NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF PRODUCTION ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M.Tech. Manufacturing Technology**		
Course Title	**Theory of Plasticity**		
Course Code	**PR 604**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**-**		
Session	**~~July~~ / January 2019**	**Section (if, applicable)**	**~~A / B~~**
Name of Faculty	**Dr.R.Narayanasamy**	**Department**	**Production Engineering**
Official Email	narayan@nitt.edu	**Telephone No.**	**0431-2503504**
Name of Course Coordinator(s) (if, applicable)	**-**		
Official E-mail	**-**	**Telephone No.**	**-**
Course Type (please tick appropriately)	☑ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Mohr's Circle, Plastic instability, Tensile test, Advantages of true stress and true strain diagrams etc., Various Yield theories and comparison - Von-Mises Yield theory, Tresca Yield theory, Solving problems related to Yield theories

Plastic instability in biaxial tension, Plastic instability using old Hill's Yield theory, Plastic instability using latest Hill's Yield theory, Plastic instability using Bassni's yield theory

Anisotropy in sheet metals, Hill's Anisotropic Plasticity theory, Special cases, Generalization of Hill's criterion, Bassani's Yield theory, M-K analysis for imperfect sheets, Upper bound theorem, Plane strain, Simple indendation, Compression between smooth plates, Upper bound problems

Slab analysis, Sheet drawing, Wire/rod drawing, Direct compression in plane strain, Sticking friction at interface, Axisymmetric compression, extrusion, Cold rolling theory of strip or plate

Slip line filed theory, Governing stress equations, Properties of SLF, Velocity equations, Derivation of Velocity diagram, Simple stress boundary conditions, Thick walled cylinder under internal pressure solution by SLF method, Processes, Theory of plasticity for porous materials.

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OBJECTIVES
To study the basic concepts of metal forming techniques and to develop force calculation in metal forming process Application of metal plasticity concepts in realtime industrial applications.

MAPPING OF COs with POs	
Course Outcomes	**Programme Outcomes (PO)** (Enter Numbers only)
1. Recognize the various metal forming techniques	**1,2,3**
2. Apply the theory of plasticity and its application for analyzing various metal forming Processes	**2,4**
3. Describe the advancement in forming technologies	**4,5**

COURSE PLAN – PART II

COURSE OVERVIEW

- Study on Mohr's circle and yield theories
- Plastic instability and Hill's yield theory
- Anisotrpy in sheet metals
- Slab analysis for various metal forming processes
- Slip line field theory

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1	Introduction to Theory of Plasticity, Mohr's Circle, Plastic instability Tensile test, Advantages of true stress and true strain diagrams etc	Lecture – PPT – Chalk and board
2	Week 2	Various Yield theories and comparison - Von-Mises Yield theory, Tresca Yield theory	
3	Week 3	Solving problems related to Yield theories	
4	Week 4	Plastic instability in biaxial tension, Plastic instability using old Hill's Yield theory	Lecture – PPT – Chalk and board
5	Week 5	Plastic instability using latest Hill's Yield theory, Plastic instability using Bassni's yield theory	

6	Week 6	Cycle Test – 1	
7	Week 7	Anisotropy in sheet metals, Hill's Anisotropic Plasticity theory, Special cases, Generalization of Hill's criterion,	Lecture – PPT – Chalk and board
8	Week 8	Bassani's Yield theory, M-K analysis for imperfect sheets,	
9	Week 9	Upper bound theorem, Plane strain, Simple indendation, Compression between smooth plates, Upper bound problems	
10	Week 10	Slab analysis, Sheet drawing, Wire/rod drawing, Direct compression in plane strain	Lecture – PPT – Chalk and board
11	Week 11	Sticking friction at interface, Axisymmetric compression, extrusion, Cold rolling theory of strip or plate	
12	Week 12	Cycle Test – 2	
13	Week 13	Slip line filed theory, Governing stress equations, Properties of SLF, Velocity equations, Derivation of Velocity diagram	Lecture – PPT – Chalk and board
14	Week 14	Simple stress boundary conditions, Thick walled cylinder under internal pressure solution by SLF method, Processes, Theory of plasticity for porous materials	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	Week 6	1 hr	20 marks
2	Cycle Test 2	Week 12	1 hr	20 marks
3	Assisgnments	Week 7 & 13	2 weeks	10 marks
CPA	Compensation Assessment*	Week 13	1 hr	20 marks
4	Final Assessment *	Week 14/15	3 hrs	50 marks

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

***mandatory; refer to guidelines on page 4**
COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)
Through MIS and Class committee meetings.
COURSE POLICY (including compensation assessment to be specified)
Attending all the assessments are MANDATORY for every student. One Compensation Assessment (CPA) will be conducted for those students who are being physically absent due to valid reasons for any of the assessment and it covers the entire contents of the course.
ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed) ➢ At least 75% attendance in each course is mandatory. ➢ A maximum of 10% shall be allowed under On Duty (OD) category. ➢ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.
ACADEMIC DISHONESTY & PLAGIARISM ➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty. ➢ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark. ➢ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office. ➢ The above policy against academic dishonesty shall be applicable for all the programmes.
ADDITIONAL INFORMATION, IF ANY
Dr.R.Narayanasamy, Professor, Room No: MTB 201, First floor,
Department of Production Engineering.
FOR APPROVAL
Course Faculty _____ **CC- Chairperson** _____ **HOD** _____ **Dr.R.Narayanasamy** **Dr.K.Panneerselvam** **Dr.P.Sathiya**