| **Walchand College of Engineering, Sangli***(Government Aided Autonomous Institute)* |
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| **AY 2023-24** |
| **Course Information** |
| **Programme** | B. Tech. (Mechanical Engineering) |
| **Class, Semester** | Third Year B. Tech., Sem. V |
| **Course Code** | 6OE329 |
| **Course Name**  | OE 1-Non Conventional Machining Processes |
| **Desired Requisites:** |  |
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| **Teaching Scheme** | **Examination Scheme (Marks)** |
| **Lecture** | 3Hrs/week | MSE | ISE | ESE | Total |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
| **Practical** | - | - |
| **Interaction** | - | **Credits: 3** |
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| **Course Objectives** |
| **1** | To learn about various nonconventional machining processes the various techniques, performance characteristics and their applications |
| **2** | To introduce students with various machine tools and their peculiars used for nonconventional machining. |
| **3** | To train the students to identify main variables of nonconventional machining processes and to judge their effect on developed products. |
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| **Course Outcomes (CO) with Bloom’s Taxonomy Level** |
| At the end of the course, the students will be able to, |
| **CO1** | Explain various nonconventional machining processes, tooling and equipment’s required for various manufacturing applications. | understanding |
| **CO2** | Exploit the capabilities and applications of nonconventional machining processes. | Apply |
| **CO3** | Analyze effect of different parameters influencing on nonconventional machining processes and compare with other technique applications. | Analyze |
|  |
| **Module** | **Module Contents** | **Hours** |
| I | **Introduction:** Introduction to nontraditional machining methods -Need for non -traditional machining -Sources of metal removal, Classification on the basis of energy sources -Parameters influencing selection of process. | 6 |
| II | **Mechanical Type AMPs:** Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining – Ultrasonic Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters– MRR- Applications | 7 |
| III | **Thermal Type AMPs:** Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications- Micro-EDM, Micro-WEDM. | 7 |
| IV | **Chemical Type AMPs:** Principles of Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants – Maskant -techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications- equipments-Surface Roughness and MRR, Electrical circuit-Process Parameters- ECG and ECH – Applications | 7 |
| V | **Medium Assisted AMPs:**Laser Beam Machining: Material removal mechanism, types of Lasers, LBM equipment, process characteristics, applications. Electron Beam Machining: Basic equipment and metal removal mechanism, process characteristics, applications. Plasma Beam Machining: Machining systems, material removal rate, accuracy and surface quality, applications. Ion Beam Machining: Introduction, material removal rate, accuracy and surface effects, applications | 7 |
| VI | **Advanced MPs:**Basics and definitions: Principle of layer-based technology, advantages, classification. Rapid Prototyping Process Chain: 3D Modeling, Data Conversion and Transmission, Checking and Preparing, model building, post processing. Rapid prototyping techniques: Stereo lithography, Solid Ground Curing (SGC), Fused Deposition Modeling (FDM) | 6 |
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| **Text Books** |
| 1 | Jagadeesha T., “Nontraditional Machining Processes”, Wiley India-Dreamtech Presss ,2020 |
| 2 | Jagadeesha T., “Unconventional Machining Processes”, Wiley India-Dreamtech Presss ,2020 |
| 3 | Mishra P. K., “Non-Conventional Machining”, The Institution of Engineers (India), Text Book Series, New Delhi, 1997 |
| 4 | Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd, New Delhi, 2009. |
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| **References** |
| 1 | Hassan El-Hofy, “Advanced Machining Processes: Nontraditional and Hybrid Machining Processes”, McGraw-Hill Co, New York (2005). |
| 2 | Benedict, Gary F., “Non-Traditional Manufacturing Processes”, Marcel Dekker Inc., New York (1987) |
| 3 | Garry F. Benedict, “Unconventional Machining Process”, Marcel Dekker Publication, New York, 1987 |
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| **Useful Links** |
| 1 | https://www.youtube.com/watch?v=oI3RIAvyVxc&list=PLbMVogVj5nJSzoQXmu7dsj9ZKJyZ1P4O8 |
| 2 | https://www.youtube.com/watch?v=P8zdXuIxQt4 |
| 3 | https://www.youtube.com/watch?v=Hc6mfNWT8oQ&t=5s |
| 4 | https://nptel.ac.in/courses/112/105/112105212/ |
| 5 | https://nptel.ac.in/courses/112/103/112103202/ |
| 6 | https://www.youtube.com/watch?v=yWBGnkhGKz8 |
| 7 | https://www.youtube.com/watch?v=Cz-KsEBLWNI |
| 8 | https://www.youtube.com/watch?v=r4Qws2G3f8E |
| 9 | https://youtu.be/Sfj8\_9oRCNk |
| 10 | https://www.youtube.com/watch?v=cxU1zUOpGLk |
| 11 | https://www.youtube.com/watch?v=PaYInS9axxw&list=PLzCSUZGIUJkaSyCzPiQMWynGyxmC8hrpl |
| 12 | https://www.youtube.com/watch?v=QJ-kKIdALRk |

**Civil**

| **CO-PO Mapping** |
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|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 |  |  | 2 | 2 |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 2 |  |  | 1 |  |  |  | 1 | 1 |  |  |  |  |  |
| **CO3** | 2 | 2 |  |  | 1 | 1 | 1 |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Electronics**

| **CO-PO Mapping** |
| --- |
|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 |  |  |  | 2 | 2 |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 1 |  |  | 1 | 1 | 1 |  |  |  |  | 1 |  |  |  |
| **CO3** | 2 | 2 | 2 | 2 | 1 |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Electrical**

| **CO-PO Mapping** |
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|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 |  |  | 2 |  |  |  |  |  |  |  | 1 |  |  |  |
| **CO2** | 2 | 2 |  |  | 2 |  |  |  | 1 |  |  | 1 |  |  |  |
| **CO3** | 2 | 2 |  | 2 | 2 |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Computer Science**

| **CO-PO Mapping** |
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|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 |  |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 2 | 1 |  | 2 |  |  |  |  |  |  | 1 |  |  |  |
| **CO3** | 2 | 1 | 2 |  | 2 |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Information Technology**

| **CO-PO Mapping** |
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|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| **CO1** | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 1 |  |  | 2 |  |  |  | 1 |  |  |  |  |  |  |
| **CO3** | 1 | 2 | 2 |  | 2 |  |  |  | 1 |  |  |  |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

| **Assessment (for Theory Course)** |
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| The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3.ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing) |