel, Powder Metallurgy & Non-destructive Testing Advantages, limitations and applications of Powder Metallurgy for engineering products. Brief Description of Process of Powder Metallurgy – Powder making.

Text Books:

1. O. P. Khanna "A Textbook of Material Science and Metallurgy" Dhanpat Rai & Sons
2. R. K. Rajput "Engineering Materials and Metallurgy" S. K. Khatri & Sons.

Reference Book:

1. S. K. Hazra and Choudhary" Material Science and Processes" Indian Book Distribution Co.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 3003 APPLIED MECHANICS

OBJECTIVE: Students will be able to

1. Know basic concepts about force system.
2. Learn to find the resultant of given force system.
3. Find the reactions of beam.
4. Find the centre of gravity of composite solids Find M.A., V.R.
5. Efficiency and establish law of machine.
6. To know about different laws and processes.

Module-I: Force System Fundamentals: - Definitions of mechanics, statics and dynamics, scalar and vector, Engineering Mechanics law, principle of transmissibility, Triangle and parallelogram and polygon law, Resolution of forces, Resultant of a forces system, Moment of a force, Definition, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment, Couple.

Module-II: Equilibrium:
Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram, General condition of equilibrium, Action & reactions, Equilibrium of a particle under Three Forces,

Module-III: Centroid and Moment of inertia:
Centroid**:** Definition of centroid. Moment of an area about an axis, Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure, Center of gravity such as cylinder, sphere, hemisphere, cone, cube, and rectangular block , Radius of Gyration, parallel and perpendicular axis of Theorem, moment of inertia of standard forms and moment of inertia of composite Materials.

Module-IV: Friction:
Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coefficient of friction. Cone of friction, types of friction, and laws of friction, advantages and disadvantages of friction, Equilibrium of bodies on level plane external force applied horizontal and inclined up and down. Equilibrium of bodies on inclined plane

Module-V: Simple Machines:
Definitions of simple machine, compound machine, load, effort, mechanical advantage, velocity ratio. Input on a machine, output of a machine, and efficiency of a machine, expression for mechanical advantage, velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load. Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine.

Text Books:
1. Engineering Mechanics - Beer – Johnson
2. Engineering Mechanics - Basu

Reference Books:
1. Engineering Mechanics – R K Bansal

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 3006 MACHINE DRAWING

OBJECTIVE: Students will be able to

1. Develop ability towards recognizing significance of standardized representations
2. Understand various fastening elements and offer engineering drawing thereof in manual mode.
3. Learn geometrical constraints and function of components in assemblies such as bearings and screw jack.
4. Know functional requirement of major components and offer engineering drawing in manual mode thereof.
5. Know about different joints.

Module-I: Conventional-presentations

(a) Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete, and Rubber, (b) Long and short break in pipe, rod and shaft. (c) Ball and Roller bearing, pipe joints, cocks, valves, internal / external, threads. (d) Various sections- Half, removed, revolved, offset, partial and aligned sections. (e) Knurling, serrated shafts, splined shafts, and chain wheels. (f) Springs with square and flat ends, Gears, sprocket wheel (g) Countersunk & counter bore. (h) Tapers.

Module-II: Limits, Fits and Tolerances

Characteristics of surface roughness- Indication o machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods. 2. Introduction to ISO system of tolerencing, dimensional tolerances, and elements of interchangeable system, hole & shaft based system, limits, fits & allowances. 3. Geometrical tolerances, tolerances of form and position and its geometric representation.

Module-III: Details to Assembly

1. Introduction. 2. Couplings – Universal couplings & Oldham's Coupling 3. Bearing – Foot Step Bearing & Pedestal Bearing, 4. Lathe tool Post, 5. Machine vice, 6. Screw Jack.

Module-IV: Assembly to Details

1. Introduction – 2. Pedestal Bearing, 3. Lathe Tail Stock, 4. Drilling Jig, 5. Piston & connecting rod,6. Gland and Stuffing box Assembly, 7. Fast & loose pulley, Bolt, nut and threads, Screws and rivet.

Module-V: Pipe joint

Conventional symbols, Union joint, Nipple joint, Cotter and spigot joint, Knuckle joints and Universal joints. Pipe Vice, Valve – Not more than eight parts.

Text Books:

Name of Authors	Titles of the Book Edition
N.D.Bhatt	Machine Drawing
IS Code SP 46 (1988) Drawing. Practice	Code of practice for general engineering

Reference Books:

L.K.Narayanan	P.Kannaich, Production Drawing

DME 3106 MANUFACTURING PROCESS LAB-I

LIST OF EXPERIMENTS

1. Study of different tools and equipment used in Carpentry Shop.
2. To make a wooden pattern of given dimension in Carpentry shop.
3. Study of different tools and equipment used in Foundry Shop.
4. To make a mould using given pattern made in carpentry shop.
5. Testing of permeability of given sand.
6. Testing of hardness of given sand.
7. Sieve analysis of given sand.

DMM 3004 APPLIED MECHANICS LAB

LIST OF EXPERIMENTS

a. To verify the Polygon Law of Forces, with the help of force polygon apparatus.

b. To verify the parallelogram law of forces.

c. To study Lami's theorem using universal force table apparatus.

d. To verify the forces in the different members of a jib crane.

e. To find out centre of gravity of regular laminas.

f. To find out centre of gravity of irregular laminas.

g. To find moment of inertia of flywheel.

h. Comparison of coefficient of friction of various pairs of surfaces & determination of angle of repose.

i. To find the mechanical advantage, velocity ratio and efficiency in the case of Screw Jack.

j. Deflections of a truss-horizontal deflections & vertical deflections of various joints of a pin-jointed truss.

k. To find the mechanical advantage, velocity ratio and efficiency in the case of Winch Crab Single Graphical Representation.

l. To study the performance of differential axle and wheel and find its velocity ratio, efficiency and law of machine.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 3102 THERMAL ENGINEERING LAB

LIST OF EXPERIMENTS

1. Study of Lancashire boiler.
2. Study of Babcock and Wilcox boiler.
3. Study of Reverse flue gas oil fired packaged boiler.
4. Study of Rover gas turbine, its components and instrumentation provided over it.
5. Study of Steam turbine.
6. Study of Steam Power Plant.
7. Study of Single stage and multistage compressor.
8. Study of Refrigeration and Air conditioning.

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DHU 3002 PROFESSIONAL PRACTICES-II

Module-I:

Industrial visit: Industrial visit be arrange and report of the same should be submitted by the individual student, to form a part of team work. TWO industrial visits be arranged in the following areas/industries:

i. Manufacturing organisations for observing various manufacturing processes.
ii. Material testing laboratories in industries or reputed organizations
iii. Auto workshop/Garage

Module-II:

Lectures by professional /Industrial expert be organised from any one of the following areas:

i. Use of plastics in automobiles
ii. Non-ferrous metals and alloys for engineering applications
iii. Industrial hygiene
iv. Composite materials
v. Heat treatment processes
vi. Ceramics
vii. Safety engineering and waste elimination

Module-III:

Individual assignments:

Any two from the following lists;

i. Process sequence of any two machine operations
ii. Write material specification of any two composite jobs
iii. Collections of different plastic material or cutting tools with properties, applications and specifications
iv. List the various properties and applications of following materials-
    a) Ceramics, b) Thermoplastic plastics, c) thermo setting plastics and d) rubbers.

Module-IV:

Conduct any one of the following activities through active participation of the students and write report:

i. Survey for local social problems such as malnutrition, unemployment, cleanliness, illiteracy
ii. Conduct aptitude, general knowledge test, IQ test.

Module-V:

Seminar:

Seminar on any advanced technical topic to be presented by individual student in a batch of 5.

.

SYLLABUS

SEMESTER-IV

Diploma in Manufacturing Engineering
(wef 2018 batch)

Course Structure
Diploma in Manufacturing Engineering

Fourth Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DMM 4007	Strength of Materials	3	1	0	4
DME 4105	Theory of Machine	3	0	0	3
DME 4007	Manufacturing Process-II	3	0	0	3
DMM 4103	Fluid Mechanics and Machines	3	0	0	3
DAC 4001	Environmental Science	2	0	0	2
DCS 4011	Computer Programming	3	0	0	3
DMM 4008	Strength of Materials Lab.	0	1	2	2
DME 4102	Manufacturing Process Lab.-II	0	0	2	1
DMM 4104	Fluid Mechanics and Machinery Lab.	0	0	2	1
DCS 4012	Computer Programming Lab.	0	1	2	2
DHU 4002	Professional Practices-III	0	0	2	1
	Periods per week	**17**	**3**	**10**	-
	Total credits	-	-	-	**25**
	Total Periods per week	-	-	-	**30**

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 4007 STRENGTH OF MATERIALS

OBJECTIVE: The Student should be able to

1. Understand the fundamentals of solid mechanics.
2. Acquire elementary knowledge of stresses, strains & material properties.
3. Understand & analyse the basic principles involved in the behaviour of machine parts under load in the context of designing it.
4. Understand & analyse the mechanical properties of the various materials.

Module –I:
Basic Concepts: Definition, elastic & plastic properties of material, stress & strain diagram for ductile & brittle materials, introductory remarks on fatigue, creep & fracture .Simple stresses and strains: Stress & strain, Simple stress and strain in composite sections, Thermal stresses, relation between elastic constants.

Module –II:
Principal Planes and Stresses: Principal stresses and principal planes, Mohr's circle for biaxial stresses.

Module –III:
Bending Moment and shearing forces : Types of beams, types of support, shear force and bending moment diagram for simply supported, and cantilever subjected to point and uniformly distributed loads, relation between intensity of loading shear force and bending moment.

Module-IV:
Bending, slope and deflection of beams: Definitions, theory of simple bending, relation between slope and deflection calculations for cantilever & simply supported beams.

Module –V:
Torsion & Vibration: Concept of Pure Torsion, Torsion equation for solid and hollow circular shaft**s**, power Transmitted and stiffness of shaft. Assumptions in theory of pure Torsion, Comparison between Solid and Hollow Shafts, Theory of Failure for Brittle and Ductile material. Types of vibrations, free vibrations.

Text Books :
1. Strength of materials – Ryder
2. Strength of materials – Sadhu Singh
3. Strength of materials – Rajput

Reference Books:
4. Strength of materials – Bansal

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 4105 THEORY OF MACHINES

OBJECTIVE: The Student should be able to

1. To focus on understanding the concept of machines, mechanisms and their elements. Also study kinematics aspects of various links in mechanisms. To form foundation for kinematics synthesis, analysis and design of mechanism.
2. To know different machine elements and mechanisms.
3. Understand Kinematics and dynamics of different machines and mechanisms.
4. Select Suitable drives and mechanisms for a particular application,
5. Appreciate concept of balancing.
6. Develop ability to come up with innovative ideas.

Module-I:
Mechanisms: Kinematic concept of Link, Kinematic chain, Mechanism, degree of freedom, Inversions of four bar mechanism, single slider crank mechanism and double slider crank mechanisms.

Module-II:
Motion Analysis: Types of motion: Kinematic and Dynamic quantities; Vector diagrams, Velocity and acceleration diagram of plane mechanism.

Module-III:
Flywheel & Belt: Concept, function and application of flywheel with the help of Turning Moment diagram; Fluctuation of energy and speed. Types of belt, ration of tension in belt, Centrifugal tension in belt & Power transmission

Module-IV:
Gears: Fundamental laws of gearing: classification and basic terminology, involute tooth profile and its kinematic consideration, spur gears, other types of gears, standards in tooth forms.
Gear trains: Simple and, compound gear trains.

Module-V:
CAM & Balancing: Balancing of Rotating masses by a single mass in same plane, Balancing of a single rotating mass by two masses rotating in different planes, Balancing of several masses rotating in same plane. Various types of cams, Displacement, velocity and acceleration of followers, Graphical determination of CAM profiles with simple followers.

Text Book:
1. Theory of Machine by R.S. Khurmi.

Reference Books:
1. Theory of Machines and Mechanism by Ghosh and Malik
2. Mechanism and Machine Theory by J.S. Rao and R.V. Dukkibati
3. Theory of Machine by S.S. Rattan, Tata McGrow Hill.
4. Theory of Machine by Thomas Beven

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 4007 MANUFACTURING PROCESS – II

OBJECTIVE: The Student should be able to

1. Know different traditional machining processes.
2. Understanding the working of different machines.
3. Work as maintenance engineer
4. Produce jobs as per given requirements by selecting specific machining process.
5. Adopt safety practices while working on various machines.

Module –I:

Introduction and classification of machine tool:

Basic concept of machining, different type of tool material, Cutting fluid (Classification and purpose), Types of chip, Orthogonal and Oblique cutting. Lathe Machine: Type of Lathe machine, Specification of lathe machine, Type of accessories and attachment used, Types of operation which can be performed, Work holding methods, different method of cantering the job, taper turning methods, principle of thread cutting operation. Concept of semiautomatic, automatic and CNC lathe, difference between Capstan and Turret lathe.

Module –II:

Shaper, Slotter and Planer: Difference between shaper, slotter and planer machine, Classification and specification of shaper, slotter and planer machine. Quick return mechanism, Type of operation performed, type of work holding and tool holding mechanism.

Module –III:

Drilling, Rimming and Boring: Classification and specification of drilling, rimming and boring machine, different type of work holding mechanism, Type of operation performed, drilling, boring and rimming tool.

Module –IV:

Milling Machine: Classification and specification of milling machine, up milling and down milling, types of milling cutter, different type of work holding and tool holding methods, Different type of milling operation.

Module –V:

Grinding Machine: Classification and specification of grinding machine, specification of grinding wheel, lapping, honing, super finishing, polishing, buffing, operation.

Text Books:

1. Hajra Choudhary SK, Bose HK and Hajra Choudhary AK ”Elements of Workshop Technology, Vol II” ,12 th Edition , Media Promoters and Publishers Pvt.Ltd.
2. Workshop Practice II - Hajara Choudhary.
3. Workshop practice - Chap man and Hall

Reference Books:

1.Khanna, O.P and Lal,M, “A Text book of Production Technology, Vol II” Dhanpat Rai Publications Pvt Ltd.

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 4103 FLUID MECHANICS AND MACHINES

OBJECTIVE: The Student should be able to

1. Measure various properties such as pressure, velocity, flow rate using various instruments.
2. Calculate different parameters such as co-efficient of friction, power, efficiency etc. of various Systems
3. Describe the construction and working of turbines and pumps.
4. Test the performance of turbines and pumps.
5. Plot characteristics curves of turbines and pumps.

Module-I:

Properties of fluid:

Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility, , laws of viscosity, Hydrostatic and Pascal's law.

Module-II:

Fluid Pressure & Pressure Measurement:

Fluid pressure, Pressure head, Pressure intensity, Concept of absolute vacuum, gauge pressure, atmospheric Pressure, absolute pressure, Simple and differential manometers, Bourdon pressure, gauge. Concept of total pressure on immersed bodies, centre of pressure, Buoyancy, centre of Buoyancy, Metacentre and metacentric Height, conditions of Equilibrium of a Floating and submerged Bodies

Module –III:

Fluid Flow and Measurement:

Types of fluid flows, Continuity equation, Bernoulli's theorem, Venturimeter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturimeter, Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter Pitot tube – Construction, Principle of Working.

Module –IV:

Hydraulic Turbines:

Impact of jet on fixed vertical, moving vertical flat plates, Impact of jet on curved vanes with special reference to turbines & pumps, Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available Construction and working principle of Pelton wheel, Francis and Kaplan turbine. Draft tubes- types and construction, Concept of cavitation in turbines Calculation of Work done, Power, efficiency of turbine.

Module –V:

Hydraulics pump and Hydraulic Devices:

Construction, working principle and applications of single and double acting reciprocating pumps. Concept of Slip, Negative slip, Cavitation and separation, Use of air Vessel, Construction, principle of working and applications of centrifugal Pump, Types of casings and impellers. Concept of multistage Priming and its methods, Cavitation, Manometric head, Work done, Monomeric efficiency, overall, efficiency, NPSH, Performance, Hydraulic Device :

Construction, working and applications of submersible, jet pump, Hydraulic Ram, Hydraulic press, Hydraulic Accumulator, Fluid coupling and Torque converter.

Text Books:

1. R.K.Bansal," Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publication.
2. Kothandaraman, C.P.and Roodramoorthy,R."Basic Fluid Mechanics", New Age International.

Reference Books:

1. Robert, W.Fox and Allan, T.McDonald. "Introduction to Fluid Mechanics", John Willey and Sons.

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DAC 4001 ENVIRONMENTAL SCIENCE

OBJECTIVE

The main aim of Environmental Science is to make the students acquainted with various types of pollution hazards, which are becoming more critical every day and also acquire the knowledge to participate in solving environmental problems for green earth.

Students will be able to understand:

1. Importance of Environmental Science as well as biogeochemical cycles and food chain
2. Composition and function of various segments of environment
3. Water pollution, various pollutants, their toxic effects and water treatment process
4. Classification, toxic effects and sources of air pollutants and their control measures
5. Brief introduction to Noise Pollution, Soil Pollution and radiation pollution

Module I Multidisciplinary nature of Environmental Science & Ecology:

Definition & importance of Environmental Science. Ecosystem, basic structure of an ecosystem (abiotic and biotic components), nutrient and biogeochemical cycles (carbon cycle, nitrogen cycle, and hydrological cycle), food chain, food web.

Module II Segments of environment:

Atmosphere, hydrosphere, lithosphere, soil profile and composition of soil, biosphere.

Module III Water Pollution & Waste water treatment:

Water resources, sources of water pollution, various pollutants, their toxic effect, potability of water, rain water harvesting, primary and secondary waste water treatment (Trickling filter & Activated sludge process.

Module IV Air Pollution:

Classification of air pollutants, toxic effects, sources and their control measures like ESP, catalytic converter and bag house filter.

Module V Noise & Soil Pollution:

A brief introduction to Noise Pollution, Soil Pollution and radiation pollution.

Text books:

1. Environmental Chemistry – A. K. Dey
2. A basic course in Environmental studies - Deswal & Deswal

Reference books:

1. Environmental pollution – B. K. Sharma
2. Environmental pollution and control - C. S. Rao
3. Essentials of ecology & environmental Sciences - S.V.S. Rana

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DCS 4011 COMPUTER PROGRAMMING

OBJECTIVE

1. To understand basic programming concepts and write simple programs.
2. To use operators and library functions for writing arithmetic expressions.
3. To apply programming logic and develop problem solving approach.
4. To use arrays for developing more efficient logic.
5. To apply function oriented approach in program design.

Module-I:

Programming techniques and overview of c language:

Algorithm and Programming Development, Steps in development of a program. Flow charts, Algorithm development, Program Debugging, Program Structure. Formatted input, formatted output., assignment statements, Constants, variables and data types.

Module-II:

Operators and Expressions:

Arithmetic, Relational, Increment, increment, Assignment, logical and Conditional Operators, Operator precedence and associativity, type casting, size of () operator, Math functions sqrt ()), pow(), sin(), cos() and tan() .

Module-III:

Decision making and branching:

if statement (if, if-else, else-if ladder, nested if-else), Switch case statement, break statement, goto.

Decision making and looping:

while, do, do-while statements for loop, continue statement

Module-IV:

Arrays and Strings:

Declaration and initialization of one dimensional, two dimensional and character arrays, accessing array elements. Declaration and initialization of string variables, string handling functions from standard library (strlen (), strcpy (), strcat (),strcmp ()).

Module-V:

Functions:

Need of functions, scope and lifetime of variables, defining functions, function call (call by value, call by reference), return values, storage classes. Category of function (No argument No return value, No argument with return value, argument with return value), recursion.

Pointers:

Understanding pointers, declaring and accessing pointers, Pointers arithmetic, pointers and arrays.

Text Books:-

1. E Balagurusamy, "Programming in ANSI C" Tata McGraw-Hill, New Delhi.

Reference Books:

1. Ashok N. Kamthane, "Programming in C" Pearson Education India, New Delhi.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 4008 STRENGTH OF MATERIALS LAB

LIST OF EXPERIMRNTS

1. Study of Rockwell Hardness Machine.
2. Study of Brinell Hardness Machine.
3. Study of Tensile Strength of mild steel
4. Study of Young Modulus of bending.
5. Study of torsion test.
6. Study of Universal Testing Machine.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 4012 MANUFACTURING PROCESS LAB-II

LIST OF EXPERIMENTS

1. Identification and Specification of Lathe machine.
2. Do some lathe operations on the given job.
3. Identification and Specification of Drilling machine.
4. Do some drilling operations on the given job.
5. Identification and Specification of Shaper machine.
6. Do some shaping operations on the given job.
7. Identification and Specification of Milling machine.
8. Do some milling operations on the given job.
9. To make a job like (nut & bolt) using all the above four machines.

.

DMM 4104 FLUID MECHANICS AND MACHINERY LAB

LIST OF EXPERIMENTS

1. Study of Bernoulli's theorem.
2. Study of Impulse Turbine.
3. To determine the Co-efficient of discharge of Rotameter.
4. Study of Reciprocating Pump.
5. Study of Radial flow Reaction Turbine.
6. To find the characteristics of Centrifugal Pump at different speed.

DCS 4012 COMPUTER PROGRAMMING LAB

LIST OF EXPERIMENTS

1. Write Programs in C to implement
2. Programming Exercise on Executing and Editing a C Program.
3. Programming Exercise on defining Variable and assigning values to variables.
4. Programming Exercise on arithmetic's and relational operators.
5. Programming Exercise on arithmetic expression and their evaluation.
6. Programming Exercise on formatting input/output using printf and scanf
7. Programming Exercise using if-statement.
8. Programming Exercise using if-else statement.
9. Programming Exercise on switch statement
10. Programming Exercise on do-while statement.
11. Programming Exercise on for statement.
12. Programming exercise on one-dimensional array and two-dimensional array.
13. (i) Programs for putting two strings together (ii) Programs for comparing two strings.
14. Simple programs using structures and Union.

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DHU 4002 PROFESSIONAL PRACTICES-III

Module-I:

Industrial visit:

Industrial visit be arranged and report of the same be submitted by the individual student, to form a part of term work. One industrial visit may be arranged in the following areas to observe material handling system, Quality control chart/ production records/ layout system/ hydraulic and pneumatic system/working of boilers and steam engineering applications.

Module –II:

Lectures by professionals/ industrial expert be organised from any one of the following areas.

- Use of plastics in automobiles
- Non-ferrous metals and alloys for engineering applications
- Industrial hygiene
- Composite materials
- Heat treatment processes
- Ceramics
- Safety engineering and waste elimination

Module –III:

Group-Discussion:

The students shall discuss in group of six to eight students and write a brief report on the same as a part of term work.

Module –IV:

Student Activities:

The students in a group of 3 or 4 will perform any two of the following activities and write a report as a part of term work.

Activity:

i. Study any one type of CNC machine centre and prepare on tooling and tool holding devices.
ii. For a given job write a sequence of operations performed by automated manufacturing system. Draw a block diagram of control system to perform above operations.
iii. For a drilling or milling operations on a simple machine component, draw a jig or fixtures showing various features like locating clamping tool.
iv. For a given job involving 3 to 4 operations suggest to prepare a report.

Module –V:

Seminar:

Seminar on any advanced technical topic to be presented by individual student.

SYLLABUS

SEMESTER-V

Diploma in Manufacturing Engineering
(wef 2018 batch)

Course Structure
Diploma in Manufacturing Engineering
Fifth Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DME 5011	Tool and Die Design	3	0	0	3
DME 5103	Measurement and Metrology	3	1	0	4
DME 5013	Quality Control	3	1	0	4
DMM 5103	CAD/CAM	3	1	0	4
DME 5015	Manufacturing Process-III	3	0	0	3
DMM 5104	CAD Lab.	0	0	2	1
DME 5104	Measurement and Metrology Lab.	0	0	2	1
DME 5012	Tool and Die Design Lab.	0	0	2	1
DME 5012	Project-I	0	0	4	2
	Periods per week	**15**	**3**	**10**	-
	Total credits	-	-	-	**23**
	Total Periods per week	-	-	-	**28**

DME 5011 TOOL AND DIE DESIGN

OBJECTIVE: Students will be able to

1. Understand tool angles of cutting tools and their importance.
2. To understand different types of dies and their working principle.
3. Study different types of dies and die design fundamentals.
4. Study of forging die.
5. How to design jigs and fixtures?

Module-I:

Tool Design Consideration & Cutting Tools:

Basic metal cutting process, requirements of cutting tool, mechanism of chip formation, forces on cutting tool, power required, machinability of various materials, selection of cutting speed and feed, chatter-and vibration, cutting fluid. Cutting Tools: Design of Single Point Cutting Tool. Form tools – Introduction, types, design of form tools. Drills – Introduction, Types, Design of drill. Milling cutters – Introduction, Types, Geometry. Design of milling cutters.

Module-II:

Bending methods: Bending Terminology, V – Bending, Air bending, bottoming Dies, spring back & its prevention. Design Principles- Bend radius, Bend allowance, width of die opening, Bending pressure.

Module –III:

Forming and Drawing Dies:

Forming Dies – Introduction, Types – solid form dies, pad type form dies, , Embossing dies, coiningdies, Bulgingdies, Assemblydies.

Drawing Dies – Introduction, Difference between blending, forming & drawing, Metal flow during drawing, Design, Design consideration – Radius of draw die, Punch Radius, Draw clearance, Drawing speed, Calculating blank size, , Drawing pressure, Blank holding pressure.

Module IV:

Forging Die Design:

Introduction, Classification of forging dies, Single impression dies, Forging design factors – Draft, fillet & Corner radius, parting line, shrinkage & die wear, mismatch, finish allowances, webs , forging operation- fullering, edging, bending, drawing, flattering, blacking finishing ,Die design for machine forging – determination of stock size in closed & open die forging.

Module-V:

Design of Jigs & Fixtures:

Introduction, locating & clamping – principle of location, principle of pin location, locating devices, radial or angular location, V –location, bush location design principle for location purpose, principle for clamping purposes, clamping devices, design principles common to jigs & fixtures.

Drilling Jigs: Design principles, drill bushes, design principles for drill bushings, Types of drilling jigs – Template jig, plate type jig, open type jig, swinging leaf jig, Box type jig, channel type jig. Jig feet.

Milling Fixtures: Essential features of milling fixtures, milling machine vice, Design principles for milling fixtures, Indexing jig & fixtures, Automatic clamping devices

Text Books:

1. Production Engineering Design (Tool Design), Umesh Chandra & Surender Kumar, Satya Prakashan, New Delhi
2. Tool Design, C.Donaldso, G.H.Lecain and V.C.Goold, Tata McGraw Hill

Reference Books:

1.	Principles of Tool Design	S.K. Basu
2.	Jigs & Fixtures	Fred H. Colvin
3.	Handbook, Fundamentals of Tool Design	ASTME
4.	Basic Die Making	Osterguard E., Mc-Graw Hill Book Co.
5.	Metal Cutting & Tool Design	V.Arshinov, Mir Publication.
6.	Design and Production of Metal-Cutting Tools	P.Rodin, Mir Publishers, Moscow.
7.	Fundamentals of Tool Design	Frank W. Wilson
8.	Properties and Selection of Tool Material	Kortesoja, Victor A., ASM.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 5103 MEASUREMENT & METROLOGY

OBJECTIVE: Students will be able to

1. Understand the principle of operation of an instrument.
2. Use measuring device for a particular application
3. Differentiate between different types of errors.
4. Define accuracy, precision, calibration, sensitivity etc. in metrology.
5. Select appropriate instruments for specific measurement.

Module –I:

Introduction: Principles of dimensional and form measurements. Basic standards of length and angle. Industrial standards. Errors in measurement. Classification & Types of measuring instruments, limits, fits & tolerances.

Vernier Caliper & Gauges**:** Construction and parts of Vernier, Principle of Vernier. Classification & Description of gauges, Micrometer**:** Working principle, Construction and parts of micrometer, Straightness and Taper Measurement: Sinebar, autocollimators

Module – II:

Measurement : General measurement system, Sensor, Signal conditioner, Data display and data output block, Calibration, traceability and standards, Common terms encountered in measurement techniques, Transducer, Range and span, Response: time lag, linear, Response time constant, Resolution, sensitivity, Precision and repeatability, Significant figures, Average value or mean, root mean square value, Accuracy and Errors.

Module –III:

Measurement of Temperature & Pressure: Glass thermometers, Thermocouples, Temperature compensation, Calibration, Advantages and disadvantages, uses of thermocouples. Bimetals Resistance thermometer, Thermistors, their advantages and disadvantages and field of use, Pyrometers.

Module –IV:

Measurement of Level, Vibration & Humidity: Method of measurement, float indicator, displacement type, pressure dependent, capacitance, ultrasonic transducer, piezoelectric transducer. Different types of pickups and transducers, their principle of operation & field of use.

Module – V:

Measurement of Torque, Velocity & Acceleration: Different types of dynamometers, Principle of operation and field of use. Transducers used and method of measurement, Introduction to Coordinate Measuring Machines.

Text Books:

1. Measurements – Harsh Vardhan
2. Electrical & Electronics and Instrument – A. K. Sawhney

Reference Books:

1. Mechanical Measurement and Control – R. V. Jalgaonkar
2. Production Technology – O.P.Khanna & M. Lal

DME 5013 QUALITY CONTROL

OBJECTIVE: Students will be able to

1. Understand the terms like quality, quality control, inspection, value of quality, cost of quality.
2. Know about reliability and statistical quality control.
3. Construct and draw control charts.
4. Understand different sampling methods and draw OC curve.
5. Understand ISO certification procedure and quality system.

Module –I:

Concept of Quality: Definition of quality cost of quality, value of quality. Quality control, objectives of quality control, quality control and inspection.

Module –II:

Statistical concepts and Reliability: Definition of probability, laws of probability. Normal and Binomial probability distributions. Statistical Quality Control, Definition of reliability, basic concept. Failure patterns for complex product, designing for reliability, System reliability.

Module –III:

Control Charts for Variables and Attributes: Introduction, objectives, theories of control charts for averages, ranges, standard deviations. Process capability study, Fraction defectives and number of defects. Interpretation of control charts.

Module –IV:

Acceptance Sampling by attributes: Concepts of acceptance sampling, advantages and limitations, sampling methods, single, double and- multiple sampling plants .operating characteristic curves.

Module –V:

Total Quality Management and ISO 9000 Quality System: Concept of Total Quality management, Principle objectives of TQM, History of ISO: 9000, ISO: 9000 series in general, benefits by becoming an ISO: 9000 company, steps to registration, India and ISO: 9000.

Text Books:

1. Statistical Quality Control - M.Mahahjan
2. Quality Planning and Analysis - J.M .Juran & Frank M Gryna

Reference Books:

1.Statistical Quality Control by Eugune L.Grant & Richard S Leaven worth
2.Total Quality Management by John M Kelly
3.TQM by R.P. Mohanty & R.R. Lakhe.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DMM 5103 CAD/CAM

OBJECTIVE: Students will be able to

1. Understand the concept and requirement of the integration of the design and manufacturing.
2. Acquire knowledge about the computer assistance in the design process and analysis.
3. Understand the concepts of manufacturing with computer assistance in the shop floor.
4. Learn the principle and working of the CNC machines.
5. Learn the method of CNC programming with international codes.
6. Acquire the basic concept of automatic material handling equipment and robot.

Module-I Basic Concepts of CAD and CAM:
Introduction of Computer Aided Design, The Design Process, Product Cycle, CAD/CAM Developments, Definition of CAD&CAM Tools, Hardware and Software requirement of CAD, Engineering Application of CAD.

Module-II Computer Graphics:
Graphic System: CRT, Raster Scan system and Display process, Random Scan System and display, direct view storage tubes, Graphics Software configuration. Line draw algorithm – DDA & Bresenhems, Circle Mid-point circle Algorithm, Bezier & B-Spline curves. Bezier & B-Spline surfaces. The various surface representation scheme & techniques.

Module-III Geometric Transformations and Modelling System:
2D & 3D Transformations. Translation, Rotation, Scaling, Reflection, Homogeneous co-ordinates, windowing & clipping, Orthographic projection, Isometric projection.
Geometric modelling: Wire frame, surface & solid modelling. Techniques, Boundary Representation and constructive Solid Geometry method.

Module-IV Introduction to CAM, ROBOTICS & FMS:
Concept of numerical control machine, CNC machine and DNC machine Working principle of NC, Features of CNC machine, Construction and working principle of. Concept & Introduction of Robotics, Configuration of Robots, Industrial application of ROBOT. Introduction to FMS, components of FMS, Layout of FMS, Types of FMS.

Module V CAM & Part Programming:
NC coordinate system, various programming technique, manual programming, conventional programming and APT, Word address format, NC coordinate system, types of motor control, preparatory function and G code, simple program for lathe and milling: linear & circular interpolation.

Text Book:

1. CAD/CAM by M.P. Groover

Reference Books:

1. CAD/CAM – by Ibrahim Zeid ,Tata McGraw Hill Publishing Comp. Ltd., New Delhi
2. CAD/CAM – by P. N. Rao
3. CAD/CAM – by Chirs McMohan, Publication: Pearson Education Asia.
4. Computer Aided Design – by R.K. Srivastava, Umesh Publication.
5. Computer Graphics – by Hearn & Baker, Publication Prentice Hall

DME 5015 MANUFACTURING PROCESS - III

Module –I:

Metal-working process: Classification, principles; merits, demerits and application of different conventional forming processes ,Hot & Cold working : Introduction, Hot working, Cold working, Comparison of hot and cold working ,Advantages and Disadvantages of hot and cold working.

Module –II:

Forging and Rolling: Introduction, advantages and disadvantages of forging, classification of forging, methods of forging, defects in forging, cleaning and finishing of forging. Hot & Cold rolling, Principle of rolling, types of rolling mills, Defects in rolling.

Module –III:

Extrusion and Drawing: Introduction, advantages, disadvantages and application of extrusion, classification of extrusion process- forward extrusion, backward extrusion, tube extrusion, impact extrusion, Wire drawing, Tube drawing.

Module –IV:

Metal Stamping and Forming: Introduction, Bending, Deep drawing, Stretch forming, Metal spinning, Blanking, Piercing, Embossing & Coining, Roll forming, Rubber press forming, defects in sheet metal formed parts.

Module –V:

Presses and Dies: Introduction, classification of dies, causes and failure of dies in metal working operations, classification of presses, cutting forces and energy in press work, punch and die clearances for blanking and piercing, effect of clearance.

Text Books:

1. Elements of Workshop Technology by Hazra S. K. and Chaudhary, Vol. I & II
2. Workshop Technology by Raghuwanshi B. S.

Reference Books:

1. Workshop Technology Vol. I & II by Gupta K. N. and Kaushin J. P.
2. Workshop Practice Vol. I & V by Atherton W. H.
3. Principle of Foundry Technology – K. P. Sinha
4. Manufacturing Technology Vol. I & II – O. P. Khanna
5. Welding Technology – O.P. Khanna
6. Production Technology – R. K. Jain
7. Workshop Technology-S.K.Garg

DMM 5104 CAD LAB.

1. Practice on the following commands
Units , limits , grid , line , poly-line , donut , polygon , chamfer , fillet , offset , text , de-text.

2. Practice on the following commands:
O snap , Extension , undo , redo , oops , color , line-type , layer , save , quit , end.
Hints: use layers, color, line-types)

3. Practice on the following commands:

Erase , Copy , move , array , break , trim , mirror , pedit , pan , divide , zoom

4. **Practice on the following commands:** Hatch, batch, Hatchedit, boundary and dimensioning.

5. Draw the details of the footstep bearing and also draw plan and elevation (full sectional).

6. Draw the details of connecting Rod, Crank pin, cylinder block and also draw plan and Elevation.

7. Draw all the Automobile components by using the CAD Tools.

DME 5104 MEASUREMENT AND METROLOGY LAB

LIST OF EXPERIMENTS

1. To study the measurement of dimensions of given workpiece using Vernier Calliper
2. To study the measurement of dimensions of given workpiece using Outside Micrometer.
3. To study the measurement of dimensions of given workpiece using Vernier Height Gauge.
4. To study the measurement of dimensions of given workpiece using inside Micrometer.
5. To study Slip Gauges and Angle Gauges to construct different given dimensions and angles.
6. To determine the included angle of a given angle plate using sine bar and slip gauges.
7. To measure the different angle of a single point cutting tool(“V” tool) by Profile Projector.
8. To study the working of auto-collimator.
9. To study the working of optical flat and monochromatic light source.
10. To study the working of workshop microscope.
11. To study the working of Floating Carriage Diameter Measuring Machine to measure the external threads of a given workpiece.

DME 5012 TOOL AND DIE DESIGN LAB

LIST OF EXPERIMENTS

i. Study of dies and presses.

ii. Sketches of Combination Die, Progressive Die, Drawing Die and Bending Die.

iii. Sketches of Pressure die, casting die and forging die.

iv. Calculation of cutting forces and shear angle based on Merchant's circle.

v. Development of blank length for bending operation.

vi. Designation of single point tool.

vii. To draw types of cutting tools showing various angles.

viii. To design and draw drawing die for a given component.

SYLLABUS

SEMESTER-VI

Diploma in Manufacturing Engineering
(wef 2018 batch)

Course Structure
Diploma in Manufacturing Engineering

Sixth Semester

Subject Code	Subject	Theory	Tutorial	Lab.	Credit
DME 6021	Maintenance Engineering	3	0	0	3
DME 6009	Machine Tool Design	3	1	0	4
DME 6011	Industrial Engineering	3	0	0	3
	Elective	4	0	0	4
DME 6013	Advanced Manufacturing Process	3	1	0	4
DME 6004	CAM Lab.	0	0	3	2
DME 6014	Advanced Manufacturing Process Lab.	0	0	3	2
DME 6012	Project-II	0	0	6	3
List of Elective(Any one)					
DME 6107	Operation Research	4	0	0	4
DME 6015	Mechatronics	4	0	0	4
DME 6017	Alternative Energy Resources	4	0	0	4
DME 6019	Ergonomics and Human Factor Engineering	4	0	0	4
	Periods per week	**16**	**2**	**12**	**-**
	Total credits	**-**	**-**	**-**	**25**
	Total Periods per week	**-**	**-**	**-**	**31**

DME 6021 MAINTENANCE ENGINEERING

OBJECTIVE: Students will be able to

1. Understand the concept of maintainability and failure.
2. Understand different types of maintenance and their application.
3. Work with safety provisions.
4. Learn different types of hazards and their prevention.
5. Fire protection and prevention.

Module –I:

Definition, Importance, Purpose and results of maintainability efforts, maintainability in product life cycle, maintainability tools; failure mode, effect and critical analysis, fault tree analysis, cause and effect diagram, total quality management.

Module –II:

Principle, relative advantage, limitation and application of various maintenance strategies like, preventive maintenance, predictive maintenance, total productive maintenance, reliability based maintenance, computer integrated maintenance etc.

Module –III:

Concept and strategies for tero-technology, maintenance planning and condition based maintenance.

Module –IV:

Industrial safety-concept and relevance, Importance, Fundamental Concepts and Terms, occupational diseases, hazards and their control, electrical and mechanical hazards, radiation and biohazards, personal protective equipment and clothing.

Module –V:

Safety responsibility and function of various functionaries and departments, Fire protection and prevention, explosion and explosives, safety & profitably employee training and safety, workers compensation

Text Books:

1. B.S. Dhillon **"**Engineering Maintainability"**,** Eastern Economy Edition PHI
2. A.K. Gupta **"**Reliability Engineering and Technology", Macmillan India Limited
3. S.K. Srivastav, "Industrial Maintenance Management" S. Chand & Company

Reference Books:

1. E.T. Newbrough **"**Effective Maintenance Management", Mc Graw Hill
2. K. Tarafadar, K. J. Tarfdar **"**Industrial Safety Management", Dhanpat Rai

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6009 MACHINE TOOL DESIGN

OBJECTIVE: Students will be able to

1. Understand the general requirements of machine tool design and processes.
2. Understand kinematic structure.
3. Find various constraints on spindle speed.
4. Study design procedure of various machine elements.
5. Design gear box.

Module –I:

Introduction : Classification of machine tools, basic motion and general requirements of machine tool design, Procedure of machine tool design Factors affecting machine tool design.

Module –II:

Kinematics of Machine Tools and Vibrations : Types of drives, selection and design requirements, stepped and stepless regulation, Sources, effects and elimination of vibration.

Module –III:

Layout of spindle speeds, preferred numbers, structure diagram, ray diagram, design of gear box for speed and feed.

Module –IV:

Design of Machine Tool Structures: Compliance, stiffness and rigidity, design criterion, materials and basic design procedures for beds, tables and columns.

Module –V:

Machine Tool Slides, Guideways and Spindle: Function, requirements, constructional features, design criterion and tribological aspects of machine tool guideways and spindles, antifriction and roller slides.

Text Books

1. Machine tool design — N.K. Mehta, Tata McGraw-Hill Pub. Co.
2. Design of machine tools — S.K. Basu & D.K. Pal, Oxford & IBH
3. Principles of Machine tools — G.C. Sen. & A. Bhattacharyya

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6011 INDUSTRIAL ENGINEERING

OBJECTIVE: The student will be able to

1. Understand importance of productivity, factors affecting productivity and forecasting.
2. Find the breakeven point for manufacturing a product.
3. Prepare or modify layout of production system.
4. Find the economic order quantity for given situation.
5. Using techniques of work measurement and method study should be able to improve the existing manufacturing method.

Module –I:

Production Functions and Forecasting: Concept, Types and Management of production systems, Predicting markets for products, components of demands, time series forecasting methods (moving average, exponentially weighted moving average, Delphi, market survey and historical and life cycle analysis.

Module-II:

Facility Layout and Engineering Economy: Process charts, line and product layout, functional process lay out, group layout, balancing technique, Concept of replacement and depreciation, Break even analysis, overhead, fixed and variable cost.

Module –III:

Inventory Control : System inventories, EOQ, buffer stock, reorder point, fixed reorder quantity system, periodic reorder system, ABC analysis, Material requirement planning.

Module –IV:

Concept of JIT, Lean Manufacturing & Group Technology: Production wastages and its control, Concept, classification and coding of parts, coding system, OPTIZ coding system and its application.

Module –V:

Work study: Conceptual frame work of Method Study, Micromotion study and work measurement, Principle of Motion Economy, Work sampling.

Books Recommended :

1. Industrial Engg. & Management – O. P. Khanna
2. Production & Operation Management – S. N. Chary
3. Production & Operation Management – Ronald, S. Ebert
4. Production & Operation Management – S. K Sharma

DME 6013 ADVANCED MANUFACTURING PROCESS

OBJECTIVE: The student will be able to

1. Know different non-traditional machining process.
2. Know the working of Special Purpose Machine.
3. Use of specific machine as per specific requirement.
4. Develop the mindset towards modern trends in manufacturing.
5. Work as maintenance engineer.

Module-I:

Introduction to modern manufacturing processes, classification of unconventional machining method, operating principles, applications, limitations, process parameters of abrasive jet machining, water jet machining, abrasive flow machining.

Module –II:

Fundamental principles, operational characteristics, applications. advantages and limitations of ultrasonic machining and ultrasonic welding, electrical discharge machining.

Module –III:

Fundamental principles, process parameters, applications advantages and limitations of chemical machining, electro chemical machining and grinding.

Module –IV:

Principles, process parameters, applications, advantages and limitations of LASER beam, electron beam machining and plasma arc machining.

Module –V:

Concept, general elements of special purpose machine (SPM), productivity improvement by special purpose machine, introduction to total productivity maintenance (TPM)

Text-Books:

1. New Technology by Amitava Bhattacharya (IEI)
2. Non-Conventional Manufacturing by V K Jain.
3. Production Technology by R. K. Jain

Reference-Books:

1. Non-Conventional manufacturing by P K Mishra
2. Manufacturing Science by Amitabh Ghosh

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6004 CAM LAB.

OBJECTIVE:

1. Study the working principle of CNC machines
2. Study the datum points and offsets.
3. Differentiate incremental System with absolute system
4. Study the simulation software package.
5. Write program and simulate in the Lathe software and Milling software.
6. Prepare a part program, edit and execute in CNC Turning centre.
7. Prepare a part program, edit and execute in CNC Machining centre.
8. Produce components in the CNC Turning centre and CNC Machining centre.

1. Introductions

1. Study of CNC lathe and CNC Vertical Machining centre (milling)
2. Study of international standard G-Codes and M-Codes
3. Program writing – Turning simulator, Milling simulator, IS practice, commands, menus
4. Editing the program in the CNC machines.
5. Execute the program in the CNC machines

2. CNC Turning Simulation

1. Create a part program for step turning and simulate in the software - Using Linear interpolation.
2. Create a part program for taper turning and simulate in the software

3. CNC Milling Simulation

1. Create a part program for grooving and simulate in the software – Using Linear interpolation and Circular interpolation.
2. Create a part program for drilling and counter sinking and simulate in the software - Using canned cycle.
3. Create a part program for rectangular and circular pocketing and simulate in the software - Using canned cycle.

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6014 ADVANCED MANUFACTURING PROCESS LAB.

LIST OF EXPERIMENTS

1. Study of wire EDM machine.
2. Study of process parameters on EDM.
3. Programming of different shapes on EDM machining.
4. Study of Abrasive Jet machining.
5. Study of process parameters on Abrasive Jet machining.
6. Programming of different shapes cut on Abrasive Jet machining.
7. Study of EDM machine.
8. Study of process parameters on EDM machine.
9. Programming of different shapes on EDM machining.
10. Study of micro EDM machine.
11. Study of process parameters on micro EDM machine.
12. Programming of different micro shapes cut on MICRO EDM machining.

    A) Circular shapes of given diameter.

    B) Polygon of different diamete

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6107 OPERATIONAL RESEARCH

OBJECTIVE: - Students will be able to

1. Develop the essential background in Operations Research.
2. Learn to use the LPP in different fields of engineering problems.
3. Learn to use Assignment and Transportation algorithms necessary for practical problems.
4. Acquire basic skills in PERT/CPM and Queuing Theory.
5. Learn to use Sequencing Problem and Inventory Models for managing practical engineering jobs.

Module-I:

Operation Research:

An overview, Organ and Development of OR, Nature and Features of OR, Modelling in OR, General Solution Methods for OR models, Scientific method in OR, Methodology of OR, Application, Opportunities and Shortcomings of OR.

Module-II:

Linear Programming Problem

Introduction, Mathematical Formulation of the Problem, Graphical Solution Method, Some Exceptional Cases.

General LPP, Canonical and Standard forms of LPP.

Simplex Method: Introduction, Fundamental properties of solutions, the Computational Procedure, Use of Artificial variables.

Module-III:

Assignment Problem, Transportation Problem

The transportation problem, Formulation of Transportation Problem, Initial Feasible Solution Methods, Optimality Test, Degeneracy in TP.

Assignment Problem, Balanced Assignment Problems, Hungerian Method.

Module-IV:

PERT/CPM and Queuing Theory

Network representation, Critical path (CPM) computations and PERT networks.

Queuing Models: The M/M/1/FIFO queuing systems.

Module-V:

Sequencing Problem and Inventory Models

Sequencing Problem, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem.

Deterministic Inventory Models: EOQ Model and EOQ Cost Model. Sensitivity Analysis.

Text Book

1. Kanti Swarup, P.K. Gupta, Man Mohan, "Operations Research", Sultan Chand & Sons, New Delhi – 2001

Reference Books

1. Hillier & Lieberman, "Operations Research", TMH
2. Sharma, J.K., "Operations Research-Theory and Applications", 4th Ed. Macmillan India, 2009.

DME 6015 MECHATRONICS

.

OBJECTIVE: Students should be able to:

1. Identify various input and output devices in an automated system.
2. Understand and draw ladder diagrams.
3. Write simple programs for PLCs.
4. Interpret and use operations manual of a PLC manufacturer.
5. Use simulation software provided with the PLC.
6. Understand interfacing of input and output devices

Module –I Introduction and Mechatronics elements:
Definition of mechatronics. Mechatronics in manufacturing, products and design. Review of fundamentals of electronics. Introduction to Sensors, Transducers and Actuators Principle, working and applications of-Limit switches, proximity switches like inductive ,capacitive and optical (deflecting and through beam type) , Thumb wheel Switches magnetic reed switches , Optical encoders-displacement measurement, rotary, incremental, opto-couplers. Actuator – solenoids – on-off applications, latching, triggering

Module- II Processors /controllers:
Microprocessors, microcontrollers, PID controllers and PLCs.

Module –III Drives and mechanisms of an automated system:
Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems.

Module – IV Hydraulic system:
Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits.

Module – V Pneumatic system:
Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems

Text Books:

1. Bolton W. Mechatronics- Electronic control systems in Mechanical and Electrical Engineering. Pearson Education Ltd.
2. Histand B.H. and Alciatore D.G .Introduction to Mechatronics and Measurement systems Tata McGraw Hill Publishing
3. John W. Webb and Ronald Reis Programmable Logic Controllers Prentice Hall of India.
4. NIIT Programmable Logic Control – Principles and ApplicationsPrentice Hall of India
5. Kholk R.A. and Shetty D.Mechatronics systems design Vikas Publishing, New Delhi
6. Mahalik N.P. Mechatronics principles, concepts and applications Tata McGraw Hill Publishing

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6017ALTERNATIVE ENERGY RESOURCES

OBJECTIVE: Students will be able to

1. Develop among students for effective utilization of alternative energy resources.
2. Identify solar energy and wind energy devices.
3. Identify biomass plant.
4. Use energy conservation technique for commonly used power absorbing and generating devices.
5. Learn to use principles of energy conservation energy management techniques.

Module-I:

Introduction to Energy Sources:

Introduction, Major sources of energy: renewable and nonrenewable. Need of alternate energy sources, prospect of alternate energy sources, primary and secondary energy sources.

Module-II:

Solar Energy:

Principle of conservation of solar energy into heat and electricity, Application of solar energy: construction and working of flat plate collector and solar concentrating collectors and their applications, advantages and limitations, space heating and cooling, solar pumping and green house, agriculture and industrial process heat.

Module-III:

Wind Energy:

Principle of wind energy conversion, main consideration in selecting a site for wind mills, advantages and disadvantages of wind energy conservation, types of wind mills, application of wind energy for power generation and pumping.

Module-IV:

Energy from Biomass:

Common species required for biomass, methods of getting energy from biomass, biodiesel production and application, agriculture waste as a biomass, comparison of biomass with conventional fuels.

Module-V:

Energy conservation and Management:

Need and importance of energy conservation and management, study of different energy management methods like: analysis of output, reuse and recycle of waste, energy education, principles and methods of energy conservation, Global and Indian energy market, costing of utilities like steam, electricity, compressed air and water.

Text Books:

1. Renewable Energy Sources and Emerging Technologies-D.P.Kothari,K.C.Singhal and Rakesh Ranjan
2. Non-Conventional Energy Sources and Utilisation- R.K.Rajput

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

Syllabus of Diploma in Engineering (Manufacturing Engineering)

DME 6019 ERGONOMICS AND HUMAN FACTOR ENGINEERING

OBJECTIVE : Students will be able to

1. Have idea about work study.
2. To layout the plant, problems in layout and their solutions.
3. Learn about motion economy.
4. Learn about salary, wages and method of job evaluation.
5. Have idea about material handling equipment and selection of tool.

Module -I:

Introductory Concept:

Definition, objective and scope of work study and ergonomics, interrelationship between work study and ergonomics, role of work study and ergonomics in productivity improvement.

Module-II:

Method Engineering:

Definition, objective, advantages, limitations and methodology of method engineering, Plant layout, types of layout problems, factors affecting plant layout, types of plant layout, types of flow pattern.

Module-III:

Work Measurement and Motion Economy:

Definition, objective, advantages, limitations and different methods of work measurement, Work sampling, Principles of motion economy and methodology of motion analysis.

Module-IV:

Job Evaluation, Merit Rating, Wages and Salary:

Definition, objectives and techniques of job evaluation and merit rating. Definition of wage and salary administration, comparative study of incentive schemes.

Module-V:

Ergonomics and Material Handling:

Man-Machine interaction, workstation design, material handling, types of load, objectives and principles of material handling, material handling equipment and their selection.

Text Books:

1. Work Study - O.P.Khanna
2. Industrial Engineering & Production Management- Martand Telsang