



ELEMENTS OF METAL CUTTING, MACHINE TOOLS, GEAR CUTTING AND CNC MACHINING

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TYPE OF COURSE : Rerun | Core | UG/PG
COURSE DURATION : 12 weeks (26-Jul' 21 - 15-Oct'21)
EXAM DATE : 23 Oct 2021

INTENDED AUDIENCE: Undergraduate or postgraduate students of mechanical engineering, manufacturing engg, production engg, diploma and certificate students of mechanical trade

COURSE OUTLINE :

In the course metal cutting and machine tools, gear cutting and CNC machine tools and processes, the students will be made familiar with metal cutting theory including cutting tool geometry, mechanism of chip formation, force analysis in the orthogonal cutting system, measurement of cutting forces – dynamometers, Theory of tool wear and tool life, Study of different machine tools: Lathe and Milling machine. Study of gear cutting on milling machine, gear shaping and gear Hobbing machines. Study of non-traditional machining : LBM, EDM, ECM, USM, AJM, AWJM Study of CNC machining. Study of Gear cutting : Introduction to gears, Different types of gears. Simple gear calculations involving numbers of teeth, rpm etc. Gear cutting on the milling machine with rotary disc type form gear milling cutter : Spur and Helical gear cutting with simple and differential indexing, calculation of change gear ratio Gear cutting on the gear shaper – calculation of speed gear box, feed gear box, index gear box ratios Gear cutting on the gear hobbing machine (both straight spur and helical gears) – calculation of speed gear box, feed gear box, index gear box and lead change gear box Computer numerical control : Introduction, Classification: Point to point and continuous control, open loop and closed loop control. Kinematic structure of CNC machine tools, different types of prime movers used, feedback devices Digital logic and use of digital logic in CNC machines Interpolation in CNC machines: Linear and circular interpolation Programming in CNC machine - programming on the CNC turning centre and machining centre CNC Free form surface machining with ball ended milling cutter on 3 axis machining centre – basic concepts

ABOUT INSTRUCTOR :

Prof. Asimava Roy Choudhury received his B.E, (Mechanical) Degree from Jadavpur University in 1983, M.Tech. (Machine Tools Engg) from IIT Kharagpur in 1984 and Ph.D. (Engg) from IIT Kharagpur in 1999. Asimava Roy Choudhury is at present a professor in the Mechanical Engineering Department of IIT Kharagpur. His interests include: Computer numerical control, Direct slicing in Rapid Prototyping, Non-traditional manufacturing processes and Laser coating of surfaces.

COURSE PLAN :

- Week 1:** Introduction to metal cutting: Tool geometry
- Week 2:** Tool geometry, Mechanism of chip formation, orthogonal cutting, forces in metal cutting (orthogonal cutting)
- Week 3:** Theory of tool wear, machine tools : Lathe and milling machines
- Week 4:** Lathe and milling machines contd., Gear cutting machines, Non-traditional machining, CNC machining
- Week 5:** Introduction to gears, simple calculations involving gears
- Week 6:** Milling of gears, simple and differential indexing
- Week 7:** Helical gear cutting, gear teeth calculations
- Week 8:** Gear Shaping and Gear hobbing
- Week 9:** CNC – basic principals, classification, binary logic
- Week 10:** Features and devices of CNC machines, prime movers, feedback devices, programming
- Week 11:** Programming and Interpolation
- Week 12:** CNC Free form surface machining