

| GANPAT UNIVERSITY                   |                     |    |                 |    |                                     |                        |    |           |       |
|-------------------------------------|---------------------|----|-----------------|----|-------------------------------------|------------------------|----|-----------|-------|
| FACULTY OF ENGINEERING & TECHNOLOGY |                     |    |                 |    |                                     |                        |    |           |       |
| Programme                           | Diploma Engineering |    |                 |    | Branch                              | Mechanical Engineering |    |           |       |
| Semester                            | V                   |    |                 |    | Version                             | 1.0.0.0                |    |           |       |
| Effective from Academic Year        |                     |    | 2020-21         |    | Effective for the batch Admitted in |                        |    | July 2018 |       |
| Subject code                        | 1ME2502             |    | Subject Name    |    | MACHINE TOOLS TECHNOLOGY            |                        |    |           |       |
| Teaching scheme                     |                     |    |                 |    | Examination scheme (Marks)          |                        |    |           |       |
| (Per week)                          | Lecture(DT )        |    | Practical(Lab.) |    | Total                               |                        | CE | SEE       | Total |
|                                     | L                   | TU | P               | TW |                                     |                        |    |           |       |
| Credit                              | 3                   | 0  | 2               | 0  | 5                                   | Theory                 | 40 | 60        | 100   |
| Hours                               | 3                   | 0  | 4               | 0  | 7                                   | Practical              | 60 | 40        | 100   |

| Pre-requisites:   |
|---|
| Student must have knowledge of workshop practices, work shop tools, manufacturing processes like metal removal process, non-traditional machining processes, advance machining processes, engineering drawing and production drawing. Students also have Knowledge of limits, fits and tolerance. |

| Course Learning Outcomes:   |
|---|
| <p>The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:</p> <p>After completions of this course, students will able to:</p> <p>CO1. Explain working of grinding, super finishing, gear cutting, broaching, threading, non-conventional machining and advance machining methods with kinematics systems of each element.</p> <p>CO2. Interpret designation system / method of cutting tools and tool holders used on machine tools.</p> <p>CO3. Select appropriate cutting tools, work holding devices and cutting parameters for the given work piece.</p> <p>CO4. Set the machine and mount the job, cutting tools and tool holders correctly.</p> <p>CO5. Developing the skill of manufacturing. Ability to convert the engineering drawing in to production drawing.</p> <p>Make the job as per given manufacturing drawing. The practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.</p> |

| Course Content   |   |   |       |     |
|--|---|---|-------|-----|
| Name of UNIT   | Unit Content  | Unit Learning Outcomes  | Marks | Hrs |
| <p><b>UNIT – 1</b><br/><b>Introduction to Manufacturing Engineering-III.</b></p> | <p><b>1.1</b> Need, Scope &amp; importance of Manufacturing Engineering-III in the industries-----various grinding and super-finishing machines, thread production, broaching machines, Non-conventional and advance methods of machining. Electro-mechanical systems (MEMS).</p> <p><b>1.2</b> Definitions of machine tool, cutting speed, feed, depth of cut, metal removal rate, surface finish symbols and values, cutting tools and their geometry.</p> <p><b>1.3</b> Importance of processes and required parameters (like material removal rate, cutting power, cutting time, cutting speed, feed, depth of cut, number of cuts, tool signature, tool life etc.) on quality and cost of product.</p> <p><b>1.4</b> Need of attitude, knowledge &amp; skill required for shop floor supervision in Machine tools based industries for quality and cost effective production</p> | <p><b>1a.</b> Explain Need, Scope &amp; importance of Manufacturing Engineering.</p> <p><b>1b.</b> Define machining parameters.</p> <p><b>1c.</b> Explain the effect of different machining parameters on quality and cost of product.</p>  | 4     | 4   |
| <p><b>UNIT – 2</b><br/><b>Grinding and super finishing processes.</b></p>        | <p><b>2.1</b> Cutting action of grinding wheel.</p> <p><b>2.2</b> Terms associated with grinding wheel operations including loading, Dressing and truing.</p> <p><b>2.3</b> Grinding wheels Nomenclature and Types and shapes of Grinding wheels.</p> <p><b>2.4</b> Classification, Constructional features working, application and cutting parameters of following grinding machines with commonly used grinding wheels and work piece materials. Methods of mounting work piece on</p>   | <p><b>2a.</b> Explain Cutting action of grinding wheel.</p> <p><b>2b.</b> Define Terms associated with grinding wheel operations including loading, glazing, Dressing and truing.</p> <p><b>2c.</b> Select grinding wheel and Maintain grinding wheel for effective grinding.</p> <p><b>2d.</b> Classify grinding machines.</p> <p><b>2e.</b> Describe constructional features and working of</p> | 14    | 9   |

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|--|---|--|----|----|
|  | <p>cylindrical grinding machines (Including chuck and mandrel)</p> <p>i) Cylindrical (centre less, internal &amp; external) grinding machines.</p> <p>ii) Bench and portable grinder.</p> <p>iii) Tool and cutter grinding machine.</p> <p>iv) Profile grinding machine.</p> <p><b>2.6</b> Honing, lapping, buffing and other super finishing processes and their applications.</p>   | <p>various grinding and super-finishing machines.</p> <p><b>2f.</b> Explain Honing, lapping, buffing &amp; super-finishing processes with their applications.</p> <p><b>2g.</b> Select appropriate finishing operation and grinding machine as per production drawing of the component.</p>  |    |    |
| <p><b>UNIT – 3</b><br/><b>Gear manufacturing &amp; finishing processes.</b></p>            | <p><b>3.1</b> Types of gears, nomenclature of spur and helical gears.</p> <p><b>3.2</b> Gear generating and forming processes-concept, differences and applications. Gear finishing processes- shaving &amp; grinding.</p> <p><b>3.3</b> Classification, constructional features, working and application of gear milling, gear hobbing and gear shaping machines.</p> <p><b>3.4</b> Tool mounting methods on gear milling, gear shaping and gear hobbing machines.</p> | <p><b>3a.</b> List types of gears.</p> <p><b>3b.</b> Types of Gear forming &amp; gear generating manufacturing Methods &amp; gear finishing processes.</p> <p><b>3c.</b> Describe constructional features working, and application of various gear manufacturing machines.</p> <p><b>3e.</b> Select appropriate gear manufacturing machine as per the given situation.</p> | 12 | 8  |
| <p><b>UNIT – 4</b><br/><b>Thread production methods.</b></p>                               | <p><b>4.1</b> Thread nomenclature and important terminologies used in thread production drawing.</p> <p><b>4.2</b> Various threads production processes like turning, rolling, grinding, tapping, etc. their applications (including Helicoil), advantages and limitations.</p> <p><b>4.3</b> Thread cutting parameters for commonly used materials and work-piece.</p>   | <p><b>4a.</b> Explain thread production processes.</p> <p><b>4b.</b> Describe constructional features and working of various thread production Machines.</p> <p><b>4c.</b> Select appropriate thread production machine as per the given situation.</p> <p><b>4d.</b> Explain different steps for producing thread on thread production machine.</p>                       | 8  | 4  |
| <p><b>UNIT – 5</b><br/><b>Broaching, jig boring and special purpose machine tools.</b></p> | <p><b>5.1</b> Types, constructional features including coolant and lubrication systems, motion and power transmission path, working and applications of broaching machines.</p> <p><b>5.2</b> Different Shapes that can be produced by broaching process.</p>   | <p><b>5a.</b> Explain constructional features, working and applications of broaching machines.</p> <p><b>5b.</b> List types of broaching machines and types of broch tool.</p>   | 10 | 10 |

|   |  |  |    |    |
|---|--|--|----|----|
|   | <p><b>5.3</b> Nomenclature and sketch of a simple broach.</p> <p><b>5.4</b> Types, constructional features, working and application of jig boring machines. different locating &amp; measuring system in jig boring machine.</p> <p><b>5.5</b> Concept of SPM (Only names) and their need and areas of application.</p>  | <p><b>5c.</b> Select appropriate broaching machine as per the given situation.</p> <p><b>5d.</b> Explain constructional features and working of jig boring machines.</p>   |    |    |
| <p><b>UNIT – 6</b></p> <p><b>Non-conventional and advance methods of machining.</b></p> | <p><b>6.1</b> Need of nonconventional machining and comparison between conventional &amp; non-conventional machining methods.</p> <p><b>6.2</b> Classification, working principles, application and working parameters of following non-conventional machining methods:</p> <p>i. Electro chemical machining (ECM).<br/> ii. Electro chemical grinding.( ECG)<br/> iii. Electro discharge machining (EDM)<br/> iv. Ultrasonic machining (USM).<br/> v. Abrasive jet machining (AJM).<br/> vi water jet machining (WJM)<br/> vii Laser beam machining (LBM).<br/> viii Electron beam machining (EBM).</p> <p><b>6.3</b> Need of micro electro-mechanical systems (MEMS).</p> <p><b>6.4</b> Materials and their properties used for MEMS manufacturing.</p> <p><b>6.5</b> Working principle and applications of MEMS fabrication techniques:</p> <p>i. Chemical vapour deposition.<br/> ii. Lithography.<br/> iii. Photolithography.<br/> iv. Dry &amp; wet etching.</p> | <p><b>6a.</b> Appreciate use of Non-conventional machining methods.</p> <p><b>6b.</b> Explain working principles and working parameters of non-conventional machining methods.</p> <p><b>6c.</b> Select a non-conventional machine as per requirement.</p> <p><b>6d.</b> Explain micro electro-mechanical systems (MEMS).</p> <p><b>6e.</b> List materials used for MEMS.</p> <p><b>6f.</b> Explain working principle and applications of various MEMS fabrication techniques.</p> | 14 | 10 |

| List of Practical |          |  |
|-------------------|----------|--|
| No.               | Unit     | Name of Practical  |
| 1                 | UNIT – I | Demonstrate various cutting parameters, carbide inserts with ISO designation system and explain the steps to calculate cutting speeds of different machine tool like as lathe, shaper, drilling and milling machine. |

|    |                    |   |
|----|--------------------|---|
| 2  | UNIT – I           | To study about single point cutting tool Geometry and Grinding various cutting tool angles of single point cutting tool.  |
| 3  | UNIT – II,III,IV,V | To study and demonstrate about Kinematics and motion transmission systems of different machine tool like as shaper, milling, drilling, grinding etc.  |
| 4  | UNIT – I           | <b>Prepare a turning job on lathe machine.</b><br>Sketch the production drawing of the part. Part should include turning, taper turning, knurling, facing, chamfering, grooving,                        |
| 5  | UNIT –IV           | <b>Prepare a Threading job on lathe machine.</b><br>Sketch the production drawing of the part. Part should include external and internal two start threading operation on lathe machine.                |
| 7  | UNIT – III         | <b>Prepare Gear on milling machine.</b><br>Sketch the production drawing of the part. Part should include gear cutting operation by gear milling process on milling machine.                            |
| 8  | UNIT – II          | <b>Prepare job on surface grinding machine.</b><br>Sketch the production drawing of the part. Part should include surface finishing operation by surface grinding operation on surface grinding machine |
| 9  | UNIT - VI          | Demonstrate and prepare a job on any one non-conventional machine.  |
| 10 | UNIT-V & VI        | <b>Presentation</b><br>Using power point presentation, each student will present the topic.<br>Presentation must include related movie/s.   |

#### List of Instruments/Equipment/Trainer Board

|   |  |
|---|--|
| 1 | Lathe Machine  |
| 2 | Milling Machine, Indexing head                       |
| 3 | Surface Grinding Machine , Bench Grinding Machine    |
| 4 | Radial Drilling Machine                              |
| 5 | Shaping Machine                                      |
| 6 | Work holding devices for all machines                |
| 7 | Measuring instruments                                |
| 8 | Single point cutting tool, multi point cutting tool. |

#### Link of Text Books

| No | Title of Books             | Authors         | Publication                 |
|----|----------------------------|-----------------|-----------------------------|
| 1  | Machine tools technology   | G. S. Kandasami | Khanna publisher            |
| 2  | Production Technology      | HMT             | Tata McGraw Hill, New Delhi |
| 3  | Modern Machining Processes | P. C. Pandey    | Tata McGraw Hill, New Delhi |

#### List of Reference Books

| No | Title of Reference Books                          | Authors                             | Publication        |
|----|---|-------------------------------------|--------------------|
| 1  | Advanced Machining                                | V.K.Jain                            | Allied Publishers, |
| 2  | M.E.M.S.: Fundamental Technology and Application  | VikasChoudhary                      | CRC Press          |
| 3  | Fundamentals of Metal Machining and Machine Tools | W. A. Knight and Geoffrey Boothroyd | CRC Press          |
| 5  | Manufacturing Engineering and Technology          | SeropeKalpakJian                    | Pearson            |

#### Link of Learning Web Resource

|   |   |
|---|---|
| 1 | <a href="http://nptel.ac.in/video.php?subjectId=112105126">http://nptel.ac.in/video.php?subjectId=112105126</a> |
| 2 | <a href="http://nptel.ac.in/courses.php?disciplineld=112">http://nptel.ac.in/courses.php?disciplineld=112</a>   |

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|---|---|
| 3 | <a href="http://nptel.ac.in/courses/112105126/27">http://nptel.ac.in/courses/112105126/27</a>       |
| 4 | <a href="http://nptel.ac.in/courses/112104028/">http://nptel.ac.in/courses/112104028/</a>           |
| 5 | <a href="http://www.youtube.com/watch?v=mWy9awGv6so">http://www.youtube.com/watch?v=mWy9awGv6so</a> |
| 6 | <a href="http://www.youtube.com/watch?v=mKES5Fyz9I0">http://www.youtube.com/watch?v=mKES5Fyz9I0</a> |
| 7 | <a href="http://www.youtube.com/watch?v=49GpJ7yhecq">http://www.youtube.com/watch?v=49GpJ7yhecq</a> |
| 8 | <a href="http://www.youtube.com/watch?v=pl1QGpmKqow">http://www.youtube.com/watch?v=pl1QGpmKqow</a> |

## PO & CO Mapping

| Sr.No | Name of PO | Description   | Co1 | Co2  | Co3 | Co4 | Co5  |
|-------|------------|---|-----|------|-----|-----|------|
| 1     | PO 1       | Acquire fundamental knowledge of mathematics, science, and civil engineering.   | SLI | NONE | SLI | SLI | SLI  |
| 2     | PO 2       | Design and conduct experiments, as well as analyze and interpret data.  | SLI | SUB  | MED | MED | SUB  |
| 3     | PO 3       | Use the techniques, skills, and modern engineering tools necessary for engineering practice                                       | SUB | MED  | SUB | MED | MED  |
| 4     | PO 4       | Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.                                     | SLI | SLI  | MED | SLI | NONE |
| 5     | PO 5       | Clear understanding of his duties and responsibilities as a civil engineer.   | MED | MED  | MED | SLI | SLI  |
| 6     | PO 6       | Develop effective communication skill and provide leadership for professional development.  | MED | MED  | SLI | SUB | MED  |
| 7     | PO 7       | Engage in life-long learning in civil engineering field and comprehend issues related to environment and sustainable development. | SLI | SUB  | MED | MED | MED  |
| 8     | PO 8       | Graduate will demonstrate knowledge of professional and ethical responsibilities.   | SLI | SLI  | SLI | SLI | NONE |
| 9     | PO 9       | Incorporate economics and business practice including project and risk management.  | SLI | NONE | SLI | MED | SLI  |
| 10    | PO 10      | Graduated are able to share their knowledge to the industries as well as society.   | SUB | MED  | SLI | MED | MED  |
| 11    | PO 11      | Graduated will be able to apply their skill and knowledge for the sustainable development of nation.                              | SLI | MED  | SLI | MED | SLI  |
| 12    | PO 12      | Graduated are able to learn to work with with the team and also with the inter discipliners.                                      | SLI | MED  | SLI | SLI | MED  |