Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BANGALORE

COURSE PLAN

Academic Year 2019-20

Program:	Mechanical Engineering
Semester :	3
Course Code:	18MEL38A
Course Title:	WORKSHOP & MACHINE SHOP LAB
Credit / L-T-P:	2 / 0-1-2
Total Contact Hours:	42
Course Plan Author:	K B ARUN KUMAR / SHANKAREGOWDA K C

Academic Evaluation and Monitoring Cell

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INSTRUCTIONS TO TEACHERS

- Classroom / Lab activity shall be started after taking attendance.
- Attendance shall only be signed in the classroom by students.

- Three hours attendance should be given to each Lab.
- Use only Blue or Black Pen to fill the attendance.
- Attendance shall be updated on-line & status discussed in DUGC.
- No attendance should be added to late comers.
- Modification of any attendance, over writings, etc is strictly prohibited.
- Updated register is to be brought to every academic review meeting as per the COE.

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Note : Remove “Table of Content” before including in CP Book
Each Laboratory 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. LABORATORY INFORMATION

1. Laboratory Overview

Degree:	BE	*Program:*	ME
Year / Semester :	2 / 3	*Academic Year:*	2019-20
Course Title:	WORKSHOP & MACHINE SHOP LAB	*Course Code:*	18MEL38A
Credit / L-T-P:	2 / 0-1-2	*SEE Duration:*	180 Minutes
Total Contact Hours:	42	*SEE Marks:*	60 Marks
CIA Marks:	40	*Assignment*	---
Lab. Plan Author:	K B ARUN KUMAR	*Sign*	Dt :
Checked By:	SHANKAREGOWDA K C	*Sign*	Dt :

2. Laboratory Content

Expt.	Title of the Experiments	Lab Hours	Concept	Blooms Level

Part-A				
1	Introduction to fitting Preparation of fitting joint models-1	9	Demonstration	L3 Apply
2	Preparation of fitting joint models-2	3	Demonstration	L3 Apply
Part B				
1	Preparation of turning models	3	Demonstration	L3 Apply
2	Preparation of turning models involving plain turning, taper turning, step turning, thread cutting using lathe machine	15	Demonstration	L3 Apply
Part C				
1	Cutting of v-Groove / dovetail/ rectangular groove using shaper machine	9	Demonstration	L3 Apply
2	Cutting of gear teeth using milling machine	3	Demonstration	L3 Apply

3. Laboratory Material

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

Expt.	Details	Expt. in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	-	-
1	Machine Tools by Hajra choudhary & Nirjhar Roy SK, 2016	In Lib	
2	Mechanical workshop Practice by john K C 2018	In Lib	
3	workshop Technology vol III by Chapman W A J 2000	In Lib	
B	**Reference books**		
1	Elements of workshop Technology volume 1 Manufacturing processes by Hajra choudhary	In dept	
C	**Concept Videos or Simulation for Understanding**		
C1	s://www.youtube.com/watch?v=XXpOwsD0fWM		
C2	https://www.youtube.com/watch?v=8zVHxCqusec		
C3	https://www.youtube.com/watch?v=xMPYLUoGqLY		
C4	https://www.youtube.com/watch?v=lU9IeYwirRg		
C5	youtube.com/watch?v=zQwbh-mpY7I		
D	**Software Tools for Design**	-	-
1			
E	**Recent Developments for Research**	-	-
1			
2			
F	**Others (Web, Video, Simulation, Notes etc.)**	-	-
1	https://www.gopracticals.com/workshop/workshop-practical-machine-shop-lathe/		
2	https://en.wikipedia.org/wiki/Machine_shop		

4. Laboratory 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 . . .

Expt.	Lab. Code	Lab. Name	Topic / Description	Sem	Remarks	Blooms

						Level
1						
2						
3						
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.

Expt.	Topic / Description	Area	Remarks	Blooms Level
1	Lathe machine	Manufacturing	Turning models involving plain turning, taper turning, step turning, thread cutting using lathe machine	L2
2	Shaper machine	Manufacturing	Cutting of v-Groove / dovetail/ rectangular groove using shaper machine	L2
3	Milling machine	Manufacturing	Cutting of gear teeth using milling machine	L2

B. Laboratory Instructions

1. General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	
2	Students should report to the concerned lab as per the time table.	
3	After completion of the program, certification of the concerned staff in-charge in the observation book is necessary.	
4	Student should bring a notebook of 100 pages and should enter the readings /observations into the notebook while performing the experiment.	
5	The record of observations along with the detailed experimental procedure of the experiment in the Immediate last session should be submitted and certified staff member in-charge.	
6	Should attempt all problems / assignments given in the list session wise.	
7	It is responsibility to create a separate directory to store all the programs, so that nobody else can read or copy.	
8	When the experiment is completed, should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.	
9	Any damage of the equipment or burn-out components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year	
10	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the algorithm, program code along with comments and output for various inputs given	

2. Laboratory Specific Instructions

SNo	Specific Instructions	Remarks
1	Every student should obtain a set of instruction sheets entitled manufacturing processes Laboratory.	
2	The student should take the permission of the Lab Staff / Tutor before handling any machine.	
3	Students are required to clear off the chips from the machine and lubricate the guides etc. at the end of the session.	
4	Power to the machines will be put off 10 minutes before the end of laboratory session	

	to allow the students to return the tools.	
5	The student should not lean on the machine when it is working.	

C. OBE PARAMETERS

1. Laboratory Outcomes

Expt.	Lab Code #	COs / Experiment Outcome	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
-	-	**At the end of the experiment, the student should be able to . . .**	-	-	-	-	-
1	18MEL38.1	Prepare the fitting model as per given dimension	12	fitting	Demonstrate	Pratical record ,IA test	L3
2	18MEL38.3	Prepare the turning model as per given dimension	18	turning	Demonstrate	Pratical record ,IA test	L3
3	18MEL38.5	Prepare the v-Groove / dovetail/ rectangular groove using shaper	9	shaper	Demonstrate	Pratical record ,IA test	L3
4	18MEL38.6	Prepare the gear teeth using milling machine	3	milling	Demonstrate	Pratical record ,IA test	L3
-		**Total**	**42**	-	-	-	-

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

2. Laboratory Applications

Expt.	Application Area	CO	Level
1	Joining of metals	C01	L3
2	The main function of a lathe is to remove metal from a piece of work to give it the required shape and size by holding the work securely and rigidly on the machine and then turning it against cutting tool which will remove metal from the work in the form of chips.	C02	L3
3	Lathe used for sanding, drilling, cutting for wood turning, metal spinning, glass working in various industries.	C02	L3
4	Facing is used for machining a large flat area, typically the top of the part in preparation for other milling operations.	C03	L3
5	Taps are used to cut internal threads of a specific size and pitch. Like reamers, a tap requires a hole be drilled first to the size of the minor diameter.	C03	L3
6	Shaper is used to form keyhole, slots and internal splines that fasten pulleys on the shaft.	C04	L3

Note: Write 1 or 2 applications per CO.

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Expt.	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	-	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	-
1	CO1	PO1	L2,L3	Knowledge of microscope is required to understand the micro structure of material	L3
2	CO2	PO1	L2,L3	Knowledge of stress, strain is required to study the behavior of the material	L3
3	CO3	PO1	L2,L3	Knowledge of alloys is required to Understand the characteristics and properties of alloys	L3
4	CO4	PO1	L2,L3	Knowledge of iron and carbon and their alloys is required to study the iron-carbon diagram for different phases & comparison with metal and alloys	L3

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Experiment Outcomes	Program Outcomes															-
Expt.	CO.#	**At the end of the experiment student should be able to . . .**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	Level
1	CO1	Prepare the fitting model as per given dimension	√	-	-	-	-	-	-	-	-	-	-	-				L3
2	CO4	Prepare the turning model as per given dimension	√	-	-	-	-	-	-	-	-	-	-	-				L3
3	CO5	Prepare the v-Groove / dovetail/ rectangular groove using shaper	√	-	-	-	-	-	-	-	√	-	-	-				L3
4	CO5	Prepare the gear teeth using milling machine	√	-	-	-	-	-	-	-	√	-	-	-				L3
-	**18MEL38A**	**Average attainment (1, 2, or 3)**																-
-	*PO, PSO*	*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*																

5. Curricular Gap and Experiments

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

Expt	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. Experiments Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

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

D. COURSE ASSESSMENT

1. Laboratory 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.

Unit	Title	Teaching Hours	No. of question in Exam							CO	Levels
			CIA-1	CIA-2	CIA-3	Asg-1	Asg-2	Asg-3	SEE		
1	Prepare the fitting model as per given dimension	12	1	-	-	1	-	-	1	CO1	L3
2	Prepare the turning model as per given dimension	18	-	1	-	-	1	-	1	CO2	L3
3	Prepare the v-Groove / dovetail/ rectangular groove using shaper	9	-	-	1	-	-	1	1	CO3	L3
4	Prepare the gear teeth using milling machine	3	-	-	1	-	-	1	1	CO4	L3
-	**Total**	**42**									

2. Continuous Internal Assessment (CIA)

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

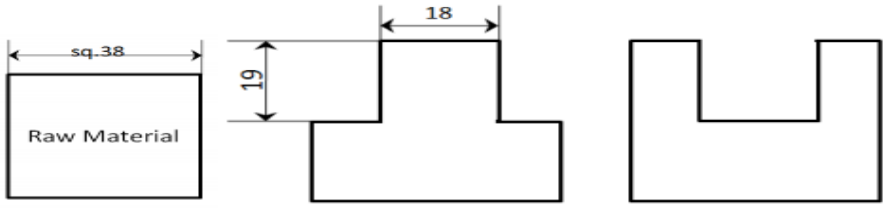
Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	20	CO1	L3
CIA Exam – 2	20	CO2	L3
CIA Exam – 3	20	CO3, CO4	L3
	-	-	-
Other Activities – define – Slip test	-	-	-
Final CIA Marks	**40**	-	-

-

SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	05 Marks
2	Record Writing / Viva	10 Marks for each Expt
3	Internal Exam Assessment	20Marks
4	Internal Assessment	5 Marks
5	SEE	60Marks
-	**Total**	**100 Marks**

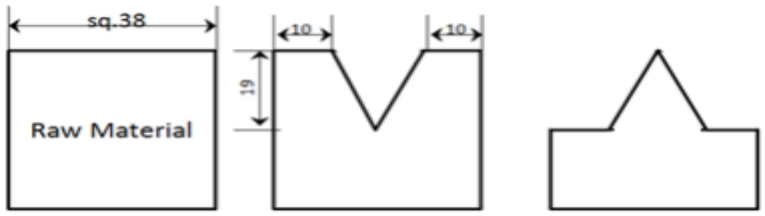
E. EXPERIMENTS

Experiment 1: Fitting model-1

-	**Experiment No.:**	1	**Marks**	10	**Date Planned**		**Date Conducted**	
1	Title	Fitting Section (V-joint)						
2	Course Outcomes	Preparation of Fitting joint						
3	Aim	Preparation of Fitting model						
4	Material / Equipment Required	2 Mild steel specimen of unknown dimension						
5	Theory, Formula, Principle, Concept	-1. Filling 2. Marking 3. Punching 4. Sawing 5. Filling 6. Finishing						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	-1. The given mild steel flat piece is checked for given dimensions. 2. One edge of given is filled to straightness with rough and smooth files and checked with try square. 3. An adjacent is also filled such that is square to first edge and checked with try square. 4. Wet chalk is applied on one side of the flat and dried for making. 5. Lines are marked according to given figure, using odd leg caliper and steel rule. 6. using the dot punch are made along the marked lines. 7. The excess materials removed from the remaining two edges with try square level up to half of the marked dots. 8. Finally buts are removed by the filling on the surface of the fitted job.						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	 -						
8	Observation Table, Look-up Table, Output	-						
9	Sample Calculations	-						
10	Graphs, Outputs	-						
11	Results & Analysis	Fitting model						
12	Application Areas	Joining of materials						

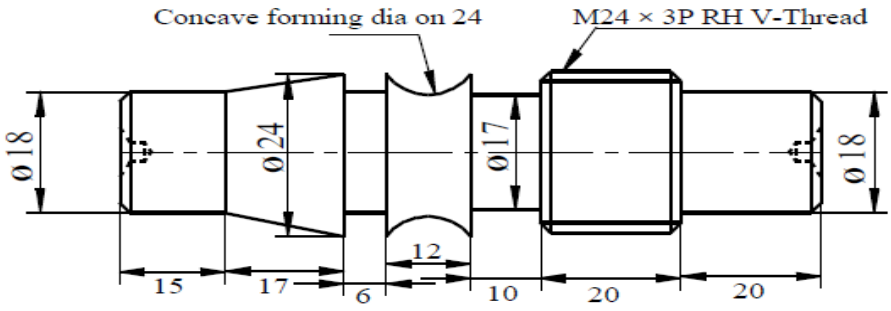
13	Remarks	
14	Faculty Signature with Date	

Experiment 2 : Fitting model-2

-	**Experiment No.:**	2	**Marks**	10	**Date Planned**		**Date Conducted**	
1	Title	Fitting Section (Half round joint)						
2	Course Outcomes	Preparation of Fitting joint						
3	Aim	Preparation of Fitting model						
4	Material / Equipment Required	2 Mild steel specimen of unknown dimension, Bench vice						
	Theory, Formula, Principle, Concept	-1. Filling 2. Marking 3. Punching 4. Sawing 5. Filling 6. Finishing						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	-1. The given mild steel flat piece is checked for given dimensions. 2. One edge of given is filled with rough and smooth files and checked with try square for straightness. 3. An adjacent edge is also filled such that it is square to first edge and checked with try square. 4. Wet chalk is applied on one side of the flat and dried for marking. 5. Lines are marked according to given figure, using odd leg caliper and steel rule. 6. Using the dot punch, punches are made along the marked lines. 7. The excess materials removed from the remaining two edges with try square level up to half of the marked dots. 8. Finally buts are removed by the filling on the surface of the fitted job.						
7	Block, Circuit, Model-Diagram, Reaction Equation, Expected Graph	- 						
8	Observation Table, Look-up Table, Output	-						
9	Sample Calculations	-						
10	Graphs, Outputs	-						
11	Results & Analysis	Fitting model						
12	Application Areas	Joining of materials						
13	Remarks	-						
14	Faculty Signature with Date	-						

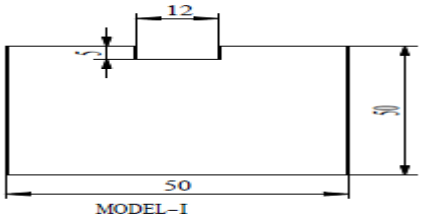
Experiment 3 : Turning model 1

-	**Experiment No.:**	3	**Marks**	10	**Date Planned**		**Date Conducted**	
1	Title	Turning						
2	Course Outcomes	Preparation of turning model						
3	Aim	Preparation of turning model with all operations on it						
4	Material / Equipment Required	Mild steel specimen , Lathe						
5	Theory, Formula, Principle, Concept	Tan= D-d/2l 1. Study the drawing. 2. Hold the workpiece on 3 jaw chuck by keeping 60 to 70 mm outside and						

		face the workpiece to clear the roughness. 3. Face the job and counter sinking at one end. 4. Plain turning the job to Ø23.8 to maximum length. 5. Step turning to Ø17 for a length of 20 mm. 6. Under cut the dia 17 for a length of 15 mm as per the sketch. 7. Threads to be cut on diameter 23.8 mm for a length of 25 mm.
6	Procedure, Program, Activity, Algorithm, Pseudo Code	-1. Reverse hold the job on Ø19 and face to maintain total length 100 mm 2. Centre drilling 3. Step turn diameter 17 for a length of 20 mm 4. Turn diameter 23.75 mm for threading to a length of 20 mm 5. Chamfer 0.5 mm all sharp corners 6. Take the revolving centre support 7. Threads to be cut on diameter 23.8 mm for a length of 25 mm.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	 -
8	Observation Table, Look-up Table, Output	-
9	Sample Calculations	--
10	Graphs, Outputs	-
11	Results & Analysis	-
12	Application Areas	
13	Remarks	
14	Faculty Signature with Date	

Experiment 4 : Shaping Operation

-	**Experiment No.:**	4	**Marks**	10	**Date Planned**		**Date Conducted**	
1	Title	**Cutting of V groove *dovetail* rectangular**						
2	Course Outcomes	**Shaping Operation**						

3	Aim	**Cutting of V groove *dovetail* rectangular in a shaper**
4	Material / Equipment Required	Mild steel specimen, Shaper
5	Theory, Formula, Principle, Concept	-
6	Procedure, Program, Activity, Algorithm, Pseudo Code	1. Take the rectangular block of standard size and mark the dimension on the work. 2. Hold the job on the work holding device on a work table of a shaping machine. 3. Produce a slot on the work piece on 3 sides of the rectangular block as per drawing. 4. Rotate the tool head to an angle 45_0 and produce to V slot as per sketch. 5. Finish the job as per the sketch.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	-
9	Sample Calculations	-
10	Graphs, Outputs	-
11	Results & Analysis	-
12	Application Areas	-
13	Remarks	-
14	Faculty Signature with Date	-

Experiment 5 : Cutting of gear teeth using Milling Machine

-	**Experiment No.:**	5	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Gear tooth profile						
2	Course Outcomes	Gear tooth operation						
3	Aim	Milling cutter						
4	Material / Equipment Required	Specimen, Milling machine						
5	Theory, Formula, Principle, Concept	1. Full number of Index lever rotations are achieved when divisions of 40 by the required number of divisions, gives the full number Example: Divisions required: 10 D: Number of Index lever rotations IS: Dividing head constan MACHINE SHOP- 15MEL48B IV SEM, ME Dept. of ME, C.I.T. Gubbi, Tumakuru Page 42 T = Divisions required D = IS/t = 40/10 = 4 i.e., 4 rotation of the Index lever represents 1/10 rotation of DH Spindle						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	1. Mounting and aligning of the dividing head and tail stock on the horizontal milling machine.						

		2. Mounting of gear milling cutter on the cutter arbor and checking for concentric running. 3. Clamping of work piece between centre and setting to the centre of the cutter. 4. Adjusting the sector arms for the indexing head [dividing head] 5. Setting of revolution and feed for milling. 6. Cutter should have slightly on the work piece. 7. with drawing work piece out of range of the cutter and lifting. 8. Milling of first tooth space. 9. With drawing work from the cut, and turning the indexing handle by the tooth pitch, milling of the next tooth space. 10. Milling of remaining tooth.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	--
8	Observation Table, Look-up Table, Output	-
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	
13	Remarks	---
14	Faculty Signature with Date	---

F. Content to Experiment Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Expt-#	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	Preparation of Fitting operation	12	L3 (Apply)L	L3 (Understand)	Develop	Demonstrate	Viva & presentation
2	Preparation of Turning operation	18	L3 (Apply)	L3 (Apply)	Develop	Demonstrate	Viva & presentation
3	Preparation of Shaping operation	9	L3 (Apply)	L3 Analyze	Develop	Demonstrate	Viva & presentation
4	Preparation of Milling operation	3	L3 (Apply)	L3 Analyze	Develop	Demonstrate	Viva & presentation

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Expt - #	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 ...**
A	*I*	*J*	*K*	*L*	*M*	*N*
1	Fitting operation	Fitting operation	Fitting operation	Will be able to prepare the fitting model	Action Verb : Understanding Knowledge : preparation	Understand the preparation of fitting
2	Turning operation	Turning	Turning	Will be able to prepare the Turning model	Action Verb : Understanding Knowledge : preparation	Understand the preparation of Turning
3	Shaping operation	Shaper	shaper	Will be able to prepare the shaping mode	Action Verb : Understanding Knowledge : preparation	Understand the preparation of shaping operation
4	Milling operation	Milling	Milling cutter	Will be able to prepare the shaping mode	Action Verb : Understanding Knowledge : preparation	Understand the preparation of shaping operation