Third – Year Curriculum Syllabus for B.Voc. Degree Programme in

Industrial Tool Manufacturing

(DrBabasahebAmbedkar Technological University, Lonere)

Semester V

Sr. No.	Course Code	Name of the Course	Teaching scheme			Evaluation on Scheme			Credits	Tot al Marks
			L	T	P	IA	MSE	ESE		
General Education										
		Theory								
1	BVTMC501	Reliability, Maintenance & Safety Engineering	3	0	0	25	0	25	3	50
2	BVTMC502	Design Concepts in Engineering	3	0	0	25	0	25	3	50
3	BVTMC503	Product Design and Development	3	0	0	25	0	25	3	50
4	BVTMC504	CAD & CAM	3	0	0	25	0	25	3	50
		Total							**12**	**200**
Skill Components										
		Lab/Practical								
5	BVTMC505	CAD & CAM Lab - Practical	0	0	1	50	0	50	3	100
		On-Job-Training (OJT)/Qualification Packs (Any One)								
			Evaluation Scheme							
			IA			**ESE**				
5	BVTME516	Tool & Die Maker (CSC/Q0306)	50			150			15	200
6	BVTME527	Designer _ Mechanical (CSC/Q0405)								
7	BVTME538	Service Engineer _ Breakdown Service (CSC/Q0503)								
		Total							**18**	**300**

Semester VI

Sr. No.	Course Code	Name of the Course	Teaching scheme			Evaluation on Scheme			Credits	Tot al Marks
			L	T	P	IA	MSE	ESE		
General Education										
		Theory								
1	BVTMC601	Rapid Prototyping and Reverse Engineering	3	0	0	25	0	25	3	50
2	BVTMC602	Process Planning and Cost Estimation	3	0	0	25	0	25	3	50
		Total							**06**	**100**
Skill Components										
		Lab/Practical								
3	BVTMC603	Project	0	0	1	100	0	100	12	200
		On-Job-Training (OJT)/Qualification Packs (Any one more QP to be opted from the QPs mentioned in the semester V)								
			Evaluation Scheme							
			IA			**ESE**				
4	BVTME516	Tool & Die Maker (CSC/Q0306)	50			150			15	200
5	BVTME527	Designer – Mechanical (CSC/Q0405)								
6	BVTME538	Service Engineer – Breakdown Service (CSC/Q0503)								
		Total							**27**	**400**

Semester

V

Syllabus

Subject Name: Reliability, Maintenance & Safety Engineering	
Course Code : **BVTMC501**	Semester: **V**
Weekly Teaching Hours: TH: **03** Tut: **00**	Scheme of Marking TH: **25,** IA: **25,** Total: **50**
TH Exam Duration: **01 Hours**	Scheme of Marking PR: --
Credit:**3**	

Content		Hours
Unit – I	**Reliability**	08
	Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability	
Unit II	**Constant Failure rate model**	07
–	Exponential Reliability function, Failure Modes, CFR model, memory lessness, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement	
Unit III	**Design for reliability**	07
–	Reliability specifications and system Measurements, System Effectiveness, redundancy, Classification of Redundancy. Introduction of failure mode and effect analysis(FMEA)	
Unit IV	**Maintainability**	07
–	Analysis of Downtime, repair time distribution, stochastic point processes.	
Unit V	**Safety engineering**	07
–	Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipments, Safety targets, standards, objectives.	

Books

Name of Authors	Title of the Book	Publisher
Dr.A.K.Gupta	Reliability, Maintenance & Safety Engineering	Laxmi publication
Alessandor	Reliability Engineering	Springer
Frank R Spellman	Safety Engineering	Rowman Littlefield

Subject Name: Design Concepts in Engineering	
Course Code : **BVTMC502**	Semester: **V**
Weekly Teaching Hours: TH: **03** Tut: **00**	Scheme of Marking TH: **25,** IA: **25,** Total: **50**
TH Exam Duration: **01 Hours**	Scheme of Marking PR: **--**
Credit:**3**	

Content		Hours
Unit I	**Design Fundamentals**	08
	Importance of design- The design process-Considerations of Good Design Morphology of Design Organization for design Computer Aided Engineering Designing to codes and standards Concurrent Engineering Product and process Cycles Technological Forecasting Market Identification Competition Bench marking.	
Unit II	**Customer Oriented Design & Societal Considerations**	08
	Identification of customer needs- customer requirements- Quality Function employment- Product Design Specifications- Human Factors in Design Ergonomics and Aesthetics. Societal consideration –Contracts Product liability. Protecting intellectual property Legal and ethical Domains Codes of ethics –Ethical conflicts Environment responsible design-future trends in interaction of engineering with society.	
Unit III	**Design Methods**	08
	Creativity and Problem Solving Creativity methods-Theory of Inventive Problem Solving (TRIZ) Conceptualdecomposition- Generating designconcepts-AxiomaticDesign Evaluation methods- Embodiment Design-Product Architecture-Configuration Design- Parametric Design. Role of models in design-Mathematical Modeling Simulation Geometric Modeling Rapid prototyping-Finite Element Analysis Optimization Search Methods.	
Unit IV	**Material Selection Processing and Design**	08
	Material Selection Process Economics Cost Vs. Performance Weighted property Index Value Analysis Role of Processing in Design Classification of Manufacturing Process Design for Manufacture Design for Assembly Designing for castings, Forging, Metal Forming, Machining and Welding Residual Stresses Fatigue, Fracture andFailure.	

Books

Name of Authors	Title of the Book	Publisher
Dr.Mukesh Krishnanan	Concept in Engineering Design	Notion Press
Mark N Horenstein	Design Concept For Engineers	Pearson
Atif Aziz	Concept in Engineering Design	New Age International

Subject Name: Product Design and Development	
Course Code : **BVTMC503**	Semester: **V**
Weekly Teaching Hours: TH: **03** Tut: **00**	Scheme of Marking TH: **25,** IA: **25,** Total: **50**
TH Exam Duration: **01 Hours**	Scheme of Marking PR: **--**
Credit:**3**	

Content		Hours
Unit – I	**Importance of New Product**	10
	Definition-importance-Development Process, Importance of new product for growth of enterprise, Definition of product and new product, Responsibility for new product development, Demands on product development team, Classification of products from new product development point of view. New product development process and organization, Generic product development process for Market Pull Products, Modification of this process for other types of products.	
Unit II	**Need Analysis**	08
–	Problem formulation establishing economic existence of need, need identification and analysis, engineering statement of problem, establishing target specification.	
Unit III	**Generation of Alternatives and Concept Selection**	09
–	Concept generation- a creative process, Creativity, Road Elects to creative thinking-Fear of criticism and Psychological set, Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process, Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.	
Unit IV	**Preliminary and Detailed Design**	09
	Design Review Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility, Detailed design of subsystems, component design, Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.	

Books

Name of Authors	Title of the Book	Publisher
Karl T Ulrich	Product Design and Development	Tata MCGraw Hill
Devdas Shetty	Product Design For Engineers	Cengage Learning
Ali Jamnia	Product Design and Development	Taylor & Francis Ltd
Richard Crowson	Product Design & Factory Develpoment	Taylor & Francis Ltd

Subject Name: CAD & CAM	
Course Code **BVTMC504**	Semester: **V**
Weekly Teaching Hours: TH: **03** Tut: **00**	Scheme of Marking TH: **25,** IA: **25,** Total: **50**
TH Exam Duration: **01 Hours**	Scheme of Marking PR: --
Credit:**3**	

Content		Hours
Unit I	**Introduction CIM and CAD & Analysis**	08
	CIM: Introduction of CIM concept of CIM - evolution of CIM CIM wheel Benefits integrated CAD/CAM. CAD: Introduction CAD definition Shigley's designCAD activities benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling surface modeling solid modeling.	
Unit II	**Computer aided Manufacturing**	07
	CAM: Definition, functions, benefits. Group technology Part family Parts classification and coding - coding structure Optiz system, MICLASS system and CODE System –process planning CAPP Types of CAPP: Variant type, Generative type advantages of CAPP production planning and control Computer integrated production management system Master Production Schedule (MPS) Capacity planning Materials Requirement Planning (MRP) Manufacturing Resources Planning(MRP-II).	
Unit III	**CNC Machine and Component**	07
	CNC Machines: Numerical control definition components of NC systems development of NC DNC Adaptive control systems 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 centers machine axes conventions turning centre and machining centre design considerations of NC machine tools.	
Unit IV	**Part Programming**	07
	NC part programming methods manual programming conversational programming APT programming - Format: sequential and word address formats - sequence number coordinate system types of motion control: point-to-point, paraxial and contouring Datum points: machine zero, work zero, tool zero NC dimensioning reference points tool material tool inserts - tool offsets and compensation -NC Dimensioning preparatory functions and G codes, miscellaneous functions and M-codes interpolation: linear interpolation and circular interpolation.	
Unit V	**FMS, Integrated Material Handling and Robot**	07
	Types of manufacturing - introduction to FMS FMS components FMS layouts Types of FMS: flexible manufacturing cell flexible turning cell flexible transfer line flexible machining systems benefits of FMS - introduction to intelligent manufacturing system virtual machining. Computer Integrated material handling AGV: working principle types, benefits Automatic Storage and Retrieval Systems (ASRS).ROBOT definition robot configurations basic robot motion robot programming method robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection	

Books		
Name of Authors	**Title of the Book**	**Publisher**
P. Radhakrishna & S. Subramanyan	CAD/CAM/CIM	New Age Publication
Ibrahim Zeid	CAD-CAM	McGraw Hill
P N Rao	CAD-CAM	McGraw Hill
J.Shrinivas	CAD-CAM	Oxford
R.B.Patil	Computer Aided Design	Tech-Max Publications

Subject Name: CAD & CAM Lab	
Course Code : **BVTMC505**	Semester: **V**
Weekly Practicals: PR: **01** Tut: **00**	Scheme of Marking TH: **--**
TH Exam Duration: **--**	Scheme of Marking PR: **25,** IA: **25,** Total: **50**
Credit:**1.5**	

Content

1. Introduction and different features of the CADSoftware.
2. 2-DDrafting.
3. 3-DModeling.
4. 3-D Advanced Modeling.
5. Assemblymodeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet MetalOperations.
9. Surface Modeling
10. To prepare part programming for plain turningoperation.
11. To prepare part programming for turning operation in absolutemode.
12. To prepare part program in inch mode for plain turningoperation.
13. To prepare part program for taper turningoperation.
14. To prepare part program for turning operations using turningcycle.
15. To prepare part program for threadingoperation.
16. To prepare part program for slot millingoperation.
17. To prepare part program for gear cuttingoperation.
18. To prepare part program for gear cutting using millcycle.
19. To prepare part program for drillingoperation.

Group GTM3 of Qualifier Packs

Subject Name: Tool & Die Maker (CSC/Q0306)	
Course Code : **BVTME516**	Semester: **V**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: **150,** IA: **50,** Total: **200**
Credit:**15**	**Choose any one from specified Group GTM3 of Qualification Packs**
Syllabus for this qualifier Pack is available https://www.nqr.gov.in/qualification-title?nid=2366	

SubjectName:Designer – Mechanical (CSC/Q0405)	
Course Code **: BVTME527**	Semester: **V**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: **150,** IA: 5**0,** Total: **200**
Credit:**15**	**Choose any one from specified Group GTM3 of Qualification Packs**
Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/qualification-title?nid=2500	

Subject Name:Service Engineer – Breakdown Service (CSC/Q0503)	
Course Code **: BVTME538**	Semester: **V**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: **150,** IA: 5**0,** Total: **200**
Credit:**15**	**Choose any one from specified Group GTM3 of Qualification Packs**
Syllabus for this qualifier Pack is available on Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/qualification-title?nid=2391	

***Skill Practical assessment will be done rules/ procedure of respective Skill Sector Council of India**

Semester

VI

Syllabus

Subject Name: Rapid Prototyping and Reverse Engineering	
Course Code : **BVTMC601**	Semester: **VI**
Weekly Teaching Hours: TH: **03** Tut: **00**	Scheme of Marking TH: **25,** IA: **25,** Total: **50**
TH Exam Duration: **01 Hours**	Scheme of Marking PR: **--**
Credit:**3**	

Content		Hours
Unit I	**INTRODUCTION**	07
–	Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.	
Unit II	**CAD MODELLING AND DATA PROCESSING FOR RP**	07
	CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.	
Unit III	**RP SYSTEMS**	08
–	Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes. Extrusion - Based RP Systems, 3D Printing process modeling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure- properties, relationships, Benefits and drawbacks.	
Unit IV	**RAPID TOOLING**	07
	Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.	
Unit V	**RP APPLICATIONS**	07
–	Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP	

Books

Name of Authors	Title of the Book	Publisher
kaushik Kumar, Divya Zindani , J. Paulo Davim	Rapid Prototyping, Rapid Tooling and Reverse Engineering: From Biological Models to 3D Bio-Printers (Advanced Mechanical Engineering)	De Gruyter publication
Prof. G. A. Berti	Rapid Prototyping & Rapid Tooling	-

Subject Name: **Process Planning and Cost Estimation**	
Course Code : **BVTMC602**	Semester: **VI**
Weekly Teaching Hours: TH: **03** Tut: **00**	Scheme of Marking TH: **25,** IA: **25,** Total: **50**
TH Exam Duration: **01 Hours**	Scheme of Marking PR: --
Credit:**3**	

Content		**Hours**
Unit I	**Introduction to Process Planning**	09
	Process Planning Definition, Purpose of Process Planning, Concept of Process Planning, Objectives of Process Planning, Scope of Process Planning, and Information required to do Process Planning, Preparing Operation Planning Sheet.	
Unit II	**Process Planning activities**	09
	Process Planning Procedure, Approaches of Process Planning, Manual Process Planning, Computer Aided Process Planning, Factors Affecting Selection Process, Machine Capacity, Determination of Man, Machine and Material Requirements, Factors Influencing Choice of Machinery.	
Unit III	**Introduction to Cost Estimation**	09
	Reasons for doing Estimates, Importance of Estimating, Objectives or Purpose of Estimating, Functions Of Estimating, Cost Accounting of Costing, Importance of Costing, Aims of Cost Accounting, Difference Between Cost Estimating and Cost Accounting, Cost of Product (Ladder of Cost)Production Cost Estimation, Determination of Material Cost, Mensuration in Estimating.	
Unit IV	**Machining Time Calculation**	09
	Selection of Cutting Speed, Feed and Depth of Cut for Turning: Machining Time Calculation for Turning Operation. Selection of Cutting Speed, Feed and Depth of Cut for Milling Operation: Machining Time Calculation for Milling Operation. Selection of Cutting Speed, Feed Depth of Cut for Drilling Operation: Machining Time Calculation for Drilling Operation.	

Books

Name of Authors	**Title of the Book**	**Publisher**
B. Vijaya Ramnath, C. Elanchezhian, and R. Kesavan	Process Planning and Cost Estimation	New Age International Publishers
Dr. V. Jayakumar	Process Planning and Cost Estimation	Laxmi Publications
R. Panneerselvam, P. Sivasankaran	Process Planning and Cost Estimation	PHI

Name: Project	
Course Code : **BVTMC603**	Semester: **VI**
Weekly Teaching Hours: TH: **00** Tut: **00** PR : **03**	Scheme of Marking PR: 100**,** IA: 100**,** Total: 200
Credit:12	

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skill.

Group GTM3 of Qualifier Packs

(Any one more QP to be opted from the QPs mentioned in the semester V)

Subject Name: Tool & Die Maker (CSC/Q0306)	
Course Code : **BVTME516**	Semester: **VI**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: **150,** IA: **50,** Total: **200**
Credit:**15**	**Choose any one from specified Group GTM3 of Qualification Packs**
Syllabus for this qualifier Pack is available https://www.nqr.gov.in/qualification-title?nid=2366	

SubjectName:Designer – Mechanical (CSC/Q0405)	
Course Code **: BVTME527**	Semester: **VI**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: **150,** IA: 5**0,** Total: **200**
Credit:**15**	**Choose any one from specified Group GTM3 of Qualification Packs**
Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/qualification-title?nid=2500	

Subject Name:Service Engineer – Breakdown Service (CSC/Q0503)	
Course Code **: BVTME538**	Semester: **VI**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: **150,** IA: 5**0,** Total: **200**
Credit:**15**	**Choose any one from specified Group GTM3 of Qualification Packs**
Syllabus for this qualifier Pack is available on Syllabus for this qualifier Pack is available on https://www.nqr.gov.in/qualification-title?nid=2391	

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