GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3172119
Semester – VII
Subject Name: Alloy Steel

Type of course: Engineering/science

Prerequisite: Basic knowledge of Physical metallurgy, Phase transformation

Rationale: There are different types of steels available and widely used for intended applications. The syllabus of alloy steels is designed in such a way that the Metallurgical Engineer should be acquainted with knowledge of composition, microstructure , properties, various strengthening mechanisms for alloys, and their applications.
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Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	4	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction to steel, classification of steel ,Types of plain carbon steel, effect of carbon and other inherent impurities on the properties of steel	**4**
2	Designation of steel as per ASTM, SAE, EN, IS, DIN,JISI,GHOST,UN Standards, Effect of alloying elements in plain carbon steel	**4**
3	Special purpose steel with its introduction, composition, manufacturing, and applications : Ausforming steel, Maraging steel, spring steel, ball bearing steel, Hadfield Mn Steel, Dual Phase steels, stainless steel:- Austenitic stainless steel, Ferritic stainless steel, Martensitic Stainless steel, Duplex stainless steel, precipitation hardenable stainless steel (PHSS), microstructure related problems in Stainless steel , HSLA steel,etc.	**12**
4	Tool steel:- introduction, classification of tool steel, designation of tool steels, Factors affecting selection of tool steels, Water hardening tool steel, Shock resisting tool steel, Cold work tool steel, Hot work tool steel, High speed tool steel, Mold steel, Special purpose tool steel with its application.	**8**
	Total hrs.	**28**

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25%	**30%**	**35%**	**10%**	**0%**	**0%**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Introduction to physical metallurgy by Sidney H. Avner
2. Physical Metallurgy for Engineers – Donald S. Clark & Wilbur R. Varney, CBS Publishers & Distributors, New Delhi.
3. Physical metallurgy by Vijendra Singh.ISBN:81-86308-63-6
4. ASM Handbook, Vol.1 & 2, Properties and Selection: Metals Park, Ohio
5. Structure and Properties of Alloys – Robert M. Brick, Robert B. Gordon & Arthur Phillips, Eurasia Publishing House (Private) Ltd., New Delhi.
6. Physical Metallurgy – Vol. II – A Gulyaev, MIR Publishers, Moscow
7. Metals Hand Book Ninth Edition – Vol. 1
8. Metallurgy and Heat Treatment of Tool Steels – Robert Wilson, McGraw-Hill Book Company (U.K.) Ltd. London

Course Outcomes
After completing this course, students will able to,

Sr. No.	CO statement	Marks % weightage
CO1	Understand the role of alloying elements added to plain carbon steels	20
CO2	Select the alloy steels for intended applications	45
CO3	Differentiate the alloy steels as per composition, microstructure, and application	35

List of experiment:

1. Observe microstructure ,measure properties and find the suitable application of low carbon steel
2. Observe microstructure ,measure properties and find the suitable application of medium carbon steel
3. Observe microstructure ,measure properties and find the suitable application of High carbon steel
4. To study the different code/ designation system of steel
5. To study the effect of alloying element added to plain carbon steel
6. Observe the microstructure of EN 31 steel
7. Observe the microstructure, measure the properties and find suitable application of different types of stainless steel
8. Observe the microstructure, measure the properties and find the application of HSLA steel
9. Observe the microstructure, measure the properties and find the suitable application of tool steel.

10. Report writing of industrial visit/expert lecture

Major Equipment:

1. Metallurgical microscope,
2. Muffle furnace
3. Image Analyzer

List of Open Source Software/learning website:

I. http://nptel.iitm.ac.in/
II. www.ocw.mit.edu