DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

II YEAR

III SEMESTER

32032 – MANUFACTURING PROCESSES

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : 32032

Semester : III

Subject Title : **MANUFACTURING PROCESSES**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Manufacturing Processes	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
	6	90	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	FOUNDRY TECHNOLOGY	17
II	WELDING TECHNOLOGY	17
III	FORMING TECHNOLOGY	17
IV	THEORY OF METAL CUTTING & LATHE	16
V	DRILLING & METROLOGY	16
	TEST AND REVISION	7
	TOTAL	**90**

RATIONALE:

Manufacturing, the major and the most important aspect in industries needs utmost care and attention. Knowledge about various processes and allied areas will be of great use to the personnel involved in production. This will provide the students an opportunity to skill themselves for the industrial scenario.

OBJECTIVES:

- Acquire Knowledge about types of pattern, casting, and moulding.
- Describe the various casting processes.
- Knowledge about various welding process and its working principle.
- Appreciate the safety practices used in welding.
- Acquire knowledge about various forming technologies.
- Knowledge about the lathe and its working parts.
- Describe the functioning of semi-automatic lathes.
- Study about the drilling process.
- Study about metrology and measuring instruments.

MANUFACTURING PROCESSES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Foundry Technology**	17

Patterns: Definition – types of pattern – solid piece – split piece - loose piece – match plate - sweep - skeleton – segmental – shell – pattern materials – pattern allowances.

Moulding: Moulding sand – constituents – types – properties of moulding sand – moulding sand preparation – moulding tools - moulding boxes – types of moulds – green sand mould – dry sand mould – loam mould – methods of moulding – moulding machines – jolting – squeezing – sand slinger construction and working principle.

Cores: Essential qualities of core – materials – core sand preparation – core binders – core boxes - CO_2 process core making – types of core.

Metallurgy :– Introduction - Iron-carbon diagram.

Melting furnaces: Blast furnace – Cupola furnace – crucible furnace – types – pit furnace – coke fired – oil fired – electric furnace – types – direct arc – indirect arc – induction furnace – working principles.

Casting: Shell mould casting – investment casting – pressure die casting – hot chamber die casting – cold chamber die casting – gravity die casting – centrifugal casting – continuous casting - defects in casting – causes and remedies.

II Welding Technology **17**

Arc Welding: Definition – arc welding equipment – electrode types – filler and flux materials - arc welding methods – metal arc - Metal Inert gas (MIG) - Tungsten inert gas (TIG) - Submerged arc - Electro slag welding – resistance welding – spot welding – butt welding – seam welding – Plasma arc welding – Thermit welding – Electron beam welding – Laser beam welding – friction welding – ultrasonic welding – Induction welding - working principle – applications – advantages and disadvantages.

Gas welding: Oxy-acetylene welding – advantages - limitations - gas welding equipment - Three types of flames – welding techniques – filler rods. – Flame cutting – soldering – brazing – difference between soldering and brazing.

Types of welded joints – merits and demerits of welded joints – inspection and testing of welded joints – destructive and non-destructive types of tests – magnetic particle test – radiographic and ultrasonic test - defects in welding – causes and remedies.

III Forming Technology **17**

Forging: Hot working, cold working – advantages of hot working and cold working– hot working operations – rolling, forging, smith forging, drop forging, upset forging, press forging – roll forging.

Press Working: Types of presses - mechanical and hydraulic presses - press tools and accessories - press working operations - bending operations - angle bending - channel bending – curling – drawing - shearing operations - blanking, piercing, trimming – notching – lancing.

Powder Metallurgy: Methods of manufacturing metal powders – atomization, reduction and electrolysis deposition – compacting – sintering – sizing – infiltration – mechanical properties of parts

made by powder metallurgy – design rules for the power metallurgy process.

IV	**Theory of metal cutting:** Introduction – orthogonal cutting – oblique cutting - single point cutting tool – nomenclature – types of chips – chip breakers – cutting tool materials – properties – tool wears – factors affecting tool life – cutting fluids – functions – properties of cutting fluid. **Centre Lathe:** Introduction - specifications – simple sketch – principal parts – head stock – back geared type – all geared type – feed mechanism - tumbler gear mechanism – quick change gear box – apron mechanism – work holding device – three jaw chuck – four jaw chuck – centres - faceplate – mandrel – steady rest – follower rest – machining operations done on lathe - straight turning – step turning - taper turning methods: form tool – tailstock set over method – compound rest method – taper turning attachment – knurling - Thread cutting – Facing – Boring – chamfering –grooving – parting-off – eccentric turning - cutting speed – feed - depth of cut - metal removal rate. **Semi-Automatic Lathes:** Types of semi-automatic lathes – capstan and turret lathes – Geneva indexing mechanism – bar feeding mechanism - difference between turret and capstan – work holding devices – tool holders.	**16**
V	**Drilling and Metrology** **Drilling Machines:** Drills - flat drills - twist drills – nomenclature of twist drill - types of drilling machines - bench type - floor type - radial type - gang drill – multi spindle type -principle of operation in drilling - methods of holding drill bit - drill chucks - socket and sleeve –drilling operation – reaming - counter sinking - counter boring - spot facing – tapping - deep hole drilling. **Metrology:** Definition – need of inspection – precision – accuracy – sensitivity - magnification – repeatability – calibration – comparator – Advantages – requirements – mechanical comparator – optical comparator – electrical comparator –	**16**

pneumatic comparator – Principles – advantages and disadvantages.

Measuring instruments: Construction and principles only - Steel rule – Callipers: outside calliper – inside calliper – jenny calliper – Combination set – Feeler gauge – Pitch screw gauge – Vernier calliper – Digital calliper – Vernier height gauge – Micrometer – Inside micrometer – Thread micrometer – Slip gauges – requirement – Indian standard – care and use - Sine bar – types – uses – limitations – Working principle of clinometers, autocollimator, angle dekkor.

Text Books:

1) Elements of workshop Technology Volume I & II – Hajra Chowdry & Bhattacharaya - IIth Edition - Media Promoters & Publishers Pvt. Ltd., Seewai Building `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2) Introduction of basic manufacturing processes and workshop technology – Rajendersingh – New age International (P) Ltd. Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi - 110002

Reference Books:

1) Manufacturing process – Begeman - 5th Edition -McGraw Hill, New Delhi 1981.
2) Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
3) Workshop Technology – Raghuwanshi - Khanna Publishers. Jain & Gupta,
4) Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006
5) Production Technology - P. C. SHARMA - Edn. X - S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006
6) Production Technology – HMT - Edn. 18 - published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.