# Lesson Plan

Name of the Faculty  :  Sh. Laxman Ram

Discipline  :  Mechanical Engineering

Semester  :  5<sup>th</sup>

Subject  :  CNC Machines and Automation

Lesson Plan duration  :  15 weeks (01.9.2023 to 15.12.2023)

Work load per week  :  Lecture – 03, Practical – 04

| Week | Theory | | EXECUTION | |
|---|---|---|---|---|
| | Lecture Day | Topic (Including assessment/test) | Date | Sign. |
| 1<sup>st</sup> | 1<sup>st</sup> | Introduction about the subject & brief overview. | | |
| | 2<sup>nd</sup> | **1. Introduction:** Introduction to NC, Components of NC, binary Coding | | |
| | 3<sup>rd</sup> | Machine Control Unit, input devices, Advantages, disadvantages of NC over Conventional machine, | | |
| 2<sup>nd</sup> | 4<sup>th</sup> | CNC & DNC, Their type, Advantages & disadvantages and Applications | | |
| | 5<sup>th</sup> | Selection of components to be machined on CNC machines | | |
| | 6<sup>th</sup> | Problems with conventional NC, Axis identification | | |
| 3<sup>rd</sup> | 7<sup>th</sup> | New development in NC, PLC Control and its purpose. | | |
| | 8<sup>th</sup> | **2. Construction and Tooling:** Design features, special mechanical design features, specification Chart of CNC machines | | |
| | 9<sup>th</sup> | Type of slide ways, balls, roller, | | |
| 4<sup>th</sup> | 10<sup>th</sup> | motor-servo/stepper and Axis drive, Lead screw, recirculating ball screw & nut assembly | | |
| | 11<sup>th</sup> | Swarf removal, safety and guarding devices. | | |
| | 12<sup>th</sup> | Various cutting tools for CNC machines, Overview of CNC tool holder | | |
| 5<sup>th</sup> | 13<sup>th</sup> | different pallet systems and automatic tool changer system | | |
| | 14<sup>th</sup> | Tool change cycle, management of a tool room. | | |
| | 15<sup>th</sup> | **3. System Devices:** Control System; Feedback control classification(Open Loop and Closed Loop System) | | |
| 6<sup>th</sup> | 16<sup>th</sup> | Concept of Actuators, Transducers and Sensors | | |
| | 17<sup>th</sup> | **1<sup>st</sup> sessional test (Tentative)** | | |
| | 18<sup>th</sup> | **Assessment** | | |
| 7<sup>th</sup> | 19<sup>th</sup> | Tachometer, LVDT, | | |
| | 20<sup>th</sup> | Opto-interrupters, potentiometers for linear and angular Position | | |

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| | 21st | Encoder and decoder and axis drives, other classification of CNC feedback, motion, positioning. | | |
| 8th | 22nd | **4. Part Programming:** Introduction to Part programming | | |
| | 23rd | Basic concepts of part programming, NC words, Blocks | | |
| | 24th | Part programming formats, simple programming for rational components(PTP, Straight Line, Curved Surface) | | |
| 9th | 25th | Tool offset, cutter radius compensation, Wear compensation, | | |
| | 26th | Advamced Structure: Advantages of using advanced structure, part programming using conned cycles, subroutines and do loops and mirror image | | |
| | 27th | **5. Problems in CNC Machines:** Common problems in mechanical components of NC machines, | | |
| 10th | 28th | Common problems in electrical components of NC machines, | | |
| | 29th | **2nd sessional test (Tentative)** | | |
| | 30th | **Assessment** | | |
| 11th | 31st | Common problems in pneumatic components of NC machines, | | |
| | 32nd | Common problems in electronic and PC components of NC machines. | | |
| | 33rd | Study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machines, | | |
| 12th | 34th | Method of using discussion forums, Environmental problems | | |
| | 35th | **6. Automation and NC system:** Concept of automation | | |
| | 36th | Suitability of production system to automation, and their types | | |
| 13th | 37th | Emerging trends in automation Automatic assembly, Manufacturing of PCB, manufacturing of IC, | | |
| | 38th | Overview of FMS, AGV, ASRS, Group Technology, CAD/Cam& CIM | | |
| | 39th | Automated Identification system, Concept of AI, Robotics, nomenclature of joints, motion | | |
| 14th | 40th | **3rd sessional test (Tentative)** | | |
| | 41st | **Assessment** | | |
| | 42nd | Revision | | |
| 15th | 43rd | Revision | | |
| | 44th | Revision | | |
| | 45th | Revision | | |

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Work load per week   :        Lecture – 03, Practical – 04

| Week | | | EXECUTION | | |
|---|---|---|---|---|---|
| | Practical Day | Topic | G1 | G2 | Sign. |
| 1<sup>st</sup> | 1<sup>st</sup> | Introduction about the Lab & brief discussion over the Lab practical's to be conducted. | | | |
| | 2<sup>nd</sup> | 1. Study of constructional detail of CNC lathe | | | |
| 2<sup>nd</sup> | 3<sup>rd</sup> | 2. Study of constructional detail of CNC milling machine. | | | |
| | 4<sup>th</sup> | 3. Study the constructional details and working of: -Automatic tool changer and tool setter | | | |
| 3<sup>rd</sup> | 5<sup>th</sup> | 3. Study the constructional details and working of: -Multiple pallets | | | |
| | 6<sup>th</sup> | 3. Study the constructional details and working of:-Swarf Removal -Safety Devices. | | | |
| 4<sup>th</sup> | 7<sup>th</sup> | 4. Develop a part programme for following lathe operations and make the job on CNC lathe & CNC turning Center. 1. Plain turning and facing operation 2. Taper turning operation | | | |
| | 8<sup>th</sup> | 4. Develop a part programme for following lathe operations and make the job on CNC lathe & CNC turning Center. 3. Operation along contour using Circular interpolation | | | |
| 5<sup>th</sup> | 9<sup>th</sup> | 5. Develop a part programme for the following milling operation and make the job on CNC milling 1. Plain milling | | | |
| | 10<sup>th</sup> | 5. Develop a part programme for the following milling operation and make the job on CNC milling     2. Slot milling | | | |

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| 6<sup>th</sup> | 11<sup>th</sup> | Checking of Practical file/ | | | |
| | 12<sup>th</sup> | **1st sessional test (Tentative)** | | | |
| 7<sup>th</sup> | 13<sup>th</sup> | 5. Develop a part programme for the following milling operation and make the job on CNC milling<br>3. Contouring | | | |
| | 14<sup>th</sup> | 5. Develop a part programme for the following milling operation and make the job on CNC milling<br>4.Pocket milling | | | |
| 8<sup>th</sup> | 15<sup>th</sup> | Calculate coordinate points for a zigzag job by consideration sign conventions for milling | | | |
| | 16<sup>th</sup> | 6. Develop a part program by using Canned cycle on CNC lathe turning, Facing | | | |
| 9<sup>th</sup> | 17<sup>th</sup> | 6. Develop a part program by using Canned cycle on CNC lathe turning, Facing | | | |
| | 18<sup>th</sup> | 6. Develop a part program by using Canned cycle on CNC lathe turning, Facing | | | |
| 10<sup>th</sup> | 19<sup>th</sup> | Checking of Practical file/ | | | |
| | 20<sup>th</sup> | **2nd sessional test (Tentative)** | | | |
| 11<sup>th</sup> | 21<sup>st</sup> | 7. Preparation of work instructions for machine operator | | | |
| | 22<sup>nd</sup> | 7. Preparation of work instructions for machine operator | | | |
| 12<sup>th</sup> | 23<sup>rd</sup> | 8.Preparation of preventive maintenance schedule for CNC machine. | | | |
| | 24<sup>th</sup> | 8.Preparation of preventive maintenance schedule for CNC machine. | | | |
| 13<sup>th</sup> | 25<sup>th</sup> | 9. Demonstration through industrial visit for awareness of actual working of FMS in production. | | | |
| | 26<sup>th</sup> | 9. Demonstration through industrial visit for awareness of actual working of FMS in production. | | | |
| 14<sup>th</sup> | 27<sup>th</sup> | Checking of Practical file/ | | | |
| | 28<sup>th</sup> | **3rd sessional test (Tentative)** | | | |
| 15<sup>th</sup> | 29<sup>th</sup> | 10. Use of software for turning operation on CNC turning center. | | | |
| | 30<sup>th</sup> | Checking of Practical file/<br>Evaluation | | | |