Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME601		INDUSTRIAL ENGINEERING	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

To introduction with (A) Industrial Engineering, (B) Production Planning and Inventory Control, Plant Layout and Material Handling, (C) Work Study

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Students will be able to understand basic concept of Industrial Engineering.
2. Students will be able to understand concept of Production Planning and Control and its importance.
3. Students will be able to understand concept of Inventory and solve basic problem related to Inventory control.
4. Students will be able to understand concept of Plant Layout & Material Handling system.
5. Students will be able to understand concept of Work Study and its importance.

Syllabus

UNIT - I

Introduction to Industrial Engineering: Evolution of modern concepts in Industrial Engineering; historical development of concepts in Industrial Engineering; application of Industrial Engineering; Product Development; design function, objectives of design, manufacturing vs purchase; development of designs- prototype, production and testing; human factors in design; value engineering; job plan; Preventive and break- down maintenance.

UNIT - II

Production Planning and Control: Importance of planning; job; batch and mass production; determination of economic lot size in batch production; functions of production control; routing,

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vis laya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

scheduling, dispatching and follow up; Gantt charts; Quality control and inspection; Introduction to concepts of TQM, ISO, Six Sigma and quality circles (brief description only).

UNIT - III

Inventory Control: Types of inventories; ABC analysis; concepts of Economic Order Quantity (EOQ); inventory control with deterministic demand; instantaneous and gradual replenishment; quantity discount; shortages; Problems on Simple inventory control model without shortages.

UNIT - IV

Plant Layout & Material Handling: Introduction; Relationship between material handling and plant layout; functions of material handling systems; objective of material handling system; study of plant layout; flow systems; types of layout; requirements of good plant layout; different material handling equipments.

UNIT -V

Work Study: Introduction to Work Study; Definition, benefits, measures of effectiveness and Productivity improvement techniques; Method study; Definition, need and method study procedures; Flow Diagrams, String Diagrams; Process charts - Outline process chart, Flow Process Chart, Multiple activity charts, Travel chart; Principles of Motion Study, Two handed process chart; Work measurement; Work Sampling; Time study – procedures & equipments.

Reference Books:

1. *O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd.(2003)*
2. *T. R. Banga & S. C. Sharma, Engineering Economics and Management, published by McGraw Hill, New Delhi.*
3. *Praveen Kumar, Industrial Engineering and Management, Pearson India Education Pvt. Ltd.(2015)*
4. *M Mahajan, Industrial Engineering & Production Management, Dhanpat Rai Pub.(2011)*
5. *Heinz Weihrich, Harold Koontz, Management, A global perspective, McGraw Hill international edition.(1992)*
6. *Joseph L. Massie, Essentials of Management, 4th Edition, Prentice-Hall of India, New Delhi.(1990)*
7. *Telsang, T. Martand, Industrial Engineering and Production Management, 3rd edition, S.chand publication (2018)*
8. *A Textbook of Production Engineering, Sharma P.C, S.chand publication (2017)*

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME602		REFRIGERATION AND AIR-CONDITIONING	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

To introduction with (A) Refrigeration, (B) Vapour Compression Refrigeration, (C) Refrigerants and Absorption Refrigeration (D) Psychometric and Air conditioning loads calculation.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes -

1. Students would be able to understand the Refrigeration system, and its importance, need and applications.
2. Students would be able to analyses basics of vapour compression refrigeration.
3. Students would be able to understand desirable properties of refrigerants.
4. Students will be able to understand absorption refrigeration system.
5. Students would be able to calculation of psychometric properties of air by tables and charts.
6. Students would be able to calculation of summer & winter air conditioning load.

Syllabus

UNIT - I

Introduction to Refrigeration: Principles and methods of refrigeration; unit of refrigeration and C.O.P.; Joule Thomson effect and reverse Carnot cycle; types of air-refrigeration; Joule's cycle; Boot-strap cycle; Applications and limitations; advantages and disadvantages of air refrigeration cycle.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

UNIT - II

Vapour Compression Refrigeration: Working principle and essential components of the plant; Simple vapour compression refrigeration cycle - COP, Representation of cycle on T-S and p-h charts; Effects of sub cooling and super heating; Influence of various parameters on system performance; necessity of multi-staging.

UNIT – III

Refrigerants and Absorption Refrigeration: Desirable properties of refrigerants; classification of refrigerants, nomenclature, environment friendly refrigerants and refrigerant mixtures; ozone Layer depletion; global warming; vapor absorption system; calculation of maximum COP; description and working of NH_3-H_2O and Li Br-H_2O system.

UNIT – IV

Psychometric: Calculation of psychometric properties of air by table and charts; psychometric processes: sensible heating, Sensible cooling, evaporative cooling, cooling and dehumidification, heating and humidification, sensible heat factor.

UNIT-V

Air conditioning Loads: Principle of air conditioning; requirements of comfort air conditioning, ventilation standards; infiltrated air load; fresh air load human comfort; effective temperature & chart; Calculation of summer & winter air conditioning load; bypass factor of coil; calculation of supply air rate & its condition; room sensible heat factor; grand sensible heat factor; effective sensible heat factor; dehumidified air quantity; Problems on cooling load calculation.

Reference Books:

1. *Refrigeration and Air Conditioning by C. P. Arora, Tata McGraw Hill, 2008.*
2. *Refrigeration and Air Conditioning Technology by R. J. Dossat, Pearson Education India, 2002.*
3. *Refrigeration and Air Conditioning by P. L. Ballaney, New Delhi, 2014.*
4. *Refrigeration and Air Conditioning by Wilbert F. Stoecker and Jerold W. Jones, Tata McGraw Hill, 2009.*
5. *Refrigeration & Air Conditioning by Domkundwar. Dhanpat Rai, 2010.*
6. *Refrigeration & Air Conditioning by Manohar Prasad, New Age International, 2011.*
7. *ASHRAE Handbook – Refrigeration 2010, ISBN- 9781933742922.*
8. *A Textbook of Refrigeration and Air Conditioning, Khurmi R.S. and Gupta J. K.,S.chand publication,2017.*

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

List of Practical's:

1. General Study of vapor compression refrigeration system.
2. General Study of Ice Plant.
3. General Study of Electrolux Refrigeration.
4. General Study of Water cooler.
5. General Study of Psychometry (Absorption type)
6. General Study and working of Gas charging Rig.
7. General Study of window Air Conditioner.
8. General Study and working of Vapor compression Air conditioning Test rig.
9. Experimentation on Vapor compression Air Conditioning test rig.
10. General Study and working of Vapor absorption refrigeration system.

Further Necessities: Cold storage visit give greater clarity about important refrigeration concepts and functioning of all components of refrigeration system, as students practically experience how these fundamental concepts are put into action.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME603		FABRICATION TECHNOLOGY	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

To introduce the students with basics of (A) Fabrication, (B) Various welding technology, (C) Inspection, testing and errors in welding joints.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Students would be able to understand the need and importance of fabrication technology in industries.
2. Students would be able to inspect drawing of various welding joints.
3. Students would be able to perform test on welded joint to check their strength.
4. Students will be able to proposed safety guideline for welding operation.
5. Students would be able to recognize production methodology and their need.
6. Students would be able to perform different thermal sheet metal joining operations

Syllabus

UNIT - I

Introduction: Need and scope of fabrication technology in industries; Weldability - concept, meaning, definition, factors affecting and its importance; Power source-classification, advantages, limitations, features, applications and selection criteria.

UNIT - II

Drawing Interpretation: Welding location of elements; welding general nomenclature; welding symbols as per IS: 696-1972; welding supplementary symbols; abbreviations used for welding

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

processes and welding position; Interpretation and method to work out bill of material for following types of drawings - i. Welding / fabrication; ii. Process and instrumentation; iii. Piping isometric; Welding documents - Weld Test Plan (WTP) and Shop Weld Plan (SWP); Need and application areas of different codes used in fabrication industries remaining ASME sections; ASTM, AWS, IS, BIS, JIS, EN, DIN, TEMA, EJMA.

UNIT - III

Fabrication Processes and Safety: Preheating and inter-pass: need, method and applications; Post heating-need; method and applications; Post Weld Heat Treatment (PWHT) need, methods, applications and selection criteria; Methods of relieving thermal stresses; Arc welding parameters-setting criteria- i. Voltage, ii. Current, iii. Welding speed, iv. Welding feed, v. Arc length; Advance welding methods and their applications; Ultrasonic welding, Laser beam welding, Electron beam welding, Friction stir welding; Need, precautions and safety norms during welding and fabrication process.

UNIT - IV

Inspection and Testing: Common weld defects; their causes and remedies; Thermal distortion-concept, meaning, definition, causes, effect and types; Weld quality-concept, meaning, definition, importance and affecting factors.

Introduction to inspection and testing: Stages of inspection; Types, methods of testing and importance of destructive testing (DT), Tensile test, compressive test, impact test, bend test, and hardness test; Special types of test like Hydro test, Pneumatic test, and Leak test by soap water and helium gas.

UNIT-V

Surface preparation, Finishing and Coating Methods: Surface preparation methods; sand blasting and ball blasting; Surface finishing methods; brushing and grinding; Surface colour coating by brush; roller and spray applications.

Reference Books:

1. *Welding technology by Khanna,O.P; Dhanpat Rai Publications, New Delhi - 22nd Edition (2011)*
2. *Welding engineering and technology by Parmar, R.S.; Khanna Publishers, New Delhi - 1st edition.(2004)*
3. *Metal fabrication technology, Syamal Mukherjee, PHI.(2010)*
4. *Workshop Technology Part One Manufacturing Processes by Tikam Lal Chaudhary Khanna Publishers, New Delhi – 5th edition.(2006)*
5. *A Textbook of Production Technology, Sharma P.C, S.chand publication (2017)*

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

List of Practical's:

1. Prepare Sheet Metal Pattern Development of Box.
2. Prepare Sheet Metal Pattern Development of Funnel.
3. Prepare Sheet Metal Pattern Development of Three Piece Elbow.
4. Perform Gas welding operation on given job (Two jobs of different type).
5. Perform Spot welding operation on given job.
6. Perform Upset butt welding operation on given jobs (Two jobs of different type).
7. Perform any two quality test on welded joint.
8. Inspect strength of joint by any one method.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME604A		OPERATION RESEARCH AND SCM	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

Describe various theories of organizations, their characteristics, strengths and Weaknesses (A) Operation Research (B) Application of operation research (C) Supply chain management and concepts.

Course Outcomes (COs):

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Collaborative project experiences involving both written and oral presentations.
2. Courses with significant experiential learning components.
3. Experiences with identifying, accessing, evaluating, and interpreting information and data
4. In support of assignments, projects, or research.
5. Course experiences with large-scale datasets.

Syllabus

UNIT – I

Introduction: History and development of Operations Research; Scientific Methods; Characteristics; Scope; Models in Operations Research.

Linear Programming: Formulation; graphical methods; simplex method; Big- M- method.

UNIT – II

Assignment Models: Definition; Mathematical Representation; Formulation and Solution; Alternate optimal solution.

Transportation Models: Definition; Formulation and solution; Alternate optimal solution; stepping stone method; Modified distribution (MODI) or u-v method.

Chairperson
Board of Studies
Shri V... ...v Vidyapeeth
Vish... ...ya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

UNIT - III

Forecasting: Introduction; Definition; Need of Forecasting; Applications and Limitations of forecasting; Forecasting methods- Qualitative vs. quantitative methods, Average approach Time series methods and Causal /Forecasting accuracy econometric forecasting methods.

UNIT - IV

Network Analysis: Network diagram; Time estimation; Basic steps in PERT and CPM; PERT and CPM computation; critical path; Float; Cost analysis; crashing the network.

UNIT-V

Introduction to SCM: Definition; elements of supply chain; building blocks of supply chain network; drivers of supply chain; Decision making in supply chain; Decision making models; supply chain performance measurement.

References Books:

1. *"Operations Research", by Tasha Hamady 7th edition, (USA: Macmillan Publishing Company), 2003.*
2. *"Operations Research", by Tasha, Tata McGraw Hill.2002.*
3. *"Operations Research", by Wagner, PHI. New Delhi, 2003.*
4. *"Operations Research", by Ravi dram & Philips, Tata McGraw Hill, 2005.*
5. *"Operations Research", by Gupta & Hira, S. Chand. 1e, 2008.*

List of Practical's:

1. Use computer and software to solve problems contained in the syllabus.
2. Case studies in SCM.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME604B		HYDRAULIC AND PNEUMATIC DEVICES	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

The course should be taught and curriculum should be implemented with (A) The aim to develop required skills in the students (B) Identify and solve various Hydraulic and Pneumatic problems.

Course Outcomes (COs):

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

1. Draw symbols used in hydraulic systems.
2. Operate different types of valves used in hydraulic systems
3. Classify the valves used in hydraulic systems.
4. Maintain different valves and auxiliaries.
5. Assemble pumps and motors to rectify problems.
6. Develop efficient hydraulic circuits.
7. Maintain the pneumatic and hydraulic system

Syllabus

UNIT - I

Basic Concepts of Hydraulics: Introduction & Definitions of important terms like Hydraulics, Pressure, Force, Vacuum etc., and Pascal's Law and its Application to Hydraulics; Bernoulli's Principle; Hydraulic Jack; Hydraulic Symbols; Advantages and Disadvantages of Hydraulic System; Hydraulic Oil; Purpose of Hydraulic Oil; Ideal Characteristics of Hydraulic Oil; Maintenance of Hydraulic Oil.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

UNIT - II

Accessories of Hydraulic System: Classify the accessories use in hydraulic system i.e. Connectors, Steel pipe, Tubing, Hose, Gauges, Packing & Seals, Filters & Strainers; Hydraulic Tank.

Hydraulic Valves and Auxiliaries: Directional Control Valves; Pressure Control Valves; Flow Control Valves; Pressure Intensifiers; Accumulators; Cartridge Valves.

UNIT - III

Hydraulic Pumps and Motors: Pump Specifications; Construction & Working of Gear Pump, Vane Pump; Radial Piston Pump; Pump Maintenance & Trouble Shooting; Hydraulic Motor Specifications; Construction & Working of Gear Motor; Vane Motor, Radial Piston Motor.

UNIT – IV

Hydraulic Circuits: Clamp Control Circuit; Injection Control Circuit; Reciprocating Screw Circuit Oil Filtration Circuit; Deceleration Circuit; Prefill Circuit; Hydraulic Motor Circuit; Hi-Low Pump Circuit.

UNIT-V

Pneumatics: Pneumatics; Comparison with Hydraulic System; Air Compressors- Single Acting and Double Acting; Components of Pneumatic System; Air receiver and pressure control; Stages of Air Treatment; Intercooler; Lubricator; Filter; Air dryer; Pneumatic Circuit for Plastic Processing Machine.

References Books:

1. *"Hydraulic and Pneumatic controls", Shanmuga sundaram.K, S.Chand & Co, 2016.*
2. *"Oil Hydraulics Systems-Principles and Maintenance", Majumdar, S.R.,Tata McGraw Hill, 2001*
3. *"Pneumatic Systems-Principles and Maintenance", Majumdar, S.R., Tata McGraw Hill, 2007.*
4. *"Power Hydraulics", Micheal J, Pinches and Ashby, J.G., Prentice Hall, 1989.*
5. *"Fluid Power with Applications", Anthony Esposito," PHI / Pearson Education, 2005.*
6. *"Basic Fluid Power", Dudelyt A. Pease and John J Pippenger, Prentice Hall, 1987.*

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

List of Practical's:

1. Demonstrate application of Pascal's law in hydraulic system.
2. Demonstrate various accessories and their uses in hydraulic system.
3. Demonstrate use of directional control valves.
4. Demonstrate use of pressure control valves.
5. Demonstrate application of flow control valves.
6. Demonstrate applications of various types of pumps.
7. Demonstrate use of hydraulic motors.
8. Demonstrate application of injection control circuit.
9. Demonstrate use of clamp control and reciprocating screw circuits.
10. Demonstrate application of single stage compressors.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME604C		FOUNDARY TECHNOLOGY	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

This course provides: (A) A basic understanding of foundry practice and metal casting as one of the important manufacturing processes. (B) An explanation of the fundamental process of solidification of pure metals and alloys. (C)Sand molding and permanent die molding are explained in detail. (D)The standard foundry practices for casting of ferrous and non-ferrous alloys elaborated. (E) An overview of the designing of molds, casting defects, inspection and testing of castings and modernization of foundries.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:

1. Be able to understand casting process and the steps involved in casting.
2. Be able to analyze the basic foundry furnace, pattern and pattern making.
3. Be able to understand the requirement of sand molding and various properties.
4. Know about the various molding processes and their use.
5. Be able to understand the different foundry practices such as cast iron, steels.

Syllabus

UNIT - I

Introduction: Introduction to casting process and the steps involved; Components produced by casting process; Comparison of metal casting with metal joining; Advantages and limitations of casting process; Rate of solidification, Chvorinov's Rule.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

UNIT - II
Foundry Furnaces: Types of foundry furnaces- crucible, pot and reverberatory furnace; Cupola; Electric arc furnace; Induction furnace.
Patterns and Pattern Making: Definition, functions, Materials used for patterns, pattern allowances and their significance; Classification of patterns; BIS colour coding of patterns, Core boxes.

UNIT - III
Sand Molding: Types and requirements of base sand; Binders and additives used-types and properties; Molding tools and equipment-hand molding tools, molding machines-Jolt type, squeeze type, Jolt and Squeeze type; Cores-types, core prints, core venting and baking, core shifting and chaplets, method of making cores, binders used, core sand molding; stack molding, green sand molding, dry sand molding, loam molding.

UNIT - IV
Special Molding Processes: Study of important molding processes; No bake molds, Flask less molds, Sweep mold, CO2 mold, Shell mold and Investment mold.
Metal Molds: Gravity die casting, Pressure die casting, Centrifugal casting, Squeeze casting, Slush casting, Thixo-casting, Continuous casting.
Non-Metal Molding: Plaster and Ceramic molding; Expandable pattern mold casting.

UNIT-IV
Types of Gates: Element of gating system; Design of gating system; Gating ratios and chills, Casting Process Planning; Cost estimation and product design for castability.

UNIT-V
Finishing processes: Fettling and cleaning of castings; removal of gates and risers.
Inspection and testing of castings: Defects in castings-types, causes and remedies; Inspection and non-destructive testing of castings.
Modernization and mechanization of foundry: Material handling; Pollution control in foundry; Application of computers in casting process.

Reference Books:

1. *P. N. Rao, "Manufacturing Technology: Foundry, forming and welding", 3rd Ed., Tata McGraw Hill, 2003*
2. *R. A. Flinn, "Fundamentals of Metal casting", Addison Wesley, 1963.*

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

3. *R.W. Heine, C.R. Loper & P.C. Rosenthal, "Principles of Metal casting", Tata McGraw Hill, 2001.*
4. *R.A. Lindberg, "Processes and Materials for Manufacturing", 4th Ed, Pearson Education, 2006.*
5. *"ASM Handbook: Volume 15: Casting" 9th Ed., American Society of Metals, Ohio, 2008.*
6. *A Textbook of Workshop Technology, Khurmi R.S. & Gupta J.K.,S.Chand,2018*

List of Practical's:

1. To Study about Pattern and Pattern Making.
2. To Study about Mould and Mould Making.
3. To Study about Melting Furnaces.
4. To Study about Gating Systems.
5. To Study about Finishing Processes.
6. To Study about Advance Casting Processes.
7. To Study about Inspection and Testing of Casting.
8. To Study about Modernization and Mechanization of Foundry.
9. Foundry Industries Industrial Visit with student's individual report.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME605		CNC TECHNOLOGY LAB	0	0	0	30	20	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

To introduction with (A) To study the basic principles and applications of the CNC machine tools (B) To provide the student with an understanding of the modern CNC machine tools and their programming methods.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:

1. Understand the basic principle of CNC machine tools.
2. Describe tooling and work holding devices for CNC machine tools.
3. Explain drives and positional transducers used in CNC machine tools.
4. Able to program for CNC machine tools.

List of Practical's:

1. Preparatory activity: a. Collect mechanical components manufactured on CNC machines and show difference compared to conventional machining b. Identify operations on those components. c. Prepare conventional process plan for at least two components.
2. Demonstrate constructional features and modes of operations of CNC.
3. Demonstrate inserts, holders and tool management systems.
4. Develop and simulate CNC Turning part program (at least five), identify errors and manufacture on CNC turning machine.
5. Develop and simulate CNC Milling part program (at least five) and identify errors and manufacture on CNC milling machine.
6. Prepare part program with CAD/ CAM software (like master cam, NX) and interface with CNC machine.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME606		MAJOR PROJECT	0	0	0	30	20	0	0	8	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same (B) To train the students in preparing project reports and to face reviews and viva voce examination.

Course Outcomes (COs):

After completion of this course the students are expected to be able to

1. Identify real world problems of mechanical engineering and related systems.
2. Interpret the working of mechanical engineering systems.
3. Apply the principles of mechanical engineering in real world systems.
4. Criticize and experiment to arrive at solutions for real world mechanical engineering problems.
5. Analyse and evaluate to obtain solution for problems in mechanical engineering systems.
6. Develop a prototypes/models, experimental set-up and software systems necessary to meet the objectives.
7. Identify methods and materials to carry out experiments/develop code.
8. Reorganize the procedures with a concern for society, environment and ethics.
9. Analyze and discuss the results to draw valid conclusions.
10. Prepare a report as per recommended format and defend the work.

Syllabus

1. Major Project:

Each project will cover all the aspects (to the extent possible) of real life application of concepts studied under the program; Alternately, a few research problems also may be identified for investigation; The project shall be driven by realistic constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

2. Internship:
Alternately, a student is encouraged to take an industrial project with reputed organizations or firms chosen by the institute. In such cases the student will stay with the firm and carry out the project. The project will be guided by the faculty member and the concerned officer in the industry. All the requirements spelt out under 'MAJOR PROJECT' above, shall be incorporated under this work also. However reviews will be conducted in the institute which the student shall attend.

2.1 Course Description:
An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks.

2.2 Learning Goals:
The internship will provide students with the opportunity to:

1. Gain practical experience within the business environment.
2. Acquire knowledge of the industry in which the internship is done.
3. Apply knowledge and skills learned in the classroom in a work setting.
4. Develop a greater understanding about career options while more clearly defining personal career goals.
5. Experience the activities and functions of business professionals.
6. Develop and refine oral and written communication skills.
7. Identify areas for future knowledge and skill development.

3. General Rules of Selection/Allotment of Dissertation Title and Its Submission:
3.1) The selection of dissertation title should be non-trivial, analytical, practical/hardware implementation based, application oriented (relevant to the need of industries) and should involve the elementary research and/or development effort based on a specific theme.

3.2) Students may be encouraged to undertake industry defined dissertation. For the industry defined dissertation there shall be one external supervisor of the industry and one internal supervisor of student's own department. It will be the sole responsibility of internal supervisor to define the research problem, scope, methodology and possible outcome from the dissertation in consultation with external supervisor.

3.3) Supervisors for the dissertation can suggest the titles of dissertation considering their long term goal for research.
3.4) Students can also discuss the titles of their choice or titles given from industries with the supervisors and if feasible and accepted by supervisors, can be included in the list of suggested titles.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

3.5) Consolidated list of suggested dissertation titles will be communicated to the students in semester VI

3.6) In case, if two students give choice for same title; title will be allotted based on merit.

3.7) Final allotment of titles and supervisors will be published on notice board in consultation with Head of the Department.

3.8) Requirement of change in the title of dissertation work should be applied to the Head of the Department with sufficient reasons for the change, before the exam of Dissertation Progress Review-I.

3.9) After Dissertation Progress Review-I exam, change of the title will be permitted based on the comments of internal examiner. Such cases should apply for the change in titles and should get approval from the Head of the Department.

4. Dissertation Work in Collaboration with Industry:

4.1) It is preferable that students, with the approval of the Head of the Department, visit industry or a Research Laboratory for data collection, discussion of the dissertation, experimental work, survey, field studies, etc. during the project period. Projects sponsored by the Industries or R&D organizations will be encouraged and a close liaison with such organizations will be maintained.

4.2) Students shall acknowledge the involvement and / or contribution of an Industries or R&D organizations for their dissertations.

4.3) Satisfactory completion certificate issued by the Industry or R&D organization should be attached with the dissertation report.

4.4) Internal supervisor, should monitor the progress of his/her students by remaining in contact with the students and external supervisors by emails, video conferencing and/or by making visits to the industries at least once in a month, depending on the need of particular project and as decided by concerned Head of the Department.

5. Supervisors:

5.1) Students shall be assigned one or two supervisors(s) from the Institute.

5.2) In case any supervisor leaves the Institute permanently or temporarily for a period exceeding one semester, the Head of the Department shall appoint new supervisor for the concern students. Any such arrangements made, should get approval from Head of the Institute.

5.3) A faculty can supervise maximum 6 (Six) Dissertations at a time.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

5.4) In case of interdisciplinary areas, at least one supervisor must belong to the discipline in which the student is registered.

6. Dissertation Evaluations:

6.1) For continuous evaluation (*CE), a comprehensive internal assessment of the dissertation work should be made by an internal review panel formed by Head of the Department, supervisor and at least 2 senior faculty with expertise in same field of dissertation work.

6.2) Internal review panel will review the progress of the students in the last week of 1st , 2nd, 3rd and 4th month of semester VI (i.e four presentation in front of internal review panel) and finally give his/her assessment of the work done by the students for internal continuous evaluation marks with comments of the review.

6.3) Dissertation and External Viva-Voce:

1. If any student has not done satisfactory work then internal review panel may not allow the student for external practical exam.
2. Review record for all the previous reviews along with remedial review (if applicable) should be maintained by the supervisor and marks will be allotted based on the review.
3. Students must submit a dissertation report on the project work carried out by him/her. The guidelines for preparation of dissertation report shall be followed by every student as per guidelines given by the department
4. The final dissertation report shall be submitted on or before the submission date mentioned in academic calendar.
5. For DISSERTATION, three hard bound copies (for supervisor, department library and student copy) along with a soft copy (in CD containing pdf of the report, certificate of paper published (if any) and detailed paper, with name, enrollment number, branch, year of admission of the student written on the CD) of the dissertation report shall be submitted to the Head of the Department before final examination of DISSERTATION on or before the date notified by the University. Reports must be certified by the supervisor, Head of the Department and the Head of the Institution.
6. Dissertation viva - voce will be held within the date fixed in the academic calendar and the grades will be finalized. External examiner will evaluate dissertation work in semester VI. For DISSERTATION External examiner shall be from outside the Institution. The external expert who examines the dissertation will conduct the viva voce.
7. Details of the all internal review (Internal continuous evaluation) and external exams (External Practical) shall be adequately notified so as to enable interested faculty members and students to attend the same.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Diploma in Mechanical Engineering
SEMESTER VI

6.4) Work to be completed by the students till the internal review and external viva (External Pr) exam should be as follows:

Sem	Subject and Sub. Code	Details	Work to be complete
Sem VI	DISSERTATION PROGRESS REVIEW	**DISSERTATION PROGRESS REVIEW I** for continuous evaluation (To be taken at the end of 1st month of sem VI)	Students should demonstrate in-depth knowledge and thoughtful application in stating an in-depth analysis of key theories supporting the study, problem definition must be complete. In this Presentation students have to teach the theory related to dissertation title with 10% of work completion.
		DISSERTATION PROGRESS REVIEW II for continuous evaluation (To be taken at the end of 2nd month of sem VI)	Literature review and problem definition with objectives should be complete. Presentation of literature review should be in terms of table comparing different points. 20% of work should be complete
		DISSERTATION PROGRESS REVIEW III for continuous evaluation (To be taken at the end of 3rd month of Sem VI)	Demonstrate understanding, Application of relevant methodology, techniques and analysis with 40% of work completion.
		DISSERTATION PROGRESS REVIEW IV for continuous evaluation (To be taken at the 4th Month of Sem VI)	60% of work should be complete, future action plan/methodology and outcomes must be clear. (If dissertation is based on simulation/analysis and hardware then 100% simulation/analysis work should be complete)
	FINAL DISSERTATION	**FINAL DISSERTATION** (External-Pr) (To be taken at the end of sem VI)	100% of work should be complete, reporting the study's main results/findings with clear interpretation and discussion of the results.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, INDORE

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore