



DEPARTMENT OF MECHANICAL ENGINEERING

Lesson Plan

| | | |
|-----------------------------|---|-------------------------------------------|
| Head of Department | : | Er. SHALANDER MOR |
| Name of the faculty | : | Er. Shalander Mor |
| Discipline | : | Mechanical Engineering |
| Semester | : | 5th |
| Subject | : | CNC Machines and Automation |
| Lesson Plan Duration | : | 16weeks |
| Work Load | : | (L/P) (3 Periods/ 2 periods) /Week |

| | | Theory Topics | Practical Topics |
|-----------------|------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Week | Lecture Day | | |
| 1 st | 1 st | Unit 1 Introduction- Introduction to NC their advantages, disadvantages and applications. | Study of constructional detail of CNC lathe. |
| | 2 nd | Introduction to CNC their advantages, disadvantages and applications. | |
| | 3 rd | Introduction to DNC their advantages, disadvantages and applications. | |
| 2 nd | 4 th | Basic components of CNC machines, MCU. | Study of constructional detail of CNC lathe. |
| | 5 th | Input devices, selection of components to be machined on CNC machines. | |
| | 6 th | Axis identification. | |
| 3 rd | 7 th | Unit 2 Construction and Tooling- Design features, specification of CNC machines | Study the constructional details and working of: Automatic tool changer and tool setter |
| | 8 th | Use of slideways, balls, rollers and coatings, motor and leadscrew, | |

| | | | |
|-----------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 9 th | Swarf removal, safety and guarding devices | Multiple pallets Swarf removal Safety devices |
| 4 th | 10 th 11 th 12 th | Various cutting tools for CNC machines, Concept of CNC tool holder, Different pallet systems and automatic tool changer system | Develop a part programme for following lathe operations and make the job on CNC lathe and CNC turning center.(for finish pass only) – (At least two) |
| 5 th | 13 th 14 th 15 th | Management of a tool room Unit 3 System Devices- Control System; Open Loop and Closed Loop System | Calculating coordinate points for a cylindrical job by considering sign convention for lathe Plain turning and facing operations |
| 6 th | 16 th 17 th 18 th | Concept of Actuators SESSIONAL I Transducers and Sensors | Develop a part programme for the following milling operations and make the job on CNC milling (for finish Pass only)- At least two |

| | | | |
|------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 7 th | 19 th 20 th 21 st | Tachometer LVDT Opto-interrupters | Calculate coordinate points for a zig zag job by considering sign convention for milling |
| 8 th | 22 nd 23 rd 24 th | Potentiometers for linear and angular position, Encoder Decoder & axis drives | Develop a part program by using canned cycle on CNC lathe for turning , facing |
| 9 th | 25 th 26 th 27 th | Unit 4 Part Programming- Introduction to Part programming Basic concepts of part programming NC words, part programming formats | Preparation of work instruction for machine operator |
| 10 th | 28 th 29 th 30 th | Simple programming for rational components Part programming using conned cycles, Subroutines and do loops, tool off sets | Preparation of preventive maintenance schedule for CNC machine |
| 11 th | 31 st 32 nd 33 rd | Cutter radius compensation Tool wear compensation SESSIONAL II | Demonstration through industrial visit for awareness of actual working of FMS in production. |
| 12 th | 34 th 35 th 36 th | Unit 5 Problems in CNC Machines- Common problems in CNC machines related to mechanical, electrical components Common problems in CNC machines related to pneumatic, electronic components Study of common problems and remedies | Use of software for turning operations on CNC turning center |
| 13 th | 37 th 38 th 39 th | Use of on-time fault finding diagnosis tools in CNC machines. Unit 6 Automation and NC system- Concept of automation, emerging trends in automation Automatic assembly, components of Automation & Types. | Use of software for milling operations on machine centres. |
| 14 th | 40 th 41 st 42 nd | Overview of FMS, Group technology, CAD/CAM and CIM. Automated Identification system | FILE CHECK |
| 15 th | 43 rd 44 th 45 th | concept of AI, Robotics nomenclature of joints, motion SESSIONAL III | VIVA-VOCE |

Government Polytechnic Nanakpur



DEPARTMENT OF MECHANICAL ENGINEERING

Lesson Plan

Head of Department : **Er. SHALANDER MOR**
Name of the faculty: **Sh. SANJAY KUMAR/ Sh. AMIT KUMAR**
Discipline: **MECHANICAL ENGINEERING**
Semester: **5TH MECHANICAL**
Subject: **MACHINE DESIGN**

Lesson Plan Duration: **15 weeks (from JULY, 2019 to DEC, 2019)**

| Week | Theory | | Practical | |
|-----------------|-------------|------------------------------------------------------|---------------|----------------------------------|
| | Lecture Day | Topic (including assignment / test) | Practical Day | Topic |
| 1 st | 1 | Design – Definition, Type of design | 1 | Drawing of rectangular key |
| | 2 | Necessity of design | 2. | Drawing of parallel key |
| | 3 | Comparison of designed and undesigned work | | |
| 2 nd | 4 | Design procedure, fatigue, endurance limit | 3. | Drawing of rectangular taper key |
| | 5 | Characteristics of a good designer | 4. | Drawing of square taper key |
| | 6 | Design terminology: stress, strain, factor of safety | | |

| | | | | |
|-----------------|----|---------------------------------------------------------------------------------------------------------------------------|----|--------------------------|
| 3 rd | 7 | factors affecting factor of safety | 5. | Wood ruff key |
| | 8 | stress concentration | 6. | Drawings of saddle keys |
| | 9 | methods to reduce stress concentration | | |
| 4 th | 10 | General design consideration | 7. | Drawing of VEE threads |
| | 11 | Codes and Standards (BIS standards) | 8. | Drawing of Sqaure thread |
| | 12 | Engineering materials and their mechanical properties | | |
| 5 th | 13 | Properties of engineering materials: elasticity, plasticity, malleability, ductility, toughness, hardness and resilience. | 9. | Drawings of bolt |

| | | | | |
|------------------|----|-------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|
| | 14 | Fatigue, creep, tenacity, strength | 10. | Drawings of cap screw |
| | 15 | Selection of materials, criterion of material selection | | |
| 6 th | 16 | Design Failure :Various design failures-maximum stress theory, | 11. | Drawings of stud |
| | 17 | maximum strain theory, maximum strain energy theory | 12. | Drawings of machine screw |
| | 18 | Classification of loads | | |
| 7 th | 19 | Design under tensile, compressive and torsional loads. | 13. | Drawings of set screw |
| | 20 | Design of Shaft | 14. | Drawings of locking devices |
| | 21 | Type of shaft, shaft materials, Type of loading on shaft | | |
| 8 th | 22 | standard sizes of shaft available | 15. | Drawing of parallel shafts |
| | 23 | Shaft subjected to torsion only, | 16. | Drawing of taper shafts |
| | 24 | determination of shaft diameter (hollow and solid shaft) on the basis of : - Strength criterion | | |
| 9 th | 25 | Rigidity criterion | 17. | Profile of cam and roller follower with constant velocity profile |
| | 26 | Determination of shaft dia (hollow and solid shaft) subjected to bending | 18. | Profile of cam and followers with knife edge follower in UAD motion |
| | 27 | Determination of shaft dia (hollow and solid shaft) subjected to combined torsion and bending | | |
| 10 th | 28 | Design of Key | 19 | Profile of cam and followers with roller follower in UAD motion |
| | 29 | Types of key, materials of key | 20 | Profile of cam and followers with knife edge follower in SHM motion |
| | 30 | functions of key | | |
| 11 th | 31 | Failure of key (by Shearing and Crushing) | 21 | Profile of cam and followers with Roller follower in SHM motion |
| | 32 | Design of key (Determination of key dimension). | 22 | Profile of cam and knife edge follower with constant velocity profile |
| | 33 | Effect of keyway on shaft | | |

| | | | | |
|------------------|----|------------------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------|
| | | strength | | |
| 12 th | 34 | Design of Screwed Joints | 23 | Profile of cam and followers with roller follower in constant velocity motion |
| | 35 | Introduction, Advantages and Disadvantages of screw joints | 24 | Profile of cam and followers with knife edge follower in combined constant velocity & UAD motion |
| | 36 | location of screw joints. | | |
| 13 th | 37 | Important terms used in screw threads | 25 | Profile of cam and followers with knife edge follower in combined constant velocity & SHM motion |
| | 38 | designation of screw threads | 26 | Profile of cam and followers with knife edge follower in combined SHM & UAD motion |
| | 39 | Initial stresses due to screw up forces, stresses due to combined forces | | |
| 14 th | 40 | Design of power screws (Press, screw jack, screw clamp) | 27 | Profile of cam and followers with roller follower in constant velocity motion and offset axis |
| | 41 | Types of cams and followers | 28. | Profile of cam and followers with roller follower in SHM motion |
| | 42 | Profile of cams for imparting following motion with knife edge and roller Uniform motion followers, SHM and UAD motion | | |
| 15 th | 43 | Nomenclature of gears and conventional representation | 29 | Drawing the actual profile of involute teeth gear by absolute methods |
| | 44 | revision | 30. | Drawing the actual profile of involute teeth gear by tracing absolute methods |
| | 45 | class test | | |

Government Polytechnic Nanakpur



DEPARTMENT OF MECHANICAL ENGINEERING

Lesson Plan

| | |
|------------------------|-------------------------------------------|
| Head of Department | Er. SHALANDER MOR |
| Name of the faculty | Sh. AMIT KUMAR |
| Discipline : | Mechanical Engineering |
| Semester : | 5th |
| Subject : | Refrigeration and Air Conditioning |
| Lesson Plan Duration : | 16 weeks |
| Work Load : | (L/P) (3 Periods/ 2 periods) /Week |

| Week | Lecture Day | Theory Topics | Practical Topics |
|-----------------|-----------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 st | 1 st | Unit 1 Fundamentals of Refrigeration Introduction to refrigeration, and air conditioning | 1 st Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes (Cont.). |
| | 2 nd | Meaning of refrigerating effect, units of refrigeration, COP | |
| | 3 rd | Methods of refrigeration (Cont.) | |
| | 4 th | Methods of refrigeration (Cont.) | |
| 2 nd | 5 th | Methods of refrigeration | 1 st Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes. |
| | 6 th | Introduction to air refrigerator working on reversed carnot cycle | |
| | 7 th | Unit 2 Vapour Compression System Introduction | |

| | | | |
|-----------------|------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| | 8 th | Principle, function, parts and necessity of vapour compression system | |
| 3 rd | 9 th | T- ϕ and p- H charts | |
| | 10 th | Dry, wet and superheated compression | 2 nd Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers (Cont.). |
| | 11 th | Effect of sub cooling, super heating, | |
| | 12 th | Mass flow rate, entropy, enthalpy, work done | |
| 4 th | 13 th | Refrigerating effect and COP | |
| | 14 th | Actual vapour compression system | 2 nd Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers. |
| | 15 th | Unit 3 Refrigerants Functions | |
| | 16 th | Classification of refrigerants | |
| 5 th | 17 th | Properties of R - 717, R – 22 | 3 rd Identify various parts of a refrigerator and window air conditioner (Cont.). |
| | 18 th | R–134 (a) and CO ₂ . | |

| | | | |
|------------------|------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| | 19 th | Properties of ideal refrigerant | |
| | 20 th | SESSIONAL I | |
| 6 th | 21 st | selection of refrigerant | 3 rd Identify various parts of a refrigerator and window air conditioner. |
| | 22 nd | Unit 4 Vapour Absorption System Introduction | |
| | 23 rd | Principle and working of simple absorption system | |
| | 24 th | Domestic Electrolux refrigeration systems | |
| 7 th | 25 th | Solar power refrigeration system | 4 th To find COP of Refrigeration system. |
| | 26 th | advantages and disadvantages of solar power refrigeration system over vapour compression system | |
| | 27 th | Unit 5 Refrigeration Equipment 5.1 Compressor - Function | |
| | 28 th | Various types of compressors (Cont.) | |
| 8 th | 29 th | Various types of compressors | 5 th To detect trouble/faults in a refrigerator/window type air conditioner (Cont.). |
| | 30 th | 5.2 Condenser - Function | |
| | 31 st | Various types of condensers (Cont.) | |
| | 32 nd | Various types of condensers | |
| 9 th | 33 rd | 5.3 Evaporator - Function | 5 th To detect trouble/faults in a refrigerator/window type air conditioner. |
| | 34 th | Various types of evaporators (Cont.) | |
| | 35 th | Various types of evaporators | |
| | 36 th | 5.4 Expansion Valve - Function | |
| 10 th | 37 th | Various types such as capillary tube, thermostatic expansion valve | 6 th Charging of a refrigerator/window type air conditioner (Cont.). |
| | 38 th | Low side and high side float valves | |
| | 39 th | SESSIONAL II | |
| | 40 th | Application of various expansion valves | |
| 11 th | 41 st | 5.5. Safety Devices -Thermostat, overload protector | 6 th Charging of a refrigerator/window type air conditioner. |
| | 42 nd | LP, HP cut out switch | |
| | 43 rd | Unit 6 Psychrometry Definition, importance | |
| | 44 th | Specific humidity, relative humidity, degree of saturation | |
| 12 th | 45 th | DBT, WBT, DPT | 7 th Study of cut section of single cylinder compressor |
| | 46 th | Sensible heat, latent heat | |

47th Total enthalpy of air. Psychrometry chart

48th Various processes of psychrometry (Cont.)

| | | | |
|------------------|------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 13 th | 49 th | Various processes of psychrometry | 8 th Visit to an ice plant, cold storage plant, central air conditioning plant(Cont.). |
| | 50 th | Unit 7 Air-Conditioner Study of window air-conditioning (Cont.) | |
| | 51 st | Study of window air-conditioning | |
| | 52 nd | Split type air conditioning (Cont.) | |
| 14 th | 53 rd | Split type air conditioning | 8 th Visit to an ice plant, cold storage plant, central air conditioning plant. |
| | 54 th | Concept of central air condition (Cont.) | |
| | 55 th | Concept of central air condition | |
| | 56 th | Automobile air-conditioning (Cont.) | |
| 15 th | 57 th | Automobile air-conditioning | VIVA- VOCE |
| | 58 th | Revision of Syllabus | |
| | 59 th | Revision of Syllabus | |
| | 60 th | SESSIONAL III | |

Government Polytechnic Nanakpur



DEPARTMENT OF MECHANICAL ENGINEERING

Lesson Plan

Head of Department : **Er. SHALANDER MOR**

Name of the Faculty : **Sh. SANJAY KUMAR**

Discipline : **Mechanical Engineering**

Semester : **5TH**

Subject : **TOM**

Lesson Plan duration : **15 weeks**

| Week | Theory | | Practical | |
|-----------------|-----------------|-----------------------------------------------------------------------------------------------------|-----------------|-------|
| | Lecture Day | Topic (Including assessment/test) | Practical Day | Topic |
| 1 st | 1 st | Unit 1: Simple Mechanisms Introduction, | 1 st | NA |
| | 2 nd | Introduction to link, kinematic pair, lower and higher pair, | | |
| | 3 rd | Kinematic chain, Different types of mechanisms | | |
| 2 nd | 4 th | Power Transmission Introduction to Belt and Rope drives, Types of belt drives and types of pulleys. | 2 nd | NA |

| | | | | |
|-----------------|------------------|---------------------------------------------------------|-----------------|----|
| | 5 th | Concept of velocity ratio, slip and creep | | |
| | 6 th | crowning of pulleys | | |
| 3 rd | 7 th | Flat and V belt drive: Ratio of driving tensions | 3 rd | NA |
| | 8 th | power transmitted, centrifugal tension | | |
| | 9 th | condition for maximum horse power | | |
| 4 th | 10 th | Different types of chains and their terminology | 4 th | NA |
| | 11 th | Gear terminology, types of gears and their applications | | |

| | | | | |
|-----------------|------------------|------------------------------------------------------------------|-----------------|----|
| | | | | |
| | 12 th | power transmitted by simple spur gear | | |
| 5 th | 13 th | Principle and applications of flywheel | 5 th | NA |
| | 14 th | Turning - moment diagram of flywheel for different engines | | |
| | 15 th | Fluctuation of speed and fluctuation of energy - Concept only | | |

| | | | | |
|------------------|------------------|-----------------------------------------------------------------------------------------|------------------|----|
| | | | | |
| 6 th | 16 th | 1st sessional test (Tentative) | 6 th | NA |
| | 17 th | Coefficient of fluctuation of speed and coefficient of fluctuation of energy | | |
| | 18 th | Simple numerical problems on fluctuation of speed and fluctuation of energy | | |
| 7 th | 19 th | Principal of governor | 7 th | NA |
| | 20 th | Simple description and working of Watt, Porter and Hartnel governor | | |
| | 21 st | Hunting, isochronism, stability, sensitiveness of a governor | | |
| 8 th | 22 nd | Simple numerical problems | 8 th | NA |
| | 23 rd | Concept of balancing | | |
| | 24 th | Introduction to balancing of rotating masses | | |
| 9 th | 25 th | Concept of vibrations and its types - longitudinal, transverse and torsional vibrations | 9 th | NA |
| | 26 th | Concept of vibrations and its types - longitudinal, transverse and torsional vibrations | | |
| | 27 th | Concept of vibrations and its types - longitudinal, transverse and torsional vibrations | | |
| 10 th | 28 th | Simple numerical problems | 10 th | NA |

| | | | | |
|------------------|------------------|-----------------------------------|------------------|----|
| | | | | |
| | 29 th | Damping of vibrations | | |
| | 30 th | 2 nd sessional test | | |
| 11 th | 31 st | Assessment | 11 th | NA |
| | 32 nd | Causes of vibrations in machines, | | |
| | 33 rd | Causes of vibrations in machines, | | |
| 12 th | 34 th | REVISION | 12 th | NA |
| | 35 th | REVISION | | |
| | 36 th | REVISION | | |

| | | | | |
|------------------|------------------|--------------------------------|------------------|----|
| 13 th | 37 th | REVISION | | NA |
| | 38 th | TEST | | |
| | 39 th | TEST | | |
| 14 th | 40 th | TEST | 14 th | NA |
| | 41 st | REVISION | | |
| | 42 nd | REVISION | | |
| 15 th | 43 rd | REVISION | 15 th | NA |
| | 44 th | 3 rd sessional test | | |
| | 45 th | Assessment | | |

Government Polytechnic Nanakpur



DEPARTMENT OF MECHANICAL ENGINEERING

Lesson Plan

Head of Department : **Er. SHALANDER MOR**

Name of the faculty: **Er..SHALANDER MOR**

Discipline: MECHANICAL ENGINEERING

Semester: 5TH

Subject: WORKSHOP TECHNOLOGY-III

Lesson Plan Duration: **15 weeks**

| Week | Theory | | Practical | |
|-----------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|
| | Lecture Day | Topic (including assignment / test) | Practical Day | Topic |
| 1 st | 1 | Milling (12 hrs) 1.1 Specification and working principle of milling machine 1.2 Classification, brief description and applications of milling machine | | |
| | 2 | 1.3 Main parts of column and knee type milling machine 1.4 Milling machine accessories and attachment – Arbors, adaptors, collets, vices, | | |
| | 3 | circular table, indexing head and tail stock, vertical milling attachment | | |

| | | | | |
|-----------------|---|--------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 2 nd | 4 | 1.5 Milling methods - up milling and down milling 1.6 Identification of different milling cutters and work mandrels | | |
| | 5 | 1.7 Work holding devices 1.8 Milling operations – face milling, angular milling, form milling, straddle milling and gang milling. | | |
| | 6 | 1.9 Cutting parameters 1.10 Indexing on dividing heads, plain and universal dividing heads | | |
| 3 rd | 7 | 1.11 Indexing methods: direct, Plain or simple, compound, differential and angular indexing, numerical problems on indexing. | | |

| | | | | |
|-----------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| | 8 | Grinding (12 hrs) 2.1 Purpose of grinding | | |
| | 9 | 2.2 Various elements of grinding wheel – Abrasive, Grade, structure, Bond | | |
| 4 th | 10 | 2.3 Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS. | | |
| | 11 | 2.4 Truing, dressing, balancing and mounting of wheel. | | |
| | 12 | 2.5 Grinding methods – Surface grinding, cylindrical grinding and centreless grinding. | | |
| 5 th | 13 | 2.6 Grinding machine – Cylindrical grinder, surface grinder, internal grinder, centreless grinder, tool and cutter grinder. | | |
| | 14 | 2.7 Selection of grinding wheel | | |
| | 15 | REVISION | | |
| 6 th | 16 | REVISION | | |
| | 17 | REVISION | | |
| | 18 | 3. Gear Manufacturing and Finishing Processes | | |
| 7 th | 19 | 3.1 Gear hobbing | | |
| | 20 | 3.2 Gear shaping | | |
| | 21 | Modern Machining Processes (08 hrs) | | |
| 8 th | 22 | 4.1 Mechanical Process - Ultrasonic machining (USM): Introduction, principle, | | |
| | 23 | process, advantages and limitations, | | |

| | | | | |
|------------------|----|---------------------------------------------------------------------------------------|--|--|
| | | applications | | |
| | 24 | 4.2 Electro Chemical Processes - Electro chemical machining (ECM) – Fundamental | | |
| 9 th | 25 | principle, process, applications, Electro chemical Grinding (ECG) – Fundamental | | |
| | 26 | principle, process, application | | |
| | 27 | 4.3 Electrical Discharge Machining (EDM) - Introduction, basic EDM circuit, | | |
| 10 th | 28 | Principle, metal removing rate, dielectric fluid, applications | | |
| | 29 | 4.4 Laser beam machining (LBM) – Introduction, machining process and applications | | |
| | 30 | 4.5 Electro beam machining (EBM)- Introduction, principle, process and applications | | |
| 11 th | 31 | REVISION | | |
| | 32 | REVISION | | |
| | 33 | REVISION | | |
| 12 th | 34 | Metallic Coating Processes (02 hrs) | | |
| | 35 | 5.1 Metal spraying – Wire process, powder process, applications | | |
| | 36 | 5.2 Powder coating | | |
| 13 th | 37 | Metal Finishing Processes (12 hrs) 6.1 Purpose of finishing surfaces. | | |
| | 38 | 6.2 Surface roughness-Definition and units 6.3 Honing Process, its applications | | |
| | 39 | 6.4 Description of hones. 6.5 Brief idea of honing machines. | | |
| 14 th | 40 | 6.6 Lapping process, its applications. 6.7 Description of lapping compounds and tools | | |
| | 41 | 6.8 Brief idea of lapping machines. 6.9 Super finishing process, its applications. | | |
| | 42 | 6.10 Polishing 6.11 Buffing | | |

| | | | | |
|------------------|----|----------|--|--|
| 15 th | 43 | REVISION | | |
| | 44 | REVISION | | |
| | 45 | REVISION | | |