DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech.		
Course Title	Mechanical Behavior of Materials		
Course Code	MT612	No. of Credits	3
Course Code of Pre-requisite subject(s)	---		
Session	July – Dec 2022	Section (if, applicable)	NA
Name of Faculty	Dr K Sivaprasad	Department	MME
Email	ksp@nitt.edu	Telephone No.	0431-2503466
Name of Course Coordinator(s) (if, applicable)	NA		
E-mail	---	Telephone No.	---
Course Type	☐ Core course	☑ Elective course	

Syllabus (approved in BoS)

Definition of stress, strain, transformation of coordinate systems, tensor notations, relationship between stress and strain in elastic materials, concept of principal stress and principal strain, stress invariants, modulus, Hook's law and understanding of stiffness and compliance tensors, elastic anisotropy.

Yield criteria, equivalent stress and plastic strain, Theoretical shear of perfect crystal, Mohs circle, concept of dislocations and dislocation theory, edge and screw dislocations, dislocation interactions, kink and jog, sessile and glissiles, partial dislocations, dissociation of dislocations, Thomson tetrahedral, Lomer-Cottrell barriers.

Strengthening mechanisms, work hardening, solid solution strengthening, grain boundary strengthening, particle hardening, polymer elasticity and viscoelasticity, types of reinforcements and their influence, types of composites, high temperature degradation, creep and stress rupture, deformation mechanism maps, superplasticity and hot working.

Hardness, types of hardness measurements, comparison among hardness methods and scales, nano-indentation, compression testing, comparison between tension and compression studies of materials, shear testing, shear modulus, torsion and twist.

Fatigue of materials, S-N curves, life data presentation, influence of stress, linear elastic fracture mechanics in fatigue, crack growth studies, Paris law, metallurgical aspects of fatigue failures, concepts of remedial measures, creep-fatigue interaction, theoretical strength, Griffith equation, Brittle fracture, ductile fracture, fracture maps.

COURSE OBJECTIVES

To understand the concepts on materials failure and fracture analysis of materials and to

design new materials that can with stand catastrophic failures at different environment.	
COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
1. Understand the relationship between stress and strain	**1**
2. Understand the yielding behavior and dislocation influence on plastic deformation	**1, 2**
3. Understand the various strengthening mechanisms and high temperature deformation	**1, 2, 5**
4. Understand testing methods like hardness, compression, and fatigue	**1, 10, 11**

COURSE PLAN – PART II

COURSE OVERVIEW

It's a 3 credit elective course in which some tutorial problems are combined so as to understand the concept with more examples.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st week	Stress strain relations, transformation of axes, tensor notations,	PPTs along with Chalk & talk
2	**2nd week**	concept of principal stress and strain, stiffness and compliance	
3	**3rd week**	Yielding behavior, yield criterion, Moh's circle, shear of perfect crystal, theoretical strength	
4	**4th week**	Concept of dislocations, dislocation interactions, kink and jog	
5	**5th week**	Partial dislocations, Thomson tetrahedral, Lomer Cottrell barriers	
6	**6th week**	Strengthening mechanisms, work hardening behavior, Anisotropy	
7	**7th week**	Solid-solution strengthening, gb strengthening, particle strengthening, etc.	

8	**8th week**	Polymer mechanical behavior.	
9	**9th week**	High temperature deformation, creep deformation, stress rupture, deformation mechanism maps	
10	**10th week**	Superplasticity and hot working	
11	**11th week**	Hardness, types of hardness, importance of Hardness, comparison among them, various scales	
12	**12th week**	Nanoindentation, compression test, shear test, torsion & twist	
13	**13th week**	Fatigue deformation, S-N curve, fatigue crack growth curve, metallurgical aspects of fatigue	
14	**14th week**	Types of fracture, Griffith's theory, fracture maps, ductile to brittle transition,	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Written test 1	5th week	1 hr	20
2	Written test 2	10th week	1 hr	20
3	Assignment	12th week	2 weeks	10
CPA	Compensation Assessment*	13th week	1 hr	20
5	Final Assessment * (CBT)	14th week	2 hrs	50

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Standard feedback as per institute norms.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)
Email (ksp@nitt.edu)

COMPENSATION ASSESSMENT POLICY
One compensation written test will be conducted for 20 marks only for written tests.

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

Only one compensation test would be conducted against missing one of the assessments from Sl.No.1 to 2 only.

FOR APPROVAL

(Dr. K. Sivaprasad)
Course Faculty _____ **CC-Chairperson** _____ **HOD** _____