

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (PRODUCTION ENGINEERING) (28)

SHEET METAL PROCESS

SUBJECT CODE: 2722806

SEMESTER: II

**Type of course:** MAJOR ELECTIVE - II

**Prerequisite:** NIL

**Rationale:** This course provides the knowledge and practice regarding different Sheet Metal Processes and their Design. This course gives practice for various numerical and Computer Software based model for Special Sheet Bending, Forming, Stretching and sheet roll forming like processes.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
<b>1</b>	<b>Introduction:</b> Introduction to sheet metal forming lines, sheet- tool-machine tool as a system, properties and grades of sheet metal available, their applications, manufacturing and testing procedure.	<b>05</b>	<b>14</b>
<b>2</b>	<b>Product design for sheet metal</b> Products manufacturable using sheet metals, formability, analytical prediction of forming limits, strain path, strain distribution, product design for sheet metal forming	<b>05</b>	<b>14</b>
<b>3</b>	<b>Sheet metal processes</b> Separating processes like shearing, fine blanking, plasma cutting and bending, laser cutting and bending, bending and spring back calculations, bend sequencing, drawing of sheets, draw ratio, LDR, process analysis, process analysis of axysymmetric deep drawn parts.	<b>08</b>	<b>22</b>
<b>4</b>	<b>Special sheet forming processes</b> Super plastic forming and diffusion bonding processes, sheet joining processes, deformation and weld contours, TWB forming, warm forming, sheet and tube hydro forming, roll forming.	<b>08</b>	<b>22</b>
<b>5</b>	<b>Equipment selection:</b> Different types of presses press structures, drives, safety devices, part handling, multiple point blank holding, press brakes, counter pressure bending devices, transfer presses.	<b>06</b>	<b>16</b>
<b>6</b>	<b>Computer applications in sheet metal design:</b>	<b>4</b>	<b>12</b>

	Process modeling and analysis, scope of CAD/CAM in sheet metal forming, numerical analysis of forming processes.		
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### Reference Books:

1. American Soc. For Metals, Metals Handbook, 10th Edition, Vol 15, on Metal Forming, ASM, Metals Park, Ohio, 1989.
2. David, A., Smith (Editor), Die Design Handbook, SME publications, Michigan, 1990.
3. Lange, K., Handbook of Metal Forming McGraw Hill, 1985.
4. Eary, D. F., and Reed, E. A., Techniques of Press working Sheet metal and Engineering,
5. William F. Hosfford and Robert Caddell, Metal forming: Mechanics and Metallurgy,
6. SME: Tool and Manufacturing Engineers Handbook, vol.2.
7. Rowe G.W., "Principles of Industrial Metalworking Processes", Edward Arnold publication.
8. Sadhu Singh, "Theory of Plasticity and Metal forming Processes", Khanna publishers.
9. Ivana Suchy, "Handbook of Die Design", 2nd Edition McGraw-Hill.

### Course Outcome:

After learning the course the students should be able to:

### List of Experiments:

1. Prepare Sheet Metal Pattern Development of Box
2. Prepare Sheet Metal Pattern Development of Hopper
3. Prepare Sheet Metal Pattern Development of Funnel
4. Prepare Sheet Metal Pattern Development of Liter Cane
5. Prepare Sheet Metal Pattern Development of Liter Cane
6. Prepare Sheet Metal Pattern Development of AC Duct
7. Prepare Sheet Metal Pattern Development from galvanized sheet

### Open Ended Problems:

### Major Equipments:

- i. Sheet metal working hand tools
- ii. Spot welding machine
- iii. Seam welding machine
- iv. Projection welding machine
- vii. Soldering equipments
- viii. Riveting gun
- ix. Guillotine cutting machine
- x. Sheet metal hand press
- xi. Roll Bending machine

### List of Open Source Software/learning website:

- I. <http://www.custompartnet.com/wu/sheet-metal-shearing>
- II. <http://sheetmetal.me/sheet-metal-hems/>

- III. <http://www.theheimgroup.com/resources/press-operations/>
- IV. [http://www3.eng.cam.ac.uk/DesignOffice/idp/resources/cad/sheetmetal/idp\\_sm\\_hints.pdf](http://www3.eng.cam.ac.uk/DesignOffice/idp/resources/cad/sheetmetal/idp_sm_hints.pdf)
- V. <http://www.qualitytool.com/resources/Design-Handbook-Rev3.pdf>

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.