<table>
<tr><td colspan="7">Department of Metallurgical & Materials Engineering</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Title of the course</td><td rowspan="2">Program Core (PCR) / Electives (PEL)</td><td colspan="4">Total Number of contact hours</td><td rowspan="2">Credit</td></tr>
<tr><td>Lecture (L)</td><td>Tutorial (T)</td><td>Practical (P)</td><td>Total Hours</td></tr>
<tr><td>MME717</td><td>Corrosion Engineering</td><td>PEL</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td colspan="2">Pre-requisites</td><td colspan="5">Course Assessment methods (Continuous (CT) and end assessment (EA))</td></tr>
<tr><td colspan="2">CYC-01: Engineering Chemistry</td><td colspan="5">CT+EA</td></tr>
<tr><td colspan="2">Developer</td><td colspan="5">K.S. Ghosh</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">CO1: To learn Fundamentals of Corrosion Engineering
CO2: To understand of Different Forms of Corrosion and their Mechanism.
CO3: To know the Principles of Corrosion Prevention or Combat
CO4: Techniques to acquaint with Actual Corrosion Testing
CO5: To understand the Principles, Mechanism and Prevention of High Temperature Corrosion</td></tr>
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Topics Covered	Introduction: Definition of corrosion, Cost of Corrosion, corrosion damage, environments, classification of corrosion. [1 hour] Corrosion Principles: Electrochemical reactions, thermodynamics of corrosion, cell potential, emf and galvanic series, representation of cell / cell diagram, electrode kinetics, exchange current density, polarization - activation, concentration and combined, Pourbaix diagram, Evans diagram, Passivation. [12 hours] Forms of Corrosion: Uniform attack; galvanic or two-metal corrosion; crevice corrosion; pitting corrosion; intergranular corrosion – sensitization and weld decay; Selective leaching - dezincification; erosion corrosion; Stress corrosion cracking (SCC) and hydrogen damage. Case studies of corrosion in industry e.g. steel, chemical, fertilizer and food etc. [12 hours] Corrosion Prevention: Materials selection, alteration of environments, design,inhibitors, cathodic and anodic protection, coatings – electroplating. [5 hours] Corrosion Testing: Purpose, standard expression of corrosion rate, polarization technique – Tafel extrapolation, linear polarization method, AC impedance method, evaluation of pitting damage, Huey and stretcher test for stainless steel, slow strain rate test (SSRT). Corrosion failure analysis. [5 hours] High Temperature Corrosion: Introduction, oxidation, Pilling – Bedworth (PB) ratio, electrochemical and morphological aspects, oxidation kinetics, internal oxidation, corrosion in mixed environments, salt deposited hot corrosion, case studies for high temperature corrosion. [4 hours]
Text Books, and/or reference material	1. Corrosion Engineering – Mars G. Fontana, McGraw- Hill Publication, 1987. 2. The Fundamentals of corrosion – J. C. Scully Reference books: 1. An Introduction of Metallic Corrosion – R. Evans, Eward Arnold (Publishers) Ltd, London. 2. Introduction of High Temperature Corrosion – N. Birks and G. H. Meier