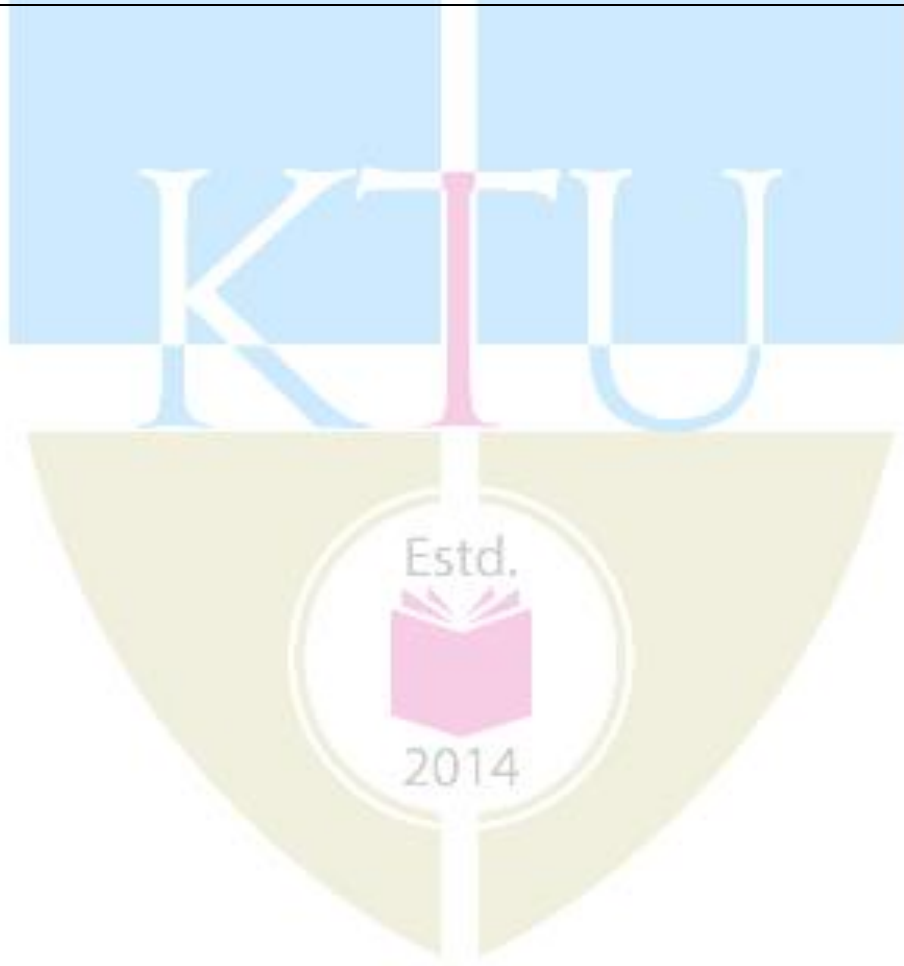


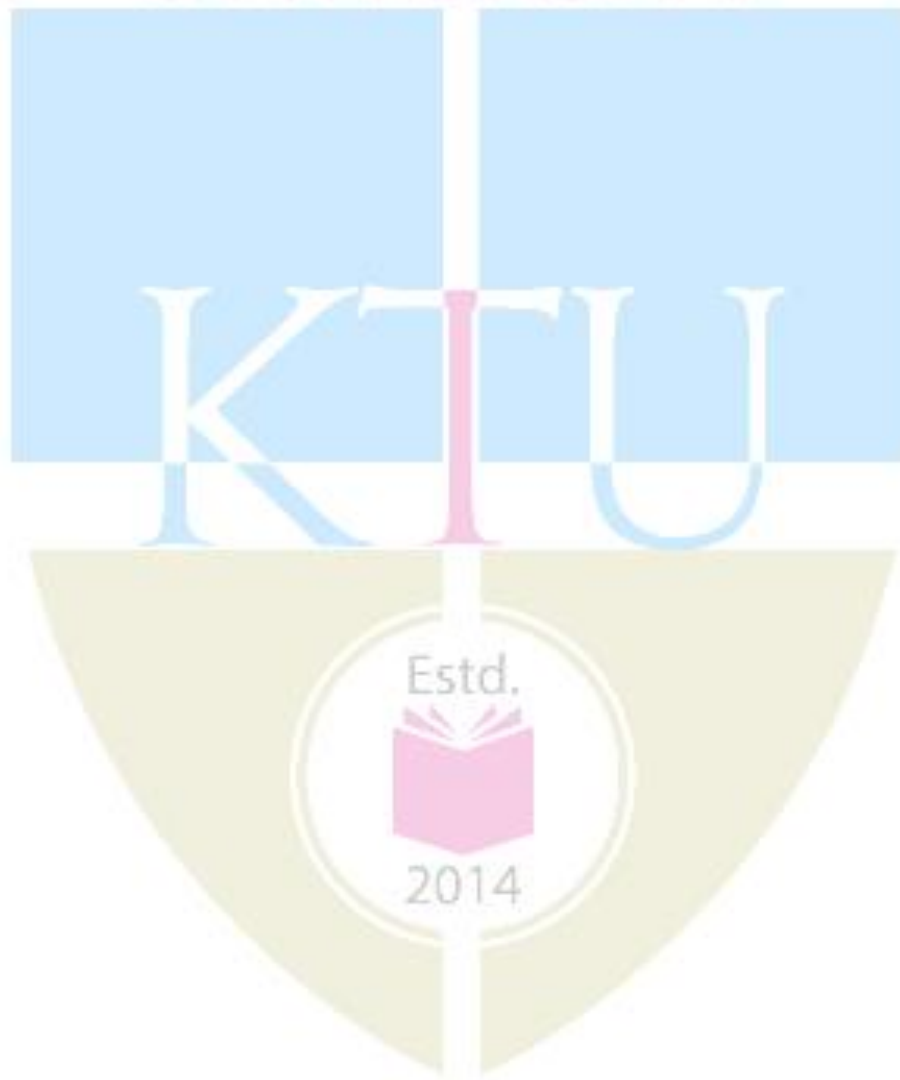
Course code	Course Name	L-T-P-Credits	Year of Introduction
ME334	MANUFACTURING TECHNOLOGY LABORATORY – II	0-0-3-1	2016
Prerequisite: ME312 Metrology and Instrumentation			
Course Objectives: <ul style="list-style-type: none"> To provide programming practice on CNC machine tools To impart knowledge on the fundamental concepts and principles of metrology To explain the need of various modern measuring instruments and precision measurements 			
List of Experiments/Exercises:			Sessions
Exercise on grinding machine			1
Study and preparation of program, simulation and exercise on CNC lathe:-turning, step turning, taper turning, thread cutting, ball and cup turning etc.			2
Study and preparation of program, simulation and exercise on CNC milling machine: - surface milling, pocket milling, contour milling etc.			2
Basics for mechanical measurements Calibration of vernier caliper, micrometer and dial gauge etc. Determination of dimensions of given specimen using vernier caliper, micrometer, height gauge, bore dial gauge etc. Determination of dimensions of a rectangular, square, cylindrical specimens using slip gauges and comparing with height gauge/vernier caliper etc			1
Experiments on Limits, Fits and Tolerance Determine the class of fits between given shaft and hole. etc.			
Linear measurements Study of different linear measuring instruments. Calibration of LVDT using slip gauges.			1
Straightness error measurement Study of different straightness error measuring instruments – basic principle of auto collimator and spirit level. Measurement of straightness error of a CI surface plate using auto collimator and comparing with spirit level. laser interferometer used to determine straightness error To check straightness error of a straight edge by the wedge method using slip gauges.			1
Angle measurements Angular measurements using bevel protractor, combination sets, clinometers, angle dekkor etc. Measurement of angle and width of a V-block and comparing with combination sets. Measurement of angle using sine bar of different samples.			1

<p>Out of roundness measurement Study of different methods used for measurement out of roundness Measurement of out of roundness using form measuring instrument Measurement of out of roundness using V-block and dial gauge Measurement of out of roundness using bench centre and dial gauge etc.</p>	1
<p>Screw thread measurement Measurement of screw thread parameters using two wire and three wire method. Measurement of screw thread parameters using tool maker's microscope etc. Measurement of screw thread parameters using thread ring gage, thread plug gage, thread snap gage, screw thread micrometer, optical comparator etc.</p>	1
<p>Bore measurement Measurement of a bore by two ball method. Measurement of a bore by four ball method. Bore measurement using slip gauges and rollers. Bore measurement using bore dial gauge etc.</p>	1
<p>Calibration and determination of uncertainties Strain measurement using strain gauge load cells. Calibration of a cantilever strain gauge load cell. Rotation measurement Determination of rpm using tachometer, optical tachometer and stroboscope, etc.</p>	1
<p>Area determination Study of planimeter and Green's theorem Determination of given irregular area using planimeter.</p>	1
<p>Gear metrology Types of gears – gear terminology – gear errors - study of Profile Projector. Measurement of profile error and gear parameters using profile projector etc. Use of Comparators Exercise on comparators: mechanical, optical, pneumatic and electronic comparators.</p>	1
<p>Use of Tool makers microscope Study of tool maker's microscope – use at shop floor applications. Measurement of gear tooth parameters using tool maker's microscope. Measurement of different angles of single point cutting tool using tool maker's microscope.</p>	1
<p>Surface roughness measurement Measurement of surface roughness using surface profilometer /roughness measuring machine of turned, milled, grounded, lapped and glass etc specimens.</p>	1
<p>Squareness measurement Determination of squareness of a trisquare using angle plate and slip gauges.</p>	1
<p>Flatness measurement Study of optical flat and variation of fringe patterns for different surfaces. Determination of parallelism error between micrometer faces. Compare given surface using optical flat with interpretation chart.</p>	1
<p>Vibration measurement Measurement of displacement, velocity and acceleration of vibration.</p>	1

Use of Pneumatic comparator Checking the limits of dimensional tolerances using pneumatic comparator Calibration using air plug gauge etc	1
Reference books <ol style="list-style-type: none"> 1. Collett, C.V. and Hope, A.D, Engineering Measurements, Second edition, ELBS/Longman,1983 2. Sharp K.W.B. and Hume, Practical Engineering Metrology, Sir Isaac Pitman and sons Ltd, London,1958 3. Shotbolt C.R. and Gayler J.F.W, Metrology for Engineers, 5th edition, ELBS, London,1990 4. Yoram Koren, Numerical Control of Machine Tools, McGraw-Hill,1983 	
<p>A minimum of 12 experiments are mandatory but the experiments/exercises in CNC machines are mandatory.</p> <p>The academic evaluation shall be carried out by faculty.</p>	



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