

20MD002 FAILURE ANALYSIS

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COURSE DESCRIPTION AND OBJECTIVE: To understand the concepts on materials failure and fracture analysis of materials and to design new materials that can withstand catastrophic failures at different environment.

COURSE OUTCOMES: the students will be able to:

- Understand the concepts of types of failures and analysis
- Analyse the various factors affecting/causing failures
- Design new materials that can withstand failures based on the environmental considerations and applications
- Apply the principles of Reliability and hazard rate for life calculations.

UNIT – I

L-12

Stages of failure analysis, classification and identification of various types of fracture. Overview of fracture mechanics, characteristics of ductile and brittle fracture.

UNIT – II

L-12

General concepts, fracture characteristics revealed by microscopy, factors affecting fatigue life Creep, stress rupture, elevated temperature fatigue, metallurgical instabilities, environmental induced failure. Some case studies failures.

UNIT – III

L-12

Analysis of wear failure. Corrosion failures- factors influencing corrosion and wear failures, Procedure for analyzing wear and corrosion failures, various types of hydrogen damage failures.

UNIT – IV

L-12

Causes of failure in forming, failure of iron and steel castings, improper heat treatment, stress concentration and service conditions. Failure of weldments - reasons for failure procedure for weld failure analysis.

UNIT -V

L-12

Reliability concept and hazard function, life prediction, condition monitoring, application of Poisson, exponential and Weibull distribution for reliability, bath tub curve, parallel and series system, mean time between failures and life testing.

TEXT BOOKS:

1. ASM Metals Handbook “Failure Analysis and Prevention”, ASM Metals Park. Ohio, Vol.10, 10th Edition, 1995.
2. Colangelo.V.J. and Heiser.F.A., “Analysis of Metallurgical Failures”, John Wiley and Sons Inc. New York, USA, 1974.