CHHATTISGARH SWAMI VIVEKANANAD TECHNICAL UNIVERSITY, BHILAI

DIPLOMA PROGRAMME IN MECHANICAL ENGINEERING
Semester-IV
COURSE OF STUDY AND SCHEME OF EXAMINATION

S. NO.	Board of Study	Subject Code	Subject	Periods / week (In Hours)			Scheme of Examination						Credit L+ (T+P)/2
				L	T	P	Theory			Practical		Total Marks	
							ESE	CT	TA	ESE	TA		
1.	Mechanical Engineering	237411 (37)	Fluid Mechanics & Hydraulic Machines	4	1	-	100	20	20	-	-	140	5
2.	Mechanical Engineering	237412 (37)	Material Technology	4	1	-	100	20	20	-	-	140	5
3.	Mechanical Engineering	237413 (37)	Plant Maintenance & Safety	3	1	-	100	20	20	-	-	140	4
4.	Mechanical Engineering	237414 (37)	Manufacturing Process	4	1	-	100	20	20	-	-	140	5
5.	Mechanical Engineering	200415 (37)	Industrial Management	4	-	-	100	20	10	-	-	130	4
6.	Mechanical Engineering	237421 (37)	Fluid Mechanics & Hydraulic Machines Lab	-	-	4	-	-	-	50	25	75	2
7.	Mechanical Engineering	237422 (37)	Material Technology Lab	-	-	3	-	-	-	50	25	75	2
8.	Mechanical Engineering	237423 (37)	Workshop Practice II	-	-	6	-	-	-	100	60	160	3
TOTAL				**19**	**4**	**13**	**500**	**100**	**90**	**200**	**110**	**1000**	**30**

L : Lecture hours, T : Tutorial hours, P : Practical hours,
ESE : End of Semester Exam, CT: Class test, TA : Teacher's Assessment

Note:- 1. Industrial Training will be done by the student after completion of 4th Semester examination.
2. Duration of training must be 4 weeks.
3. Training will be organised in 4th Semester & its evaluation will be done on 5th Semester.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

A) SEMESTER : IV
B) COURSE TITLE : FLUID MECHANICS & HYDRAULIC MACHINES
C) CODE : 237411 (37)
D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING
E) RATIONALE :

This course is intended to introduce basic principles of fluid mechanics. It is further extended to cover the application of fluid mechanics by the inclusion of fluid machinery specially water turbine and water pumps. Today the principles of fluid mechanics find wide applications in many situations directly or indirectly.

The use or fluid machinery, turbines, pumps in general and in power station are getting on accelerated fill up. Thus there is a great relevance for this course for mechanical technicians.

The mechanical technicians have to deal with large variety of fluids like water, air, steam, ammonia and oven plastics. The major emphasis is given for the study of water. However, the principles dealt with in this course will be applicable to all incompressible fluids.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit [L+(T+P)/2]
				Theory			Practical		Total Marks	
	L	T	P	ESE	CT	TA	ESE	TA		
237411 (37)	4	1	-	100	20	20	-	-	140	5
237421 (37)	-	-	4	-	-	-	50	25	75	2

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Fundamentals of Fluid Flow	06	10
2	Pressure and its Measurement	08	10
3	Hydrostatics	10	10
4	Basic Equation of Fluid Flow	08	10
5	Flow Through Orifice and Mouth Pieces	10	10
6	Flow Through Pipes	10	10
7	Impact of Jets.	06	10
8	Water Turbines	10	10
9	Pumps (Centrifugal &Jet)	06	10
10	Pumps (Submersible & Reciprocating)	06	10
	Total	80	100

H) DETAILED CONTENTS:

Chapter – 1 : Fundamental of Fluid Flow

- ?? Definition of fluid-ideal and practical
- ?? Compressible and in compressible fluids,
- ?? Fluid properties - density, specific weight, specific gravity, dynamic and kinematics viscosity
- ?? Types of flow-laminar and turbulent, steady and unsteady, uniform and non-uniform.
- ?? Continuity equation.
- ?? Simple numerical problems on continuity equation.

Chapter – 2 : Pressure and its Measurement

- ?? Concept of pressure, intensity of pressure, pressure head, gauge pressure, vacuum pressure, absolute pressure.
- ?? Manometers- Piezometer, U-tube manometer, inclined manometer, differential manometer, inverted U-tube manometer, differential manometer
- ?? Pressure gauges.
- ?? Simple numerical problems on differential manometers.

Chapter – 3 : Hydrostatics

- ?? Introduction, total pressure, center of pressure, plane, regular surfaces immersed in liquid, (horizontal, vertical and inclined)
- ?? Center of buoyancy, meta- center, meta-centric height
- ?? Condition of Equilibrium of floating and submerged bodies.

Chapter – 4 : Basic Equation of Fluid Flow

- ?? Various forms of energies applicable to fluid flow such as potential energy, kinetic energy, pressure energy, total energy of fluid flow.
- ?? Concept of datum pressure, velocity and total head of fluid particles in motion.
- ?? Bernoulli's theorem, general steady flow energy equation and derivation of Bernoulli's theorem, practical application of Bernoulli's equation
- ?? Venturimeter, orifice-meter, pitot tube, flow nozzle-their construction, working and limitation.
- ?? Simple problems on venturimeter, orifice meter, pitot tube.

Chapter – 5 : Flow Through Orifices and Mouth Pieces

- ?? Definition and types of orifices
- ?? Vena contracta, coefficient of contraction, velocity, discharge and resistance.
- ?? Torricell's theorem.
- ?? Experimental determination of Cc, Cv, and Cd.
- ?? Head loss due to sudden enlargement, contraction and obstruction in pipe, Mouth pieces types and their uses.
- ?? Simple numerical problems on discharge through orifices and pressure calculations for mouthpieces, time of emptying vessel by orifice (cylindrical, conical). Flow from vessel to another, large orifices.

Chapter – 6 : Flow Through Pipes

- ?? Laminar and turbulent flow, Reynold number, differentiation of laminar and turbulent flow on the basis of Reynold number, loss of head due to friction in pipes Darcy's formula and Chezy's equation.
- ?? Hydraulic gradient and total energy line, flow through long pipes, pipes in series and parallels branches, equivalent and parallels
- ?? Simple problems based on above formula
- ?? Water hummer and its effect, surge tank.

Chapter – 7 : Impact of Jets

- ?? Impact of jet on flat and curved plates- stationary and moving
- ?? Work done by pelton runner, velocity diagrams
- ?? Simple numerical problems on axial, radial flow.

Chapter – 8 : Water Turbines

- ?? Meaning, classification-Impulse and reaction turbine.
- ?? Comparison, description and working of pelton, Francis and Kaplan turbines.
- ?? Selection of turbines, operating&characteristics.

Chapter – 9 : Pumps (Centrifugal & Jet)

- ?? **Centrifugal pumps:** - Construction, working and installation.
- ?? Classification of centrifugal pumps, types & impellers, casings, stages, coupling, mounting in parallel arrangements, priming, cavitations, operating characteristics of pumps.
- ?? Selection of pump.
- ?? **Jet pumps:** - Construction, working and installation.
- ?? Classification of jet-pumps, types of impellers, casings, stages, couplings, mounting. Priming, cavitations, operating characteristics of pumps.
- ?? Selection of pump.

Chapter – 10 : Pumps (Submersible & Reciprocating)

- ?? **Submersible pumps :** - Construction, working & installation.
- ?? Classification & pumps: Types of impellers, casings, stages and couplings, mounting, Priming, Cavitations, operating characteristics of pumps.
- ?? Selection of pump.
- ?? **Reciprocating Pump:** - Construction, working, installation,
- ?? Classification of pump, single acting, double acting, slip, negative slip, max speed of reciprocating pump.
- ?? Use of air vessels, cavitations and indicator diagrams, operating characteristics of pumps.
- ?? Selection of pump.

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- ?? **Lecture Method.**
- ?? **Expert Lecture.**
- ?? **Demonstration.** The course shall be taught using the laboratory side by side. Underpinning laws and Principles should be explained using working models. Special emphasis should be given on Laboratory experiments.
- ?? **Industrial visits;** Industrial/field visit are to be arranged to observe the application of jet pumps, submersible pumps and water turbines. Students will be asked to measure the flow by different hydraulic machines.

J) SUGGESTED LEARNING RESOURCES.

Reference Books :

Sl. No.	Title	Author and Publisher
1	A text book of hydraulics, fluid mechanics and Hydraulic machines	Khurmi (s.chand & Co.)
2	Fluid mechanics	M.manohar
3	Hydraulic & Hydraulic machines.	Priyani
4	Fluid mechanics with engineering applications	R.L. Draughtlery & A.C. Jugersoll (Mcgraw Hills)
5.	Journal of experiments in hydraulic laboratory	V.N. Rao & Hasan. (Now heights)
6	Fluid mechanics	Dr. M.L. mathur (Std. Publications)
7	Fluid mechanics	Bansal

COURSE TITLE: FLUID MECHANICS & HYDRAULIC MACHINES LAB

PRACTICAL CODE : 237421 (37)

TOTAL HOURS : 64

LIST OF PRACTICALS / TUTORIALS:

- ?? To measure the pressure of water in pipe by
  (a) Piezometer (b) Different types of manometers.
- ?? To verify Bernoulli's equation.
- ?? To determine discharge through a given venturimeter.
- ?? To determine discharge through a given orifice meter.
- ?? To determine discharge through a pitot tube.
- ?? To determine Cc,Cv, and Cd for different types of orifices and mouth piecas.
- ?? To determine loss of head due to: -
  - o Sudden enlargement.
  - o Sudden contraction.
  - o Friction in pipes.
- ?? Study of pelton wheel, Francis turbine, and Kaplan turbines.
- ?? To determine performance characteristics of above mentioned water turbines
- ?? Study of reciprocating pump.
- ?? To determine h.p. of reciprocating pump.
- ?? Study of centrifugal pump.
- ?? To determine operating characteristics of centrifugal pump.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

A) SEMESTER : IV
B) SUBJECT TITLE : MATERIAL TECHNOLOGY
C) CODE : 237412 (37)
D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING
E) RATIONALE :

The knowledge of materials, their properties and behavior is essential for people associated with engineering activities. Materials Technology plays an important role in design and production of a product from the point of view of reliability and performance of the product.
The curriculum of the subject emphasizes upon understanding the properties and behaviour of materials in correlation with their structure and external environmental effects. The range of materials available for engineering use is quite vast, hence only the basic groups of materials such as ferrous, non-ferrous along with their general characteristics and application have been stressed upon.

F) TEACHING AND EXAMINATION SCHEME:

Course Code	Teaching Scheme (Hrs./week)				Scheme of Examination						Credit [L+(T+P)] 2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TTA	ESE	PTA		
237412 (37)	4	1	-		100	20	20	-	-	140	5
237422 (37)	-	-	3		-	-	-	50	25	75	2

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Engineering Materials and Testing	06	10
2	Structure of Solid Materials	08	10
3	Permanent Deformation	06	10
4	Phase Diagrams & Iron-Carbon System	10	10
5	Heat Treatment of Steels	10	10
6	Ferrous Metals and Alloys	10	10
7	Non-Ferrous Metals and Alloys	08	10

8	Non- Metallic Materials	08	10
9	Plastic and Powder Metallurgy	08	10
10	Preservation, Selection & Modern Trends in Materials Engineering	06	10
	Total	80	100

H) DETAILED CONTENTS:

Chapter- 1: Engineering Materials & Testing:

- ?? Introduction to engineering materials,
- ?? Classification of engineering materials and their properties,
- ?? Mechanical properties of materials,
- ?? Destructive and non-destructive testing.

Chapter- 2: Structure of Solid Materials:

- ?? Classification, Amorphous and crystalline states,
- ?? Unit cells and crystal structure (BCC , FCC,and HCP) Allotropy,
- ?? Solidification of metals, Ingot solidification, dendritic growth and its effect on properties, methods of preventing dendritic growth,
- ?? Growth of single crystals- column crystal, Equiaxed grains, segregation of impurities, grain and grain Boundaries,
- ?? Structural imperfection - types of imperfections, Impurity atoms, Point defects, Line defects, screw and mixed dislocations, surface defects.

Chapter- 3: Permanent Deformation:

- ?? Types & mechanism of plastic flow,
- ?? Slip phenomenon in single crystals,
- ?? Dislocation theory, Twinning, & Annealing,
- ?? Recovery, Recrystallization and grain growth,
- ?? Practical Metallography, preparation of specimen, selecting the specimen, grinding and polishing, Etching and etching reagents,
- ?? The metallurgical microscope, use and care of microscope.
- ?? Micro-examination, Sulphur printing.

Chapter- 4: Phase Diagrams & Iron-Carbon System:

- ?? Basic definition of phases,
- ?? solid solutions- types, formation, examples, characteristics, Factors affecting the formation of solid solutions,
- ?? Equilibrium or phase diagrams plotting of equilibrium diagrams, Interpretation, phase rule, lever rule and its applications,
- ?? Thermal equilibrium diagrams, uses, their Construction and interpretation,
- ?? Iron Carbon diagram and its interpretation, solidification and cooling of various carbon steels, structures produced,
- ?? Correlations of Mechanical properties with carbon content.

Chapter- 5: Heat Treatment of Steels:

- ?? Objective of heat treatment, Description of processes, Annealing, hardening , normalizing and tempering,
- ?? Hardening processes- surface hardening, Flame hardening case hardening, methods, their scope, limitation and advantages,
- ?? Quenching mediums and its effect on hardness- Hardening defects due to improper quenching,
- ?? Hardenability, Jommy test and interpretation of its results,
- ?? TTT curves- interpretation and use,

Chapter- 6: Ferrous Metals and Alloys:

- ?? Classification,
- ?? Types of cast Irons- their micro- structure, formation, propertities and uses,
- ?? Alloy cast irons-various alloying elements used, their effects on properties and uses,
- ?? Classification, composition and uses of Plain carbon steels, effect of impurities, Alloy steels- Classification, various elements used for alloying, their effects on properties and uses of alloy steels,
- ?? Tools steels- Typical composition, requirement of tool steels, High speed steel, High carbon steel,
- ?? standardization of steels. Designation of steels as per B.I.S codes.

Chapter- 7: Non-Ferrous Metals and Alloys:

- ?? Copper- its properties and uses,
- ?? copper base alloys- brasses and bronzes, their classification, composition, properties and uses,
- ?? Designation of copper alloys as per B.I.S,
- ?? Aluminum- its, properties and uses,
- ?? Aluminum alloys- their composition, classification properties and uses (Only commonly used important alloys),
- ?? Bearing alloys their composition and field of application.

Chapter- 8: Non- Metallic Materials:

?? Ceramic- types, characteristics and applications,
?? Refractory- desirable properties, classification, special feature of acid, basic and neutral refractory,
?? Natural & Synthetic abrasive materials, their composition, properties & uses,
?? Glass, Fiber glass, glass wool- composition, properties and uses,
?? Rubbers- Properties and uses. Vulcanization,
?? Adhesive, types, desirable qualities, principle of adhesion, setting of adhesive, surface preparation,
?? Lubricant- Functions, Properties, types and uses, commercial names of lubricants their specific application characteristics.

Chapter- 9: Plastic & Powder Metallurgy:

?? Characteristics, classification commonly used thermo setting and thermoplastics- their properties and uses,
?? Ingredients for processing plastics, Plastic processing methods- different methods,
?? Powder Metallurgy- Introduction, application, description of process, manufactures and blending of metal powders.
?? Compacting, Presintering & sintering, advantages and applications.

Chapter- 10: Preservation, Selection & Modern Trends in Materials Engineering:

?? Corrosion- meaning, various mechanism effect of corrosion, methods of minimizing corrosion,
?? Selection of Materials- selection requirements
?? Modern trends in materials engineering- new materials like FRP, Composites, Synthetic Rubbers, Synthetic wood & Super conductivity.

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

?? **Lecture method**
- Teaching through models charts of microstructures of different materials, transperancies.
- LCD Projectors.
- Video CD packages.

?? **Industrial visits**
- Plant visits with special emphasis on engineering materials lab.

?? **Experts Lecture**
- Through different field managers, engineers, site officers.

?? **Demonstration**

- Seminar on selected topics.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books

S.No.	Title	Author/Publisher
1.	A Textbook of material Science & metallurgy	O.P. Khanna
2.	Material Science of Processes	S.K.Choudhary
3.	Material Science of Processes	Lauttin- Lakhtin Pub.MIR publisher, Moscow
4.	Material of Engineers	MH. A. Kempstyl.
5.	Introduction to Material Science and Engineering	K.M..Ralls T.H.CourtneyJohn WulffPub. Wiley Eastern N. Delhi.
6.	Physical metallurgy Principles	Read Hill Pub. Affiliated East – West press pvt. Ltd. New Delhi.
7.	Engineering metallurgy	R. Higgins.
8.	Material Science	B.S. Narang CBS Pub. & Distributors- Delhi

SUBJECT TITLE : MATERIAL TECHNOLOGY LAB

PRACTICAL CODE: 237422 (37)

TOTAL HOURS: 48

LIST OF PRACTICALS / TUTORIALS :

1. Study and use of metallurgical microscope.
2. Preparation of micro specimen.
3. To study micro structural characteristics of gray cast Iron, white cast iron and Malleable cast iron.
4. To study microstructure of carbon steel.
5. To study of effect of normalizing & annealing on the hardness and micro- structure of high carbon steel.
6. To study the effect of carbon and temperature on hardening of steel.
7. To study the effect of temperature & properties during tempering of steel.
8. To study the effect of quenching media on hardness of steel
9. To study the Carbonizing and hardening of steel.
10. Jommy Hardenability test and its industrial use.
11. To study the microstructure of some important brasses and bronzes.
12. To observe the micro structural characteristics and other properties of various cast irons and prepare a report there of for industrial use.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

A) SEMESTER : IV

B) COURSE TITLE : PLANT MAINTENANCE AND SAFETY

C) CODE : 237413 (37)

D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING

E) RATIONALE :

Maintenance of the machines and equipment is of paramount importance in any organization. Regular maintenance of the machines always lead to the timely production schedules of the less problems of the break downs in the industries. The diploma pass- outs works in wide spectrum in any industry like the production, quality control planning etc. He should have the knowledge of the maintenance of the plant machinery. The course is intended to inculcate basic concept of the plant maintenance and safety aspects.

F) TEACHING AND EXMINATION SCHEME :

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit [L+(T+P)/2]
				Theory			Practical		Total Marks	
	L	T	P	ESE	CT	TA	ESE	TA		
237413 (37)	3	1	-	100	20	20	-	-	140	4

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Introduction to Plant Maintenance	05	10
2	Fundamentals of Basic Maintenance Practices	06	10
3	Organizational Structure of Maintenance Department	09	10
4	Fault Tracing Trouble Shooting and Remedies	09	10
5	Maintenance Cost & Maintainability	06	10
6	Wear and its Effect	05	10
7	Restoration of Parts	06	10
8	Safety Engineering	06	10
9	Safety Management	06	10
10	Concept of Occupational Health	06	10
	Total	64	100

H) DETAILED CONTENTS:

Chapter – 1 : Introduction to Plant Maintenance

- ?? Introduction to maintenance, its need and scope
- ?? Classification, primary and secondary functions of the maintenance department.
- ?? Functions and responsibilities of plant maintenance departments.
- ?? Nature of maintenance problems in case of (a) rotating parts (b)reciprocating parts
- ?? Economic aspects and development trends in maintenance.

Chapter – 2 : Fundamentals of Basic Maintenance Practices

- ?? Different maintenance practices
- ?? Procedure of corrective or break down maintenance, scheduled maintenance, preventive maintenance and predictive maintenance,
- ?? Methods of keeping record for condition of equipment, maintenance and replacement of parts
- ?? Standard data for maintenance and replacement of parts, standard data for maintenance form Time standards (time to complete the maintenance job), lubrication standards.

Chapter – 3 : Organisational Structure of Maintenance Department

- ?? General duties and responsibilities of maintenance department, general organizational structure of maintenance department in large and small scale industries
- ?? Controls in maintenance department by using suitable planning and scheduling procedure, machines, equipment, reference cards, maintenance records and lubrication plans for machines
- ?? Use of lubrication plans and inspection
- ?? Plant maintenance benefits, procedure, schedules
- ?? Lubrication
- ?? Store keeping of consumable and non-consumable materials, spare parts, inventory and control
- ?? Methods of storing different classes of materials.
- ?? Types of lubricants, lubrication systems & their selection criteria.

Chapter – 4 : Fault Tracing Trouble Shooting and Remedies

- ?? Sequence of activities in fault finding
- ?? Methods and procedures of repair
- ?? Various measures to prevent repetition of similar faults, various remedial actions.

Chapter – 5 : Maintenance Cost & Maintainability

- ?? Definition, classification of maintenance cost
- ?? Procedures for obtaining cost data

?? Maintenance cost control, productivity index and factors affecting the maintenance productivity index, use of control indices.
?? Definition, factors in maintainability, maintenance index.

Chapter – 6 : Wear and Its Effect

?? Definition of wear and types of wear
?? Causes of wear, effects of wear on performance, wear reduction and component replacement.

Chapter – 7 : Restoration of Parts

?? Surface coating, reconditioning methods
?? Welding, metallisation, chromium plating, seals & packing
?? Depreciation methods.

Chapter – 8 : Safety Engineering

?? Safety principles and practices
?? Safe layout
Engineering Aspects of safety:
?? Machine tools/Equipment's safety, guarding/interlocking/vibration-damping etc.
?? Safety during manufacturing processes like welding, grinding, machining, handling of chemicals etc.
?? Regular plant inspection and safety Audit, Hazard Analysis
?? Safety of electrical installations and general electrical safety practices
?? Machine maintenance, Lubrication/oiling
?? Safety during material handling in shops

Chapter – 9 : Safety Management

Accidents:
?? Accidents causes/body part affected, Accidents classified (minor, reportable, fatal, dangerous occurrences)
?? Accident Reporting and statistics
?? Factory Act & Regulations: Salient points
?? Electric regulations: Salient points
?? Safety Measurement and analysis of accidents
?? Enquiry committees and implementation of recommendations
?? **Fire prevention & Protection:**
?? Fire potential areas
?? Fire fighting measures: equipments, training, requirements.

Chapter – 10 : Concept of Occupational Health

- ?? Industrial Hygiene, First Aid
- ?? Occupational disease & control measures
- ?? Managing Noise/Dust/Fumes/Heat stress/Ventilation
- ?? Personal Protective Equipments for head, face, eye, ear, respiratory organ and other body parts and training to workers
- ?? Safety awareness, Safety organizations

SUGGESTED INSTRUCTIONAL STRATEGIES:

- ?? **Lecture Method**
- ?? **Expert Lecture**
- ?? **Demonstration.** More emphasis is to be given on demonstration of various protective equipment, fire extinguisher equipment and operation of grease gun in lubricating various components of any available machine or engine.
- ?? **Industrial visits**

  - Visit of large/medium/small scale industries for collecting information regarding the safety measures taken during material handling, handling of electrical devices, fire, material handling, handling of electrical devices, fire accidents, processes etc.

  - Visit of large/medium/small scale industries for collecting information in respect of (a) keeping record for condition of equipment maintenance and replacement of parts, if any (b) lubrication plan etc.

J) SUGGESTED LEARNING RESOURCES.

Reference Books

Sl. No.	Title	Author and Publisher
1	Accident Prevention Manual for Industrial operations	Frank E. McElroy, P.E., C.S.P. Editor in chief. National Safety Council, Chicago, U.S.A
2	Accident Prevention Manual for Administration and programs	Frank E.McElory, P.E., C.S.P. Editor in chief. National Safety Council, Chicago, U.S.A.
3	Commentary on-Factories Act with M.P. Rules	Krishanlal Sethi The lawyers Home, Indore-7
4	Industrial Accident Prevention	H.W. Heinrich McGraw Hill Book Company,
5.	A Introduction to Safety Engineering and Management	N.V. Krishnan. DPS Publishers Pvt. Ltd. Calcutta
6	Maintenance of Industrial Equipment	B. Gelberg. G. Peklis.
7	A Guide to Efficient Maintenance Management.	H.V. Mstwatt.
9	Modern maintenance management.	Miller and Blood
10	Maintenance Hand Book	Higgins, McGraw Hill
11	Maintenance Engineering Hand Book	Morrow, McGraw Hill
12	Maintenance Management	ISTE.
13	Maintenance Planning & Control	Kelly A, Eastern wiley N. Delhi,

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

A) SEMESTER : IV
B) SUBJECT TITLE : MANUFACTURING PROCESS
C) CODE : 237414 (37)
D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING
E) RATIONALE :

With the expansion of technology, Manufacturing Processes are advancing very fast. The diploma technicians are always engaged in shop floor related operations and are thus in direct contacts with various manufacturing processes in practice. It is therefore essential for students to have insight regarding the various methods of manufacturing processes. The course gives the opportunity for exhaustive study about machining, metal casting, mechanical working of metals, and metal joining.

F) TEACHING AND EXAMINATION SCHEME:

Course Code	Scheme of Examination								Total Marks	Credit L+(T+P)/2
	L	T	P	Theory			Practical			
				ESE	CT	TTA	ESE	PTA		
237414 (37)	4	1	-	100	20	20	-	-	140	5

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1.	Introduction to Manufacturing Processes	07	10
2.	Metal Casting	10	10
3.	Pattern Making	10	10
4.	Melting & Pouring	07	10
5.	Heat Treatment Processes	07	10
6.	Hot Working & Cold Working	07	10
7.	Forming Processes	09	10
8.	Press Work	07	10
9.	Various Joining Processes	09	10
10.	Introduction to Workshop Machines	07	10
	Total	80	100

H) DETAILED COURSE CONTENTS:

Chapter- 1: Introduction to manufacturing processes:

- ?? Introduction to different Conventional manufacturing processes,
- ?? Exposure to various Non-conventional manufacturing processes,

Chapter- 2: Metal Casting:

- ?? Casting as a manufacturing method,
- ?? Different casting processes,
- ?? Advantages and limitations of casting as a production process,
- ?? Casting tools,
- ?? Special casting methods viz Die casting, Centrifugal casting, Investment (lost wax) casting and Continuous casting,
- ?? Casting defects-causes and analysis, area of application of casting process.

Chapter- 3: Pattern Making & Moulding:

- ?? Definition of pattern,
- ?? Types of patterns their details, materials & allowances,
- ?? Pattern making tools, colour code for pattern definition,
- ?? Moulding, methods, types of moulds & moulding materials,
- ?? Mouldings sand its composition, and properties,
- ?? Testing parameters of sand, and their effects,
- ?? Sand preparation & conditioning,
- ?? Defects of moulds,
- ?? Cores and core making, core boxes.

Chapter- 4: Melting & Pouring:

- ?? CUPOLA, Crucible, Pit and Electric arc furnaces, their salient features, advantages and limitations,
- ?? Preparing furnaces for melting and safety aspects,
- ?? Casting processes,
- ?? Runner, risers and gate,
- ?? Cleaning of casting.

Chapter-5: Heat Treatment Processes:

- ?? Annealing,
- ?? Normalizing,

?? Tempering,
?? Hardening,
?? Case-hardening,
?? Effects of heat treatment processes on material properties.

Chapter- 6: Hot working & cold working:

?? Introduction to hot and cold working,
?? Principal of mechanical working, importance, comparison between cold & hot working,
?? Structural changes during process,
?? Pre-heating of stock, defects in ingots and rectification,
?? Advantages and disadvantages of hot working,
?? Equipment required for hot working of metals,
?? Different hot working methods,
?? Basic Principal of cold working,
?? Effect of cold working on grain structure, strength, hardness, residual stresses in cold working,
?? Type of cold working processes, Forging, Press working, Riveting, cold Rolling, Drawing, Spinning,
?? Factors which decide stocks used in hot working of a given product.

Chapter- 7: F*orming processes:*

Metal rolling:

?? Principal of metal rolling, Basic components of a simple rolling equipment, difference between a bloom and billet as applied to rolling,
?? Roller material, selection and desirable properties,
?? Principle of thread rolling,
?? Types of rolling mill.

Metal drawing:

?? Basic principle of drawing of metals,
?? Differentiate between drawing and deep drawing of metals,
?? Principle of wire drawing,
?? Basic equipment required for wire-drawing, Die details,
?? Process of metal spinning.

Extrusion :

?? Definition,

?? Classify the methods for extrusion, their advantages & limitations, Tube extrusion, Impact extrusion,
?? Application of extrusion processes.

Forging :

?? Die forging, difference between the cold die and hot die forgings,
?? Advantages of forming by forging, common defects of forged parts,
?? Limitations of forging,
?? Progressive forging, Press forging, Upset forging, Die material,
?? Applications of forging processes in engineering.

Chapter- 8: Press Work:

?? Introduction to Press working of metals,
?? Principle of Press working,
?? Description of the simple press working,
?? Press working operations-Punching, Shearing, Drawing, Bending, Slitting, Curling, Notching, Trimming,
?? Double action Press dies,
?? Specifications of a Press,
?? Safety precautions to be used while working on a press.

Chapter- 9: Various Joining Processes:

?? Introduction & classification of metal joining processes,
?? Weldability of metals, metallurgy of welding,
?? **Arc welding**- Carbon arc, Metal arc, Inertgas arc -TIG, MIG & Submerged arc,
?? **Gas welding** - Principle of operation & techniques, Gas cutting,
?? **Resistance welding**- Spot, Seam, Butt, Projection, Percussion techniques,
?? **Special welding** -Thermit, Ultra sonic, Electron beam, Explosive, Friction, Atomic hydrogen, Electro-slag, Plasma arc welding processes,
?? **Soldering & Brazing –** Types, tools, working principle, consumables, applications,
?? **Adhesive bonding -** Glue, Quickfix, Areldite, Fevicol, dendrite working principle, advantages & disadvantages,
?? Electrodes – Types, selection, Flux and their uses,
?? Defects in welds, Testing and inspection,
?? Accident prevention in Gas, Fusion & Arc welding.

Chapter- 10: Introduction to Workshop Machine

?? Introduction to lathe, milling, shaper machine & their components
?? Classification and operation of above machine

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

?? **Lecture method.**

- Teaching through models charts, transperancies.
- LCD Projectors.
- Video CD packages.

?? **Industrial visits.**

- Plant visits in related field.

?? **Experts Lecture.**

- Through different field managers, engineers, site officers.

?? **Demonstration.**

- Seminar on selected topics. This subject should be combination of input cum discussions and working in the institute's workshop.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books

S.No.	Title	Author/Publisher
1.	Process and materials of manufacture	Lindberg
2.	Work shop technology	Hazara & Choudhary
3.	Materials and manufacturing process	Dalela.
4.	Manufacturing processes	Yankee.
5.	Manufacturing processes	S.E. rusinof
6.	Welding Engineering	R.E. Rossi
7.	Foundry Engineering	P.L. Jain

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

A) SEMESTER : IV
B) SUBJECT TITLE : INDUSTRIAL MANAGEMENT
C) CODE : 200415 (37)
D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING
E) RATIONALE :

Student has been earmarked for this course since the shop floor provides majority of the opportunity available for employment & many diploma pass outs are engaged in shop floor supervisory work. Hence it has been found necessary to impart information related to the concepts, principles, procedures and 'understanding' of management techniques so that the student is brought to fairly high level of competency in 'supervisor ship'.

The course is introduced through a chapter on 'Systems Thinking'. It is felt that considerable time is spent in identification and alternative solution selection when a young engineer encounters problematic situations on the shop floor. A systematic frame of thinking and a proper problem-solving attitude is required to with these situations. The course comprises of two major parts, one is of 'Behavioral Science' where the students are exposed to the principles of Group behavior, which will help them to deal with worker's psychology, their motivation level, and finally an idea of how communication transfer is effected form the highest to lowest level. The second face deals with the 'Mathematical Approach towards Management', which comprises of Modern management concepts like CPM and PERT value Analysis, Inventory control, economic batch size determination and operation-research. It is hoped that this course will evoke considerable interest in the diploma students and will help to get jobs earlier.

F) TEACHING AND EXAMINATION SCHEME:

Course Code	Scheme of Examination								Total Marks	Credit L+(T+P)/2
	L	T	P	Theory			Practical			
				ESE	CT	TTA	ESE	PTA		
200415 (37)	4	-	-	100	20	10	-	-	130	4

G) DISTRIBUTION OF MARKS AND HOURS:

S. No.	Chapter No.	Chapter Name	Hours	Marks
1.		Management & System Thinking Concepts	06	10
2.		Materials Management	06	10
3.		Production Planning and Control	07	10
4.		Project Planning using Network Techniques	07	10
5.		Industrial Relations	07	10
6.		Supervision And Leadership	06	10
7.		Organizational Dynamics	06	10
8.		Operation Research	07	10
9.		Planning & Preparing Project Report	06	10
10.		Value Analysis & Computers in Management	06	10
		Total	64	100

H) DETAILED CONTENTS:

Chapter- 1: Management & System Thinking Concepts:

?? Management- definition, activities,
?? Theories-Decision, Quantitative, Mathematical, Behavioral Sciences,
?? System definition and parameters,
?? Production system, Non-production system and objectives,
?? System design, procedure, system variables,
?? Different types of model under system thinking.

Chapter- 2: Materials Management:

?? Introduction & function of Material Management purchase system,
?? Inventory, need & advantages of Inventory control,
?? Different techniques of Inventory control -A.B.C. analysis, simple treatment only,
?? Correlation, stock turn over, order quantity, Lead time purchase cycle,
?? Economic order Quantity, simple numerical problems ,Safety stock,
?? **Stores Management**-Definition and importance, Storing Procedure and store records.

Chapter- 3: Production Planning And Control:

?? Production system, concept of planning, meaning of PPC,

- ?? Classification & characteristics of each type,
- ?? Function of & place of PPC in a organization,
- ?? Production and consumption rate,
- ?? Job, Batch and Mass production,
- ?? Batch size, Buffer stock, Production cost components,
- ?? Concept of production scheduling. Difference between Loading & Scheduling,
- ?? Gantt chart scheduling, advantages and preparation of GANTT chart,
- ?? Interpretation updating, critical ratio scheduling,
- ?? Gap phasing and Lap phasing.

Chapter- 4: Project Planning using Network Techniques:

- ?? Network –meaning & objectives,
- ?? Network formation, representation of activities and event on network, rules for drawing network diagram, Fulkerson's rule,
- ?? Different techniques-PERT & CPM,
- ?? Dependency of activities, Dummy activities,
- ?? Different Time estimates- Optimistic, Pessimistic & Most likely Time, ET, LT, EST, LST, LCT, ECT, Floats & Slacks and Network analysis on tabular form,
- ?? Main power loading and calculation on load smoothing.

Chapter- 5: Industrial Relations:

- ?? Scope, definition, need, objective and function of personnel management,
- ?? Job analysis, Job description and its constituents,
- ?? Man power as resources, recruitment, selection, training and terminal behavior in an organization,
- ?? Communication in Industry its need and importance,
- ?? Classification, technique and barriers in communication and their effects,
- ?? Grievances, its meaning, factors responsible for grievances, process and condition for handling of grievances,
- ?? Strikes and lockouts, conditions, conciliation and adjudication machinery,
- ?? Motivation, meaning and its benefits, factors responsible for lack of motivation, techniques to boost the motivation in workers,
- ?? Job satisfaction, social and economic values, factors influencing job satisfaction.

Chapter- 6: Supervision and Leadership:

- ?? Meaning and Role of supervisor in an industry,
- ?? Need of supervision, older workers and their supervision,
- ?? Concept of leadership, Qualities of a good leader,
- ?? Effectiveness of leadership system,
- ?? Industrial acts-Introduction, Factory acts, Industrial disputes act, Boiler act, Workman's compensation act, Indian electricity act, Pollution control act, ESI act.

Chapter- 7: Organisational Dynamics:

- ?? Organization structure, characteristic and principle of organization,
- ?? Modern organization approach,
- ?? Types of organization, meaning and signification of various types,
- ?? Organization change, resistance to change, employee's attitude, factors for reducing the resistance to change.

Chapter- 8: Operation Research:

- ?? Definition and concept & methods of Operation Research,
- ?? Linear programming-problem formulation and Graphical methods,

Chapter- 9: Planning and Preparing Project Report:

- ?? Selection of project, Scheduling of activities Involved, Model format,
- ?? Project planning, preparation of action plan for implementation, preparation of project,
- ?? Cases: - illustrate some real cases, the students are advised to
  1. Visit few small-scale industries situated in the city, near by industrial area,
  2. Discuss the problem related to S.S.I. with entrepreneurs,
  3. Collect information about the market rates, quality & quantity of goods of their choice,
  4. Develop logical & analytical approach to purchase the raw material, finished good,
  5. Prepare project report for the industry, they are willing to start.

Chapter- 10: Value Analysis & Computers in Management

- ?? Concept of Cost and Concept of value,
- ?? Objectives, components and types of value,
- ?? V.A. procedure and V.A. Test. DARA SIRI method, value improvement procedures,
- ?? Role of computers in management, introduction to computer system, Personal computer and its uses-introduction to management information system (MIS).

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

?? **Lecture Method**

- Teaching through chalk board.
- H.P, LCD Projector.
- Interaction with students through seminar.
- As far as possible concepts are to visualized by extensive use of charts models.

?? **Industrial Visits**

Visits to nearby industries to expose the students to industrial environment, their working, ways of written & verbal communications, their team working & decision-making styles, , problem solving strategies, computer usage in different aspects of industrial work, Industrial relations and material management methods.

?? **Expert Lecturer**

- Expert lecturer as to be arranged on above subject through guest faculty.

?? **Demonstration**

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books

S.No.	Title	Author/Publisher
1.	Learning package on Industrial Management	T.T.T.I., Bhopal.
2.	CPM and FERT- Principles and Application	L.S. Srinath.
3.	Modern Production Management	Buffa.
4.	Essentials of Management	Kuntz , Mcgraw Hill.
5.	Industrial Engineering and Management	O.P. Khanna.
6.	Industrial organization and management	Ahuja.
7.	Value Analysis	Miles.
8.	Manpower Management	R.S. Diwedi.
9.	Personnel Management and Industrial Relations	R.S. Davar.
10.	Production and operations Management	Ray Wild.
11	Management of operations	Jack R. Meredith.
12	Production and Operations Management- Contemporary policy for managing Operating	Tata McGraw Hill.
13.	Project Engineering and Management	A.K.Sinha & Rama Sinha

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

A) SEMESTER : IV
B) SUBJECT TITLE : WORKSHOP PRACTICE - II
C) CODE : 237423 (37)
D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING
E) RATIONALE :

Rapid development in technology & competitive economy has led to the development of new trends & tools in manufacturing industry such as conventional manufacturing with new methods and tools, CNC Machines, Automation, FMS etc. Diploma engineer in professional life has to operate, supervise and maintain production systems available in the industry. In view of this, it is mandatory for him to understand the fundamentals, concepts, principles and advancements in the manufacturing processes while working on the shop floor.

F) TEACHING AND EXAMINATION SCHEME:

Course Code	Teaching Scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TTA	ESE	PTA		
237423 (37)	-	-	6		-	-	-	100	60	160	3

LIST OF PRACTICALS / TUTORIALS:

1. Industrial visits and report preparation on any two heat treatment processes.
2. Preparation of two types of pattern considering all the aspects of pattern making with the help of production drawing.
3. Industrial visits and report preparation on any two casting processes.
4. One sheet metal job covering maximum sheet metal operations.
5. Green sand mould preparation and finishing.
6. One job on each internal & external thread cutting (V or Square).
7. One job comprises of simple turning, step turning and taper turning.
8. One job on eccentric turning.
9. Practical on Tool grinding
10. One job of slot cutting on shaper machine
11. One job on drilling machine comprises of drilling, counter sinking, tapping.
12. One job on each, lap welding and T- joint.
13. Visit to an industry having CNC machines and Automation facilities and then preparation of report.

Note : Practical Journal is to be prepared on above work.