MUZAFFARPUR INSTITUTE OF TECHNOLOGY

COURSE FILE

OF

MACHINE TOOLS & MACHINING

(021514)

Faculty Name: Mr. SANTOSH KUMAR

ASSISTANT PROFESSOR,

DEPARTMENT OF MECHANICAL ENGINEERING

विज्ञान एवं प्रावैधिकी विभाग

Department of Science and Technology

Government of Bihar

CONTENTS

Department of Mechanical Engineering

Vision

- To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Mechanical Engineering.

Mission

- To build an academic environment of teaching and lifelong learning for students to make them competitive in context with advance technological, economical and ecological changes.
- To enable the students to enhance their technical skills and communications through research, innovation and consultancy projects.
- To share and explore the accomplishments through didactic, enlightenment, R & D programs with technical institution in India and abroad.

Mechanical Engineering Program Educational Objectives

After 4 year of graduation a B.TECH (ME) graduate would be able to

- Graduates will spread and enhance their technical capability and proficiency through vital domain of economical, environmental and social concerns affiliated with the mankind and industry.

- Graduates will able to work professionally with modern methods in the area of Thermal, Mechanical System Design, Manufacturing, Measurement, Quality control and other interdisciplinary fields of concerns.

- Graduates will practice Mechanical engineering in sensible, flexible and ethical manner to benefit the society, industry and nation toward the rapidly changing global technical standards.

- Graduates will serve as ambassadors for engineering by their knowledge, creativity, imagination and innovation and set new extremes in their profession through lifelong learning.

Mechanical Engineering Student Outcomes

Students who complete the B.TECH degree in ME will be able to:

1. An ability to apply the knowledge of mathematics, basic sciences and engineering concepts to solve the complex engineering problems.
2. The ability to conduct experiments and to critically analyze and interpret the experimental data to reach at substantial outcomes.
3. An ability to design systems, components, or processes to meet appropriate needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to identify, formulates, and solves the complex engineering problems.
5. An ability to function on multi-disciplinary teams that leads the multi-disciplinary projects.
6. An understanding of professional and ethical responsibility.

7. An ability to communicate effectively with written, oral, and visual means.
8. An ability to understand the impact of engineering solutions in a global, environmental, economical and societal context.
9. An ability to recognize the need to engage in life-long learning.
10. An ability to attain knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern tools necessary for Mechanical engineering practice.
12. Possess ability to estimate costs, estimate quantities and evaluate materials for design and manufacturing purposes.

Course Description

Study of fundamentals of Manufacturing Process and hence educate the students about the scope of the subject. To train the students in the metal cutting domain so as to equip them with adequate knowledge about the various processes like turning, shaping, planning, drilling, milling and grinding. To emphasize upon the prominent theories, concepts and constructional features of machines related to them. To provide an insight about the super finishing operations of lapping and honing. To lay groundwork for further studies in manufacturing stream.

Course Objectives

1. The course provides students with fundamental knowledge and principles in material removal processes.
2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
3. To demonstrate the fundamentals of machining processes and machine tools.
4. To develop knowledge and importance of metal cutting parameters.
5. To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

Course Outcomes

CO1: Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting.

CO2: Identify basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.

CO3: Design locating and clamping devices to produce a component.

CO4: Select a machining operation and corresponding machine tool for a specific application in real time.

CO5: Select a measuring instrument to inspect the dimensional and geometric features of a given component.

CO6: Understanding the computer controlled manufacturing such as CNC, NC, DNC, CAM & Robotics.

CO-PO MAPPING

Sr. No.	Course Outcome	PO
1.	**CO1**: Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting.	PO4, PO5, PO9, PO12
2.	**CO2**: Identify basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.	PO8, PO7, PO4
3.	**CO3**: Design locating and clamping devices to produce a component.	PO1, PO2, PO10, PO11
4.	**CO4**: Select a machining operation and corresponding machine tool for a specific application in real time.	PO2, PO3, PO5
5.	**CO5**: Select a measuring instrument to inspect the dimensional and geometric features of a given component.	PO1, PO2, PO6
6.	**CO6**: Understanding the computer controlled manufacturing such as CNC, NC, DNC, CAM & Robotics.	PO7, PO8, PO12

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1: Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting.				√	√				√			√
CO2: Identify basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.				√			√	√				
CO3: Design locating and clamping devices to produce a component.	√	√								√	√	
CO4: Select a machining operation and corresponding machine tool for a specific application in real time.		√	√		√							
CO5: Select a measuring instrument to inspect the dimensional and geometric features of a given component.	√	√				√						
CO6: Understanding the computer controlled manufacturing such as CNC, NC, DNC, CAM & Robotics.							√	√				√

B. Tech. V Semester (Mechanical)
ME 1x14 MACHINE TOOLS AND MACHINING

L T P/D Total	Max Marks: 100
3 -1- 0 4	Final Exam: 70 Marks
	Sessional: 20 Marks
	Internals: 10 Marks.

UNIT-I

Metal cutting and Machine Tools : Metal cutting : Mechanics of metal cutting, Geometry of tool and nomenclature, Tool materials, Orthogonal vs oblique cutting. Mechanics of chip formations, types of chips, tools angles, shear angle, Merchant's force circle diagram, Cutting forces, power required, Cutting fluids/lubricants, Tools wear and tool life.

UNIT-II

Machine Tools :

(a) Lathe : Principle, types, operations, turret/capstan, semi/automatic, Tool layout.

(b) Shaper, slotted, planer, operation, drive.

(c) Milling, Milling cutter, up & down milling, dividing head indexing, Max chip thickness, power required.

(d) Drilling and boring, reaming tools, Geometry of twist drill, Grinding, Grinding wheel, Abrasive, cutting action, grinding wheel specification, Grinding wheel wear, alterations, wear, fracture wear, dressing and trimming. Max chip thickness and guest criteria, Flat and cylindrical grinding, Centreless grinding, Super finishing, Honing lapping, Polishing.

UNIT-III

Computer controlled manufacturing process: NC, CNC, DNC, part programming, Introduction to computer aided manufacturing and robotics.

UNIT-IV

Metrology: Tolerance and limit systems, limit gauges, Measurement of surface roughness, Inspection of gears and screw threads.

UNIT-V

Jigs and Fixtures : Locating elements, clamping devices, principles of Jigs and fixtures design.

Text Books :

1. Manufacturing technology by PN Rao
2. Production technology by RK Jain

GATE SYLLABUS

NON CONVENTIONAL MANUFACTURING

Machining and Machine Tool Operations: Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, design of jigs and fixtures.

Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools.

5th Semester ME								ROOM NO-47
Day/ time	**9:00-10:00**	**10:00-11:00**	**11:00-12:00**	**12:00-13:00**	**13:00-14:00**	**14:00-15:00**	**15:00-16:00**	**16:00-17:00**
MON		**M/C Tools (SK)**			**B R E A K**			
TUE			**M/C Tools (SK)**					
WED			**M/C Tools (SK)**					
THU						**M/C Tools (SK) T1**	**M/C Tools (SK) T2**	
FRI						**M/C Tools (SK) T3**	**M/C Tools (SK) T4**	
SAT								

MUZAFFARPUR INSTITUTE OF TECHNOLOGY, MUZAFFARPUR

5th SEMESTER

S.No	AKU Reg. No.	College Roll No.	Name
1	16102107017	16M01	SAURAV KUMAR
2	16102107011	16M02	MD AKRAM ALAM
3	16102107008	16M03	ABHISHEK KUMAR
4	16102107053	16M04	RAHUL KUMAR
5	16102107007	16M05	NAWLESH KUMAR
6	16102107052	16M06	UJJWAL KUMAR
7	16102107009	16M07	ANUBHAV SHRIVASTAVA
8	16102107001	16M08	SUMAN BHARTI KESHAV
9	16102107057	16M11	ASHUTOSH KUMAR
10	16102107013	16M12	ABHISHEK ANAND
11	16102107048	16M13	ANAND MOHAN SINGH
12	16102107032	16M14	SHUBHAM
13	16102107055	16M15	SURENDRA KUMAR
14	16102107026	16M16	KANHAIYA KUMAR
15	16102107024	16M17	PRINCE KUMAR
16	16102107036	16M18	NAVNEET DHANRAJ
17	16102107003	16M19	ALOK ARAYA
18	16102107019	16M42	MD TASLIM
19	16102107005	16M20	RAJHANS KUMAR
20	16102107047	16M21	VED PRAKASH
21	16102107018	16M22	MITHUN KUMAR
22	16102107035	16M23	SHATRUDHAN KUMAR
23	16102107021	16M24	SHASHI KUMAR
24	16102107030	16M25	RAHUL PRASAD
25	16102107056	16M26	MANOHAR KUMAR
26	16102107051	16M27	VISHAL KUMAR
27	16102107004	16M31	VIKAS KUMAR BHARTI
28	16102107016	16M32	AVINASH KUMAR
29	16102107023	16M34	VISHWANATH KUMAR
30	16102107049	16M35	KANHAIYA KUMAR
31	16102107042	16M36	KUMAR RAHUL
32	16102107033	16M37	PIYUSH KUMAR
33	16102107039	16M38	FAIZ ANWAR
34	16102107037	16M40	RUPESH KUMAR
35	16102107046	16M41	RAUSHAN KUMAR
36	16102107015	16M43	RAUSHAN KUMAR
37	16102107044	16M44	VISHAL KUMAR
38	16102107041	16M47	VINOD KUMAR

39	16102107058	16M49	NIDHI KUMARI GUPTA
40	16102107012	16M51	SANDEEP RAHUL
41	16102107002	16M52	MUKUND KUMAR
42	16102107050	16M53	TUSHAR VERMA
43	16102107034	16M54	AMIT KUMAR
44	16102107040	16M55	PRABHAKAR KUMAR
45	16102107045	16M56	LALAN KUMAR
46	16102107010	16M58	VISHAL KUMAR
47	16102107022	16M59	VIVEK KUMAR
48	16102107020	16M60	KUMARI PAYAL
49	16102107043	16M61	VISHAL KUMAR
50	16102107031	16M62	SHAILENDRA KUMAR
51	16102107054	16M63	SONU KUMAR
52	16102107014	16M64	RATAN KUMAR
53	16102107028	16M65	NANDAN KUMAR
54	16102107027	16M66	AMRIT RAJ
55	16102107059	16M67	ASHUTOSH KUMAR JHA
56	16102107025	16M68	SHIWANGI KUMARI
57	16102107006	16M69	SHASHI BHUSHAN KUMAR
58	16102107038	16M70	AVINASH RAJ
59	16102107029	16M71	KRISHNA KUMAR
60	16104107033	16M72	ASHUTOSH SINHA
61		17(LE)M01	CHANDAN KUMAR
62		17(LE)M02	RAHUL RAY
63		17(LE)M03	SUDHANSHU KUMAR SHARMA
64		17(LE)M04	RAJEEV KUMAR
65		17(LE)M05	SANGAM KUMAR
66		17(LE)M06	KRISHNA KUMAR
67		17(LE)M07	ANKIT RANJAN
68		17(LE)M08	DHIRAJ KUMAR
69		17(LE)M09	GUDDU KUMAR
70		17(LE)M10	SUNNY KUMAR
71		17(LE)M11	RAKESH RAM
72		17(LE)M12	ANAND MOHAN JHA

Code : 021514

B.Tech 5th Semester Examination, 2016

Machine Tools and Machining

Time : 3 hours *Full Marks : 70*

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are Nine questions in this paper.

(iii) Attempt five questions in all.

*(iii) **Question No. 1 is Compulsory.***

---

1. Choose the correct/best answer from the following (any seven): 7×2=14

(a) A left hand tool on a lathe cuts most efficiently when:

(i) It travels from right to left

(ii) It travels from left to right

(iii) It travels across the bed

(iv) It is operated by compound slide

(v) It is connected with automatic feed

(b) The process or removing metal by a cutter which is rotated in the same direction of travel of workpiece, is called:

(i) Up milling

(ii) Down milling

(iii) Face milling

(iv) End milling

(c) Lapping is an operation of :

(i) Making a cone-shaped enlargement of the end of a hole

(ii) Smoothing and squaring the surface around a hole

(iii) Sizing and finishing a small diameter hole

(iv) Producing a hole by removing metal along the circumference of a hollow cutting tool

(d) In oblique cutting system, the cutting edge of the tool:

(i) May clear the width of the workpiece

(ii) May or may not clear the width of the workpiece

(iii) Should always clear the width of the workpiece

(iv) May not clear the width of the workpiece

(e) The purpose of jigs and fixtures is to

(i) Increase machining accuracy

(ii) Facilitate interchangeability

(iii) Decrease expenditure on quality control

(iv) All of these

(f) In order to have interference fit, it is essential that the lower limit of the shaft should be :

(i) Greater than the upper limit of the hole

(ii) Lesser than the upper limit of the hole

(iii) Greater than the lower limit of the hole

(iv) Lesser than the lower limit of the hole

(g) In a single point turning operation with a cemented carbide and steel combination having a Taylor exponent of 0.25, if the cutting speed is halved, then tool life will become:

(i) Half

(ii) Two times

(iii) Eight times

(iv) Sixteen times

(h) NC contouring is an example of:

(i) Continuous path positioning

(ii) Point-to-point positioning

(iii) Absolute positioning

(iv) Incremental positioning

(i) The difference between CAD and CAM is that CAD software is directed at product design while CAM software is:

(i) concerned with management design

(ii) Concerned with production and control of tool design

(iii) designed for communication

(iv) all of the above

(j) It is required to cut screw threads of 2 mm pitch on a lathe. The lead screw has a pitch of 6 mm. If the spindle speed is 60 r.p.m., then the speed of lead screw will be:

(i) 10 r.p.m.

(ii) 20 r.p.m.

(iii) 120 r.p.m.

(iv) 180 r.p.m.

2. (a) Differentiate between orthogonal cutting and oblique cutting. 7

(b) Explain the construction and use of Merchant's circle diagram. 7

3. (a) Discuss the reasons responsible for tool failure. How it can be improved ? 7

(b) While drilling holes in steel plate by a 20 mm diameter HSS drill at a given feed, the tool life decreased from 40 min. to 24 min. when speed was raised from 250 rpm to 320 rpm. At what speed (rpm) the life of that drill under the same condition would be 30 min.? 07

4. (a) What are the difference between an automatic and a capstan lathe? Give an example of a component suitable for a capstan lathe with dimensions. 7

(b) Derive an expression for the area of cross-section of the chip in slab milling. Ignore the direction of cut. 7

5. (a) Explain briefly the construction of a radial drilling machine with emphasis on how the requisite motions are obtained. 7

(b) Compare a shaper and planer in terms of their operation and type of workpieces. 7

6. (a) Describe in detail the various arrangements of centreless grinding with neat sketches. Mention the applications in each case. 7

(b) In a metal cutting experimentation the tool life was found to vary with the cutting speed in the following manner:

Cutting speed V, m/min	Tool life, T/mm
100	120
130	50

Derive Taylor's tool life equation for this operation and estimate the tool life at a speed of 2.5 m/s. 7

7. (a) Discuss the elements of Computer Numerical Control system and also state the advantages of CNC system. 7

(b) Describe with neat sketch various steps in computer assisted part programming. 7

8. (a) What are the difference between an automatic and a capstan lathe? Give an example of a component suitable for a capstan lathe with dimensions. 7

(b) Explain the concept of post processor as used in computer assisted part programming systems such as APT. 7

9. (a) What is meant by V location ? What error is caused by improper orientation of a V locator ? 7

(b) A limit gauge is required to check the hole $50^{+0.339}$ mm (50 H8). The depth of hole is 200 mm. Design the gauge and sketch it with dimensions. 7

***