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STUDY MATERIAL FOR BTECH EXAMS BY BITS PILANI FOR WORKING PROFESSIONALS UNDER WILP*

- WORK INTEGRATED LEARNING PROGRAM

- **Study Kit:** Coure is divided into several module as per syllabus
- **Faculty**: Guided by scholars and retd. faculty from IITR
- **Effectiveness**: 100% exam oriented with dynamic updates
- **Support**: Contact us on WhatsApp | Call | Email *anytime*

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Birla Institute of Technology & Science, Pilani
Work Integrated Learning Programmes Division
Manufacturing Processes

Digital Learning Handout

Course Title	Manufacturing Processes
Course No(s)	ETZC235/PEZC236)(S2-23)
Credit Units	4
Credit Model	1+1+2
Instructor-In-Charge	Tufan Chandra Bera (Pilani)
Instructor	Karthikeyan (Goa)
Version Number	Ver 1.1
Date	20th June 2016

Course Objectives:

- Enrich the knowledge of the students in conventional, advance and non-conventional manufacturing processes adopted across various industrial domains through experiential learning.
- Developing skill set for selection of manufacturing processes for various types of materials and products. Transforming the workplace into a learning platform that will enable student to judge the considerations in process selection and economics behind it.
- Developing skill set to judge the need for automation of processes and how to achieve it for overall growth of the industry and society.

Text Book(s):

T1	Serope Kalpakjian, Steven R. Schmid, "Manufacturing Processes for Engineering Materials", Pearson Education 5th Edition, 2011

Reference Book(s) & other resources:

R1	J. T. Black, Ronald A. Kohser "DeGarmo's Materials and Processes in Manufacturing"
R2	Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, John Wiley & Sons
R3	Amitabh Ghosh & A. K. Mallik, "Manufacturing Science", Affiliated East-West Press Pvt. Ltd.
R4	P. N. Rao, "Manufacturing Technology Vol-I and II", Tata McGraw-Hill Publications, III Edition, New Delhi

LEARNING OUTCOMES	
LO1	Explain all the scientific and technical aspects behind various manufacturing processes
LO2	Select manufacturing processes considering factors like cost, technology, manufacturing

	practices and skill set of available.
LO3	Reengineer processes using innovative ideas and automation.
LO4	Benchmark suitable processes to manufacture a particular product.

Experiential Learning Components:

1. **Lab work**: Describe the lab infrastructure needed, number of lab exercises needed, etc.
- Analysis of various forming processes - Analysis of forging, rolling etc. by using ANSYS student version 2024 software.
- The links for video tutorials of ANSYS student version 2024 will be provided to students. The students can watch these videos to carry out the lab assignments.

2. Project work: None

3. Case study: None.

4. **Work integrated Learning Exercise:** Describe how the course will integrate with the work the student is doing at his / her work place.

5. **Design work/Field work:** Students to visit their workshops & foundries for gaining real time exposure.

Content Structure:

Contact Hour	List of Topic Title	Sub-Topics
1-2	Introduction to Manufacturing processes and Mechanical Behavior of Materials	• What is manufacturing, • Lean and agile manufacturing • Mechanical behaviour of materials • Cold working on hot working
3-4	Metal Casting	• Pattern Allowances • Types of patterns • Properties of moulding sand • Solidification of metals • Design of gating elements
5-6	Metal Casting	• Casting processes • Design consideration • Defects in casting
7-8	Bulk deformation processes	• Introduction to bulk deformation processes • Forging • Types of forging • Miscellaneous forging operations
9-10	Bulk deformation processes	• Rolling • Extrusion • Swaging

		• Die manufacturing methods
11-12	Sheet metal forming processes	• Sharing • Bending of sheet and plate • Deep drawing • Equipment upset metal forming
13-14	Metal removing process	• Machining • Necessity of manufacturing operations • Mechanics of cheap formation • Chip morphology, Orthogonal and Oblique cutting
15-16	Metal removing process	• Cutting forces • Cutting force calculation • Review session
17-18	Metal removing process	• Specific Energy • Temperature. • Flank Wear. • Creater Wear.
19-20	Metal removing process	• Chipping and cutting tool material • Surface finish and surface integrity • Turning Parameters. • Drilling, reaming and tapping
21-22	Metal removing process	• Milling Operations. • Machining and turning centres • Abrasives • Mechanics of grinding • Finishing operation • Deburring
23-24	Joining process	• Fundamentals • Arc welding • Oxy –fuel gas welding • Friction welding, resistance welding, explosion welding • Soldering and Brazing, adhesive bonding and mechanical fastening
25-26	Unconventional Machining Processes	• Ultrasonic machining • Chemical machining Electrochemical machining electrochemical grinding • Electrical discharge machining, high-energy beam machining • Water jet.
27-28	Automation of Manufacturing Processes and operations	• Fundamentals of Numerical control • Programming CNC Lathe
29-30	Automation of Manufacturing Processes and operations	• Programming CNC Lathe • Programming CNC Mill
31-32	Review Session	• Review Session

Evaluation Scheme:

Legend: EC = Evaluation Component; AN = After Noon Session; FN = Fore Noon Session

Evaluation Component	Name (Quiz, Lab, Project, Mid-term exam, End semester exam, etc.)	Type (Open book, Closed book, Online, etc.)	Weight	Duration	Day, Date, Session, Time
EC - 1	Assignment-I/ Quiz-I	Online	5%	7 days	February 19-28, 2024
	Assignment-II/ Quiz-II	Online	5%	7 days	March 19-28, 2024
	Virtual Lab free version ANSYS, Smart weld, UTM	Assignment	20%		April 19-28, 2024
EC - 2	Mid-sem	Closed book	30%	2 hours	Saturday, 16/03/2024 (AN)
EC - 3	Comprehensive	Open book	40%	2 ½ hours	Saturday, 18/05/2024 (AN)

Syllabus for Mid-Semester Test (Closed Book): Topics in Contact Hours: 1 to 16

Syllabus for Comprehensive Exam (Open Book): All topics

Important links and information:

Elearn portal: https://elearn.bits-pilani.ac.in

Students are expected to visit the Elearn portal on a regular basis and stay up to date with the latest announcements and deadlines.

Contact sessions: Students should attend the online lectures as per the schedule provided on the Elearn portal.

Evaluation Guidelines:

1. EC-1 consists of either two Assignments or three Quizzes. Students will attempt them through the course pages on the Elearn portal. Announcements will be made on the portal, in a timely manner.
2. For Closed Book tests: No books or reference material of any kind will be permitted.
3. For Open Book exams: Use of books and any printed / written reference material (filed or bound) is permitted. However, loose sheets of paper will not be allowed. Use of calculators is permitted in all exams. Laptops/Mobiles of any kind are not allowed. Exchange of any material is not allowed.
4. If a student is unable to appear for the Regular Test/Exam due to genuine exigencies, the student should follow the procedure to apply for the Make-Up Test/Exam which will be made available on the Elearn portal. The Make-Up Test/Exam will be conducted only at selected exam centres on the dates to be announced later.

It shall be the responsibility of the individual student to be regular in maintaining the self-study schedule as given in the course handout, attend the online lectures, and take all the prescribed evaluation components such as Assignment/Quiz, Mid-Semester Test and Comprehensive Exam according to the evaluation scheme provided in the handout.

BITS Pilani
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Manufacturing Process: Simulation Lab

Course Handout

Contents:

Faculty Name, Email Id & Contact Details	**Ankit Sharma** ankit.sharma@wilp.bits-pilani.ac.in; **9425465393** Jayakrishnan J jkrishnan@wilp.bits-pilani.ac.in 9562228686

Scope of the lab:

- To support the theory learned in manufacturing process course with modelling and simulation to understand the implementation of various manufacturing process and instil confidence in students to approach the real world problems.

Objectives of Lab:

- Developing skill set to analyse the manufacturing related problems with the simulation aid to help before actual manufacturing.

Learning Outcome of the lab

- Understand, model and analyse various manufacturing process and solve the typical manufacturing problems.

List of simulation experiments

Tut. No.	Tut. Name	Solving Time	Assignment Marks
1.	Analysis of Beam (1D)	1 hours	10 Marks
2.	Single Stage Cold Forging Process (2D)	1 hours	
3.	Rolling Process (2D)	2 hours	
4.	UTM App	1 hours	

5.	Introduction to weld procedure optimal	1 hours	10 Marks
6	Selection of weld procedure	1 hours	
7	Isotherm analysis of weld procedure using 2D	1 hours	
8	Laser welding and optimization of weld procedure	1 hours	
	Total		20

For lab calendar in terms of practice sessions, lab exams and other instructions please use the following link:
https://drive.google.com/file/d/1KcG4tnpkKMQ8FWtBHd7Uf6zZMkoQs_Dt/view?usp=sharing

NOTE: Any changes in lab schedule, evaluation component or other changes related to EC-1 will be informed by theory or lab instructor.

Instructor-in-charge

(ET ZC235)