INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

COURSE DESCRIPTION

Course Title	**PRODUCTION TECHNOLOGY**			
Course Code	**A40312**			
Regulation	**R13**			
Course Structure	Lectures	Tutorials	Practicals	Credits
	4	1	-	4
Course Coordinator	Dr. K. G. K. Murti, Professor			
Team of Instructors	T.Vanaja,Assistant Professor			

I. COURSE OVERVIEW:

Production technology is a subject composed of many basic and advanced manufacturing processess that can be helpful for a mechanical engineer .It comprises of casting, welding and metal forming processess. The product manufacture with many elemental components requires understanding of various fabrication methods. The subject covers the information about manufacturing processes and the applications in industries.

II. PREREQUISITE(S):

Level	Credits	Periods / Week	Prerequisites
UG	4	5	Metallurgy and material science, Physics, Chemistry, Mechanics of solids, Electrical and electronics

III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam Marks	Total Marks
Mid Semester Test There shall be 2 midterm examinations. Each midterm examination consists of one objective paper, one subjective paper and two assignments. The objective paper is for 10 marks and subjective paper is for 10 marks, with duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for subjective paper). Objective paper is set for 20 bits of – multiple choice questions, fill-in the blanks, 10 marks. Subjective paper contains of 4 full questions (one from each unit) of which, the student has to answer 2 questions, each question carrying 5 marks. First midterm examination shall be conducted for 1-2.5 units of syllabus and second midterm examination shall be conducted for 2.6-5 units. 5 marks are allocated for Assignments (as specified by the concerned subject teacher) – first two assignments should be submitted before the conduct of the first mid, and the second two assignments should be submitted before the conduct of the second mid. The total marks secured by the student in each midterm examination are evaluated for 25 marks, and the average of the two midterm examination marks shall be taken as the final sessional marks secured by each candidate	75	100

IV. EVALUATION SCHEME:

S. No.	Component	Duration (hours)	Marks
1	I Mid Examination	1 hour and 20 min	20
2	I Assignment lot		5
		TOTAL	25
3	II Mid Examination	1 hour and 20 min	20
4	II Assignment lot		5
		TOTAL	25
MID Examination marks to be considered as average of above 2 MID's TOTAL			
5	EXTERNAL Examination	3	75
6		GRAND TOTAL	100

V. COURSE OBJECTIVES:

I. Practical orientation of Manufacturing Processes

II. Knowledge on different kinds of Production Processes and practices available for shaping or molding several daily used parts for industries

III. Equipment selection for various Manufacturing Processes will be understood

VI. COURSE OUTCOMES:

1. To acquire the knowledge about the modern manufacturing processes
2. To know about latest fabrication technologies
3. Enhancement of product manufacturing knowledge
4. Capability to get ideas for product establishment as an entrepreneur
5. Knowledge on economics of production

VII. HOW COURSE OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
a	An ability to apply knowledge of computing, mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems to real-world problems (fundamental engineering analysis skills)	H	Assignments Midterm and University examinations, Practicals
b	An ability to design and conduct experiments, as well as to analyze and interpret data (information retrieval skills)	H	Assignments Midterm and University examinations, Practicals
c	An ability to design , implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability (Creative Skills)	S	Assignments Midterm and University examinations, Practicals
d	An ability to function effectively on multi-disciplinary teams (team work)	N	--
e	An ability to analyze a problem, identify, formulate and use the	H	Assignments

Program Outcomes		Level	Proficiency assessed by
	appropriate computing and engineering requirements for obtaining its solution (engineering problem solving skills)		Midterm and University examinations, Practicals
f	An understanding of professional, ethical, legal, security and social issues and responsibilities (professional integrity)	N	--
g	An ability to communicate effectively both in writing and orally (speaking / writing skills)	N	--
h	The broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society (engineering impact assessment skills)	N	--
i	Recognition of the need for, and an ability to engage in continuing professional development and life-long learning (continuing education awareness)	H	Assignments Midterm and University examinations, Practicals
j	A Knowledge of contemporary issues (social awareness)	N	--
k	An ability to use current techniques, skills, and tools necessary for computing and engineering practice (practical engineering analysis skills)	S	Assignments Midterm and University examinations, Practicals
l	An ability to apply design and development principles in the construction of software and hardware systems of varying complexity (software hardware interface)	N	--
m	An ability to recognize the importance of professional development by pursuing postgraduate studies or face competitive examinations that offer challenging and rewarding careers in computing (successful career and immediate employment).	N	--

S = Supportive **H = Highly Related** **N = None**

VIII. SYLLABUS:

UNIT-1

Casting: Steps involved in making a casting – Its applications – Patterns and types of Patterns – Pattern allowances and their construction. Types of casting processes – Solidification of casting.

UNIT-2

Welding: Welding types – Oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding – Resistance welding. Thermit welding.

UNIT-3

Inert gas welding, TIG welding, MIG welding, Friction welding, induction welding, explosive welding, Laser welding, Soldering and Brazing, Heat affected zone in welding. Welding defects – causes and remedies – destructive and non-destructive testing of welds.

UNIT-4

Hot working, cold working, strain hardening, recovery, recrystallization and grain growth, comparision of properties of cold and hot worked parts, Rolling fundamentals – theory of rolling, types of rolling mills and products. Forces in rolling and power requirements.

Stamping, forming and other cold working processes: Blanking and Piercing – Bending and forming – Drawing and its types – Wire drawing and Tube drawing – Coining – Hot and Cold Spinning – Types of Presses and Press tools. Forces and power requirements for the above operations.

UNIT-5

Extrusion of metals: Basic extrusion process and its characteristics. Hot extrusion and Cold extrusion – Forward extrusion and Backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and Pipe making, Hydrostatic extrusion. Forces in extrusion.

Forging Processes: Forging operations and principles – tools – forging methods – Smith forging, Drop forging – roll forging. Forging hammers: Rotary forging – Forging defects – Cold forging, Swaging, Forces in forging operations.

TEXT BOOKS:

T1. Manufacturing Technology (Vol.1) - P.N.Rao/TMH/2nd edition.
T2. Workshop Technology (Vol.1) – Hajra Chowdhary/Asia Publishing House/2nd edition.

REFERENCES:

R1. Production Technology / Sarma P C / S.Chand
R2. Production Technology / R.K.Jain / Khanna Publishers
R3. Metal Casting / T.V.Ramana Rao / New Age
R4. Principles of Metal Castings / Rosenthal / TMH
R5. A Course In Workshop Technology / B.S.Raghuwamshi / Dhanpat Rai & Sons
R6. Manufacturing Engineering and Technology / Kalpakjin S / Pearson Edu.

IX. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Course Learning Outcomes	Topics to be covered	Reference
1-4	**Define** principle of casting process	**UNIT 1** Casting: Steps involved in making a casting – Its applications	T1,R1,R2
5-7	**Examine** various types of pattern designs	Patterns and types of Patterns – Pattern allowances and their construction	T1,R1,R2
8-10	**Relate** various types of casting processes	Types of casting processes – Solidification of casting	T1,R1,R6
11-14	**Describe** the principles of welding processes	**UNIT 2** Welding: Welding types	T1,R1,R6
15-16	**Compare** various flames	Oxy-fuel gas cutting, standard time and cost calculations	T1,R1,R6
17-20	**Explain** arc ,forge and resistance welding	Arc welding, forge welding – Resistance welding. Thermit welding.	T1,R1,R4
21-23	**Explain** Inert gas welding welding processes	**UNIT 3** Inert gas welding, TIG welding, MIG welding	R2,R6
24-26	**Discuss** various types of advances welding processes	Friction welding, induction welding, explosive welding, Laser welding	R2,R6
27-28	**Define** brazing and soldering	Soldering and Brazing	R2,R6
29-30	**Describe** defects and evaluation	Heat affected zone in welding. Welding defects – causes and remedies – destructive and non-destructive testing of welds.	R2,R6
31-32	**Describe** hot and cold working	**UNIT 4** Hot working, cold working, strain hardening, recovery	T1,R1,R6
33-34	Discuss recrystallization and	recrystallization and grain growth	T1,R1,R6

Lecture No.	Course Learning Outcomes	Topics to be covered	Reference
	grain growth		
35	Compare cold and hot working	comparison of properties of cold and hot worked parts	T1,R1,R6
36-37	**Discuss** Rolling	Rolling fundamentals – theory of rolling, types of rolling mills and products. Forces in rolling and power requirements.	T1,R1,R6
38	**Explain** Blanking and piercing, processes	Blanking and Piercing, Forces and power requirements	T1,R1,R6
39	**Discuss** bending and forming	Bending and forming, Forces and power requirements	T1,R1,R6
40-41	**Discuss** wire and tube drawing	Drawing and its types – Wire drawing and Tube drawing, Forces and power requirements	T1,R1,R6
42	**Explain** coining	Coining, Forces and power requirements	T1,R1,R6
43-44	**Discuss** hot and cold spinning	Hot and Cold Spinning, Forces and power requirements	T1,R1,R6
45-47	**Explain** various types of Press tools	Types of Presses and Press tools, Forces and power requirements	T1,R1,R6
48-49	**Explain** extrusion process	**UNIT 5** Extrusion of metals: Basic extrusion process and its characteristics	T1,R1,R6
50-52	**Compare** hot and cold extrusion	Hot extrusion and Cold extrusion – Forward extrusion and Backward extrusion – Impact extrusion	T1,R1,R6
53-55	**Explain** equipment used for extrusion of pipes	Extruding equipment, Tube extrusion and Pipe making, Hydrostatic extrusion. Forces in extrusion.	T1,R1,R6
56-58	**Discuss** forging processes	Forging Processes: Forging operations and principles – tools	T1,R1,R6
59-60	**Explain** drop and roll forging	Forging methods – Smith forging, Drop forging – roll forging	T1,R1,R6
60-63	**Discuss** forces in forging operations	Forging hammers: Rotary forging – Forging defects – Cold forging, Swaging, Forces in forging operations	T1,R1,R6

X. MAPPING OF COURSE OUTCOMES (PRODUCTION TECHNOLOGY) WITH MECH PROGRAM OUTCOMES

Course Objectives	Program Outcomes												
	A	b	c	d	e	f	g	h	i	j	k	l	m
1	H	H			S				S	S	S	S	
2								H			H	H	
3	S	H		H	S								
4									H		S	S	
5			S					S					

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XI. MAPPING OF COURSE OBJECTIVES (PRODUCTON TECHNOLOGY) WITH MECH PROGRAM OUTCOMES

Course Outcomes	Program Outcomes												
	a	b	c	d	e	f	g	h	i	j	k	l	m
I			H								S	S	
II			S		S					H	H	H	
III									S		S	H	

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Prepared B : Dr K. G. K. Murti, Professor and T.Vanaja , Assistant Professor

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