

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

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech.		
Course Title	High Temperature Materials		
Course Code	MTPE22	No. of Credits	3
Course Code of Pre-requisite subject(s)	MTPC12		
Session	July – Dec 2021	Section (if, applicable)	
Name of Faculty	Dr K.Sivaprasad	Department	MME
Email	ksp@nitt.edu	Telephone No.	0431-2503466
Name of Course coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/> Elective course	
Syllabus (approved in BoS)			
<p>Factors influencing functional life of components at elevated temperature, definition of creep curve, various stages of creep, metallurgical factors influencing various stages, effect of stress, temperature and strain rate</p> <p>Introduction to transient creep, time hardening, strain hardening, expressions for rupture life for creep, ductile and brittle materials, Monkman - Grant relationship</p> <p>Various types of fracture, brittle to ductile from low temperature to high temperature, cleavage fracture, ductile fracture due to micro void coalescence - diffusion controlled void growth; fracture maps for different alloys and oxides</p> <p>Oxidation, Pilling-Bedworth ratio, kinetic laws of oxidation - defect structure and control of oxidation by alloys additions, hot gas corrosion deposit, modified hot gas corrosion, fluxing mechanisms, effect of alloying elements on hot corrosion</p> <p>Iron base, nickel base and cobalt base superalloys, composition control, solid solution strengthening, precipitation hardening by gamma prime, grain boundary strengthening, TCP phase - embrittlement, solidification of single crystals</p>			
COURSE OBJECTIVES			
To study the high temperature sustainability of various materials in critical high temperature applications			
COURSE OUTCOMES (CO)			
Course Outcomes	Aligned Programme Outcomes (PO)		
1. Understand and analyze the basic mechanisms of high temperature deformation	[1] high		
2. Evaluate the long-term high temperature life of components.	[4] low; [2]		

	med; [1] high
3. Analyze the fracture phenomenon in various materials in high temperature failures	[2] med; [1] high
4. Apply basic understanding of high temperature phenomenon like oxidation and hot corrosion in identifying suitable materials for specific high temperature applications	[2] med; [1] high
5. Study the high temperature behaviour of various high temperature materials and design new materials for high temperature applications	[3] low; [1] high

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	1 st week	Factors influencing functional life of components at elevated temperature, definition of creep curve, various stages of creep	Chalk & talk
2	2 nd week	metallurgical factors influencing various stages, grain size influence, introduction to grain boundary engineering	Chalk & talk
3	3 rd week	effect of stress, temperature and strain rate, problems on creep failures	Chalk & talk
4	4 th week	Introduction to transient creep, time hardening, strain hardening, expressions for rupture life for creep,	Chalk & talk
5	5 th week	ductile and brittle materials, Monkman - Grant relationship, creep data extrapolation	PPT
6	6 th week	Various types of fracture, brittle to ductile from low temperature to high temperature, cleavage fracture,	PPT
7	7 th week	ductile fracture due to micro void coalescence - diffusion controlled void growth;	PPT

8	8 th week	Fracture maps for oxidation, Pilling-Bedworth ratio, kinetic laws of oxidation	PPT
9	9 th week	defect structure and control of oxidation by alloys additions, hot gas corrosion deposit,	PPT
10	10 th week	modified hot gas corrosion, fluxing mechanisms, effect of alloying elements on hot corrosion	PPT
11	11 th week	Iron base, nickel base and cobalt base superalloys, composition control, solid solution strengthening,	PPT
12	12 th week	precipitation hardening by gamma prime, grain boundary strengthening, TCP phase - embrittlement,	PPT
13	13 th week	Other high temperature alloys; high temperature coatings, TBCs, solidification of single crystals	PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Written test 1	5 th weeks	1h	20
2	Written test 2	10 th week	1h	20
3	Assignment	12 th week	1 week	10
	Compensation Assessment	13 th week	1h	20
4	Final Assessment	14 th week	3h	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 SI.No.1 to 4 only.

FOR APPROVAL


(K. SIVA PRASAD)
Course Faculty _____

CC-Chairperson _____

HOD _____