TA 202A
Introduction to Manufacturing Processes

2018-19 (I Semester)

Instructor-in-Charge: Prof. Arvind Kumar

Department of Mechanical Engineering

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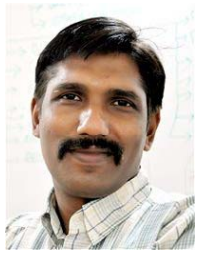
Schedule

Theory: T 8.00-9.00 am Venue: L20

Theory TAs: Alok Kumar (alokkr@), Amal B Soman (amal@), Sateesh K Yadav (sateeshk@)

Labs: M-F 2.00-5.00 pm Venue: TA202 Lab

TA-202 Introduction of Manufacturing Processes (2018-19 1st Semester)			
Day	**Tutor Name**	**TA Details**	
		Name	**Email-ID**
Monday	**Prof. S. Bhattacharya**	Gaganpreet Singh	gaganprt@iitk.ac.in
	bhattacs@iitk.ac.in	Sunny Singhania	sunnys@iitk.ac.in
Tuesday	**Prof. Arvind Kumar**	Amit Kumar Smarty	aksmarty@iitk.ac.in
	arvindkr@iitk.ac.in	Sanjay Kumar	sanjaykr@iitk.ac.in
Wednesday	**Prof. S.K. Choudhary**	Pankaj Singh Chauhan	pankajs@iitk.ac.in
	Choudhry@iitk.ac.in	Bibeka Nanda Padhi	bibeka@iitk.ac.in
Thursday	**Prof. Niraj Sinha**	Yashwant Kumar Nama	yashnama@iitk.ac.in
	nsinha@iitk.ac.in	Vijay Mandal	vijaym@iitk.ac.in
Friday	**Prof. J. Ramkumar**	Divyansh Patel	divy@iitk.ac.in
	jrkumar@iitk.ac.in	Shashank Singh	kshashan@iitk.ac.in
TAs for theory under Prof. Arvind Kumar (Tue: 8-9 AM)		Alok Kumar	alokkr@iitk.ac.in
		Amal B Soman	amal@iitk.ac.in
		Sateesh Kumar Yadav	sateeshk@iitk.ac.in

Day	Tutor Name	Photograph	Email
Monday	Prof. S. Bhattacharya		bhattacs@iitk.ac.in
Tuesday	Prof. Arvind Kumar		arvindkr@iitk.ac.in
Wednesday	Prof. S.K. Choudhary		choudhry@iitk.ac.in
Thursday	Prof. Niraj Sinha		nsinha@iitk.ac.in
Friday	Prof. J. Ramkumar		jrkumar@iitk.ac.in

Course content: Introduction to manufacturing; Conventional material removal processes: chip formation, tool dynamics, practical machining and finishing operations; CNC machining; Unconventional machining and introduction to microfabrication; Layered manufacturing; Metrology

Lecture-wise break-up

S. No.	Titles	Suggested of number of lectures
1.	Introduction to manufacturing and its evolution	2
2.	Conventional material removal processes	3
3.	Unconventional material removal processes	4
4.	Layered / generative manufacturing processes	2
5.	Computer numerical control and programming	1
6.	Engineering metrology	1
	Total number of lectures	**13**

Suggested text and reference material

- Fundamental of Modern Manufacturing: Materials, Processes and Systems: M.P. Groover (John Wiley)
- Manufacturing Science: A. Ghosh and A.K. Malik (East-West Press)
- Manufacturing Processes for Engineering Materials: S. Kalpakliam and S.R. Schmid (Prentice Hall)
- Fundamental of Manufacturing Processes: G.K. Lal and S.K. Choudhuary (Narosa)
- Advanced Machining Processes: V.K. Jain (Allied Publishers)
- Introduction to Micromachining: Ed. V.K. Jain (Narosa)
- Micromanufacturing Processes: Ed. V.K. Jain (CRC Press)

Grading Policy

Out of total marks 100

Theory: 40 % (40 marks)	Project: 60 % (60 marks)
Mid Sem Exam = 15	Lab quiz = 10 Project drawings = 5
End Sem Exam = 25	Lab reports = 2.5 Lab attendance = 2.5 Guide's overall evaluation + load sheet = 5 (2.5 each) with individual weightage. This Individual weightage will be multiplied in Final Project evaluation marks
	Project mid evaluation = 7.5 (in 5th project turn) Final project = 22.5 Project report = 5

- **To pass this course, one should score total marks ≥ 40 % (40/100). Additionally, the theory marks ≥ 25 % of the marks assigned for theory (10/40). Note that both should be fulfilled.**

Please note it carefully

Theory class attendance has no marks but lab attendance has certain weightage. please note that there is always a good, positive and almost linear correlation between alphabetic grade and attendance.

No make-up will be considered unless the student has authorized leave really for unavoidable situations. A student seeking a make-up is usually at disadvantage.

Note: No make-up for mid sem and quiz.

Academic Dishonesty

For cheating in the examination hall: **zero** tolerance → "**F**" grade

Laboratory Session

Monday	**D9,10,11**
Tuesday	**D1,2,3**
Wednesday	**D12,13,14**
Thursday	**D4,5,6**
Friday	**D7,8,15**

Session	Name of Experiment
1	Turning
2	Milling + CNC demonstration
3	Drilling and fitting
4 & 5	CNC class room training system usage and exercise
6 – 12	Project
	Project evaluation

1st & 2nd Turn	Project group formation
2nd Turn	Discussion with project ideas (come with three ideas and finalize one)
3rd Turn	Bring rough sketches (Isometric) of finalized project
4th Turn	CNC Demo & Final Drawings Discussion
5th Turn	CNC Lab Exercise & Drawing Submission
6th -12th Turn	Fabricate your project

Project involves

- Conceptual design – soft copy
- Rough detailed design – soft copy
- Manufacturing drawing – hard copy
- Fabrication

Themes

1. Agriculture,
2. Transportation,
3. Healthcare,
4. Educational toys to help school children,
5. Machines and Mechanisms.

You are required to bring your lab manual for every exercise lab turn.
Project group – 7 members (1st turn).
Size of the project should not exceed 1.5 ft (max) in all dimensions or 450×450×450 mm

From 2nd to 4th turn following are to schedule

Turn 2 – Discuss your idea with staff
– Come with minimum 3 ideas for discussion
– Simple working idea is more appreciated than complex incomplete project

Turn 3 – Finalizing rough drawing

Turn 4 – Make individual component drawing

Turn 5 – Submit hard copy of part drawing including the load sheet. This sheet you will fill from 5th turn onwards

Turn 6 – Start project

Lab Report Template

INDIAN INSTITUTE OF TECHNOLOGY, KANPUR

LABORATORY REPORT SHEET

Name	:	Subject	:
Name of Lab Partner (Group No.)	:	Roll No.	:
Section	:	Instructor / Tutor	:
Date of Experiment	:		
Date of Submission	:	Remarks by the Instructor / Tutor	:
Experiment	:		

N.B.S.

Objective:

Tools used:

Page No 2

Page No 1

Results (report deviations)

Machine specification

Procedure

Log Sheet

To be Submitted by Individual Student

Group #: Section No:
Name:
Job Assigned:

(1) Number of parts fully completed from the planned and approved main drawing (As per index submitted earlier)

S.N.	Part Name	Work done	Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

(2) Number of parts assembled together

S.N.	Names of part assembled	Work done	Date
1			
2			
3			
4			
5			
6			
7			

Guidelines:

- Each student is expected to be in the theory class by 7.55 AM. Anybody coming after 8:03 PM will not be allowed in the class.
- Each student is expected to be in the Lab class latest by 1.55 PM. If anybody comes after 2.05 PM, the Tutor/TA has the right to deny the entry in the TA202 Lab. Accordingly attendance for that day will not be considered. Since the lab attendance has a significant weightage, the students should come to the lab well in time as mentioned above and a zero tolerance policy will be followed.

Three major concerns to be followed in lab

- Safety
  - You must not wear loose clothes or clothing with loose long sleeves and not come with loose long hair.
  - You must wear shoes (slippers / chappals /sandals are prohibited) and full pant
  - Safety accessories (apron, goggles, gloves etc.) provided in the lab must be used
- No shortcut
- No mobile phones

All students are advised to carefully note the following points.

- In the first five Lab classes, videos for first 30 minutes on each day will be shown. These videos will be related to Lathe m/c, Milling m/c, Drilling m/c, Metrology instruments, Advanced Machining Processes and CNC machine.
  (Note: Question may be asked in each Mid Sem Exam and End Sem Exam regarding the machines and the measuring equipment).

Projects

- In the second Lab class itself, project groups should be formed. Name, Roll no. and Section of each member of the group written on a sheet of paper should be handed over to the concerned TA / Tutor in the Lab class.

- In the second Lab class, each group should come with a minimum of three projects ideas. They should be discussed with the guide assigned (a Lab staff) about their feasibility. The ideas should be drawn on papers to discuss with the guide. Note that the project should be finalized latest by 4th Lab class. In the 5th Lab class, each group is expected to submit their final drawings in the given template.

- Final production drawings (having dimensions, tolerances, bill of materials, no. of parts, sub-assembly and assembly drawings) will be submitted to the concerned Tutor/TA positively in the 5th Lab class. A template is uploaded on the course website. This exercise carries marks, and these drawings will be evaluated by the Tutors and Mr. Phoolchand Gond. The guides will approve the drawing initially. If the drawings are not submitted even in the beginning of the 6th Lab class by a group, then the TA / Lab Staff may not allow that group to enter in the TA202 Lab and ask them to first complete the drawings before starting fabrication of the project parts in the Lab. **Punishment will be given to those group-members who submit it late. The punishment will be given in the form of evaluating their work out of 75 % marks assigned for that activity.**

- In the 5th Lab class, each group will submit a ***load sheet*** which will clearly indicate who will make which parts. In this ***load sheet*** *the group members will first write the load distribution used to make the final production drawing. For subsequent lab classes (6th lab class onwards) this load distribution amongst the members of a group should be done in such a way that each member of the group is exposed to each type of machine (Lathe m/c, Drilling m/c, etc.). This should be checked by the project guide.* The assigned guide should help their groups in this distribution. This sheet will be very important because the questions asked during the project evaluation will be based on the work *self assigned* to each one of you.

- Each project group will have maximum seven students (except one or two groups) and maximum number of project groups per day is likely to be twelve.

- No student is supposed to do Lab report writing in the Lab hours in the Lab. Students are supposed to bring Lab reports in the subsequent Lab class complete in all respects (no late submission will be considered). Each student will submit individual hand written Lab report on the Lab sheets available in the shopping center / Hall of residence. All pages or sheets of the Lab Report before submitting to the TA / Tutor should be properly stapled. Loose sheets and report written on note-book papers/ A4 sheet will not be accepted by the TAs and will get zero marks. First page of the report should contain full information about the candidate: name, roll no., group #, section and day of the Lab (a template will be shown in the class).

- Each student is expected to be in the Lab latest by 1.55 PM. If anybody comes after 2.05 PM, the Tutor/TA has the right to deny the entry in the TA202 Lab. Accordingly attendance for that day will not be considered. Since the lab attendance has a significant weightage, the students should come to the lab well in time as mentioned above and a zero tolerance policy will be followed.
- Final project report, to be submitted during the evaluation in November month, should be according to the template uploaded on the course website.

- Students are advised to keep their mobiles in the switch off mode (they are not supposed to use their mobiles) in the Lecture Class as well as in the Lab class (especially when working on the machines).

Staff Members of TA202 Lab

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NEERAJ AWASTHI

Content

- What is manufacturing
- Materials in manufacturing
- Manufacturing processes

TA202A: Introduction to Manufacturing Processes

TA: Technical Arts.

Introduction: Latin verb *introducere*, refers to a beginning.

Manufacturing: Something made from raw materials by hand or by machinery.

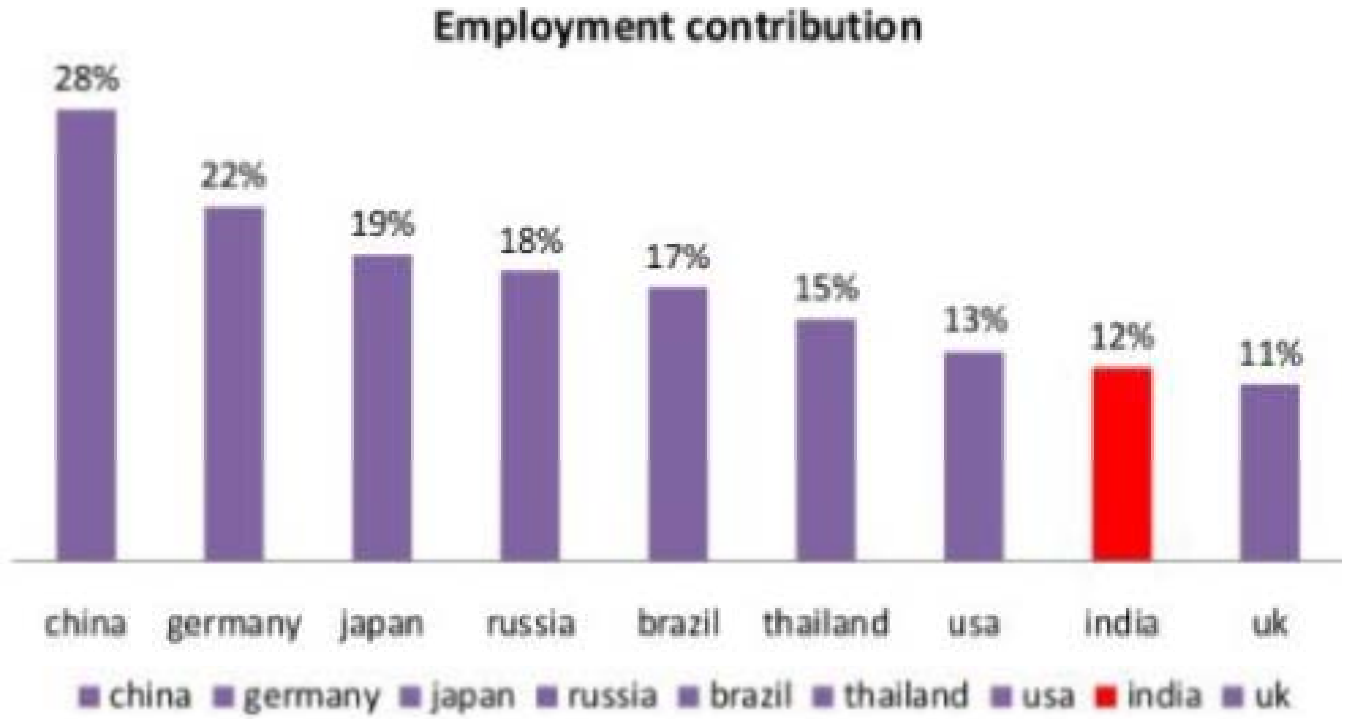
Process: A series of actions that you take in order to achieve a result.

Goal: The course aims to impart the basic knowledge about the fundamental manufacturing techniques employed to convert a raw material into final product.

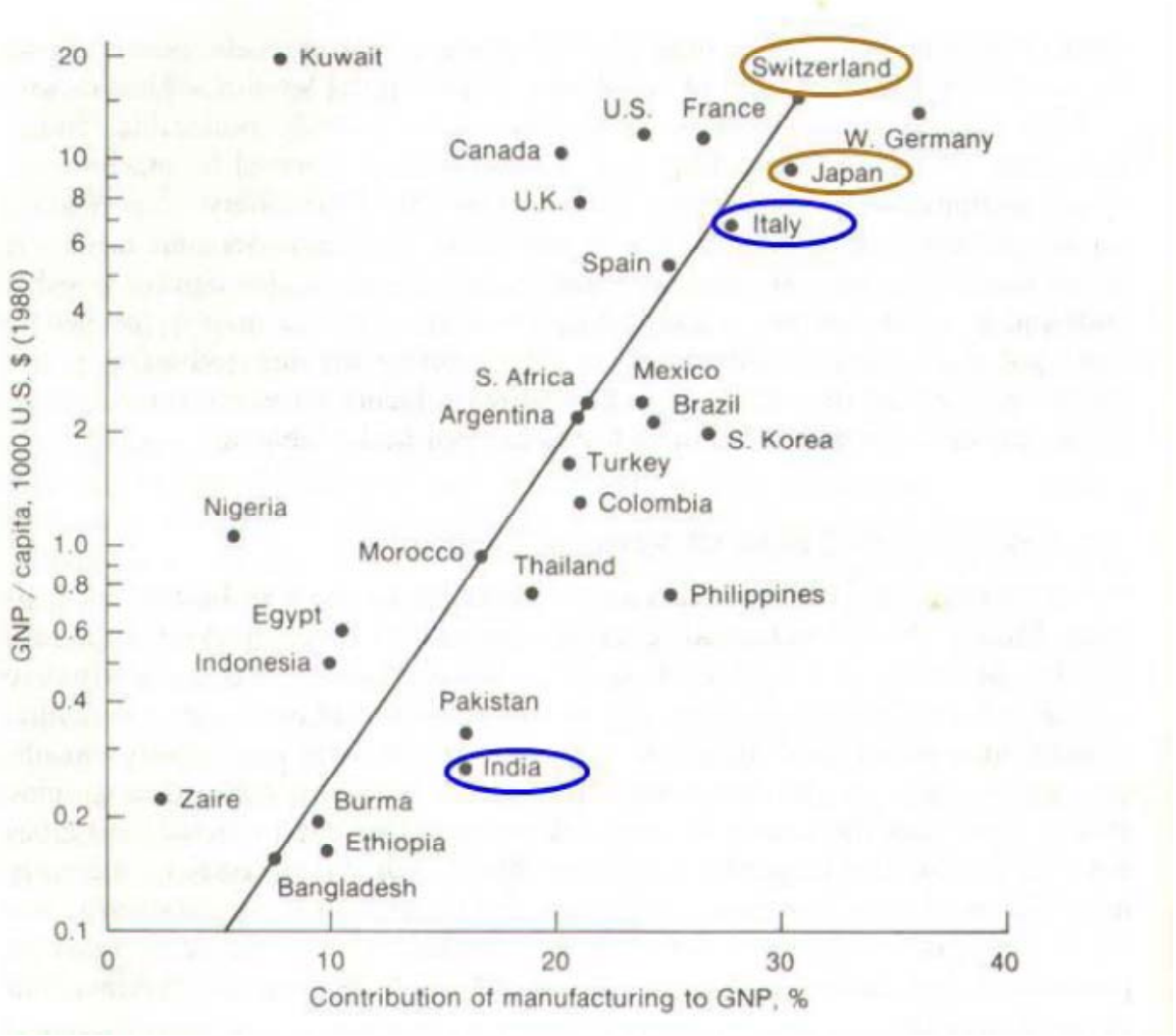
Manufacturing?

- The word manufacture is derived from two Latin words manus (hand) and factus (make); the combination means “made by hand”
- Most modern manufacturing operations are accomplished by mechanized and automated equipment that is supervised by human workers

Manufacturing & Employment Relations

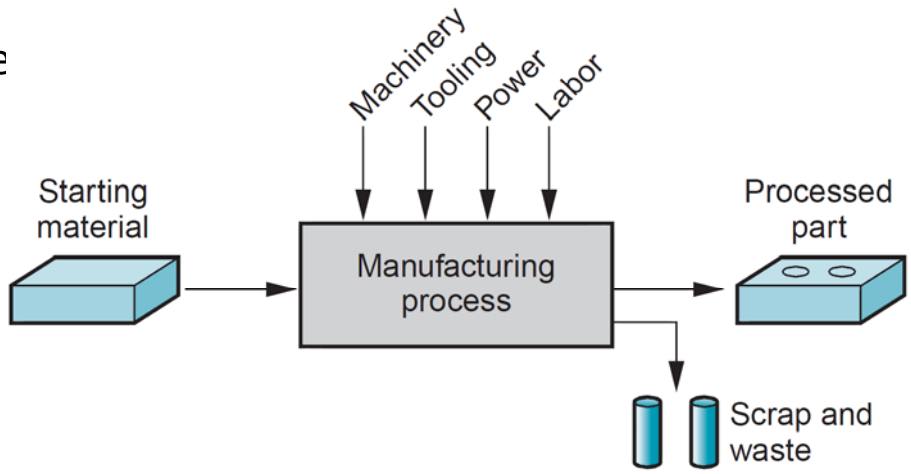


Contribution of manufacturing to GDP of different countries



Manufacturing Defined - Technological Definition

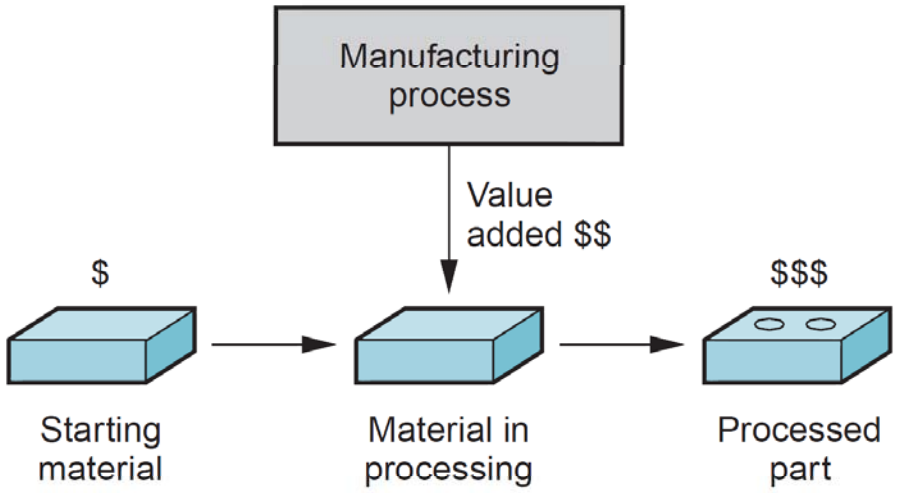
- Application of physical and chemical processes to alter the geometry, properties, and/or appearance of a given starting material to make parts or products
- Manufacturing also includes the joining of multiple parts to make assembled products
- Accomplished by a combination of machinery, tools, power, and manual labour
- Almost always carried out as a sequence of operations



Manufacturing Defined - Economic Definition

- Transformation of materials into items of greater value by means of one or more processing and/or assembly operations

- Manufacturing adds value to the material. Examples:
  - Converting iron ore to steel adds value
  - Transforming sand into glass adds value
  - Refining petroleum into plastic adds value



Manufacturing Industries

Industry consists of enterprises and organizations that produce or supply goods and services

Industries can be classified as:

1. Primary industries - cultivate and exploit natural resources, e.g., agriculture, mining
2. **Secondary industries** - take the outputs of primary industries and convert them into consumer and capital goods
3. Tertiary industries - service sector

Note: Secondary industries include manufacturing, construction, and electric power generation.

For our purposes, manufacturing means production of hardware – Nuts and bolts, forgings, cars, airplanes, digital computers, plastic parts, and ceramic products.

Manufactured Products

- Final products divide into two major classes:
  1. **Consumer goods** - products purchased directly by consumers
     - Cars, clothes, TVs, tennis rackets
  2. **Capital goods** - those purchased by companies to produce goods and/or provide services
     - Aircraft, computers, communication equipment, medical apparatus, trucks, machine tools, construction equipment

Manufacturing Processes

Two basic types:

1. **Processing operations** - transform a work material from one state of completion to a more advanced state
   - Operations that change the geometry, properties, or appearance of the starting material
2. **Assembly operations** - join two or more components to create a new entity

Question

Why do I need this course?

Why theory?

Why lab exercises?