

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

MECHANICAL TECHNOLOGY

(Code: 3335502)

Diploma Programme in which this course is offered	Semester in which offered
Fabrication Technology	3 rd Semester

1. RATIONALE

This course focuses on different types of metal cutting machine tools used in fabrication industries. It also develops safety consciousness to work in machine shop. This course also focuses on other manufacturing processes related to fabrication industries like metal casting and mechanical working of metal. This course develops quality consciousness among the student regarding this process. It includes hands-on practice for students to develop practical skills among the students. This course is very interesting and useful course for fabrication engineers.

2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency:

- **Produce different parts for fabrication jobs using knowledge and skills of mechanical manufacturing processes.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P - Practical;
C – Credit; ESE - End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Course Outcomes as per NBA terminology)	Topics and Sub-topics
Unit – I Introduction To Machine Tools	1.a Describe function and classification of machine tools. 1.b Describe attitude, knowledge and skill required for shop floor supervisor	1.1 Classification of manufacturing Processes. 1.2 Definition and concept 1.3 Function of machine tools 1.4 Classification of machine tool 1.5 Need of attitude, knowledge & skill required for shop floor supervisor in machine tool industries.
Unit– II Lathe Machine Tool	2.a Describe construction of lathe and function of its basic parts. 2.b Describe different types of lathe cutting tools and its material 2.c Show safety consciousness in student while working in machine shop 2d. Perform various operations on lathe machine tool.	2.1 Function and construction of lathe. 2.2 Size, types and selection of lathe, 2.3 Basic parts of lathe, 2.4 Feed mechanism, 2.5 Lathe accessories and lathe Attachments, 2.6 Lathe operations 2.7 Lathe cutting tools, its geometry and Material. 2.8 Cutting speed, feed, DOC, MRR 2.9 Cutting fluid and lubricants 2.10 Safety consideration in lathe
Unit– III Drilling Machine Tool	3.a Describe construction of various drilling machine tools and function of its basic parts. 3.b Describe types of tools & their geometry. 3.c Perform various operations on bench /Radial drilling machine tool.	3.1 Construction, types and size of drilling machine 3.2 Drill speed and feed mechanism 3.3 Operation performed on drilling machine 3.4 Types of drills 3.5 Twist drill geometry 3.6 Drill size, designation and drill material
Unit– IV Shaping & Planning Machine Tool	4a. Describe construction of shaping / planning machine tools and function 4b. Perform various operation on shaping / planning machine tool.	4.1 Working principle, types and size & specification 4.2 Construction & basic parts. 4.3 Operations performed. 4.4 Quick return mechanism

Unit	Major Learning Outcomes (Course Outcomes as per NBA terminology)	Topics and Sub-topics
Unit– V Milling Machine Tool	5.a. Describe construction of milling machine and function of its basic parts. 5.b. Describe milling methods. 5.c. Describe milling operations. 5.d. Calculate indexing on indexing head for making different object on milling machine.	5.1. Working principle, types and size and specification 5.2. Milling cutter 5.3. Milling methods 5.4. Milling operations 5.5. Dividing head or indexing head 5.6. Methods of indexing
Unit– VI Grinding Machine Tools	6a. Describe construction of grinding machine tools and function of its basic parts 6b. Explain selection of grinding wheels and its classification	5.1. Working principle, types, size and specification of grinding. 5.2. Machine Grinding operation . 5.3. Grinding wheels, its classification, size, shape, type of abrasives, grain size, bond grade, structure, marking system. 5.4. Glazing, loading and gumming of 5.5. grinding wheel. 5.6. Truing, dressing, balancing of grinding 5.7. wheel 5.8. Selection of grinding wheel
Unit– VII Foundry	7.a. Explain casting process. 7.b. Describe types of Patterns. 7.c. Describe moulding methods and materials. 7.d. Describe cores, its materials & making and using processes. 7.e. Explain gating systems in various moulds. 7.f. Describe cupola furnace for casting, 7.g. Describe casting materials and tool, 7.h. Describe casting defects	7.1. Casting process 7.2. Advantages & Application of casting 7.3. Foundry layout and different sections of foundry 7.4. Pattern : function, material, types, pattern making, pattern colour coding, pattern allowance 7.5. Mould : Mould materials, moulding sand, types, moulding methods, mould making steps 7.6. Core : core sand, core making process, types, core application 7.7. Principle of gating system 7.8. Function of gating system and its different elements 7.9. Cupola Furnace. 7.10. Fettling & finishing of casting 7.11. Defects in casting

Unit	Major Learning Outcomes (Course Outcomes as per NBA terminology)	Topics and Sub-topics
Unit- VIII Mechanical working of metals	8.a Describe different mechanical working processes. 8.b Explain rolling of metals, machines and defects in rolled products. 8.c Explain hot and cold extrusion processes. 8.d Explain hand forging operations and tools. 8.e Explain machine forging processes. 8.f Explain metal spinning process and its applications. 8.g Explain effect of mechanical working on mechanical properties of metals.	8.1 Principle of Hot and Cold working of metals and their effect on mechanical properties of metal 8.2 Rolling : Introduction & Concept, Hot and cold rolling of metals, Types of rolling mills, Defects in rolled products 8.3 Extrusion : Introduction & Concept, Methods of extrusion, Hot and Cold extrusion, 8.4 Forging : Introduction, Merits of forging compare to machining and casting, hand forging tools, Forging Operations, Forging process, Forging defects 8.5 Metals Spinning : Introduction and principle of operation, Spinning process, Application of spinning.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1	Introduction to machine tools	04	02	03	02	07
2	Lathe machine tool	12	04	06	04	14
3	Drilling machine tool	06	02	03	02	07
4	Shaping & Planning machine tool	06	02	03	02	07
5	Milling machine tool	05	02	03	02	07
6	Grinding machine tool	05	02	03	02	07
7	Foundry	10	04	04	04	12
8	Mechanical working of metals	08	03	03	03	09
		56	21	28	21	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx Hours Required
1	II	Prepare given job on lathe by straight turning	04
2	II	Prepare given job on lathe by Taper turning	04
3	II	Cut threads as per specification on job using lathe	04
4	III	Drill holes as per specification using drilling	04
5	IV	Prepare given job using shaping machine	04
6	IV	Demonstrate working of planing machine	02
7	V	Demonstrate working of milling machine and milling cutter	02
8	VI	Demonstrate working of grinding machine	02
9	VII	Demonstrate mould making	02
10	VIII	Demonstrate mechanical working process on metals	02
Total			30

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities:

- i. Write report on attitude, knowledge and skill required for shop floor supervisor
- ii. Write report on safety in machine shop
- iii. Write report on lathe accessories and lathe attachment
- iv. Exercise on calculation of MRR
- v. Write report on lathe cutting tools
- vi. Write report on quick return mechanism of shaping machine
- vii. Write report on indexing methods on milling machine
- viii. Write report on grinding wheel
- ix. Write report on cupola furnace
- x. Write report on casting defects
- xi. Write report on rolling and forging defects

8. SPECAIL INSTRUCTIONAL STRETAGIES (If Any)

- i. Industrial visits to nearby industries/workshops should be arranged.
- ii. Video/animation films showing different machining operations and working of machines should be shown to students.

9. SUGGESTED LEARNING RESOURCES**A. List of Books**

S.N.	Title of Books	Author	Publication
1	Production Technology Vol-1 & 2	O. P. Khanna	Dhanpat Rai Publication
2	Manufacturing Technology	P. N. Rao	Tata Macgrawhill Publishing Company Ltd, New Delhi
3	Workshop Technology vol-1 & 2	Hajra & Chaudhri	
4	Foundry Technology	O. P. Khanna	Dhanpat Rai Publication
5	Production Technology	HMT	
6	Manufacturing Science	S. Dalala	

B. List of Major Equipment/ Instrument

- i. Lathe machine tool
- ii. Shaping machine tool
- iii. Drilling machine tool
- iv. Grinding machine tool
- v. Planning machine tool
- vi. Milling machine tool
- vii. Foundry equipments
- viii. Forging equipments
- ix. Rolling machine

C. List of Software/Learning Website

- i. <http://www.lathemachinesindia.com/>
- ii. <http://en.wikipedia.org/wiki/Lathe>
- iii. <http://www.technologystudent.com/equip1/shape1.htm>
- iv. <http://uhv.cheme.cmu.edu/procedures/machining/ch4.pdf>
- v. <http://machinetools.bhavyamachinetools.com/types-of-drilling-machine-radial-drill-machine/>
- vi. http://www.youtube.com/channel/HCVo6WWN8R_dk
- vii. <http://www.custompartnet.com/wu/milling>
- viii. <http://en.wikipedia.org/wiki/Foundry>
- ix. <http://www.cold-flow.com/cf/category/coldforging.html>

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. P.B.Pathak**, I/C HOD, Dept of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. B.K.Gandhi**, Sr. Lecturer, Dept of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. S.Y.Merchant**, Sr. Lecturer, Dept of Fabrication Technology, Sir B.P.I., Bhavnagar

Co-coordinator and Faculty Members from NITTTR Bhopal

- **Dr. A.K. Sarathe**, Associate Professor Department of Mechanical Engineering.
- **Dr. C.K.Chugh**, Prof. Department of Mechanical Engineering