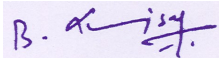

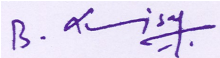


**DEPARTMENT OF METALLURGICAL and MATERIALS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I			
Course Title	Metal Forming		
Course Code	MT 706	No. of Credits	03
Course Code of Pre-requisite subject(s)	NIL		
Session	Jan 2021	Section (if, applicable)	NA
Name of Faculty	B.Ravisankar	Department	MME
Email	brs@nitt.edu	Telephone No.	9443578303
Name of Course Coordinator(s) (if, applicable)	NA		
E-mail	----	Telephone No.	----
Course Type	Core		
Syllabus (approved in BoS)			
Yielding criteria of von Mises and Tresca. Levy-Von Mises equations and Prantl Reuses equations for ideal plastic and elastic plastic solids respectively. Yield Locus. Methods of load calculation including slab method, slip line field theory, FEM, upper and lower bound methods. Texture effects. Metallurgical factors affecting recrystallization temperature and grain size. Effect of temperature, strain rate, hydrostatic pressure, Microstructure. Residual stresses, Friction and lubrication mechanisms. Lubricants in rolling, forging, extrusion, wire drawing, sheet metal forming. Tool design Types of rolling mills, Geometrical factors and forces, Factors affecting rolling load and minimum thickness, Roll pass design, wheel and tyre production. Rolling defects, Processes and equipment, Forgeability, effect of various factors, definitions. Selection of equipment, die design, parting line, flash, draft, tolerance. Defects, causes and remedies. High velocity forming methods, superplastic forming, hydroforming, isothermal forging. Principles and processes. FLD and LDR, CAD, CAM in forming use of softwares like OPTRIS, DEFORM, etc. Workability. Sol-gel and other processes for powders. Slip casting, extrusion injection moulding, HIP and CIP (Isostatic pressing), sintering. Blow moulding, Blow and Injection Moulding. Compression and transfer Moulding, Pultrusion. Filament Moulding. Resin Transfer Moulding.			
COURSE OBJECTIVES			
To know the concepts of metal forming and associate technologies and apply them to the conventional and advanced materials manufacturing for various structural applications.			
COURSE OUTCOMES (CO)			
Course Outcomes		Aligned Programme Outcomes (PO)	
1. Apply the concept of plastic deformation for metals and alloys to convert them in to useful shapes for intended engineering applications		The industrial metallurgy graduates are capable of applying knowledge of basic sciences, mathematics and engineering in their fields.	
2. Differentiate the various metal forming technology and choose the appropriate one for required engineering applications		The industrial metallurgy graduates are capable of testing and conduct experiments related to their work as well as to analyze and interpret the results	
3. Provide the successful solution to the various materials design and selection criteria for demanding engineering applications		The industrial metallurgy graduates are able to apply their knowledge and skills in solving industrial problems effectively	
4. Analyze various operational and materials parameters influencing the metal forming quality.		The industrial metallurgy graduates are capable to utilize the recent cutting edge technologies, innovative practices to develop new technologies	

5. Classify various metal forming technology (forging, rolling, extrusion etc.) and associated forming equipment	The industrial metallurgy graduates will develop eco-friendly technologies
6. Define various secondary forming procedures like stretch forming, deep drawing blanking and associated equipment	The industrial metallurgy graduates are capable of developing need basic technologies pertaining to the current industrial requirements of the country

COURSE PLAN – PART II			
COURSE OVERVIEW			
The course covers the microstructure, properties and applications of metallic materials subjected to mechanical loading to make useful shapes.			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	I-III	Yielding criteria of von Mises and Tresca. Levy-Von Mises equations and Prantl Reuses equations for ideal plastic and elastic plastic solids respectively. Yield Locus. Methods of load calculation including slab method, slip line field theory, FEM, upper and lower bound methods.	Class room lecture with both talk & talk and power point+ guest lectures
2	IV-V	Texture effects. Metallurgical factors affecting recrystallization temperature and grain size. Effect of temperature, strain rate, hydrostatic pressure, Microstructure. Residual stresses, Friction and lubrication mechanisms. Lubricants in rolling, forging, extrusion, wire drawing, sheet metal forming. Tool design	
3	Vi-VII	Types of rolling mills, Geometrical factors and forces, Factors affecting rolling load and minimum thickness, Roll pass design, wheel and tyre production. Rolling defects, Processes and equipment, Forgeability, effect of various factors, definitions. Selection of equipment, die design, parting line, flash, draft, tolerance. Defects, causes and remedies	
4	VIII-IX	High velocity forming methods, superplastic forming, hydroforming, isothermal forging. Principles and processes. FLD and LDR, CAD, CAM in forming use of softwares like OPTRIS, DEFORM, etc. Workability	
5	X-XII	Sol-gel and other processes for powders. Slip casting, extrusion injection moulding, HIP and CIP (Isostatic pressing), sintering. Blow moulding, Blow and Injection Moulding. Compression and transfer Moulding, Pultrusion. Filament Moulding. Resin Transfer Moulding	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S.No.	Mode of Assessment	Week/Date	Duration (min)	% Weightage
1	Cycle Test I (Objective-MCQ with negative mark)	II	45	20
2	Cycle Test II	IV	45	20
3	Assignment	X	Individual	15
4	Seminar	VIII	15	15
CPA	Compensation Assessment	IX	45	20
5	End semester Examination	XIII	120	30
COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)				
The exit survey will be assessed based on the questionnaire prepared by the class teacher and expected attainment is 75% on 1-10 scale basis				
COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment,, academic honesty and plagiarism etc.)				
<u>MODE OF CORRESPONDENCE (email/ phone etc)</u>				
Email/Mobile				
<u>ATTENDANCE</u>				
Minimum 75% excluding ODs. Medical certificate for genuine cases is permitted				
<u>COMPENSATION ASSESSMENT</u>				
It will be given during IX week for those who are absent on genuine grounds for any one of the cycle tests.				
<u>ACADEMIC HONESTY & PLAGIARISM</u>				
Plagiarism will be checked for assignments.				
<u>ADDITIONAL INFORMATION</u>				
The Course faculty is available for consultation at any time. Students can also contact him at any time through phone or by mail. The phone number and mail id will be given to the students at the beginning of the course				
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  Course Faculty (B. Ravisankar) </div> <div style="text-align: center;">  CC-Chairperson (Prof. S Natarajan) </div> <div style="text-align: center;">  HOD (B.Ravisankar) </div> </div>				

