Advanced Metallurgical Thermodynamics - Video course

COURSE OUTLINE

**Basics**: First, second and third laws of thermodynamics, Maxwell’s relations, Clausius-Clayperon equation.

**Solutions**: solution models, regular, sub-regular, cluster variation models, multi-parameter models, quasi-chemical theory, statistical thermodynamics, multicomponent systems.

**Equilibrium Concepts**: Unary, binary and multicomponent systems, phase equilibria, evolution of phase diagrams, metastable phase diagrams, calculation of phase diagrams, thermodynamics of defects.

**Thermodynamics of Phase Transformations**: Melting and solidification, precipitation, eutectoid, massive, spinodal, martensitic, order disorder transformations and glass transition. First and second order transitions.

**Heterogeneous Systems**: Equilibrium constant, Ellingham diagrams and their application to commercially important reactions.

COURSE DETAIL

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<thead>
<tr>
<th>Sl. No</th>
<th>Topic</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1.</td>
<td><strong>Basics</strong>: First, second and third laws of thermodynamics, free energy, Maxwell’s relations, Clausius Clayperon equation, stability.</td>
<td>4</td>
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<td>2.</td>
<td><strong>Solutions</strong>: Chemical potential, solution models, quasichemical theory, configurational entropy.</td>
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<td>3.</td>
<td><strong>Equilibrium Concepts</strong>: Unary, binary and multicomponent systems, Phase equilibria, Phase rule, evolution of phase diagrams, metastable phase diagrams, calculation of phase diagrams.</td>
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<td>4.</td>
<td><strong>Thermodynamics of Phase Transformations</strong>: Melting and solidification, precipitation, eutectoid, massive, spinodal, martensitic and order disorder transformations. First and second order transitions.</td>
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<td>5.</td>
<td><strong>Heterogeneous Systems</strong>: Equilibrium constant, Ellingham diagrams and their application to commercially important reactions.</td>
<td>8</td>
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Pre-requisites:
Basic course on Metallurgical Thermodynamics

Additional Reading:

Hyperlinks:
3. [materials.iisc.ernet.in/~abinand/courses/thermo](http://materials.iisc.ernet.in/~abinand/courses/thermo)

Coordinators:
**Prof. B.S. Murty**
Department of Metallurgical & Materials Engineering, IIT Madras
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<th>application to commercially important reactions.</th>
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<td><strong>Total</strong></td>
<td>40</td>
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**References:**

1. Physical Chemistry of Metals: L.S. Darken and R.W. Gurry
2. Thermodynamics of Solids: R.A. Swalin