DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

II YEAR

IV SEMESTER

32042 – SPECIAL MACHINES

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : 32042

Semester : IV

Subject Title : SPECIAL MACHINES

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
	Hours /Week	Hours/ Semester	Marks			Duration
Special Machines	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	Manufacturing of Plastic Components and Composite Manufacturing	14
II	Reciprocating Machines and Broaching Machine	14
III	Milling Machines and Gear Generating Processes	14
IV	Abrasive Process and Non- Conventional Machining Processes	13
V	CNC Machine and Its Components	13
	TEST AND REVISION	7
	Total	**75**

RATIONALE:

In the process of manufacturing we should possess adequate and through knowledge about the working of conventional as well as non conventional machines.

The topics included aim to inculcate in the students the skills of metal cutting, milling, grinding, CNC machines and other machining processes which are very much essential for a technician to at promptly and with precision.

OBJECTIVES:

- Understand the plastic components and its process.
- Study the manufacturing of Composite materials.
- Study the working of various machine tools: Planer, Shaper and Slotter.
- Study the various work holding devices
- Study various types of milling cutter.
- Study the different types of grinders and grinding wheels.
- Study the broaching operation and their applications.
- Study the milling procedure for spur, helical and bevel gears.
- Study the various types of gear generating processes
- Study the use of non-conventional machining processes.
- Study the CNC machines working principle and its components.

SPECIAL MACHINES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**MANUFACTURING OF PLASTIC COMPONENTS**	14
	Plastic Components: Types of plastics - Engineering plastics – thermosets – composite - structural foam, elastomers - polymer alloys and liquid crystal polymers. Factors Influencing the Selection Of Plastics - Mechanical properties – degradation - wear resistance - frictional properties - special properties –processing – cost **Processing of Plastics:** Extrusion-general features of single screw extrusion -twin screw extruders. Injection moulding types: Plunger type - Reciprocating screw injection - details of injection mould - structural foam injection mould - sandwich moulding - gas injection moulding - injection moulding of thermosetting materials - calendaring and rotational moulding. Design consideration for plastic components.	

Composite manufacturing: Introduction – characteristics of composite manufacturing - constituents – Glass fibers manufacturing process – hand laminating process – autoclave processing – filament winding – pultrusion process – liquid composite process – working principles by schematic diagram only – advantages – disadvantages.

II RECIPROCATING MACHINES **14**

Planer: Introduction - description of double housing planer – specifications -principles of operation – drives - quick return mechanism - feed mechanism - work holding devices and special fixtures - types of tools - operations.

Shaper: Introduction – specifications – principles of operations standard shaper – quick return mechanism - crank and slotted link – hydraulic shaper - feed mechanism - work holding devices – fixture - operations.

Slotter: Introduction – specifications - method of operation - Whitworth quick return mechanism - feed mechanism - work holding devices - types of tools.

Broaching: Types of broaching machine - horizontal, vertical and continuous broaching - principles of operation - types of broaches – classification - broach tool nomenclature - broaching operations.

III MILLING MACHINES AND GEAR GENERATING PROCESSES **14**

Milling Machines: Types - column and knee type – plain - universal milling machine - vertical milling machine - principles of operation - specification of milling machines - work holding devices - tool holding devices - arbor - stub arbor - spring collet – adapter. Milling cutters: cylindrical milling cutter - slitting cutter -side milling cutter - angle milling cutter - T-slot milling cutter - woodruff milling cutter - fly cutter - nomenclature of cylindrical milling cutter. Milling operations: straddle milling - gang milling - vertical milling attachment.

Indexing plate – differential indexing - simple indexing – compound indexing – simple problems.

Generating Process: gear shaper - gear hobbing - principle of operation only. Gear finishing processes: burnishing – shaving - grinding and lapping - gear materials.

IV ABRASIVE PROCESS AND NON- CONVENTIONAL MACHINING PROCESSES **13**

Abrasive Process: Types and classification – specifications - rough grinding – pedestal grinders - portable grinders - belt grinders - precision grinding - cylindrical grinder - centerless grinders – surface grinder - tool and cutter grinder - planetary grinders - principles of operations - grinding wheels – abrasives - natural and artificial diamond wheels - types of bonds - grit, grade and structure of wheels - wheel shapes and sizes - standard marking systems of grinding wheels - selection of grinding wheel - mounting of grinding wheels - Dressing and Truing of wheels - Balancing of grinding wheels.

Non-Conventional Machining Processes: Construction, working and applications of Ultrasonic machining - chemical machining - electro chemical grinding - electrical discharge machining - plasma arc machining - LASER machining - Advantages – Disadvantages.

V CNC MACHINE AND ITS COMPONENTS **13**

CNC Machines: Numerical control – definition – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centre – machine axes conventions turning centre and machining centre – Coordinate measuring machine – construction and working principle.

Components of CNC machine: Slide ways – requirement – types – friction slide ways and antifriction slide ways - linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – Encoders - in process probing - tool material – tool inserts.

Text Book:

1. Elements of Workshop Technology- Vol. I & II, Hajra Choudry & Battacharya, Edn. 11, published by Media Promoters and Publishers Pvt. Ltd., Seervai Buildings `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Production Technology, Jain & Gupta, Khanna Publishers, 2-B, North Market, Naisarak, New Delhi – 110 006 – 2006.

Reference Book:

1. Production Technology, HMT, Edn. 18, published by Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
2. Manufacturing process, Myro N Begman, , Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
3. Workshop Tech Vol I,II, III, WAJ. Chapman, published by Viva Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
4. Production processes, NITTTR, published by 5, Tata McGraw Hill Publishing Co. Ltd., West Patel Nagar, New Delhi 110 008.
5. Principles of the manufacturing of Composite materials – Suong V Hoa, DES tech publication. Inc, 439, North Duke street, Lancaster, Pennsylvania – 17602 U.S.A.