

**Syllabus of  
Second Year for  
Bachelor of Vocation  
In  
Industrial Tool Manufacturing**



**Dr. Babasaheb Ambedkar Technological  
University,  
Vidyavihar, Lonere, Maharashtra 402103**

### Semester 3

Sr · No ·	Course Code	Name of the Course	Teaching scheme			Evaluati on Scheme			Credits	Tot al Mar ks	
			L	T	P	IA	MSE	ESE			
<b>General Education</b>											
			<b>Theory</b>								
1	BVEMC301	Tool Engineering - I	3	0	0	25	0	25	3	50	
2	BVEMC302	Production Automation & Computer Integrated Mfg.	3	0	0	25	0	25	3	50	
3	BVEMC303	Fundamentals of Mechatronics	3	0	0	25	0	25	3	50	
	BVEMC304	Machining and Machine Tools	3	0	0	25	0	25	3	50	
<b>Total</b>									<b>12</b>	<b>200</b>	
<b>Skill Components</b>											
			<b>Lab/Practical</b>								
4	BVEML305	Tool Engineering Lab	0	0	1	25	0	25	1.5	50	
	BVEML306	Mechatronics lab	0	0	1	25	0	25	1.5	50	
<b>On-Job-Training (OJT)/Qualification Packs ( Any One)</b>											
			<b>Evaluation Scheme</b>								
						<b>IA</b>		<b>ESE</b>			
5	BVEME317	Service Engineer – Installation (CSC/Q0501)	50			150			15	200	
6	BVEME328	Quality Inspector – Forged, Casted or Machined Component (CSC/Q0601)									
7	BVEME339	CNC Programmer (CSC/Q0401)									
	BVTME340	Maintenance Fitter – Mechanical (CSC/Q901)									
	BVTME351	CNC Setter Cum Operator – VMC (CSC/Q0123)									
<b>Total</b>									<b>18</b>	<b>300</b>	

## Semester 4

Sr · No ·	Course Code	Name of the Course	Teaching scheme			Evaluati on Scheme			Credits	Total Marks	
			L	T	P	IA	MSE	ESE			
<b>General Education</b>											
			<b>Theory</b>								
1	BVEMC401	Tool Engineering – II	3	0	0	25	0	25	3	50	
2	BVEMC402	Agile and Lean Manufacturing Systems	3	0	0	25	0	25	3	50	
3	BVEMC403	Metal Forming Processes	3	0	0	25	0	25	3	50	
4	BVEMC404	Mass Production Devices	3	0	0	25	0	25	3	50	
		<b>Total</b>							<b>12</b>	<b>200</b>	
<b>Skill Components</b>											
			<b>Lab/Practical</b>								
5	BVEML405	Tool and Die Making Lab	0	0	1	50	0	50	3	100	
<b>On-Job-Training (OJT)/Qualification Packs ( Any One)</b>											
			<b>Evaluation Scheme</b>								
						<b>IA</b>		<b>ESE</b>			
7	One more QP to be opted from the QPs mentioned in the Level 6 first semester (Any one)		50			150		15	200		
		<b>Total</b>							<b>18</b>	<b>300</b>	

**Semester**

**III**

**Syllabus**

<b>Subject Name: Tool Engineering - I</b>	
Course Code : <b>BVTMC301</b>	Semester: <b>III</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>1.0 INTRODUCTION</b>	08
	Concept, meaning and definitions of tool, tool design and tool engineering, Tools-types, classification, features & applications, Tool engineering-functions and importance to enhance productivity and quality, Importance of process planning in tool engineering, Economy-concept, meaning, importance and principles in tool engineering	
<b>Unit – II</b>	<b>2.CUTTING TOOLS</b>	07
	Cutting tool materials-types, composition, properties and applications, Carbide inserts-types, ISO-designation and applications, Re-sharpening methods of following cutting tools: i. Drill. ii. Side and face milling cutter. iii. End mill. iv. Centre drill etc..	
<b>Unit – III</b>	<b>3.0 PRESS TOOLS</b>	
	Press working processes-types, sketches and applications, Press tools: types, working, components and their functions, Concept, meaning, definitions and calculations of press tonnage and shut height of press tool, Shear action in die cutting operation, Centre of pressure: Concept, meaning, definition, methods of finding and importance, Die clearance: Concept, meaning, definition, reasons, effects and methods of application, Scrap strip layout: - Concept, importance, method to prepare, and determining percentage stock utilization, Types, working, and applications of stock stop, pilots, strippers and knockouts, Cutting dies-types and applications	
<b>Unit – IV</b>	<b>4.0 GRINDING MACHINES</b>	11
	Bending: Types, Parts and functions of bending die, Definition, calculations and factors affecting bend radii, bend allowance and spring back, Method to compute bending pressure, Types, sketch, working and applications of bending dies. Drawing dies-types and method to determine blank size for drawing operation, Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging), Forging dies- terminology, types, sketch, working and applications, Dies / Mould: Sketch, working and applications of following i. Extrusion. ii. Plastic injection. iii. Blow moulding.	

#### **Books**

<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
G R Nagpal	Tool Engineering & Design	Khanna
J K Kumar	Machine Tool Technology (Hindi)	
Hazra & Choudhary	Workshop Technology Vol. II	Tata MCGraw Hill
P C Sharma	Production Technology	S Chand

<b>Subject Name: Production Automation &amp; Computer Integrated Mfg</b>	
Course Code : <b>BVTMC302</b>	Semester: <b>III</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>1.0 GENERAL</b>	<b>08</b>
	Automation-Definition, Scope, its types and their merits, reasons for automation, Its appreciation and criticism, Meaning of the term Computer Integrated Manufacturing (CIM CAD/ CAM) Relationship between CIM and Automation <b>FUNDAMENTALS OF MANUFACTURING AND AUTOMATION:</b> Types of Industries-Manufacturing, Processing; Basic producers, Converter, Fabricators. Types of Production-Job shop production, Batch production Mass production (Quantity Production and Flow production). Manufacturing - Functions - Processing - Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations, Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view, Automation of welding Manufacturing Process Inputs - Raw materials, Equipments (Machine Tools), Tooling and fixtures, Energy and Labour, Outputs - Finished product and Scrape/Waste. Plant Layout - Its meaning and concept of fixed position layout, Process Layout, Product layout and Group technology layout, Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control	
<b>Unit – II</b>	<b>2.0 PRODUCTION CONCEPT</b>	<b>07</b>
	Such as Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems Automation Strategies and Their Effect - Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, computer integrated manufacturing. <b>PRODUCTION ECONOMICS:</b> Methods evaluation investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing, lead time and work in process	
<b>Unit – III</b>	<b>3.0 ASSEMBLY SYSTEM AND LINE BALANCING</b>	<b>07</b>
	The assembly process, Assembly system, Manual assembly lines, Line balancing problems, Computerised line, balancing methods, Other ways to improve the line balancing, flexible manual assembly line <b>AUTOMATED ASSEMBLY SYSTEMS:</b> Design for automated assembly, Types of automated assembly systems, Parts feeding devices, analysis of multi-station Assembly machines Analysis of single station assembly machines	
<b>Unit – IV</b>	<b>4.0 NUMERICAL CONTROL PRODUCTION SYSTEM</b>	<b>07</b>
	Numerical controlling, Coordinate system, and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS	
<b>Unit – V</b>	<b>5.0 N.C. PART PROGRAMMING</b>	<b>07</b>
	Tape and Tape format, Methods of N.C. part programming, Computer assisted part programming, The APT Language, Manual data inputs, N.C. part	

	programming using CAD/CAM and Computer automated part programming. DNC, CNC & ADAPTIVE CONTROL: Direct Numerical Control (DNC), Computer Numerical control (CNC), Adaptive Control Machining, Current trends in N.C., introductory idea of FMS (Flexible Manufacturing System).	
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<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
NK Mehta	Machine tool design & Numerical Control Machines	Tata MCGraw Hill
MP Groover	Automation Production system & Computer Integrated Manufacturing	<b>Pearson</b>

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<b>Subject Name: Fundamentals of Mechatronics</b>	
Course Code : <b>BVTMC303</b>	Semester: <b>III</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>INTRODUCTION</b>	08
	Introduction to Mechatronics, systems, measurement systems, control systems, the Mechatronics approach. Introduction to Transducers: Sensors and transducers, operating characteristics of transducers, measurement of displacement, velocity, pressure, flow, and temperature.	
<b>Unit – II</b>	<b>SIGNAL CONDITIONING</b>	07
	Signal conditioning- their features and various blocks, the operational amplifiers, Protection, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing. Data Presentation Systems: Displays, Data presentation elements, Magnetic recording, Displays, Data acquisition system, Telemetry- electrical, optical and pneumatic methods of telemetry..	
<b>Unit – III</b>	<b>INTRODUCTION TO PROCESS CONTROL SYSTEMS</b>	07
	Importance of process control, analog and digital processing, Supervisory digital control, direct digital control. Controller Characteristics: Process characteristics, control system parameters, Discontinuous controller modes (two position, multiple position, floating position), Continuous controller modes i.e. P, I, D, PI, PD, PID.	
<b>Unit – IV</b>	<b>INTRODUCTION OF MECHANICAL ACTUATION SYSTEMS</b>	07
	Mechanical Actuation Systems for motion, Kinematics chains, Cams, Gear trains, Belt and chain drives, Bearings. Pneumatic and Hydraulic Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Process control valves, rotary actuators	
<b>Unit – V</b>	<b>INTRODUCTION OF ELECTRICAL ACTUATION SYSTEMS</b>	07
	Electrical systems, Mechanical Switches, Solid-state switches, Solenoids, DC motors, AC motors, Stepper motors	

**Books**

Name of Authors	Title of the Book	Publisher
N P Mahalik	Mechatronics	Tata MCGraw Hill
W Bolton	Mechatronics	Pearson
Devdas Shetty	Mechatronics System Design	



<b>Subject Name: Machining and Machine Tools</b>	
Course Code <b>BVTMC304</b>	Semester: <b>III</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>CLASSIFICATION OF METAL REMOVAL PROCESS AND MACHINES MECHANICS OF METAL CUTTING</b>	08
	Geometry of single point cutting tool and tool angles, tool nomenclature in ASA, ORS, NRS and interrelationship, introduction of mechanism of chip formation and types of chips, chip breakers, orthogonal and oblique cutting, cutting forces and power required, theories of metal cutting, thermal aspects of machining and measurement of chip tool interface temperature, friction in metal cutting	
<b>Unit – II</b>	<b>MACHINABILITY</b>	07
	Concept and evaluation of machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability, Cutting fluids, types, properties, selection and application methods, General Purpose Machine Tools: tooling, attachments and operations performed, selection of cutting parameters, Simple calculation of time for machining.	
<b>Unit – III</b>	<b>SPECIAL PURPOSE MACHINE TOOLS</b>	07
	Automatic lathes, capstan and turret lathe machines, tracer attachment in machine tools, mechanical-copying machines, Hydraulic tracing Devices, Electric tracing systems, Automatic tracing, Abrasive Processes: Abrasives, natural and synthetic, manufacturing, nomenclature, selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding, machines for surface and cylindrical grinding, their constructional details and processes, surface finishing, honing, lapping, super finishing, polishing and buffing processes.	
<b>Unit – IV</b>	<b>THREAD AND GEAR MANUFACTURING</b>	07
	Casting, thread chasing, thread cutting on lathe, thread rolling, die threading and tapping, thread milling, thread grinding, Gear Manufacturing Processes: Hot rolling, stamping, powder metallurgy, extruding etc. gear generating processes, gear hobbling, gear shaping, gear finishing processes, shaving, grinding, lapping, shot blasting, phosphate coating, gear testing	

<b>Unit – V</b>	<b>HIGH VELOCITY FORMING METHODS</b>	<b>07</b>
	(High-energy rate forming processes) Definition, Hydraulic forming, explosive forming, electro-hydraulic forming, magnetic pulse forming	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
Hassan & Helmi A Youssef	Machine Technology	CRC Press
Geoffrey Boothroyd	Fundamentals of Machining & Machine Tools	
Steve F Krar & Albert Check	Machine Tool & Manufacturing Technology	

**Subject Name: Tool Engineering Lab**

Course Code : <b>BVTML305</b>	Semester: <b>III</b>
Weekly Practicals: PR: <b>01</b> Tut: <b>00</b>	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
Credit: <b>1.5</b>	

**Content**

1. Study of the influence of tool geometry on surface integrity
  - With positive rake angle
  - With negative rake angle
2. Effect of speed, feed, depth of cut and nose radius on surface topography of the Components machined using tool inserts
3. Cutting force measurement and construction of Merchant circle diagram as a function of Rake angle
4. Study of different type of chips
5. Tool tip temperature measurement during turning of heat treated and cast products
6. Machinability studies on different materials (for different conditions)
  - Machining of the heat treated samples
  - Machining of as-cast product
7. Measurement of tool wear of inserts due to machining

<b>Subject Name: Mechatronics lab</b>	
Course Code <b>BVTML306</b>	Semester: <b>III</b>
Weekly Practicals: PR: <b>01</b> Tut: <b>00</b>	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
Credit: <b>1.5</b>	

<b>Content</b>
<ol style="list-style-type: none"> <li>1. Displacement Measurement using Capacitive &amp; inductive Pick –ups.</li> <li>2. Study of Speed Measurement System: (a) Magnetic Pick-up (b) Stroboscope</li> <li>3. Study of Load Measurement System Load Cell</li> <li>4. Measurement of temperature using thermocouple, thermistor and RTD</li> <li>5. Measurement of displacement using POT, LVDT &amp; Capacitive transducer</li> <li>6. Torque measurement using torque measuring devices</li> <li>7. Strain Measurement using strain gauge</li> <li>8. Frequency to Voltage Converter and vice versa</li> <li>9. Position and velocity measurement using encoders</li> <li>10. Study on the application of data acquisition system for industrial purposes</li> </ol>

## Group GTM2 of Qualifier Packs

<b>Subject Name: Service Engineer –Installation (CSC/Q0501)</b>	
Course Code : <b>BVTME317</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	Choose any one from specified Group GTM2 of Qualification Packs
Syllabus for this qualifier Pack is available <a href="http://www.cgsc.in/pdf/0.pdf">http://www.cgsc.in/pdf/0.pdf</a>	

<b>Subject Name: Quality Inspector – Forged, Casted or Machined Component (CSC/Q0601)</b>	
Course Code : <b>BVTME328</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	Choose any one from specified Group GTM2 of Qualification Packs
Syllabus for this qualifier Pack is available on <a href="http://www.cgsc.in/pdf/.pdf">http://www.cgsc.in/pdf/.pdf</a>	

<b>Subject Name: CNC Programmer(CSC/Q0401)</b>	
Course Code : <b>BVTME339</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	Choose any one from specified Group GTM2 of Qualification Packs
Syllabus for this qualifier Pack is available on <a href="http://www.cgsc.in/pdf/.pdf">http://www.cgsc.in/pdf/.pdf</a>	

<b>Subject Name: Maintenance Fitter –Mechanical (CSC/Q901)</b>	
Course Code : <b>BVTME340</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	Choose any one from specified Group GTM2 of Qualification Packs
Syllabus for this qualifier Pack is available on <a href="http://www.cgsc.in/pdf/.pdf">http://www.cgsc.in/pdf/.pdf</a>	

<b>Subject Name: CNC Setter Cum Operator– VMC (CSC/Q0123)</b>	
Course Code : <b>BVTME351</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>05</b> , Total: <b>200</b>
Credit: <b>15</b>	Choose any one from specified Group GTM2 of Qualification Packs
Syllabus for this qualifier Pack is available on <a href="http://www.cgsc.in/pdf/.pdf">http://www.cgsc.in/pdf/.pdf</a>	

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

**Semester**

**IV**

**Syllabus**

<b>Subject Name: Tool Engineering - II</b>	
Course Code : <b>BVTMC401</b>	Semester: <b>IV</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: --
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>1. Tool holders</b>	08
	Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.	
<b>Unit – II</b>	<b>2. Locating and clamping devices</b>	07
	Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting	
<b>Unit – III</b>	<b>3. Clamping devices</b>	06
	Types, Sketches with nomenclature, Working, Applications	
<b>Unit – IV</b>	<b>4. Jigs and fixtures</b>	07
	Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures	
<b>Unit -- V</b>	<b>5. Design of Jigs and Fixtures</b>	08
	Steps in designing jigs and fixture for given simple component	

**Books**

Name of Authors	Title of the Book	Publisher
K. Venkataraman	Design of Jigs, Fixtures and Press Tools	John Wiley & Sons
<b>Albert Atkins Dowd</b>	<b>Tool Engineering; Jigs And Fixtures</b>	McGraw-Hill
Kempster	Introduction to Jig & Fixture Design	
Edward G. Hoffman	Jig and fixture design	London : Delmar Pub

<b>Subject Name: Lean and Agile Manufacturing</b>	
Course Code : <b>BVTMC402</b>	Semester: <b>IV</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: --
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>1. Introduction</b>	08
	Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production	
<b>Unit – II</b>	<b>2. Waste Identification</b>	07
	Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection	
<b>Unit – III</b>	<b>3. Value stream mapping</b>	07
	Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities	
<b>Unit – IV</b>	<b>4. Lean manufacturing tools</b>	07
	Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools	
<b>Unit – V</b>	<b>5. Agile manufacturing</b>	07
	Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
R. Devadasan , V. Sivakumar, R. Murugesh, P. R. Shalij	Lean and Agile Manufacturing	PHI Learning Pvt. Ltd.
Terra Vanzant Stern	Lean and Agile Project Management: How to Make Any Project Better, Faster, and More Cost Effective	CRC Press
M P Chowdiah	Agile Manufacturing: Globalised Customerized Green Products	
Lonnie Wilson	How To Implement Lean Manufacturing	McGraw Hill Professional



<b>Subject Name: Metal Forming Processes</b>	
Course Code : <b>BVTMC403</b>	Semester: <b>IV</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: --
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>1. Rolling</b>	08
	Introduction, Types of rolling, Hot rolling, Two high reversing mill, Three high mill, Continuous mill, Roll bending	
<b>Unit – II</b>	<b>2. Forging</b>	07
	Introduction, Advantages of Forging, Application of Forging, Limitations of Forging, Upsetting, Hollow Forging, Impression die or closed, Methods of Forging, Drop Forging, Press Forging, Hammer and press Forging, Hot bar Forging, Upset Forging	
<b>Unit – III</b>	<b>3. Extrusion</b>	07
	Direct and forward, Sleeve method of direct, Indirect or backward, Impact Extrusion, Tube Extrusion, Stepped Extrusion, Combined forging and Extrusion	
<b>Unit – IV</b>	<b>4. Drawing</b>	07
	Wire Drawing, Cupping and Bending, Tube Drawing, Spinning, Hot and cold Spinning Advantages of Metal Spinning	
<b>Unit – V</b>	<b>5. Pipe and Tube Production</b>	07
	Manufacturing of seamless pipe- Butt welded pipe- Lap welded pipe	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
J.G. Lenard	Metal Forming Science and Practice	Mcgraw hill
Zygmunt Wusatowski	Fundamentals of Rolling	Pergamon
Hazra chaowdhari	workshop technology volume 1	Media Promoters & Pub Pvt Ltd
P. N. Rao	Manufacturing Technology, Volume 1	Tata McGraw-Hill Education, 2013

<b>Subject Name: Mass Production Devices</b>	
Course Code <b>BVTMC404</b>	Semester: <b>IV</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: --
Credit: <b>3</b>	

<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>1. Introduction</b>	08
	Properties of tool material, types of tool material, 5 basic requirement of tool material and general consideration in tool design, Tools-types, classification, features & applications	
<b>Unit – II</b>	<b>2. Design of Cutting Tools</b>	08
	Geometry and features of Single point tool, Boring tool, Twist Drill, Milling cutter, Broaches. Carbide inserts-types, ISO-designation and applications.	
<b>Unit – III</b>	<b>3. Press Tools</b>	08
	Introduction to Press tools, Elements of press tools - punches, punch holder, knockouts, pilots stock, Types of punches, Standards die sets, Element of blanking die, Element of drawing die, Element of bending die, Working of progressive and compound dies	
<b>Unit – IV</b>	<b>4. Jig &amp; Fixtures-I</b>	06
	Usefulness, Principles of Jig & Fixtures design, Principle of location, Locating and Clamping devices	
<b>Unit – V</b>	<b>5. Jig &amp; Fixtures-II</b>	06
	Type of jigs, Element of a fixture, Milling fixtures, Lathe fixture, Economics of jigs and fixtures	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
Dr P C Sharma	Production Engineering	S Chand Publications
K. Venkataraman	Design of Jigs, Fixtures and Press Tool	John Wiley & Sons
<b>Albert Atkins Dowd</b>	Tool Engineering; Jigs And Fixtures	McGraw-Hill
Edward G. Hoffman	Jig and fixture design	London : Delmar Pub

<b>Subject Name: Tool &amp; Die Making Lab</b>	
Course Code : <b>BVTML405</b>	Semester: <b>IV</b>
Weekly Practicals: PR: <b>02</b> Tut: <b>00</b>	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: <b>50</b> , IA: <b>50</b> , Total: <b>100</b>
Credit: <b>3</b>	

<b>Content</b>
<ol style="list-style-type: none"> <li>1. Manufacture of Box Jig and Angle plate jig</li> <li>2. Manufacture of “V” Block angle grinding Fixtures and profile milling fixture</li> <li>3. Manufacture of simple Blanking &amp; piercing Tool</li> <li>4. Manufacture of Progressive tool for producing a Cycle chain link</li> <li>5. Manufacture of Press tools like Combination tool &amp; Compound tool</li> <li>6. Manufacture of Draw tool</li> <li>7. Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup ,Washer and Cycle bell cup</li> <li>8. Manufacture of simple V and U bending tool</li> <li>9. Maintenance of Jig&amp; fixture and press tool</li> </ol>

<b>Group GTM2 of Qualifier Packs</b>
One more QP to be opted from the QPs mentioned in the Level 6 first semester (Any One)