GUJARAT TECHNOLOGICAL UNIVERSITY

PRODUCTION ENGINEERING

MACHINING PROCESSES
SUBJECT CODE: 2132501
B.E. 3RD SEMESTER

Type of course: Core

Prerequisite: Workshop

Rationale: Production engineers need to know varied machining routes for production of part in conjunction with the accuracy, tolerance & surface finish. The hands on skill as regards to machining process are must be it at a scale of mass, batch, or unit production. The present course intends to give the exposure of various machining routes for a product whose scale ranges from nano to mega.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Subject Content	Total Hrs	Module Weightage
1.	**Introduction of Machine Tools** Basic concepts of Machining and Machine Tools, Classification of Machine Tools , Working and auxiliary motions in machine tools, Primary cutting motions in machines tools, CNC machining.	2	5
2.	**Turning operations** Introduction – Lathe – Types of lathes – Size of a lathe – Work holding devices – Principal unit arrangements and mechanisms to obtain speed, feed and depth of cut- Lathe operations – Metal removal rate and machining time calculations- Turrets and automats-Micro turning-CNC turning- Alignment test for lathe.	20	40
3.	**Drilling and allied operations** Introduction – Drilling machines – Types - mechanism deployed for speed, feed and depth of cut – Drills – Drilling machine operations – Boring, Reaming and other operations – Material removal rate and time calculations for drilling - Methods of drilling, deep hole drilling, micro drilling, multiple drilling, CNC drilling- Alignment test for drilling- - Boring machine – Types.	8	15
4.	**Milling operations:** Introduction – Milling machines and mechanism deployed for speed and feed and– Types of Milling machines – Milling cutters – Milling process- work holding devices – milling machine attachments- Milling machine operations- alignment test for milling machine-Micro milling, horizontal and vertical CNC centres- Material removal rate and time calculations for milling.	10	15
5.	**Shapers, Planers and Slotters** Classification of Planers, Shapers and Slotters, Speed, feed and depth of cut of Planers, Shapers and Slotters, Material removal rate and time calculations for	6	10

	Planers, Shapers and Slotters, drive and feed mechanisms of Planers, Shapers and Slotters		
6.	**Broaching Operations:** Principles- Types of broaching machines- advantage, applications and limitations of broaching.	4	5
7.	**Abrasive Processes:** Basic principle- purpose and application of grinding- Selection of grinding wheels and their conditioning- Classification of grinding machines and their uses-Micro grinding-alignment test for grinding machine- Material removal rate and time calculations for grinding.	6	10

Reference Books:

1. Hajra Choudhary S.K. and Hajra Choudhary A.K ., "Workshop Technology", Media Promotors and Publishers,1992.
2. Workshop Technology Vol. I &II & III by Chapman.1972
3. Production Technology by R. K. Jain. Khanna Publishers, 2001
4. Processes and Materials of Manufacture; Lindberg Roy A.; Prentice-Hall India 1998
5. Kalpakjain S. and Schmid Steven R., "Manufacturing Processes for Engineering Materials ", Pearson Publication, 2007.
6. Bawa H.S., "Workshop Technology", Tata McGraw Hill, 1995.

Course Outcome:

After learning the course the students should be able to:

- Indicate which types of manufacturing process are suited for producing different shapes of the product.
- Demonstrate the ability to break down manufacturing processes for analysis
- Identify and measure manufacturing process variables in a manufacturing laboratory and make technical inference about the process
- Determine the time to machine/grind the jobs on machine.
- Judge the machining/grinding process inaccuracy occurring out of misalignments.
- Determine the machining process capabilities, capacities and limitations of the machining/grinding operations

List of Experiments:

1. Lathe job (individual job – 06 hours)
2. Study of different cutting tools like Single point cutting tool, Tap, Drill, Reamer, Boring tool, Saws, Milling cutters, Grinding wheels – (02 hours)
3. Capstan lathe demonstration (Group - 02 hours)
4. Drilling & Allied Operations (Group job - 02 hours)
5. Shaper, Planer, Slotter machine demonstration (Group job - 04 hours)
6. Milling and Indexing spur gear tooth cutting (Group job - 04 hours)
7. Grinding machine demonstration and Group job (02 hours)
8. Work holding and tool holding devices on lathe, Shaper, Planer, Slotter, Drilling M/C, and Milling M/C. (02 hours)
9. Study of attachment on lathe, Milling and Grinding machine (04 hours)

Design based Problems (DP)/Open Ended Problem:

- Making of Oldham coupling, flange coupling, lever (lock and key) mechanism, idler for conveyor, bicycle axel, bicycle pedal assembly, gear mechanism for bicycle/moped.

Major Equipments (machine tools):

Lathe, Radial Drilling Machine, Shaper, Planer, Slotter, Universal Milling Machine, Grinding Machine, Sawing Machine

List of Open Source Software/learning website:

1. **http://nptel.ac.in/**

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.