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COURSE PLAN

Academic Year 2019– 20

Program:	B E – MECHANICAL
Semester :	III
Course Code:	18ME35A
Course Title:	METAL CUTTING FORMING
Credit / L-T-P:	3 / 4-0-0
Total Contact Hours:	40
Course Plan Author:	SAGAR H N

Academic Evaluation and Monitoring Cell

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Note : Remove “Table of Content” before including in CP Book

Each Course Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	ME
Year / Semester :	2/III	Academic Year:	2019-2020
Course Title:	METAL CUTTING AND FORMING	Course Code:	18ME35A
Credit / L-T-P:	3/3-0-0	SEE Duration:	180 Minutes

Total Contact Hours:	40	SEE Marks:	60Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	SAGAR H N	Sign	Dt:
Checked By:		Sign	Dt:

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Module Content	Teaching Hours	Module Concepts	Bloom's Level
1	<p>Introduction to Metal cutting: Orthogonal and oblique cutting. Classification of cutting tools: single, and multi point; tool signature for single point cutting tool. Mechanics of orthogonal cutting; chip formation, shear angle and its significance, Merchant circle diagram .Numerical problems. Cutting tool materials and applications.</p> <p>Introduction to basic metal cutting machine tools: Lathe- Parts of lathe machine, accessories of lathe machine, and various operations carried out on lathe. Kinematics of lathe. Turret and Capstan lathe</p>	10	Properties and Geometry	L2
2	<p>Milling: Various Milling operations, classification of milling machines, Vertical & Horizontal milling, up milling & down milling. Indexing: need of indexing, simple, compound & differential indexing.</p> <p>Drilling: Difference between drilling, boring & reaming, types of drilling machines. Boring operations & boring machines. Shaping, Planing and Slotting machines -machining operations and operating parameters.</p> <p>Grinding:Grinding operation, classification of grinding processes: cylindrical, surface & centerless grinding.</p>	10	Machining process	L2
3	<p>Introduction to tool wear, tool wear mechanisms, tool life equations, effect of process parameters on tool life, machinability. Cutting fluid-types and applications, surface finish, effect of machining parameters on surface finish. Economics of machining process, choice of cutting speed and feed, tool life for minimum cost and production time. Numerical problems.</p>	10	Properties of tool	L2
4	<p>MECHANICAL WORKING OF METALS: Introduction to metal forming processes & classification of metal forming processes. Hot working & cold working of metals.</p> <p>Forging: Smith forging, drop forging & press forging. Forging Equipment, Defects in forging.</p> <p>Rolling: Rolling process, Angle of bite, Types of rolling mills, Variables of rolling process, Rolling defects.</p> <p>Drawing & Extrusion: Drawing of wires, rods & pipes, Variables of drawing process. Difference between drawing & extrusion. Various types of extrusion processes</p>	10	Manufacturing process	L2
5	<p>Sheet Metal Operations: Blanking, piercing, punching, drawing, draw ratio, drawing force, variables in drawing, Trimming, and Shearing.</p> <p>Bending — types of bending dies, Bending force calculation, Embossing and coining.</p> <p>Types of dies: Progressive, compound and combination dies.</p>	10	Forming process	L2

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Module	Details	Available
A	Text books (Title, Authors, Edition, Publisher, Year)	
1,2,3,4,5	Fundamentals of metal cutting and Machine Tools, B.L. Juneja, G.S. Sekhon and Nitin Seth, New Age International Publishers 2 nd Edition, 2003	In Lib, In Dept
B	All about Machine Tools, Heinrich Gerling, New Age International Publishers revised 2 nd Edition, 2006	
1,2,3,4,5	Reference books	In Lib
C	Fundamental of Machining and Machine Tools, Geoffrey Boothroyd and Winston A. Knight, CRC Taylor& Francis, Third Edition.	
C1	Metal cutting principles, Milton C. Shaw, Oxford University Press, Second Edition, 2005.	
C2		
C3	Process of product design https://www.youtube.com/watch?v=CnKeVs-_9zs-12.05mins	
C4	Decomposition in Product Design https://www.youtube.com/watch?v=A0-vPJ0ad-44-3mins	
C5	Product Development https://www.youtube.com/watch?v=w2m5eU8XDVI-4mins	
C6		
C7		
C8		
C9		
C10		
D	Software Tools for Design	
	PLM software for manufacturing https://www.plm.automation.s	

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learnt the following Courses / Topics with described Content . . .

SNo	Course Code	Course Name	Module / Topic / Description	Sem	Remarks	Blooms Level
1	18ME25	Element of Mechanical engineering	Lath machine , lathe operation , Milling machine and its operation	II	-	L2 understand

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
1	Tool geometry, tool materials	Industries		L2

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

#	Cos students should be able to...	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
18ME35A.1	Understanding the properties and geometry of various machine tools	5	Geometry of tool	Lecture / PPT	Assignment and unit test	L2 understand
18ME35A.2	Understanding the concept of machining process and its operations	5	Machining	Lecture	Assignment	L2 understand
18ME35A.3	Understanding the concept of Milling machining process and its operations	5	Milling Machining	Lecture	Assignment and unit test	L2 understand
18ME35A.4	Understanding the concept of drilling machining process and its operations	05	Drilling Machining	Lecture	Assignment ,IA ,unit test	L2 understand
18ME35A.5	Understand concept of Properties of tool	05	Tool materials	Lecture	Assignment ,IA ,unit test	L2 understand
18ME35A.6	Understand concept of tool wear	05	Tool Wear	Lecture	Lecture & ppt	Assignment ,IA ,unit test
18ME35A.7	Understand concept of Punching Process	05	Punching process	Lecture & ppt	Assignment ,IA ,unit test	L2 understand
18ME35A.8	Understand concept of Forming process	05	Forming Process	Lecture & ppt	Assignment ,IA ,unit test	L2 understand
18ME35A.9	Understand concept of Forging Process	05	Forging Process	Lecture & ppt	Assignment ,IA ,unit test	L2 understand
18ME35A.10	Under stand concept of Rolling Process	05	Rolling Process	Lecture & ppt	Assignment ,IA ,unit test	L2 understand
	Total	50	-	-	-	-

Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

2. Course Applications

Write 1 or 2 applications per CO.

Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	To produce components having different shapes	CO1	L2
1	Removing the extra material from work piece	CO2	L2
2	Used in thread cutting ,slotting ,increasing the diameter.	CO3	L2
2	Design of different kinds of gear cutting	CO4	L2
3	To remove the material by means of cutting edge	CO5	L2
3	Machine equations used in internal grinding and cylindrical grinding	CO6	L2
4	Orthogonal and oblique cutting used in industrial ares to produce knife edge tools	CO7	L2
4	Apply machine mechanisms in milling process	CO8	L2
5	Tool life is used to improve the machinability	CO9	L2
5	Evaluate production time and calculate efficiency	CO10	L2

4. Mapping Justification

Mapping		Justification	Mapping Level
CO	PO	-	-

Note: Write justification for each CO-PO mapping.

4. Articulation Matrix

(CO – PO MAPPING)

Modules	#	Course Outcomes COs	Program Outcomes																Level
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	18ME35A.1	Understanding the properties and geometry of various	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2

		machine tools																
1	18ME35A .2	Understanding the concept of machining process and its operations	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
2	18ME35A .3	Understanding the concept of Milling machining process and its operations	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
2	18ME35A .4	Understanding the concept of drilling machining process and its operations	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
3	18ME35A .5	Understand concept of Properties of tool	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
3	18ME35A .6	Understand concept of tool wear	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
4	18ME35A .7	Understand concept of Punching Process	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
4	18ME35A .8	Understand concept of Forming process	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
5	18ME35A .9	Understand concept of Forging Process	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
5	18ME35A .10	Under stand concept of Rolling Process	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	L2
-	18ME35A	Average attainment (1, 2, or 3)	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
-	PO, PSO	<i>1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design</i>																

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					

Note: Write Gap topics from A.4 and add others also.

6. Content Beyond Syllabus

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
3						

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Module #	Title	Teaching Hours	No. of question in Exam					CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra		

							Asg			
1	Introduction to Metal cutting	10	2	-	-	1	1	2	CO1, CO2	L2
2	Milling:& Drilling	10	2	-	-	1	1	2	CO3, CO4	L2
3	Introduction to tool wear	10	-	2	-	1	1	2	CO5, CO6	L2
4	MECHANICAL WORKING OF METALS	10	-	2	-	1	1	2	CO7, CO8	L2
5	Sheet Metal Operations:	10	-	-	4	1	1	2	CO9, CO10	L2
-	Total	40	4	4	4	5	5	10	-	-

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	30	CO1, CO2, CO3, CO4	L2
CIA Exam – 2	30	,CO5, CO6, CO7, CO8	L2
CIA Exam – 3	30	C09,CO10	L2
Assignment - 1	10	CO1, CO2, CO3, CO4	L2
Assignment - 2	10	,CO5, CO6, CO7, CO8	L2
Assignment - 3	10	C09,CO10	L2
Seminar - 1	-	-	-
Seminar - 2	-	-	-
Seminar - 3	-	-	-
Other Activities define – Slip test			
Final CIA Marks	40	-	-

D1. TEACHING PLAN - 1

Module - 1

Title:	Management, Planning	Appr Time:	10 Hrs
a	<i>Course Outcomes</i>	-	Blooms
-	The student should be able to:	-	Level
1	Understanding the properties and geometry of various machine tools	CO1	L2
2	Understanding the concept of machining process and its operations	CO2	L2
b	<i>Course Schedule</i>	-	-
Class No	Module Content Covered	CO	Level
1	Introduction to Metal cutting: Orthogonal and oblique cutting.	CO1	L2
2	Classification of cutting tools single, and multi point	CO1	L2
3	tool signature for single point cutting tool.	CO1	L2
4	Mechanics of orthogonal cutting	CO1	L2
5	chip formation, shear angle and its significance, Merchant circle diagram.	CO2	L2
6	Numerical problems. Cutting tool materials and applications.	CO2	L2
7	Lathe- Parts of lathe machine, accessories of lathe machine.	CO2	L2
8	various operations carried out on lath	CO2	L2

9	Kinematics of lathe. Turret and Capstan lathe		
c	Application Areas	CO	Level
1	Organization	CO1	L2
2	Planning department	CO1	L2
d	Review Questions	-	
1	Differentiate between Orthogonal and oblique cutting.	CO1	L2
2	Explain the classification of cutting tool	CO1	L2
3	Write a note on tool nomenclature	CO1	L2
4	Explain the Mechanics of orthogonal cutting	CO1	L2
5	Explain chipping process and classification of chip formation	CO1	L2
6	Explain the lathe machine parts	C02	L2
7	Explain th various operation on lathe	C02	L2
8	Explain the Turret and Capstan lathe	C02	L2
9	Explain the Kinematics of lathe	C02	L2
10	Write difference between Turret and Capstan lathe	C02	L2
e	Experiences	-	-
1			
2			
3			
4			
5			

Module – 2

Title:	Organizing And Staffing	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	Level
1	Understanding the concept of Milling machining process and its operations	CO3	L2
2	Understanding the concept of drilling machining process and its operations	CO4	L2
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
1	Milling, Various Milling operations,	CO3	L2
2	classification of milling machines,	CO3	L2
3	Vertical & Horizontal milling, up milling & down milling.	CO3	L2
4	Indexing: need of indexing	CO3	L2
5	simple, compound & differential indexing.	CO4	L2
6	Difference between drilling, boring & reaming	CO4	L2
7	types of drilling machines. Boring operations	CO4	L2
8	Shaping, Planing and Slotting machines	CO4	L2
9	Grinding operation, classification of grinding processes		
10	cylindrical, surface & center less grinding.		
c	Application Areas	CO	Level
1		CO3	L2
2		CO3	L2
d	Review Questions	-	-

1	Explain milling	CO3	L2
2	Explain Various Milling operations	CO3	L2
3	Explain the classification of milling machines,	CO3	L2
4	Explain the up milling & down milling.	CO3	L2
5	Explain the Vertical & Horizontal milling,	CO3	L2
6	What is indexing	CO4	L2
7	Explain the need of indexing	CO4	L2
8	Explain the simple, compound & differential indexing.	CO4	L2
9	Write Difference between drilling, boring & reaming	CO4	L2
10	Explain the types of drilling machines	CO4	L2
11	Explain Boring operations	CO4	L2
12	Explain Shaping, Planing and Slotting machines	CO4	L2
13	Explain Grinding operation	CO4	L2
14	Explain classification of grinding processes	CO4	L2
15	Explain cylindrical, surface & center less grinding.	CO4	L2
e	Experiences	-	-
1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	18ME35A	Sem:	VIII	Marks:	15	Time:	75 minutes	
Course:	METAL CUTTING AND FORMING							
-	-	Note: Answer any 2 questions, each carry equal marks.				Marks	CO	Level
1	a	Differentiate between Orthogonal and oblique cutting.				5	CO1	L2
	b	Explain the classification of cutting tool				5	CO1	L2
	c	Write a note on tool nomenclature				5	CO1	L2
		OR						L2
2	a	Explain various operations carried out on lathe				5	CO2	L2
	b	Explain Kinematics of lathe. Turret and Capstan lathe				5	CO2	L2
	c	Explain chipping process and classification of chip formation				5	CO2	L2
3	a	Explain the up milling & down milling.				5	CO3	L2
	b	Explain the Vertical & Horizontal milling,				5	CO3	L2
	c	What is indexing				5	CO3	L2
		OR						
4	a	Explain Shaping, Planing and Slotting machines				5	CO4	L2
	b	Explain Grinding operation				5	CO4	L2
	c	Explain classification of grinding processes				5	CO4	L2

b. Assignment -1

Model Assignment Questions							
Crs Code:	18ME35A	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes

Course: METAL CUTTING AND FORMING					
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.					
SNo	USN	Assignment Description	Marks	CO	Level
1		Differentiate between Orthogonal and oblique cutting.	5	CO1	L2
2		Explain the classification of cutting tool	5	CO1	L2
3		Write a note on tool nomenclature	5	CO1	L2
4		Explain the Mechanics of orthogonal cutting	5	CO1	L2
5		Explain chipping process and classification of chip formation	5	CO1	L2
6		Explain the lathe machine parts	5	C02	L2
7		Explain th various operation on lathe	5	C02	L2
8		Explain the Turret and Capstan lathe	5	C02	L2
9		Explain the Kinematics of lathe	5	C02	L2
10		Write difference between Turret and Capstan lathe	5	C02	L2
11		Explain milling	5	CO2	L2
12		Explain Various Milling operations	5	CO2	L2
13		Explain the classification of milling machines,	5	CO3	L2
14		Explain the up milling & down milling.	5	CO3	L2
15		Explain the Vertical & Horizontal milling,	5	CO3	L2
16		What is indexing	5	CO3	L2
17		Explain the need of indexing	5	CO4	L2
18		Explain the simple, compound & differential indexing.	5	CO4	L2
19		Write Difference between drilling, boring & reaming	5	CO4	L2
20		Explain the types of drilling machines	5	CO4	L2
21		Explain Boring operations	5	CO4	L2
22		Explain Shaping, Planing and Slotting machines	5	CO4	L2
23		Explain Grinding operation	5	CO4	L2
24		Explain classification of grinding processes	5	CO4	L2
25		Explain cylindrical, surface & center less grinding.	5	CO4	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Introduction	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Understand concept of Properties of tool	CO5	L2
2	Understand concept of tool wear	CO6	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Introduction to tool wear	CO5	L2
2	tool wear mechanisms	CO5	L2
3	tool life equations	CO5	L2
4	effect of process parameters on tool life	CO5	L2
5	machinability	CO6	L2
6	Cutting fluid-types and applications,	CO6	L2
7	Surface finish, effect of machining parameters on surface finish	CO6	L2
8	choice of cutting speed and feed	CO5	L2
9	tool life for minimum cost	CO6	L2
10	production time. Numerical problems.		

d	Review Questions	-	-
1	Explain tool wear mechanisms	CO5	L2
2	Explain tool life equations	CO5	L2
3	Explain the effect of process parameters on tool life	CO5	L2
4	Explain machinability	CO5	L2
5	Explain Cutting fluid-types and applications,	CO5	L2
6	Explain Surface finish	CO5	L2
7	Explain effect of machining parameters on surface finish	CO6	L2
8	Explain choice of cutting speed and feed	CO6	L2
9	Explain tool life for minimum cost	CO6	L2
10	Explain production time	CO6	L2
e	Experiences	-	-
1			
2			
3			
4			
5			

Module – 4

Title:	Present, future and annual worth and rate of returns	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	
1	Understand concept of Punching Process	CO7	L2
2	Understand concept of Forming process	CO8	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Sheet Metal Operations	CO7	L2
2	Blanking, piercing, punching	CO7	L2
3	drawing, draw ratio	CO7	L2
4	drawing force, variables in drawing	CO7	L2
5	Trimming, and Shearing	CO8	L2
6	Bending –types of bending dies	CO8	L2
7	Bending force calculation, Embossing and coining.	CO8	L2
8	Types of dies: Progressive, compound and combination dies.	CO8	L2
c	Application Areas	CO	Level
1		CO7	L2
2		CO8	L2
d	Review Questions	-	-
1	Explain Sheet Metal Operations	CO7	L2
2	Explain Blanking, piercing, punching	CO7	L2
3	Explain drawing, draw ratio	CO7	L2
4	Explain drawing force, variables in drawing	CO7	L2
5	Explain Trimming, and Shearing	CO8	L2
6	Explain Trimming, and Shearing	CO8	L2
7	Explain Bending and types of bending dies	CO8	L2
8	Explain Bending force calculation, Embossing and coining	CO8	L2

e	Experiences	-	-
1			
2			
3			
4			
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	18ME35A	Sem:	VIII	Marks:	15	Time:	75 minutes	
Course:	METAL CUTTING AND FORMING							
-	-	Note: Answer any 2 questions, each carry equal marks.				Marks	CO	Level
1	a	Explain the effect of process parameters on tool life				5	CO5	L2
	b	Explain machinability				5	CO5	L2
	c	Explain Cutting fluid-types and applications,				5	CO5	L2
2	a	Explain choice of cutting speed and feed				5	CO6	L2
	b	Explain tool life for minimum cost				5	CO6	L2
	c	Explain tool wear mechanisms				5	CO6	L2
3	a	Explain Blanking, piercing, punching				5	CO7	L2
	b	Explain drawing, draw ratio				5	CO7	L2
	c	Explain drawing force, variables in drawing				5	CO7	L2
4	a	Explain Bending and types of bending dies				5	CO8	L2
	b	Explain Bending force calculation, Embossing and coining				5	CO8	L2
	c	Explain Trimming, and Shearing				5	CO8	L2

b. Assignment – 2

Model Assignment Questions								
Crs Code:	18ME35A	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes	
Course:	METAL CUTTING AND FORMING							
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.								
SN0	USN	Assignment Description				Marks	CO	Level
1		Explain tool wear mechanisms				5	CO5	L2
2		Explain tool life equations				5	CO5	L2
3		Explain the effect of process parameters on tool life				5	CO5	L2
4		Explain machinability				5	CO5	L2
5		Explain Cutting fluid-types and applications,				5	CO5	L2
6		Explain Surface finish				5	CO5	L2
7		Explain effect of machining parameters on surface finish				5	CO6	L2
8		Explain choice of cutting speed and feed				5	CO6	L2
9		Explain tool life for minimum cost				5	CO6	L2
10		Explain production time				5	CO6	L2
11		Explain Sheet Metal Operations				5	CO6	L2
12		Explain Blanking, piercing, punching				5	CO6	L2
13		Explain drawing, draw ratio				5	CO7	L2

14	Explain drawing force, variables in drawing	5	CO7	L2
15	Explain Trimming, and Shearing	5	CO7	L2
16	Explain Trimming, and Shearing	5	CO7	L2
17	Explain Bending and types of bending dies	5	CO7	L2
18	Explain Bending force calculation, Embossing and coining	5	CO8	L2
19	Explain tool life for minimum cost	5	CO8	L2
20	Explain production time	5	CO8	L2
21	Explain Sheet Metal Operations	5	CO8	L2

D3. TEACHING PLAN - 3

Module – 5

Title:	Costing and depreciation	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Understand concept of Forging Process	CO9	L2
2	Under stand concept of Rolling Process	CO10	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Mechanical working of metals	CO9	L2
2	Introduction to metal forming processes	CO9	L2
3	classification of metal forming processes	CO9	L2
4	Hot working & cold working of metals	CO9	L2
5	Smith forging, drop forging & press forging	CO10	L2
6	Forging Equipment, Defects in forging.	CO10	L2
7	Rolling process, Angle of bite	CO10	L2
8	Types of rolling mills, Variables of rolling process	CO10	L2
9	Rolling defects		
10	Drawing of wires, rods & pipes, Variables of drawing process.		
11	Difference between drawing & extrusion. Various types of extrusion processes		
c	Application Areas		
1		CO9	L2
2		CO10	L2
d	Review Questions		L2
1	Explain metal forming processes	CO9	L2
2	Explain classification of metal forming processes	CO9	L2
3	Explain Hot working & cold working of metals	CO9	L2
4	Explain Smith forging, drop forging & press forging	CO9	L2
5	Explain Forging Equipment, & Defects in forging.	CO9	L2
6	Explain Rolling process, Angle of bite	CO10	L2
7	Explain Types of rolling mills	CO10	L2
8	Explain Variables of rolling process	CO10	L2
9	Explain Drawing of wires, rods & pipes	CO10	L2
10	Explain Variables of drawing process	CO10	L2
11	Explain Difference between drawing & extrusion	CO10	L2
12	Explain Various types of extrusion processes	CO10	L2
e	Experiences	-	-
1			
2			

3			
4			
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	18ME35A	Sem:	VIII	Marks:	15	Time:	75 minutes	
Course:	METAL CUTTING AND FORMING							
-	-	Note: Answer any 2 questions, each carry equal marks.				Marks	CO	Level
1	a	Explain classification of metal forming processes				8	CO9	L2
	b	Explain Hot working & cold working of metals				8	CO9	L2
	c	Explain Smith forging, drop forging & press forging				9	CO9	
		OR					CO9	
2	a	Explain Forging Equipment, & Defects in forging.				8	CO9	L2
	b	Explain Rolling process, Angle of bite				8	CO9	L2
	c	Explain Types of rolling mills				9	CO9	
3	a	Explain Variables of rolling process				8	CO10	L2
	b	Explain Drawing of wires, rods & pipes				8	CO10	L2
	c	Explain Variables of drawing process				9	CO10	
		OR					CO10	
4	a	Explain Difference between drawing & extrusion				8	CO10	L2
	b	Explain Various types of extrusion processes				8	CO10	L2
	c	Explain metal forming processes						

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions								
Crs Code:	18ME35A	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes	
Course:	METAL CUTTING AND FORMING							
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.								
SN0	USN	Assignment Description				Marks	CO	Level
1		Explain metal forming processes				5	CO9	L2
2		Explain classification of metal forming processes				5	CO9	L2
3		Explain Hot working & cold working of metals				5	CO9	L2
4		Explain Smith forging, drop forging & press forging				5	CO9	L2
5		Explain Forging Equipment, & Defects in forging.				5	CO9	L2
6		Explain Rolling process, Angle of bite				5	CO9	L2
7		Explain Types of rolling mills				5	CO9	L2
8		Explain Variables of rolling process				5	CO9	L2
9		Explain Drawing of wires, rods & pipes				5	CO10	L2
10		Explain Variables of drawing process				5	CO10	L2
11		Explain Difference between drawing & extrusion				5	CO10	L2
12		Explain Various types of extrusion processes				5	CO10	L2
13		Explain Variables of rolling process				5	CO10	L2
14		Explain Drawing of wires, rods & pipes						

F. EXAM PREPARATION

1. University Model Question Paper

Course:	METAL CUTTING AND FORMING	Month / Year	May /2018
18ME35A / A & B		Copyright ©2017. cAAS. All rights reserved.	

Crs Code:	18ME35A	Sem:	VIII	Marks:	80	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.				Marks	CO	Level
1	a	Differentiate between Orthogonal and oblique cutting.				8	CO1	L2
	b	Explain the classification of cutting tool				8	CO1	L2
	c	Write a note on tool nomenclature						
		OR						
	a	Explain various operations carried out on lathe				8	CO2	L2
	b	Explain Kinematics of lathe. Turret and Capstan lathe				8	CO2	L2
	c	Explain chipping process and classification of chip formation						
2	a	Explain the up milling & down milling.				8	CO3	L2
	b	Explain the Vertical & Horizontal milling,				8	CO3	L2
	c	What is indexing						
		OR						
	a	Explain Shaping, Planing and Slotting machines				8	CO4	L2
	b	Explain Grinding operation				8	CO4	L2
	c	Explain classification of grinding processes						
3	a	Explain tool wear mechanisms				8	CO5	L2
	b	Explain tool life equations				8	CO5	L2
	c	Explain the effect of process parameters on tool life						
		OR						
	a	Explain Cutting fluid-types and applications,				8	CO6	L2
	b	Explain Surface finish				8	CO6	L2
	c	Explain effect of machining parameters on surface finish						
4	a	Explain Blanking, piercing, punching				8	CO7	L2
	b	Explain drawing, draw ratio				8	CO7	L2
	c	Explain drawing force, variables in drawing						
		OR						
	a	Explain the effect of process parameters on tool life				8	CO8	L2
	b	Explain machinability				8	CO8	L2
	c	Explain Cutting fluid-types and applications,						
5	a	Explain Difference between drawing & extrusion				8	CO9	L2
	b	Explain Various types of extrusion processes				8	CO9	L2
	c	Explain Variables of rolling process						
	a	Explain classification of metal forming processes				8	CO10	L2
	b	Explain Hot working & cold working of metals				8	CO10	L2
	c	Explain Smith forging, drop forging & press forging						

2. SEE Important Questions

Course:	METAL CUTTING AND FORMING				Month / Year	May /2018		
Crs Code:	18ME35A	Sem:	VIII	Marks:	80	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.				-	-	
Module	Qno.	Important Question				Marks	CO	Year
1	1	Differentiate between Orthogonal and oblique cutting.				8	CO1	2018
	2	Explain the classification of cutting tool				8	CO1	2018
	3	Write a note on tool nomenclature				8	CO2	2018
	4	Explain the Mechanics of orthogonal cutting				8	CO2	2018

2	1	Explain Various Milling operations	8	CO3	2018
	2	Explain the classification of milling machines,	8	CO3	2018
	3	Explain the up milling & down milling.	8	CO4	2018
	4	Explain the Vertical & Horizontal milling,	8	CO4	2018
3	1	Explain tool wear mechanisms	8	CO5	2018
	2	Explain tool life equations	8	CO5	2018
	3	Explain the effect of process parameters on tool life	8	CO6	2018
	4	Explain machinability	8	CO6	2018
4	1	Explain Smith forging, drop forging & press forging	8	CO7	2018
	2	Explain Forging Equipment,& Defects in forging.	8	CO7	2018
	3	Explain Rolling process, Angle of bite	8	CO8	2018
	4	Explain Types of rolling mills	8	CO8	2018
5	1	Explain Variables of drawing process	8	CO9	2018
	2	Explain Difference between drawing & extrusion	8	CO9	2018
	3	Explain Various types of extrusion processes	8	CO10	2018
	4	Explain Variables of rolling process	8	CO10	2018

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Module- #	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	B	C	D	E	F	G	H
1	Introduction to Metal cutting: Orthogonal and oblique cutting. Classification of cutting tools: single, and multi point; tool signature for single point cutting tool. Mechanics of orthogonal cutting; chip formation, shear angle and its significance, Merchant circle diagram .Numerical problems. Cutting tool materials and applications.	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
1	Introduction to basic metal cutting machine tools: Lathe- Parts of lathe machine, accessories of lathe machine, and various operations carried out on lathe. Kinematics of lathe. Turret and Capstan lathe	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
2	Introduction to tool wear, tool wear mechanisms, tool life equations, effect of process parameters on tool life, machinability. Cutting fluid-types and applications,	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
2	surface finish: effect of machining parameters on surface finish. Economics of machining process, choice of cutting speed and feed, tool life for minimum cost and production time. Numerical problems.	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
3	Milling: Various Milling operations, classification of mill ing machines, Vertical & Horizontal	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment

	milling, up milling & down milling. Indexing: need of indexing, simple, compound & differential indexing.						
3	Drilling: Difference between drilling, boring & reaming, types of drilling machines. Boring operations & boring machines. Shaping, Planing and Slotting machines -machining operations and operating parameters. Grinding: Grinding operation, classification of grinding processes: cylindrical, surface & centerless grinding.	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
4	MECHANICAL WORKING OF METALS: Introduction to metal forming processes & classification of metal forming processes. Hot working & cold working of metals. Forging: Smith forging, drop forging & press forging. Forging Equipment, Defects in forging.	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
4	Rolling: Rolling process, Angle of bite, Types of rolling mills, Variables of rolling process, Rolling defects. Drawing & Extrusion: Drawing of wires, rods & pipes, Variables of drawing process. Difference between drawing & extrusion. Various types of extrusion processes	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
5	Sheet Metal Operations: Blanking, piercing, punching, drawing, draw ratio, drawing force, variables in drawing, Trimming, and Shearing.	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment
5	Bending — types of bending dies, Bending force calculation, Embossing and coining. Types of dies: Progressive, compound and combination dies.	5	- L1 - L2	L2	Understand	Lecture/Tutorial	Assignment

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Module - #	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome Student Should be able to ...
<i>A</i>	<i>I</i>	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>	<i>N</i>
1	-	-	Geometry of tool	Geometry of tool	- Understand - Geometry of tool	Understanding the properties and geometry of various machine tools
1	-	-	Machining	Machining	- Understand - Machining	Understanding the concept of machining process and its operations
2	-	-	Milling Machining	Milling Machining	- Understand - Milling Machining	Understanding the concept of Milling machining process and its operations

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2	-	-	Drilling Machining	Drilling Machining	- Understand Drilling Machining	Understanding the concept of drilling machining process and its operations
3	-	-	Tool materials	Tool materials	- Understand Tool materials	Understand concept of Properties of tool
3	-	-	Tool Wear	Tool Wear	- Understand Tool Wear	Understand concept of tool wear
4	-	-	Punching process	Punching process	- Understand Punching process	Understand concept of Punching Process
4	-	-	Forming Process	Forming Process	- Understand Forming Process	Understand concept of Forming process
5	-	-	Forging Process	Forging Process	- Understand Forging Process	Understand concept of Forging Process
5	-	-	Rolling Process	Rolling Process	- Understand Rolling Process	Under stand concept of Rolling Process