



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

MACHINE TOOLS AND METROLOGY LABORATORY								
IV Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEE21	Core	L	T	P	C	CIA	SEE	Total
		0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes:36			
Prerequisite: Production Technology Laboratory								

I. COURSE OVERVIEW:

This course introduces the mechanism of metal cutting of different geometrical shapes using wide variety of cutting tools. This emphasizes on the development/ demand of the newer materials with cutting edge technology tools. It is designed to impart the practical knowledge about the various machining processes like turning, shaping, planning, drilling, milling and grinding to produce desired shape of a product. This course introduces the metrological equipment to measure form and positional accuracy of manufactured/machined components and to interpret the results.

II. COURSES OBJECTIVES:

The students will try to learn

- I. The empirical knowledge on machine tools so that they can identify, manipulate and control various process parameters during machining processes in the manufacturing industry.
- II. The details related to thermal aspects during machining for defect free manufacturing components.
- III. The mechanics of machining process and significance of various process parameters in order to yield the optimum machining.
- IV. The principles of linear and angular measuring instruments for accurate measurement of a given component.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO1 Apply the appropriate cutting parameters for prismatic operations and their critical tool development / selection of Lathe, Milling, drilling, slotting shaping and surface grinding machines for manufacturing the components of their requirement.
- CO2 Estimate machining times for machining operations at specified levels of cutting parameters of machine tools.
- CO3 Analyze the chip formation mechanism by measuring the cutting forces during the chip formation process.
- CO4 Apply surface grinding operations to improve the quality of the surface with desired dimensions by removing uneven spots on the surface
- CO5 Apply the principles of limits, fits and tolerance while designing and manufacturing the components of their requirement to get form and position.
- CO6 Apply equipment's like Surface Roughness tester, and Tool makers Microscope to find out parameters of gear, thread, tool and surface roughness.

IV. COURSE CONTENT:

EXCERCISE-1: LATHE MACHINE

Perform Various Lathe Operations Such as Plain Turning, Step Turning, Taper Turning Knurling and Chamfering on mild steel bar of 100mm long and 25 mm diameter, tools required Vernier calipers, steel rule, spanner, chuck spanner, and H.S.S. single point cutting tool.

EXCERCISE-2: DRILLING AND TAPPING

Perform Drilling, tapping and step boring using drilling machine on Mild Steel Flat of 50 X 50 mm.

EXCERCISE-3: PLANNING AND SHAPING

Perform V and Dovetail machining & U-cut on the given work piece of Mild steel flat

EXCERCISE-4: SLOTTING

Perform a keyway using slotter machine

EXCERCISE-5: MILLING

Perform plane milling operation on the given specimen (mild steel) & get to its correct dimensions

EXCERCISE-6: SURFACE GRINDING

Make surface finish of given work piece of mild Steel 40*40*20

EXCERCISE-7: CYLINDRICAL GRINDING

Achieve a precise diameter, excellent surface finish, and roundness on a mild steel work piece

EXCERCISE-8: VERNIER CALIPERS

Measure the Length, depth, diameter of given specimen using vernier calipers

EXCERCISE-9: MICROMETER

Measure the Length, depth, diameter of given specimen using micrometer

EXCERCISE-10: BORE GAUGE

Measure the bore diameter of engine block using bore gauge

EXCERCISE-11: ANGLE MEASUREMENT – I (BEVEL PROTRACTOR)

Measure different angles using bevel protractor

EXCERCISE-12: ANGLE MEASUREMENT – II (SINE BAR)

Determine the Morse taper angle through the utilization of a sine bar setup

EXCERCISE-13: TOOL MAKERS MICROSCOPE

Determine the tool signature using tool makers microscope.

EXCERCISE-14: SURFACE ROUGHNESS MEASUREMENT

To measure the surface roughness of a given specimen using SJ210

V. TEXT BOOKS:

1. R. K. Jain, "Production Technology", Khanna Publishers, 18th Edition, 2021.
2. B. S. Raghu Vamshi, —Workshop Technology Vol – II, 9th Edition, Dhanpat Rai Publishers, New Delhi, India. 2020

VI. REFERENCE BOOKS:

1. B.L. Juneja, G.S. Sekhon, Nitin Seth" Fundamentals of Metal Cutting and Machine Tools", New Age Publishers, 2nd Edition,2019.
2. Geoffrey," Fundamentals of metal machining and machine tools", Tata McGraw Hill Education, 3rd Edition, 2019.
3. M Mahajan", A Textbook of Metrology", Dhanpatrai and Co, 2nd Edition, 2021.

VII. ELECTRONICS RESOURCES:

1. <https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/additive-manufacturing-technologies-forpracticing-engineers/>.
2. https://akanksha.iare.ac.in/index?route=course/details&course_id=337

VIII. MATERIALS ONLINE:

1. Course Outline Description
2. Laboratory Manual
3. Laboratory Exercises