

## Lesson Plan

**Name of the faculty:** Sh. Tasvir Singh, Lecturer in Mechanical Engg.

**Discipline:** Mechanical

**Semester:** 5<sup>th</sup> Mechanical A & B

**Subject:** CNC Machines and Automation

**Lesson Plan Duration:** 15 weeks

**Work Load (Lecture/ Practical) per week (in hours):** Lecturers- 03, Practicals-02

Week	Theory		Practical	
	Lecture day	Topic ( including assignment / test)	Practical Day	Topic
1 <sup>st</sup>	1 <sup>st</sup>	Introduction to NC, CNC & DNC	1 <sup>st</sup>	Study of constructional detail of CNC lathe
	2 <sup>nd</sup>	Their advantages, disadvantages and applications.		
	3 <sup>rd</sup>	Basic components of CNC machines.	2 <sup>nd</sup>	Study of constructional detail of CNC lathe
2 <sup>nd</sup>	1 <sup>st</sup>	Machine Control Unit. Input devices	1 <sup>st</sup>	Study of constructional detail of CNC milling machine
	2 <sup>nd</sup>	selection of components to be machined on CNC machines.		
	3 <sup>rd</sup>	Axis identification.	2 <sup>nd</sup>	Study of constructional detail of CNC milling machine
3 <sup>rd</sup>	1 <sup>st</sup>	Design features, specification of CNC machines.	1 <sup>st</sup>	Study the constructional details and working of Automatic tool changer and Multiple pallets
	2 <sup>nd</sup>	Use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety and guarding devices.		
	3 <sup>rd</sup>	various cutting tools for CNC machines.	2 <sup>nd</sup>	Study the constructional details and working of Automatic tool changer and Multiple pallets
4 <sup>th</sup>	1 <sup>st</sup>	Concept of CNC tool holder.	1 <sup>st</sup>	Develop a part programme for following lathe operations and make the job on CNC lathe. - Plain turning and facing operation - Taper turning operation - Circular interpolation
	2 <sup>nd</sup>	different pallet systems and automatic tool changer system.		
	3 <sup>rd</sup>	Management of a tool room.	2 <sup>nd</sup>	Develop a part programme for following lathe operations and make the job on CNC lathe. - Plain turning and facing operation - Taper turning operation - Circular interpolation
5 <sup>th</sup>	1 <sup>st</sup>	Control system	1 <sup>st</sup>	Develop a part programme for the following milling operation and make the job on CNC milling - Plain milling - Slot milling - Contouring - Pocket milling
	2 <sup>nd</sup>	Open loop and Closed Loop system		
	3 <sup>rd</sup>	concept of Actuators	2 <sup>nd</sup>	Develop a part programme for the following milling operation and make the job on CNC milling - Plain milling - Slot milling - Contouring - Pocket milling

6 <sup>th</sup>	1 <sup>st</sup>	Transducers and Sensors	1 <sup>st</sup>	Preparation of work instructions for machine operator
	2 <sup>nd</sup>	Tachometer		
	3 <sup>rd</sup>	LVDT	2 <sup>nd</sup>	Preparation of work instructions for machine operator
7 <sup>th</sup>	1 <sup>st</sup>	opto- interrupters		Preparation of preventive maintenance schedule for CNC machine.
	2 <sup>nd</sup>	potentiometers of linear		
	3 <sup>rd</sup>	angular position		Preparation of preventive maintenance schedule for CNC machine.
8 <sup>th</sup>	1 <sup>st</sup>	encoder	1 <sup>st</sup>	Demonstration through industrial visit for awareness of actual working of FMS in production.
	2 <sup>nd</sup>	decoder		
	3 <sup>rd</sup>	axis drives	2 <sup>nd</sup>	Demonstration through industrial visit for awareness of actual working of FMS in production.
9 <sup>th</sup>	1 <sup>st</sup>	Introduction to part programming		
	2 <sup>nd</sup>	basic concepts of part programming		
	3 <sup>rd</sup>	NC words		
10 <sup>th</sup>	1 <sup>st</sup>	part programming formats		
	2 <sup>nd</sup>	simple programming for rational components		
	3 <sup>rd</sup>	part programming using connedcycles		
11 <sup>th</sup>	1 <sup>st</sup>	subroutines and do loops, tool off sets		
	2 <sup>nd</sup>	cutter radius compensation and tool wear compensation.		
	3 <sup>rd</sup>	Common problems in CNC machines related to mechanical		
12 <sup>th</sup>	1 <sup>st</sup>	Electrical and pneumatic, electronic components.		
	2 <sup>nd</sup>	Study of common problem and remedies.		
	3 <sup>rd</sup>	Use of on- time fault finding diagnosis tools in CNC machines.		
13 <sup>th</sup>	1 <sup>st</sup>	Concept of automation		
	2 <sup>nd</sup>	emerging trends in automation		
	3 <sup>rd</sup>	automatic assembly		
14 <sup>th</sup>	1 <sup>st</sup>	Overview of FMS		
	2 <sup>nd</sup>	Group technology		
	3 <sup>rd</sup>	CAD/ CAM and CIM.		
15 <sup>th</sup>	1 <sup>st</sup>	Introduction to robot technology		
	2 <sup>nd</sup>	basic robot motion		
	3 <sup>rd</sup>	Its applications.		

# Lesson Plan

**Name of the faculty:** Sh. Vikas Goel, Senior Lecturer in Mechanical Engg.

**Discipline:** Mechanical

**Semester:** 5<sup>th</sup> Mechanical A & B

**Subject:** REFRIGERATION AND AIR CONDITIONING

**Lesson Plan Duration:** 15 weeks

**Work Load (Lecture/ Practical) per week (in hours):** Lectures- 03, Practicals- 02

Week	Theory		Practical	
	Lecture day	Topic ( including assignment /test)	Practical Day	Topic
1 <sup>st</sup>	1 <sup>st</sup>	Introduction to refrigeration, and air conditioning	1 <sup>st</sup>	Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes.
	2 <sup>nd</sup>	meaning of refrigerating effect, units of refrigeration, COP		
	3 <sup>rd</sup>	methods of refrigeration, Introduction to air refrigerator	2 <sup>nd</sup>	Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes.
2 <sup>nd</sup>	1 <sup>st</sup>	working on reversed carnot cycle.	1 <sup>st</sup>	Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers
	2 <sup>nd</sup>	Introduction of vapour compression system		
	3 <sup>rd</sup>	Principle of vapour compression System, function of vapour compression system	2 <sup>nd</sup>	Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers
3 <sup>rd</sup>	1 <sup>st</sup>	parts of vapour compression system,	1 <sup>st</sup>	Identify various parts of a refrigerator and window air conditioner.
	2 <sup>nd</sup>	necessity of vapour compression system,		
	3 <sup>rd</sup>	□T- Chart, p– H chart.	2 <sup>nd</sup>	Identify various parts of a refrigerator and window air conditioner.
4 <sup>th</sup>	1 <sup>st</sup>	dry, wet and superheated compression.	1 <sup>st</sup>	To find COP of Refrigeration system
	2 <sup>nd</sup>	Effect of sub cooling		
	3 <sup>rd</sup>	super heating, mass flow rate	2 <sup>nd</sup>	To find COP of Refrigeration system
5 <sup>th</sup>	1 <sup>st</sup>	entropy, enthalpy	1 <sup>st</sup>	To detect trouble/faults in a refrigerator/window type air conditioner
	2 <sup>nd</sup>	work done		
	3 <sup>rd</sup>	Refrigerating effect, COP	2 <sup>nd</sup>	To detect trouble/faults in a refrigerator/window type air conditioner
6 <sup>th</sup>	1 <sup>st</sup>	actual vapour compression system	1 <sup>st</sup>	Charging of a refrigerator/window type air conditioner.
	2 <sup>nd</sup>	Functions of refrigerants		
	3 <sup>rd</sup>	classification of refrigerants, properties of R - 717	2 <sup>nd</sup>	Charging of a refrigerator/window type air conditioner.
7 <sup>th</sup>	1 <sup>st</sup>	properties of R - 22	1 <sup>st</sup>	Study of cut section of single cylinder compressor
	2 <sup>nd</sup>	Properties of R–134 (a) and CO2		
	3 <sup>rd</sup>	Properties of ideal refrigerant selection of refrigerant	2 <sup>nd</sup>	Study of cut section of single cylinder compressor

8 <sup>th</sup>	1 <sup>st</sup>	Introduction of simple absorption System, Introduction of domestic electrolux refrigeration systems	1 <sup>st</sup>	Visit to an ice plant, cold storage plant, central air conditioning plant
	2 <sup>nd</sup>	Principle of simple absorption system		
	3 <sup>rd</sup>	Principle of domestic electrolux refrigeration systems	2 <sup>nd</sup>	Visit to an ice plant, cold storage plant, central airconditioning plant
9 <sup>th</sup>	1 <sup>st</sup>	Working of simple absorption system		
	2 <sup>nd</sup>	Working of domestic electrolux refrigeration systems Solar power refrigeration system		
	3 <sup>rd</sup>	advantages of solar power refrigeration system over vapour compression system.		
10 <sup>th</sup>	1 <sup>st</sup>	disadvantages of solar power refrigeration system over vapour compression system.		
	2 <sup>nd</sup>	Refrigeration Equipment		
	3 <sup>rd</sup>	Compressor, Function of compressors		
11 <sup>th</sup>	1 <sup>st</sup>	Various types of compressors.		
	2 <sup>nd</sup>	Condenser – Function, various types of condensers		
	3 <sup>rd</sup>	Evaporator - Function, types of evaporators		
12 <sup>th</sup>	1 <sup>st</sup>	Expansion Valve - Function, various types such as capillary tube, thermostatic expansion valve		
	2 <sup>nd</sup>	low side and high side float valves, application of various expansion valves		
	3 <sup>rd</sup>	Safety Devices-Thermostat Safety Devices- overload protector LP		
13 <sup>th</sup>	1 <sup>st</sup>	Safety Devices-HP cut out switch		
	2 <sup>nd</sup>	Definition of Psychrometry		
	3 <sup>rd</sup>	importance of Psychrometry, specific humidity, relative humidity		
14 <sup>th</sup>	1 <sup>st</sup>	degree of saturation		
	2 <sup>nd</sup>	DBT, WBT, DPT, sensible heat, latent heat.		
	3 <sup>rd</sup>	Total enthalpy of air		
15 <sup>th</sup>	1 <sup>st</sup>	Psychrometry chart and various processes of psychrometry		
	2 <sup>nd</sup>	Study of window air-conditioning split type air conditioning		
	3 <sup>rd</sup>	concept of central air- condition, automobile air-conditioning		

## Lesson Plan

**Name of the faculty:** Sh. Kuldeep Singh, Lecturer in Mechanical Engg.

**Discipline:** Mechanical

**Semester:** 5<sup>th</sup> Mechanical

**Subject:** THEORY OF MACHINES

**Lesson Plan Duration:** 15 weeks

**Work Load (Lecture/ Practical) per week (in hours):** Lectures- 02, Practical- 02

Week	Theory		Practical	
	Lecture day	Topic ( including assignment /test)	Practical Day	Topic
1 <sup>st</sup>	1 <sup>st</sup>	Simple Mechanisms, Introduction to link	1 <sup>st</sup> & 2 <sup>nd</sup>	To study inversion of Four Bar Mechanism, Single Slider Crank Chain and Double Slider Crank Chain Mechanism with the help of working models.
	2 <sup>nd</sup>	kinematic pair, lower and higher pair		
2 <sup>nd</sup>	1 <sup>st</sup>	Kinematic chain Mechanism and Inversions	1 <sup>st</sup> & 2 <sup>nd</sup>	To construct radial cam profile for uniform velocity with knife edge and roller follower on drawing sheet.
	2 <sup>nd</sup>	Different types of mechanisms (with examples )		
3 <sup>rd</sup>	1 <sup>st</sup>	Introduction to Belt and Rope drives	1 <sup>st</sup> & 2 <sup>nd</sup>	To construct radial cam profile for SHM with knife edge and roller follower on drawing sheet.
	2 <sup>nd</sup>	Types of belt drives, types of pulleys		
4 <sup>th</sup>	1 <sup>st</sup>	Concept of velocity ratio, slip and creep	1 <sup>st</sup> & 2 <sup>nd</sup>	To construct radial cam profile for uniform acceleration and retardation with knife edge and roller follower on drawing sheet.
	2 <sup>nd</sup>	crowning of pulleys (simple numericals) condition for maximum horse power (simple numericals)		
5 <sup>th</sup>	1 <sup>st</sup>	Different types of chains and their terminology	1 <sup>st</sup> & 2 <sup>nd</sup>	To find the moment of inertia of a flywheel.
	2 <sup>nd</sup>	Gear terminology and types of gears		
6 <sup>th</sup>	1 <sup>st</sup>	applications of gears, simple gear train.	1 <sup>st</sup> & 2 <sup>nd</sup>	To Study the different types of centrifugal governors & plot graph between R.P.M & Displacement of sleeve.
	2 <sup>nd</sup>	compound gear train, power transmitted by simple spur gear		
7 <sup>th</sup>	1 <sup>st</sup>	Principle of flywheel, applications of flywheel	1 <sup>st</sup> & 2 <sup>nd</sup>	To study various types of belts drives and to calculate velocity ratio.
	2 <sup>nd</sup>	Turning - moment diagram of flywheel for different engines		
8 <sup>th</sup>	1 <sup>st</sup>	Fluctuation of speed and speed	1 <sup>st</sup> & 2 <sup>nd</sup>	To study different types of gear trains with the help of working models and to calculate Velocity ratio.
	2 <sup>nd</sup>	Coefficient of fluctuation of speed and energy		
9 <sup>th</sup>	1 <sup>st</sup>	Simple numerical problems on fluctuation of speed	1 <sup>st</sup> & 2 <sup>nd</sup>	To perform the experiment of Balancing of rotating parts and find the unbalanced couple and forces.
	2 <sup>nd</sup>	Principal of governor, Simple description		
10 <sup>th</sup>	1 <sup>st</sup>	working of Watt , Porter and Hartnel governor (simple numericals based on watt governor)		
	2 <sup>nd</sup>	Hunting and isochronisms of governor		
11 <sup>th</sup>	1 <sup>st</sup>	Stability and sensitiveness of a governor		
	2 <sup>nd</sup>	Concept of balancing		
12 <sup>th</sup>	1 <sup>st</sup>	Introduction to balancing of rotating masses, simple numericals on balancing.		
	2 <sup>nd</sup>	Simple problems related to several masses rotating in different planes		
13 <sup>th</sup>	1 <sup>st</sup>	Concept of vibrations		
	2 <sup>nd</sup>	Types of vibrations.		
14 <sup>th</sup>	1 <sup>st</sup>	longitudinal , transverse and torsional vibrations		
	2 <sup>nd</sup>	Simple numerical on vibrations. Damping of vibrations		
15 <sup>th</sup>	1 <sup>st</sup>	Causes of vibrations in machines		
	2 <sup>nd</sup>	harmful effects on vibrations, remedies		

## Lesson Plan

**Name of the faculty:** Sh. Parveen Malik, Lecturer in Mechanical Engg.

**Discipline:** Mechanical

**Semester:** 5<sup>th</sup> Mechanical A & B

**Subject:** Plant Maintenance and Material Handling

**Lesson Plan Duration:** 15 weeks

**Work Load (Lecture/ Practical) per week (in hours):** Theory – 03

Week	Theory		Practicals	
	Lecture day	Topic ( including assignment / test)		
1 <sup>st</sup>	1 <sup>st</sup>	Necessity and advantages of testing, repair and maintenance, common instruments required for testing		
	2 <sup>nd</sup>	significance of B-T curve in life span of machine tool, Acceptance test for machine tools		
	3 <sup>rd</sup>	Revision		
2 <sup>nd</sup>	1 <sup>st</sup>	Economic aspects, manpower planning and materials management		
	2 <sup>nd</sup>	Fits and tolerances – common fits and tolerances used for various machine parts		
	3 <sup>rd</sup>	Revision		
3 <sup>rd</sup>	1 <sup>st</sup>	Location, layout of machines in Plant Layout, Principles of Plant layout		
	2 <sup>nd</sup>	types of plant layout and positioning of machines, grouping of machines.		
	3 <sup>rd</sup>	Foundation – types of foundation, various considerations for machine foundations, foundation plan, types of foundation bolts		
4 <sup>th</sup>	1 <sup>st</sup>	erection and leveling, grouting Vibration, damping, vibration isolation – methods of isolation, anti vibration mounts		
	2 <sup>nd</sup>	Testing equipment – dial gauge, mandrel, spirit level, straight edge, auto collimator Recalibration of measuring instruments like vernier calliper		
	3 <sup>rd</sup>	Testing methods – geometrical/alignment test, performance test, testing under load, run test, vibrations, noise		
5 <sup>th</sup>	1 <sup>st</sup>	Definition, advantages, limitations, functions and types of maintenance organisation. Types of maintenance viz. emergency, preventive, breakdown/corrective, predictive		
	2 <sup>nd</sup>	Introduction to computerized maintenance record like facility register, maintenance request		
	3 <sup>rd</sup>	ISO standards for maintenance documentation Introduction to machine history card – purpose and advantages		
6 <sup>th</sup>	1 <sup>st</sup>	Preparation of scheduled yearly plan for preventive maintenance, difference of work content of servicing, repairs and overhauling. MTBF and MTTR. Maintainability		
	2 <sup>nd</sup>	Spare parts- Need of frequently needed spare parts inventory, Make provision of spares for parts not available in market		
	3 <sup>rd</sup>	Common parts which are prone to failure, reasons of failure		
7 <sup>th</sup>	1 <sup>st</sup>	Repair schedule Parts that commonly need repair such as belts		
	2 <sup>nd</sup>	couplings, nuts, and bolts repairing the engines, compressors and boilers.		
	3 <sup>rd</sup>	couplings, nuts, and bolts repairing the engines, compressors and boilers.		

8 <sup>th</sup>	1 <sup>st</sup>	couplings, nuts, and bolts repairing the engines, compressors and boilers.		
	2 <sup>nd</sup>	Revision		
	3 <sup>rd</sup>	Lubrication methods and periodical lubrication chart for various machines (daily, weekly, monthly )		
9 <sup>th</sup>	1 <sup>st</sup>	Handling and storage of lubricants		
	2 <sup>nd</sup>	Lubricants conditioning and disposal		
	3 <sup>rd</sup>	Lubricant and their grades needed gears and bearings		
10 <sup>th</sup>	1 <sup>st</sup>	Lubricant and their grades needed for chains		
	2 <sup>nd</sup>	Purpose and procedure of changing oil periodically (like gear box oil)		
	3 <sup>rd</sup>	Purpose and procedure of changing oil periodically (like gear box oil)		
11 <sup>th</sup>	1 <sup>st</sup>	Revision		
	2 <sup>nd</sup>	Basic principles of material handling,		
	3 <sup>rd</sup>	Basic types of material handling equipments and its characteristic		
12 <sup>th</sup>	1 <sup>st</sup>	Uses and limitations, forklift trucks		
	2 <sup>nd</sup>	Selection of material handling equipment		
	3 <sup>rd</sup>	Unit load: pallet sizing and loading		
13 <sup>th</sup>	1 <sup>st</sup>	Conveyor models		
	2 <sup>nd</sup>	Revision		
	3 <sup>rd</sup>	AGV Systems		
14 <sup>th</sup>	1 <sup>st</sup>	Automated Storage		
	2 <sup>nd</sup>	Retrieval System (ASRS)		
	3 <sup>rd</sup>	Carousels		
15 <sup>th</sup>	1 <sup>st</sup>	Revision		
	2 <sup>nd</sup>	Revision		
	3 <sup>rd</sup>	Revision		