NPTEL Video Course - Metallurgy and Material Science - NOC:Phase Field Modelling: The Materials Science, Math

Subject Co-ordinator - Dr. M.P. Gururajan

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Module 1
Lecture 2 - Module 1
Lecture 3 - Module 1
Lecture 4 - Module 1
Lecture 5 - Module 1
Lecture 6 - Module 2
Lecture 7 - Module 1
Lecture 8 - Module 1
Lecture 9 - Module 1
Lecture 10 - Module 1
Lecture 11 - Module 1
Lecture 12 - Module 2
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Lecture 24 - Module 4
Lecture 25 - Module 4
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Lecture 28 - Module 4
Lecture 29 - Module 5

Lecture 30 - Module 5
Lecture 31 - Module 5
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Lecture 51 - Module 11
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Lecture 53 - Module 11
Lecture 54 - Module 11
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Lecture 57 - Module 12
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Lecture 67 - Module 14
Lecture 68 - Module 14

Lecture 69 - Module 15
Lecture 70 - Module 15
Lecture 71 - Module 16
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Lecture 78 - Module 18
Lecture 79 - Module 18
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Lecture 81 - Module 19
Lecture 82 - Module 19
Lecture 83 - Module 20
Lecture 84 - Module 20
Lecture 85 - Module 21
Lecture 86 - Module 21
Lecture 87 - Module 22

NPTEL Video Course - Metallurgy and Material Science - NOC:Dealing with Materials Data: Collection, Analysis

Subject Co-ordinator - Dr. M.P. Gururajan

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Aqueous Corrosion and its Control

Subject Co-ordinator - Prof. V. S. Raja

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Forms of corrosion
Lecture 31 - Forms of corrosion
Lecture 32 - Forms of corrosion
Lecture 33 - Forms of corrosion
Lecture 34 - Effective corrosion management

NPTEL Video Course - Metallurgy and Material Science - NOC:Cathodic Protection Engineering

Subject Co-ordinator - Prof. V.S. Raja

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Introduction to Materials Science and Engineering

Subject Co-ordinator - Prof. Rajesh Prasad

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Buckminsterfullerene (C60)
Lecture 31 - Ionic solids
Lecture 32 - NaCl
Lecture 33 - CsCl
Lecture 34 - ZnS
Lecture 35 - BCC vs CsCl
Lecture 36 - Amorphous Solids
Lecture 37 - Polymers
Lecture 38 - Vinyl Polymers
Lecture 39 - Thermoplasts and Thermosets
Lecture 40 - Tacticity
Lecture 41 - Copolymers
Lecture 42 - Crystallinity in Polymers
Lecture 43 - Defects in Crystals
Lecture 44 - Vacancies
Lecture 45 - Edge dislocation
Lecture 46 - Edge dislocation
Lecture 47 - Characteristic vectors of a dislocation
Lecture 48 - Edge, screw and mixed dislocations
Lecture 49 - Screw dislocations
Lecture 50 - Burgers circuit
Lecture 51 - Elastic energy of a dislocation line
Lecture 52 - Burgers vector
Lecture 53 - Burgers vector of a dislocation is constant along the line
Lecture 54 - Geometrical properties of a dislocations
Lecture 55 - Dislocation cannot end abruptly in a crystal
Lecture 56 - Dislocation cannot end abruptly in a crystal
Lecture 57 - Dislocation cannot end abruptly in a crystal
Lecture 58 - Dislocation motion
Lecture 59 - 2D defects
Lecture 60 - Free surface or external surface of the crystal
Lecture 61 - Stacking faults
Lecture 62 - Twin boundary
Lecture 63 - Grain boundary
Lecture 64 - Small angle symmetric tilt boundary
Lecture 65 - Ball bearing model
Lecture 66 - Phase diagrams
Lecture 67 - Phases and components
Lecture 68 - Uses of phase diagrams

Lecture 69 - Phases present in the system
Lecture 70 - Composition of phases present in the system
Lecture 71 - Proportion of phases present in the system
Lecture 72 - Microstructure evolution during solidification in isomorphous systems
Lecture 73 - Eutectic system
Lecture 74 - Eutectic reaction
Lecture 75 - Eutectic, hypoeutectic and hypereutectic alloys
Lecture 76 - Gibbsâ phase rule
Lecture 77 - Fe-C phase diagram
Lecture 78 - Eutectoid, hypoeutectoid and hypereutectoid steels
Lecture 79 - Microstructure of a hypoeutectoid steel
Lecture 80 - Microstructure of a hypereutectoid steel
Lecture 81 - Diffusion
Lecture 82 - Fickâ s first law
Lecture 83 - Fickâ s second law
Lecture 84 - Error function solution of Fickâ s second law
Lecture 85 - Atomic mechanisms of diffusion
Lecture 86 - Substitutional diffusion revisited
Lecture 87 - Diffusion paths
Lecture 88 - Steady and unsteady state diffusion
Lecture 89 - Phase Transformation
Lecture 90 - Nucleation
Lecture 91 - Nucleation and capillary rise
Lecture 92 - Nucleation, growth and overall transformation
Lecture 93 - Time-temperature-transformation (TTT) diagram
Lecture 94 - Homogeneus and heterogeneous nucleation
Lecture 95 - Heat treatment of steels
Lecture 96 - TTT diagram of Eutectoid Steels
Lecture 97 - Quenching and martensite
Lecture 98 - Austempering and bainite
Lecture 99 - Tempering
Lecture 100 - Residual stresses and Quench cracks
Lecture 101 - Marquenching and martempering
Lecture 102 - TTT diagram of hypoeutectoid and hypereutectoid steels
Lecture 103 - TTT diagram of alloy steel
Lecture 104 - hardenability of steels
Lecture 105 - Glass Ceramics
Lecture 106 - Tensile test
Lecture 107 - Plastic deformation and crystal structure

Lecture 147 - Sub-Critical crack growth

NPTEL Video Course - Metallurgy and Material Science - NOC:Crystals, Symmetry and Tensors

Subject Co-ordinator - Prof. Rajesh Prasad

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 (9d)
Lecture 31 (10a)
Lecture 32 (10b)
Lecture 33 (11a)
Lecture 34 (11b)
Lecture 35 (11c)
Lecture 36 (11d)
Lecture 37 (12a)
Lecture 38 (12b)
Lecture 39 (13a)
Lecture 40 (13b)
Lecture 41 (14a)
Lecture 42 (14b)
Lecture 43 (15a)
Lecture 44 (15b)
Lecture 45 (15c)
Lecture 46 (16a)
Lecture 47 (16b)
Lecture 48 (17)
Lecture 49 (18a)
Lecture 50 (18b)
Lecture 51 (18c)
Lecture 52 (18d)
Lecture 53 (19a)
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Lecture 55 (19c)
Lecture 56 (19d)
Lecture 57 (20a)
Lecture 58 (20b)
Lecture 59 (20c)
Lecture 60 (20d)
Lecture 61 (20e)
Lecture 62 (21a)
Lecture 63 (21b)
Lecture 64 (21c)
Lecture 65 (21d)
Lecture 66 (21e)
Lecture 67 (22a)
Lecture 68 (22b)

NPTEL Video Course - Metallurgy and Material Science - NOC:Corrosion-Environmental Degradation-Surface Engine

Subject Co-ordinator - Prof. (Hag) Harish Hirani

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1
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Lecture 33
Lecture 34
Lecture 35

NPTEL Video Course - Metallurgy and Material Science - NOC:Introduction to Crystal Elasticity and Crystal Pla

Subject Co-ordinator - Prof. Swarup bag

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Advanced Characterization Techniques

Subject Co-ordinator - Dr. Krishanu Biswas, Prof.N.P.Gurao

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Advanced Characterization Techniques
Lecture 2 - Advanced Characterization Techniques
Lecture 3 - Advanced Characterization Techniques
Lecture 4 - Advanced Characterization Techniques
Lecture 5 - Advanced Characterization Techniques
Lecture 6 - Advanced Characterization Techniques
Lecture 7 - Advanced Characterization Techniques
Lecture 8 - Advanced Characterization Techniques
Lecture 9 - Advanced Characterization Techniques
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Lecture 26 - Advanced Characterization Techniques
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Lecture 29 - Advanced Characterization Techniques

Lecture 30 - Advanced Characterization Techniques
Lecture 31 - Advanced Characterization Techniques
Lecture 32 - Advanced Characterization Techniques
Lecture 33 - Advanced Characterization Techniques

NPTEL Video Course - Metallurgy and Material Science - Electroceramics

Subject Co-ordinator - Dr. Ashish Garg

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30
Lecture 31
Lecture 32
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Lecture 34
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Lecture 36
Lecture 37
Lecture 38
Lecture 39
Lecture 40
Lecture 41

NPTEL Video Course - Metallurgy and Material Science - Fuels Refractory and Furnaces

Subject Co-ordinator - Prof. Satish Ch. Koria

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Transport Phenomena in Furnaces
Lecture 31 - Transport Phenomena in Furnaces
Lecture 32 - Steady Heat flows in Furnace and Heat Exchanger
Lecture 33 - Exercises on Heat Flow in Furnaces and Heat Exchangers
Lecture 34 - Exercises on Heat Flow in Furnaces and Heat Exchangers
Lecture 35 - Miscellaneous Topics
Lecture 36 - Miscellaneous Topics
Lecture 37 - Miscellaneous Topics
Lecture 38 - Miscellaneous topics
Lecture 39 - Furnace efficiency, Fuel Saving, Carbon Offset
Lecture 40 - Furnace efficiency, Fuel Saving, Carbon Offset

NPTEL Video Course - Metallurgy and Material Science - Introduction to Biomaterials

Subject Co-ordinator - Dr. Kantesh Balani, Dr. Birkamjit Basu

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Materials and Energy balance in Metallurgical Processe

Subject Co-ordinator - Prof. Satish Ch. Koria

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Material & Heat Balance in Ironmaking - II
Lecture 31 - RIST Diagram - I
Lecture 32 - RIST Diagram - II
Lecture 33 - Concepts in Converting
Lecture 34 - Exercise in Converting
Lecture 35 - Additional Topics - I Melting in Cupola
Lecture 36 - Additional Topics - II Gasification
Lecture 37 - Additional Topics - III Material Balance in Gasification
Lecture 38 - Additional Topics - IV Industrial Furnaces
Lecture 39 - Energy Balance in Industrial Furnaces
Lecture 40 - Thoughts on Application of Energy Balance

NPTEL Video Course - Metallurgy and Material Science - Optoelectronic Materials and Devices

Subject Co-ordinator - Prof. Deepak Gupta, Prof. Monica Katiyar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Conductivity of materials, Drudeâ s theory and its failures
Lecture 2 - Free electron theory
Lecture 3 - Free electron theory
Lecture 4 - Crystal structure, Reciprocal lattice I
Lecture 5 - Reciprocal lattice II, Brillouin zone and Braggâ s diffraction condition
Lecture 6 - Electrons in a crystal, Blochâ s electron
Lecture 7 - Free electron band diagrams in an empty lattice
Lecture 8 - Effect of periodic potential, Origin of band-gap through Kronig-Penny model
Lecture 9 - Electron dynamics
Lecture 10 - Conduction in relation to band diagrams
Lecture 11 - Semiconductor E-k diagrams and their material properties
Lecture 12 - Equilibrium carrier statistics in semiconductors
Lecture 13 - Equilibrium carrier statistics in semiconductors
Lecture 14 - Equilibrium carrier statistics in semiconductors
Lecture 15 - Doping in semiconductors
Lecture 16 - Equilibrium carrier statistics in semiconductors
Lecture 17 - Equilibrium carrier statistics in semiconductors
Lecture 18 - Semiconductor junctions in band-diagrams
Lecture 19 - Linear dielectric behavior
Lecture 20 - Non-linear dielectric behavior
Lecture 21 - Carrier recombination-generation - I
Lecture 22 - Carrier recombination-generation - II
Lecture 23 - R-G statistics via R-G centers
Lecture 24 - Optoelectronic materials and bandgap engineering
Lecture 25 - Optical properties of materials
Lecture 26 - Optical properties of single interfaces
Lecture 27 - Optical Properties of two interfaces
Lecture 28 - Drift
Lecture 29 - Diffusion

NPTEL Video Course - Metallurgy and Material Science - Steel Making

Subject Co-ordinator - Prof. Satish Ch. Koria, Prof. Dipak Mazumdar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30
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Lecture 39
Lecture 40
Lecture 41
Lecture 42

NPTEL Video Course - Metallurgy and Material Science - Structure of Materials

Subject Co-ordinator - Dr. Anandh Subramaniam

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Diffusion in Solids
Lecture 31 - Diffusion in Solids
Lecture 32 - Phase Diagrams
Lecture 33 - Phase Diagrams
Lecture 34 - Phase Diagrams
Lecture 35 - Phase Diagrams
Lecture 36 - Phase Diagrams
Lecture 37 - Phase Transformations
Lecture 38 - Phase Transformations
Lecture 39 - Phase Transformations
Lecture 40 - Phase Transformations
Lecture 41 - Phase Transformations
Lecture 42 - Phase Transformations
Lecture 43 - Phase Transformations
Lecture 44 - Phase Transformations
Lecture 45 - Phase Transformations

NPTEL Video Course - Metallurgy and Material Science - Environmental Degradation of Materials

Subject Co-ordinator - Dr. Kallol Mondal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Erosion corrosion, Cavitation
Lecture 31 - Cavitation, Fretting corrosion, corrosion cracking
Lecture 32 - Stress corrosion cracking
Lecture 33 - Stress corrosion cracking
Lecture 34 - Biologically influenced corrosion, liquid metal attack
Lecture 35 - Corrosion protection, change of materials, effect of design of component
Lecture 36 - Corrosion protection, change of environment, Inhibitors, coatings
Lecture 37 - Oxidation and hot corrosion, pitting Bedworth ratio, thermodynamics of oxidation
Lecture 38 - Thermodynamics of oxidation, Ellingham diagram, oxidation kinetics and laws
Lecture 39 - Oxide structure and Oxidation
Lecture 40 - Hot corrosion, corrosion testing and failure analysis, linear polarization
Lecture 41 - Degradation of composites, polymers and ceramics, corrosion and society

NPTEL Video Course - Metallurgy and Material Science - NOC:Phase Diagrams in Materials Science and Engineerir

Subject Co-ordinator - Dr. Krishanu Biswas

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Pearlite Transformation
Lecture 31 - Martensite Transformation - I
Lecture 32 - Martensite Transformation - II
Lecture 33 - Tempering of Martensite
Lecture 34 - Bainite Transformation
Lecture 35 - TTT curves for Steel
Lecture 36 - Cast Iron - I
Lecture 37 - Cast Iron - II
Lecture 38 - Ductile Iron and Nodular Iron
Lecture 39 - Malleable Iron
Lecture 40 - Alloyed Cast Iron
Lecture 41 - Phase Diagram for different Solid State Reaction
Lecture 42 - Phase Diagram of Ceramic
Lecture 43 - Ternary Phase Diagram - I
Lecture 44 - Ternary Phase Diagram - II
Lecture 45 - Ternary Phase Diagram and Tie Line Construction - I
Lecture 46 - Ternary Phase Diagram and Tie Line Construction - II
Lecture 47 - Ternary Phase Diagram and Tie Line Construction - III
Lecture 48 - Ternary Isomorphous Phase Diagram
Lecture 49 - Ternary Three Phase Equilibria
Lecture 50 - Three Phase Equilibria in Ternary Systems - I
Lecture 51 - Three Phase Equilibria in Ternary Systems - II
Lecture 52 - Solidification Behaviour of Ternary Alloy
Lecture 53 - Three Phase Equilibria
Lecture 54 - Ternary Four Phase Equilibria - I
Lecture 55 - Ternary Four Phase Equilibria - II
Lecture 56 - Solidification Behaviour of Ternary Eutectic Alloys
Lecture 57 - Phase Diagram of Ternary Eutectic with Terminal Solid Solution
Lecture 58 - Ternary Peritectic Reaction
Lecture 59 - Quasi-peritectic Reaction
Lecture 60 - Case Studies on Ternary Phase Diagrams - I
Lecture 61 - Case Studies on Ternary Phase Diagrams - II

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals of Material Processing - I

Subject Co-ordinator - Prof. Shashank Shekhar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Heat Treatment and Surface Hardening - I

Subject Co-ordinator - Dr. Kallol Mondal, Prof. Sandeep Sangal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Interface controlled growth
Lecture 31 - Diffusion controlled growth
Lecture 32 - Avrami Kinetics - I
Lecture 33 - Avrami Kinetics - II
Lecture 34 - Avrami Kinetics - III
Lecture 35 - Time-Temperature-Transformation (TTT) diagram
Lecture 36 - Diffusion in Solids - I
Lecture 37 - Diffusion in Solids - II
Lecture 38 - Diffusion in Solids - III
Lecture 39 - Diffusion in Solids - IV
Lecture 40 - Applications of heat treatment

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals of Material Processing - Part 2

Subject Co-ordinator - Prof. Shashank Shekhar, Prof. Jitesh J Thakkar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Nature and Properties of Materials - An Introducto

Subject Co-ordinator - Dr. Ashish Garg

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Defects in Crystalline Solids - Part I

Subject Co-ordinator - Prof. Shashank Shekhar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Glide+Kinks
Lecture 31 - Cross-slip+Climb
Lecture 32 - Climb+Jogs
Lecture 33 - Examples on Jogs+Dislocation Intersection
Lecture 34 - Dislocation Intersection and step characteristics+Superjogs
Lecture 35 - Strain and strain-rate due to dislocation motion+Velocity of dislocations+Observation of disloca
Lecture 36 - Observation of dislocation (Continued...) + Dislocation Dynamics
Lecture 37 - Dislocations in FCC+Partial dislocations
Lecture 38 - Partial dislocations (Continued...) +Stacking Fault
Lecture 39 - Thompson's Tetrahedron+Examples
Lecture 40 - Dislocations in BCC+Asymmetry of Slip

NPTEL Video Course - Metallurgy and Material Science - NOC:Corrosion - Part I

Subject Co-ordinator - Dr. Kallol Mondal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Solar Photovoltaics: Principles, Technologies and

Subject Co-ordinator - Dr. Ashish Garg

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Defects in Crystalline Solids - Part II

Subject Co-ordinator - Prof. Shashank Shekhar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Corrosion - Part II

Subject Co-ordinator - Dr. Kallol Mondal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals and Applications of Dielectric Cerami

Subject Co-ordinator - Dr. Ashish Garg

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Properties of Materials (Nature and Properties of

Subject Co-ordinator - Dr. Ashish Garg

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Strain Hardening
Lecture 31 - Grain Boundary Strengthening
Lecture 32 - Solid Solution Strengthening
Lecture 33 - Precipitation Hardening
Lecture 34 - Electrical Conduction in Metals
Lecture 35 - Free Electron Theory
Lecture 36 - Fermi-Dirac Statistics and Electronic conductivity of Metals
Lecture 37 - Fundamental of Semiconductors
Lecture 38 - Band Theory
Lecture 39 - Intrinsic Semiconductors
Lecture 40 - Extrinsic Semiconductors

NPTEL Video Course - Metallurgy and Material Science - NOC:Diffusion in Multicomponent Solids

Subject Co-ordinator - Prof. Kaustubh Kulkarni

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Corrosion Failures and Analysis

Subject Co-ordinator - Prof. Kallol Mondal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - An introduction to corrosion failure and analysis
Lecture 2 - Various forms of corrosion
Lecture 3 - Discussion of various factors affecting corrosion
Lecture 4 - Forms of corrosion: Uniform corrosion - Part 1
Lecture 5 - Forms of corrosion: Uniform corrosion - Part 2
Lecture 6 - Galvanic corrosion - I
Lecture 7 - Galvanic corrosion - II
Lecture 8 - Galvanic corrosion - III
Lecture 9 - Galvanic corrosion - IV
Lecture 10 - Importance of galvanic series
Lecture 11 - Factors associated with galvanic corrosion: Case study 1
Lecture 12 - Factors associated with galvanic corrosion: Case study 2
Lecture 13 - Factors associated with galvanic corrosion: Case study 3
Lecture 14 - Preventive measures and advantages of galvanic corrosion
Lecture 15 - Dealloying/Selective leaching
Lecture 16 - Dealloying or selective leaching: Mechanism
Lecture 17 - Dealloying or selective leaching: Applications and protection methods
Lecture 18 - Graphitic corrosion and protection from dezincification
Lecture 19 - Intergranular Corrosion
Lecture 20 - Intergranular corrosion in case of 304, 321 and 347 stainless steel
Lecture 21 - Intergranular Corrosion: Sensitization and Weld Decay
Lecture 22 - Intergranular Corrosion: Control of Sensitization - Weld Decay
Lecture 23 - Intergranular Corrosion: Knife Line Attack and Prevention Methods
Lecture 24 - Crevice Corrosion: Introduction
Lecture 25 - Crevice Corrosion: Mechanism
Lecture 26 - Crevice corrosion: Mechanism and Various stages
Lecture 27 - Crevice corrosion: Case studies and Protection methods
Lecture 28 - Pitting corrosion: Introduction and Case studies
Lecture 29 - Various conditions favouring pitting corrosion - I

NPTEL Video Course - Metallurgy and Material Science - NOC:Nanomaterials and their Properties

Subject Co-ordinator - Prof. Krishanu Biswas

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Mechanical Behaviour of Materials - Part I

Subject Co-ordinator - Prof. Shashank Shekhar, Prof. Sudhanshu Shekhar Singh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Mechanical Behaviour of Materials - Part II

Subject Co-ordinator - Prof. Sudhanshu Shekhar Singh, Prof. Shashank Shekhar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Electronic Properties of the Materials: Computatic

Subject Co-ordinator - Prof. Somnath Bhowmick

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1
Lecture 2
Lecture 3
Lecture 4
Lecture 5
Lecture 6
Lecture 7
Lecture 8
Lecture 9
Lecture 10
Lecture 11
Lecture 12
Lecture 13
Lecture 14
Lecture 15
Lecture 16
Lecture 17
Lecture 18
Lecture 19
Lecture 20
Lecture 21
Lecture 22
Lecture 23
Lecture 24
Lecture 25
Lecture 26
Lecture 27
Lecture 28
Lecture 29

Lecture 30
Lecture 31
Lecture 32
Lecture 33
Lecture 34
Lecture 35
Lecture 36
Lecture 37
Lecture 38
Lecture 39

NPTEL Video Course - Metallurgy and Material Science - NOC:Corrosion Protection Methods

Subject Co-ordinator - Prof. Kallol Mondal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30
Lecture 31
Lecture 32
Lecture 33
Lecture 34
Lecture 35
Lecture 36
Lecture 37
Lecture 38
Lecture 39
Lecture 40 (Part 1)
Lecture 41 (Part 2)

NPTEL Video Course - Metallurgy and Material Science - NOC:Phase Diagrams in Single Component and Binary Syst

Subject Co-ordinator - Prof. Kallol Mondal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Introduction to the non-ideal solutions
Lecture 31 - The quasi-chemical approach
Lecture 32 - Quasi-chemical approach to obtain change in enthalpy in regular solutions
Lecture 33 - Effect of enthalpy change in change in Gibbs free energy - Part 1
Lecture 34 - Effect of enthalpy change in change in Gibbs free energy - Part 2
Lecture 35 - Effect of enthalpy change in change in Gibbs free energy and final Gibbs free energy - I
Lecture 36 - Effect of enthalpy change in change in Gibbs free energy and final Gibbs free energy - II
Lecture 37 - Effect of enthalpy change in change in Gibbs free energy and final Gibbs free energy - III
Lecture 38 - Free energies of liquid and solid solutions
Lecture 39 - Phase diagram on the basis of enthalpy of mixing of solid and liquid solutions - I
Lecture 40 - Phase diagram on the basis of enthalpy of mixing of solid and liquid solutions - II
Lecture 41 - Phase diagram on the basis of enthalpy of mixing of solid and liquid solutions - III
Lecture 42 - Eutectic, peritectic, and eutectoid phase diagrams - Part 1
Lecture 43 - Eutectic, peritectic, and eutectoid phase diagrams - Part 2
Lecture 44 - Phase rule - Part I
Lecture 45 - Derivation of phase rule

NPTEL Video Course - Metallurgy and Material Science - NOC:Artificial Intelligence and Machine Learning in Ma

Subject Co-ordinator - Prof. Krishanu Biswas

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Part 2 - Machine Learning Algorithms - II
Lecture 31 - Part 1 - Machine Learning Algorithms - III
Lecture 32 - Part 2 - Machine Learning Algorithms - IV
Lecture 33 - Part 1 - Machine Learning Algorithms - V
Lecture 34 - Part 2 - Machine Learning Algorithms - VI
Lecture 35 - Part 1 - Machine Learning Algorithms - VII
Lecture 36 - Part 2 - Machine Learning Algorithms - VIII
Lecture 37 - Part 1 - Machine Learning Algorithms - IX
Lecture 38 - Part 2 - Machine Learning Algorithms - X
Lecture 39 - Part 1 - Machine Learning Algorithms - XI
Lecture 40 - Part 2 - Machine Learning Algorithms - XII
Lecture 41 - Part 1 - Machine Learning Algorithms - XIII
Lecture 42 - Part 2 - Machine Learning Algorithms - XIV
Lecture 43 - Part 1 - Machine Learning Algorithms - XV
Lecture 44 - Part 2 - Machine Learning Algorithms - XVI
Lecture 45 - Part 1 - Machine Learning Algorithms - XVII
Lecture 46 - Part 2 - Machine Learning Algorithms - XVIII
Lecture 47 - Part 1 - Deep Learning Methods - I
Lecture 48 - Part 2 - Deep Learning Methods - II
Lecture 49 - Part 1 - Deep Learning Methods - III
Lecture 50 - Part 2 - Deep Learning Methods - IV
Lecture 51 - Part 1 - Deep Learning Methods - V
Lecture 52 - Part 2 - Deep Learning Methods - VI
Lecture 53 - Part 1 - Deep Learning Methods - VII
Lecture 54 - Part 2 - Deep Learning Methods - VIII
Lecture 55 - Part 1 - Materials Design at Different Length Scale - I
Lecture 56 - Part 2 - Materials Design at Different Length Scale - II
Lecture 57 - Part 1 - Materials Design at Different Length Scale - III
Lecture 58 - Part 2 - Materials Design at Different Length Scale - IV
Lecture 59 - Part 1 - Materials Design at Different Length Scale - V
Lecture 60 - Part 2 - Materials Design at Different Length Scale - VI
Lecture 61 - Part 1 - Molecular Dynamic Simulation
Lecture 62 - Part 2 - Molecular Dynamic Simulation
Lecture 63 - Part 1 - Density Function Theory (DFT)
Lecture 64 - Part 2 - Density Function Theory (DFT)
Lecture 65 - Part 1 - Advanced Deep Learning - I
Lecture 66 - Part 2 - Advanced Deep Learning - II
Lecture 67 - Part 1 - Advanced Deep Learning - III
Lecture 68 - Part 2 - Advanced Deep Learning - IV

NPTEL Video Course - Metallurgy and Material Science - NOC:Metallurgical and Electronic Waste Recycling

Subject Co-ordinator - Prof. Arunabh Meshram

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Wastewater recycling
Lecture 31 - Recycling of E-Waste
Lecture 32 - Waste Printed Circuit Boards (WPCBs) recycling
Lecture 33 - WPCBs recycling: Delamination
Lecture 34 - WPCBs recycling: Pyrometallurgical processes
Lecture 35 - WPCBs recycling: Hydrometallurgical processes
Lecture 36 - Battery Recycling: Ni-based batteries
Lecture 37 - Battery Recycling: Lead-acid batteries
Lecture 38 - Battery Recycling: Zinc-based batteries
Lecture 39 - Battery Recycling: Li-ion batteries
Lecture 40 - Environmental Impacts of Recycling
Lecture 41 - Conclusion

NPTEL Video Course - Metallurgy and Material Science - NOC:Crystal Symmetry, X-Ray Diffraction and Physical P

Subject Co-ordinator - Prof. Sandeep Sangal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Mechanical Behavior of Materials (Hindi)

Subject Co-ordinator - Prof. Niraj Mohan Chawake

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Elasticity: Introduction Definition and Units
Lecture 2 - Engineering Stress Strain Curve and Measures of Strength
Lecture 3 - Measures of Ductility, UTS and Necking
Lecture 4 - True Stress - True Strain Curve and Necking Criterion
Lecture 5 - Atomistic Basis of Elasticity
Lecture 6 - Stress at a point and Poissonâ s Ratio
Lecture 7 - Normal Stresses and Shear Stresses
Lecture 8 - Independence of stress components
Lecture 9 - Plane stress transformation equations in 2D
Lecture 10 - Mohrâ s Circle of stress
Lecture 11 - Principal stresses and Principal planes
Lecture 12 - Principal stresses in 3D and stress invariants
Lecture 13 - Stress Tensor: Transformation and Hydrostatic and Deviatoric stress state
Lecture 14 - Concept of Strain - Normal strain and shear strain
Lecture 15 - State of Strain at a Point - Displacement, Rotation and Strain Tensors
Lecture 16 - Elastic Constants and Elastic Stress - Strain Relations
Lecture 17 - Anisotropy of Elastic Behavior
Lecture 18 - Elastic Constants and Symmetry
Lecture 19 - Yielding Criteria
Lecture 20 - Atomistic Mechanisms of Yielding and Slip
Lecture 21 - Resolved Shear Stress and Schmidâ s law
Lecture 22 - Maximum Shear Strength of Crystalline Materials
Lecture 23 - Dislocations: Edge and Screw
Lecture 24 - Mixed Dislocation and Burgers Circuit
Lecture 25 - Peierls-Nabarro Stress
Lecture 26 - Geometrical Properties of Dislocations
Lecture 27 - Dislocation Motions: Glide, Cross-Slip and Climb
Lecture 28 - Plastic Strain and Dislocation Motion
Lecture 29 - Forces on dislocations: Peach Kohler Equation

Lecture 30 - Stress Field around a Screw Dislocations
Lecture 31 - Stress Field around an Edge Dislocation
Lecture 32 - Strain Energy of a Dislocation
Lecture 33 - Dislocation Dissociation and Dislocation Line Tension
Lecture 34 - Strain Hardening and Dislocations Interactions
Lecture 35 - Dislocation Interaction: Stable Configurations and Strain Hardening
Lecture 36 - Dislocation: Nucleation and Frank Read Source
Lecture 37 - Partial Dislocations and Stacking Faults in FCC
Lecture 38 - Dislocation Locks: Lomer-Cottrell Lock
Lecture 39 - Ordered Structures: Superlattice Dislocations and APBs
Lecture 40 - Dislocation and Stacking Sequence in BCC
Lecture 41 - Intersection of Dislocations: Jogs and Kinks
Lecture 42 - Strain Hardening stages in an FCC Single Crystal
Lecture 43 - Independent Slip Systems: Von Mises Criterion for Plasticity
Lecture 44 - Solid Soloutions Strengthening (SSS)
Lecture 45 - Solid Soloutions Strengthening: Interaction of Solutes and Defects
Lecture 46 - Cottrell Atmosphere and Yield Point Phenomenon
Lecture 47 - Precipitation Hardening and Dispersion Strengthening
Lecture 48 - Grain Size Strengthening
Lecture 49 - Dislocation model for grain boundaries
Lecture 50 - Twinning in Crystalline Materials
Lecture 51 - Fracture and Theoretical Cohesive Strength of Materials
Lecture 52 - Fracture and Theoretical Cohesive Strength of Materials
Lecture 53 - Fracture modes and Stress Concentration
Lecture 54 - Fracture Mechanics - LEFM vs EPFM and J-Integral
Lecture 55 - Creep Deformation of Materials
Lecture 56 - Deformation Mechanics Map and Superplasticity
Lecture 57 - Fatigue of Materials: Introduction and SN Curve
Lecture 58 - Fatigue Stages and Paris Law
Lecture 59 - Cyclic Stress-Strain Curve and Strain Life Curve
Lecture 60 - Effect of Mean Stress and Stress Amplitude
Lecture 61 - Hardness of Materials
Lecture 62 - Impact Testing of Materials
Lecture 63 - Anelastic Behaviour and Composite Materials

NPTEL Video Course - Metallurgy and Material Science - NOC:Introductory Materials Informatics

Subject Co-ordinator - Prof. Krishanu Biswas, Prof. Pratik Kumar Ray

Co-ordinating Institute - IIT Kanpur, IIT - Ropar

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Neural Networks - Part 2
Lecture 31 - Clustering - Part 1
Lecture 32 - Clustering - Part 2
Lecture 33 - Model Selection - Part 1
Lecture 34 - Clustering - Part 2
Lecture 35 - Visualization - Part 1
Lecture 36 - Visualization and transformation - Part 2
Lecture 37 - Dataset transformations - Part 1
Lecture 38 - Dataset transformations - Part 2
Lecture 39 - Data mining - Part 1
Lecture 40 - Mapping of materials - Part 2
Lecture 41 - Data in Materials Informatics - Part 1
Lecture 42 - Data in Materials Informatics - Part 2
Lecture 43 - Structure Maps - Part 1
Lecture 44 - Structure Maps - Part 2
Lecture 45 - Phase Diagrams - Part 1
Lecture 46 - Periodic Table and Elemental Descriptors - Part 2
Lecture 47 - Featurization - Physical Principles - Part 1
Lecture 48 - Featurization - Pair Plots and Correlation Matrix - Part 2
Lecture 49 - Thermodynamic Features - Miedemaâ s Model
Lecture 50 - Structure of Materials - Part 1
Lecture 51 - Structure of Materials - Microstructure - Part 2
Lecture 52 - Prediction of Composition Based Properties - Part I
Lecture 53 - Prediction of Composition Based Properties - Part II
Lecture 54 - Molecular Fingerprints - Part I
Lecture 55 - Molecular Fingerprints - Part II
Lecture 56 - Mathematical Microstructure - Part 1
Lecture 57 - The Microstructure Function - Part 2
Lecture 58 - Two-point Statistics and Dimensionality Reduction
Lecture 59 - Combinatorial-Materials-Science
Lecture 60 - Convolutional Neural Network
Lecture 61 - Microstructure Representation-Synthetic Microstructures
Lecture 62 - P-S-P Linkage
Lecture 63 - Decision Making and Interpretation
Lecture 64 - Setting up ML problems - Part 1
Lecture 65 - Interrogating Machine Learning models - Examples - Part 2
Lecture 66 - Physically Informed Neural Networks
Lecture 67 - Combinatorial Materials Processing
Lecture 68 - High throughput Characterization

Lecture 69 - Synthetic Data
Lecture 70 - Conclusion, Challenges and Future Directions

NPTEL Video Course - Metallurgy and Material Science - NOC:Phase Diagrams in Single Component and Binary Syst

Subject Co-ordinator - Prof. Kallol Mondal

Co-ordinating Institute - IIT Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Advanced ceramics for strategic applications

Subject Co-ordinator - Prof. H.S. Maiti

Co-ordinating Institute - Central Glass and Ceramic Research Institute

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Non-ferrous Extractive Metallurgy

Subject Co-ordinator - Prof. H.S. Ray, Mr. L. Pugazhenthy

Co-ordinating Institute - IIT - Kharagpur | India Lead Zine Development Association

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Principles of Physical Metallurgy

Subject Co-ordinator - Prof. R.N. Ghosh

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Processing of Semiconducting Materials

Subject Co-ordinator - Dr. Pallab Banerji

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Metal-Semiconductor Contact - II
Lecture 31 - Applications of Metal-Semiconductor Contact
Lecture 32 - Oxidation - I
Lecture 33 - Oxidation - II
Lecture 34 - Different Types of Semiconductor - I
Lecture 35 - Oxidation - I
Lecture 36 - Oxidation - II
Lecture 37 - Dielectric Films
Lecture 38 - Low - K and High - K materials
Lecture 39 - Metallization
Lecture 40 - Materials for Photovoltaics

NPTEL Video Course - Metallurgy and Material Science - Science and Technology of Polymers

Subject Co-ordinator - Prof. B. Adhikari

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Advanced Materials and Processes

Subject Co-ordinator - Prof. B.S. Murty

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Principles of Polymer Synthesis

Subject Co-ordinator - Prof. Rajat K Das

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Historical development of polymer science
Lecture 2 - Molecular Weight Determination Of Polymers
Lecture 3 - Molecular Weight Determination Of Polymers (Continued...)
Lecture 4 - Molecular Weight Determination of Polymers (Continued...)
Lecture 5 - Molecular Weight Determination of Polymers (Continued...)
Lecture 6 - Principles of step growth polymerization
Lecture 7 - Principles of step growth polymerization (Continued...)
Lecture 8 - Principles of step growth polymerization (Continued...)
Lecture 9 - Principles of step growth polymerization (Continued...)
Lecture 10 - Principles of step growth polymerization (Continued...)
Lecture 11 - Principles of radical chain polymerization
Lecture 12 - Principles of radical chain polymerization (Continued...)
Lecture 13 - Principles of radical chain polymerization (Continued...)
Lecture 14 - Principles of radical chain polymerization (Continued...)
Lecture 15 - Principles of radical chain polymerization (Continued...)
Lecture 16 - Principles of radical chain polymerization (Continued...)
Lecture 17 - Principles of Chain Copolymerization
Lecture 18 - Principles of Chain Copolymerization (Continued...)
Lecture 19 - Principles of Chain Copolymerization (Continued...)
Lecture 20 - Principles of Living Chain polymerization
Lecture 21 - Principles of Living Chain polymerization (Continued...)
Lecture 22 - Design of Chemical Reactors
Lecture 23 - Design of Chemical Reactors (Continued...)
Lecture 24 - Design of Chemical Reactors (Continued...)
Lecture 25 - Design of Chemical Reactors (Continued...)
Lecture 26 - Design of Chemical Reactors (Continued...)
Lecture 27 - Design of Chemical Reactors (Continued...)
Lecture 28 - Design of Chemical Reactors (Continued...)
Lecture 29 - Design of Chemical Reactors (Continued...)

NPTEL Video Course - Metallurgy and Material Science - NOC:Advanced Materials and Processes

Subject Co-ordinator - Prof. Jayanta Das

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction
Lecture 2 - Introduction (Continued...)
Lecture 3 - Introduction (Continued...)
Lecture 4 - Introduction (Continued...)
Lecture 5 - Introduction (Continued...)
Lecture 6 - Bulk Metallic Glass, Glassy and Amorphous Materials
Lecture 7 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 8 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 9 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 10 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 11 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 12 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 13 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 14 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 15 - Bulk Metallic Glass, Glassy and Amorphous Materials (Continued...)
Lecture 16 - Shape Memory Alloys
Lecture 17 - Shape Memory Alloys (Continued...)
Lecture 18 - Shape Memory Alloys (Continued...)
Lecture 19 - Shape Memory Alloys (Continued...)
Lecture 20 - Shape Memory Alloys (Continued...)
Lecture 21 - Shape Memory Alloys
Lecture 22 - Shape Memory Alloys
Lecture 23 - Shape Memory Alloys
Lecture 24 - Shape Memory Alloys
Lecture 25 - Shape Memory Alloys
Lecture 26 - Introduction of High Temperature Materials
Lecture 27 - Introduction of High Temperature Materials (Continued...)
Lecture 28 - Introduction of High Temperature Materials (Continued...)
Lecture 29 - Introduction of High Temperature Materials (Continued...)

NPTEL Video Course - Metallurgy and Material Science - NOC:Surface Engineering for Corrosion and Wear Resista

Subject Co-ordinator - Prof. Jyotsna Dutta Majumder, Prof. I. Manna

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Ironmaking and Steelmaking

Subject Co-ordinator - Prof. Gour Gopal Roy

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Kinetics of slag metal reaction
Lecture 31 - LD steelmaking
Lecture 32 - LD Steel making
Lecture 33 - Evolution of impurities in steel and slag constituents during LD processing
Lecture 34 - Hybrid Processes
Lecture 35 - Electric steel making
Lecture 36 - Secondary Steel making
Lecture 37 - Secondary Steel making
Lecture 38 - Secondary Steel making
Lecture 39 - Homogenization and Gas stirred ladle
Lecture 40 - Ladle de-sulphurization, alloying, stainless steel making
Lecture 41 - Inclusion and its control
Lecture 42 - Injection Metallurgy
Lecture 43 - Cored wire injection-Modeling, melting sequence, effect of operating parameters
Lecture 44 - IM
Lecture 45 - IM
Lecture 46 - Casting fundamentals- Heat Transfer
Lecture 47 - Casting fundamentals- segregation
Lecture 48 - Morphology of solidification structure and Ingot casting
Lecture 49 - Continuous casting
Lecture 50 - Downstream processing and near net shape casting
Lecture 51 - Introduction to Direct Reduction (DR) and smelting Reduction (SR) Processes
Lecture 52 - Introduction to Direct Reduction (DR) and smelting Reduction (SR) Processes (Continued...)
Lecture 53 - Coal Based DR Processes
Lecture 54 - Coal Based DR Processes (Continued...)
Lecture 55 - Gas based DR Processes
Lecture 56 - Gas based DR Processes (Continued...)
Lecture 57 - Smelting Reduction (SR) Processes
Lecture 58 - Smelting Reduction (SR) Processes (Continued...)
Lecture 59 - Ironmaking and Steelmaking in India
Lecture 60 - Ironmaking and Steelmaking in India (Continued...)

NPTEL Video Course - Metallurgy and Material Science - NOC:Non-Metallic Materials

Subject Co-ordinator - Prof. Subhasish Basu Majumder

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Introduction to electrochemistry, Galvanic cells, Cell potentials and Gibbs Energy, Concentratio
Lecture 31 - Electrochemical storage, rechargeable batteries
Lecture 32 - Introduction to electrochemical methods; cyclic voltammetry and other related techniques
Lecture 33 - Fuel Cell and Energy harvesting
Lecture 34 - Preparation of ceramic powders: auto-combustion, sol-gel synthesis, microwave assisted hydrother
Lecture 35 - Introduction to sintering, sintering mechanism
Lecture 36 - Solid-state sintering and microstructure development
Lecture 37 - Solid-state sintering and microstructure development (Continued...)
Lecture 38 - Liquid phase sintering and microstructure development, speciality sintering, reactive sintering
Lecture 39 - Processing of glass and amorphous/non-crystalline solids
Lecture 40 - Fundamental of thin film growth, growth mechanism and kinetics
Lecture 41 - Thin film growth techniques, thermal evaporation, CVD, sputtering, CSD
Lecture 42 - Fundamentals and processing of conducting and semiconducting ceramic devices
Lecture 43 - Processing of ceramics devices
Lecture 44 - Organic electronic materials: conducting polymers, semi-conducting organic materials, applicatio
Lecture 45 - Thermal analyses
Lecture 46 - Introduction of spectroscopic technique : UV-VIS spectroscopy
Lecture 47 - Infra-red and Raman spectroscopy
Lecture 48 - Optical and scanning electron microscopy
Lecture 49 - X-ray photoelectron spectroscopy
Lecture 50 - Measurement of mechanical properties, fracture toughness, MOR, hardness
Lecture 51 - Ferroelectric thin film: synthesis and characterization
Lecture 52 - Thermal analysis techniques: Differential scanning calorimetry and thermogravimetry
Lecture 53 - Measurement of optical properties
Lecture 54 - Novel ferroic composites: Synthesis and measurement
Lecture 55 - Fundamentals of corrosion, corrosion of materials
Lecture 56 - Oxidation, corrosion of ceramic materials, degradation of polymers: swelling and dissolution, bo
Lecture 57 - Ceramics in biology and medicine
Lecture 58 - Design of Ceramics
Lecture 59 - Finishing of Ceramics
Lecture 60 - Fly-ash based glazed wall tiles: A case study

NPTEL Video Course - Metallurgy and Material Science - NOC:Scanning Electron-Ion-Probe Microscopy in Material

Subject Co-ordinator - Prof. Debabrata Pradhan

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Techniques of Material Characterization

Subject Co-ordinator - Prof. Shibayan Roy

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to the course and basic principles of image formation
Lecture 2 - Image formation, resolution, magnification, depth of field and depth of focus
Lecture 3 - Aberrations in microscopy: General concepts
Lecture 4 - Introduction, types and image formation in Optical microscopy
Lecture 5 - Components of optical microscope
Lecture 6 - Bright field and Dark field modes
Lecture 7 - Phase contrast optical microscopy
Lecture 8 - Polarized light microscopy
Lecture 9 - Differential interference contrast
Lecture 10 - Fluorescence microscopy
Lecture 11 - Basic components of electron microscope
Lecture 12 - Basic components of electron microscope (Continued...)
Lecture 13 - Basic components of electron microscope (Continued...)
Lecture 14 - Electron-material interaction
Lecture 15 - Electron-material interaction (Continued...)
Lecture 16 - Electron-material interaction (Continued...) and Image formation and contrast generation
Lecture 17 - Modes of TEM (BF and DF)
Lecture 18 - Modes of TEM
Lecture 19 - Modes of TEM (Continued...) and Electron diffraction in TEM
Lecture 20 - Electron diffraction in TEM
Lecture 21 - Electron diffraction in TEM (Continued...)
Lecture 22 - Electron diffraction in TEM (Continued...)
Lecture 23 - Electron diffraction in TEM (Continued...)
Lecture 24 - Electron diffraction in TEM (Continued...)
Lecture 25 - Application of Electron diffraction
Lecture 26 - Signal generation in SEM
Lecture 27 - Signal generation in SEM (Continued...)
Lecture 28 - Signal generation in SEM (Continued...)
Lecture 29 - Signal generation in SEM (Continued...)

Lecture 30 - Signal generation in SEM (Continued...)
Lecture 31 - Basic components of SEM
Lecture 32 - Basic components of SEM (Continued...)
Lecture 33 - Optics of SEM
Lecture 34 - Optics of SEM (Continued...)
Lecture 35 - Optics of SEM (Continued...) and analytical detectors
Lecture 36 - Analytical detectors in SEM
Lecture 37 - Analytical (WDS) detector and contrast formation in SEM
Lecture 38 - Imaging in SEM
Lecture 39 - Imaging in SEM (Continued...)
Lecture 40 - Imaging in SEM (Continued...)
Lecture 41 - Imaging in SEM and X-ray diffraction
Lecture 42 - Continuous and characteristics X-ray spectrum
Lecture 43 - Characteristics X-ray radiation
Lecture 44 - Characteristics X-ray radiation (Continued...) and X-ray absorption
Lecture 45 - X-ray absorption (Continued...)
Lecture 46 - X-ray absorption and filters
Lecture 47 - Intensity of diffracted beam
Lecture 48 - Intensity of diffracted beam (Continued...)
Lecture 49 - Intensity of diffracted beam (Continued...)
Lecture 50 - Intensity of diffracted beam (Continued...)
Lecture 51 - Intensity of diffracted beam (Continued...)
Lecture 52 - Intensity of diffracted beam (Continued...)
Lecture 53 - Intensity of diffracted beam (Continued...)
Lecture 54 - Intensity of diffracted beam (Continued...)
Lecture 55 - Intensity of diffracted beam (Continued...)
Lecture 56 - Intensity of diffracted beam (Continued...) and X-ray diffraction profile and analysis
Lecture 57 - X-ray diffraction profile and analysis
Lecture 58 - X-ray diffraction profile and analysis (Continued...)
Lecture 59 - X-ray diffraction profile and analysis (Continued...)
Lecture 60 - Electron backscatter diffraction (EBSD)

NPTEL Video Course - Metallurgy and Material Science - NOC:Electrochemical Energy Storage

Subject Co-ordinator - Prof. Subhasish Basu Majumder

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Fundamentals of electrochemistry, definition of primary and secondary batteries
Lecture 2 - Primary batteries and Secondary batteries
Lecture 3 - Supercapacitors
Lecture 4 - Concepts of thermodynamics pertinent to electrochemical cells
Lecture 5 - Kinetics of electrochemical cells and structural characteristics of electrodes
Lecture 6 - Introduction to EMF, redox potential, Faraday law and Nernstâ s law
Lecture 7 - Terminology related to secondary battery : half-cell,full-cell, redox couple,positive
Lecture 8 - Measurements: Cyclic voltammetry, nominal voltage, capacity, rate performance
Lecture 9 - Impedance spectroscopy measurement and analyses
Lecture 10 - Measurement of rechargeable cell: Case study
Lecture 11 - History and categories of lithium batteries
Lecture 12 - Operational mechanisms for lithium batteries: Intercalation materials, alloys
Lecture 13 - Differences of voltage profiles between intercalation materials, alloys, and conversion
Lecture 14 - Properties of electrode materials (Case study: alloy as anode)
Lecture 15 - Properties of electrode materials (conversion type oxide as case study)
Lecture 16 - Positive electrodes: Lithiated transition metal oxides, lithiated iron oxyphosphates etc
Lecture 17 - Negative electrodes: Carbonaceous materials, lithium titanium oxides etc
Lecture 18 - Electrolyte :Liquid Electrolyte, Polymer Electrolyte
Lecture 19 - Current Collector, Conductive Agents, Separator and Other Accessories
Lecture 20 - Novel materials for lithium ion rechargeable cells
Lecture 21 - Principle of Operation of Commerical Cells : viz. C - NMC, C - NCA etc
Lecture 22 - Principle of operation of commercial cells
Lecture 23 - Major characteristics of commercial Li ion cells: Cell performance,degradation phenomena
Lecture 24 - Fabrication of Li ion cell: Cylindrical configuration
Lecture 25 - Fabrication of Li ion cell: Pouch and prismatic cell
Lecture 26 - Positive electrodes: Layered oxide, polyanionic compounds (phosphates, sulphates etc)
Lecture 27 - Negative electrodes: Carbonaceous materials, alloy based and other materials
Lecture 28 - Electrolytes: Roles and requirements, organic electrolyte, ionic liquid electrolyte
Lecture 29 - Performance of Na ion rechargeable cell

Lecture 30 - Future perspective of Na ion cells
Lecture 31 - Introduction to battery module, BMS, thermal management and pack design
Lecture 32 - Degradation and safety issues of Li ion rechargeable cells
Lecture 33 - Introduction to battery management system: BMS topologies, hardware, concept of active
Lecture 34 - Introduction to thermal management: Active thermal management system, passive thermal
Lecture 35 - Packaging of battery pack and battery testing: Material selection, sealing of enclosure
Lecture 36 - Classification of supercapacitors: EDLC and pseudocapacitative type
Lecture 37 - Pseudocapacitor
Lecture 38 - Asymmetric supercapacitor and BATCAP: Battery supercapacitor hybrid electrochemical
Lecture 39 - Electrolytes for supercapacitors: Aqueous/organic liquid electrolytes/ionic liquid
Lecture 40 - Current collectors, separators etc. and their effect on performance
Lecture 41 - Operational principles of aqueous and Li - O2 batteries
Lecture 42 - Electrolytes for Li - O2 batteries
Lecture 43 - Limitations of Li - Air batteries
Lecture 44 - State of the art Li - Air batteries : Carbonaceous materials
Lecture 45 - State of the art Li - Air batteries: Case study
Lecture 46 - The element sulfur, principle of operation
Lecture 47 - Advantages and disadvantages of Li - S batteries, positive electrodes
Lecture 48 - Electrolyte and negative electrode for Li - S battery
Lecture 49 - State of the art Li - S batteries : Case study - I
Lecture 50 - State of the art Li - S batteries : Case study - II
Lecture 51 - Global Geographic Distribution of Raw Lithium Resources
Lecture 52 - Nature and geological origin of all potential lithium resources
Lecture 53 - State of the art extraction techniques and known production reserves
Lecture 54 - Recycling of lithium and other battery constituents from used battery
Lecture 55 - Recycling of lithium and other battery constituents from used battery (Continued...)
Lecture 56 - Lead Acid Batteries: Operational principles, main characteristics and applications
Lecture 57 - Lead Acid Batteries: Operational principles, main characteristics and applications (Continued...
Lecture 58 - Ni-Cd and Ni-MeH Batteries: Operational principles, main characteristics and applications
Lecture 59 - Redox flow battery vanadium redox battery,operational principle, and main characteristics
Lecture 60 - Other Redox Flow Battery Technologies

NPTEL Video Course - Metallurgy and Material Science - NOC:Texture in Materials

Subject Co-ordinator - Prof. Somjeet Biswas

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Kikuchi Diffraction Pattern - I
Lecture 31 - Kikuchi Diffraction Pattern - II
Lecture 32 - Quantitative Evaluation of Kikuchi Diffraction Pattern - I
Lecture 33 - Quantitative evaluation of Kikuchi Diffraction Pattern - II
Lecture 34 - Quantitative evaluation of Kikuchi Diffraction Pattern - III
Lecture 35 - Analysis using the TSL-OIM software
Lecture 36 - Analysis using the AZtec Crystal software
Lecture 37 - Analysis using the ATEX software
Lecture 38 - Introduction to solidification texture
Lecture 39 - Solidification texture in Alloys
Lecture 40 - Solidification texture in FCC, BCC, and HCP structures
Lecture 41 - Phase Transformation Texture and Bain Strain
Lecture 42 - Orientation Relationships between FCC and BCC / BCT
Lecture 43 - Various Orientation Relationships and Variants
Lecture 44 - Basic Mechanics of Polycrystal Plasticity
Lecture 45 - Basic Mechanics of Polycrystal Plasticity (Continued...)
Lecture 46 - A Metallurgist Point of View
Lecture 47 - A Metallurgist Point of View (Continued...)
Lecture 48 - Texture in FCC polycrystals
Lecture 49 - Texture in BCC polycrystals - I
Lecture 50 - Texture in BCC polycrystals - II
Lecture 51 - Texture in HCP polycrystals - I
Lecture 52 - Texture in HCP polycrystals - II
Lecture 53 - Texture in HCP polycrystals - III
Lecture 54 - Static recrystallization
Lecture 55 - Dynamic recrystallization and recrystallization texture
Lecture 56 - Dynamic recrystallization and grain refinement during hot large strain shear

NPTEL Video Course - Metallurgy and Material Science - NOC:Bulk Material Transport and Handling Systems

Subject Co-ordinator - Prof. Khanindra Pathak

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Environmental Degradation and Surface Engineering

Subject Co-ordinator - Prof. Indranil Manna, Prof. Jyotsna Dutta Majumdar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Characterization
Lecture 31 - Surface/Interface
Lecture 32 - Scope, Classification and Objectives of Surface Engineering
Lecture 33 - Shot Peening
Lecture 34 - Grinding and Polishing
Lecture 35 - Ultrasonic Peening and Laser Shock Peening
Lecture 36 - Conventional Surface Hardening (Flame and induction)
Lecture 37 - Pack Carburizing
Lecture 38 - Fluidized Bed Carburizing
Lecture 39 - Fused bath and Gas Nitriding
Lecture 40 - Plasma Nitriding
Lecture 41 - Diffusion Based Coatings - Solid State
Lecture 42 - Chemical Conversion Coatings
Lecture 43 - Electrodeposition
Lecture 44 - Electrophoretic and Electroless deposition
Lecture 45 - Galvanizing and Hot Dipping
Lecture 46 - Thick Coatings by Weld Overlay and Cladding
Lecture 47 - Introduction to thin film deposition
Lecture 48 - Physical Vapor Deposition including Sputtering
Lecture 49 - Chemical Vapor Deposition (CVD) and Composite Coating
Lecture 50 - Chemical Vapor Deposition (CVD) and Composite Coating
Lecture 51 - Spray Coating Techniques II - Plasma Spray and Cold Spray
Lecture 52 - Ion Implantation
Lecture 53 - Electron Beam Assisted Surface Engineering
Lecture 54 - Laser Material Processing
Lecture 55 - Laser Surface Engineering
Lecture 56 - Laser Assisted Additive Manufacturing, LAM
Lecture 57 - Strengthening Mechanisms in Surface Engineering
Lecture 58 - Microstructural Characterization after Surface Engineering
Lecture 59 - Compositional Characterization after Surface Engineering
Lecture 60 - Summary of surface engineering and Conclusion

NPTEL Video Course - Metallurgy and Material Science - NOC:Fracture, Fatigue and Failure of Materials

Subject Co-ordinator - Prof. Indrani Sen

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Mine Closure and Sustainability Planning

Subject Co-ordinator - Prof. Khanindra Pathak

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Post Mine Closure Waste to Wealth Conversion
Lecture 31 - CSR and EMP Integration
Lecture 32 - Introduction to Asset Management
Lecture 33 - Principle of Asset Management and Decommissioning of Assets for Site Restoration
Lecture 34 - Brownfield Redevelopment and Value Addition to Assets
Lecture 35 - Landform Design and Post Mining Asset Creation
Lecture 36 - Concept of Sustainable Development and Mining industry
Lecture 37 - Sustainability Measurement and Reporting
Lecture 38 - Sustainability Measurement and Reporting (Continued...)
Lecture 39 - Sustainable Mineral Industry
Lecture 40 - Policy and Legislative Framework of Sustainability for SDG and Mine Closure
Lecture 41 - Communicating sustainability performance
Lecture 42 - Framework of Sustainability reporting
Lecture 43 - Sustainable accounting
Lecture 44 - Case studies on Sustainability initiatives in Mining Industry
Lecture 45 - Data Analytics for Sustainability management
Lecture 46 - Cleaner Production Based Closure Management
Lecture 47 - Regenerative environment design for sustainable Mine Closure
Lecture 48 - Reusable resource identification in post closure mine site
Lecture 49 - Optimization of Residual Value of Assets
Lecture 50 - Post Mining Site for Community wealth
Lecture 51 - Management of water resources
Lecture 52 - Soil Treatment and Revegetation
Lecture 53 - Bio-diversity: Post Land reclamation and plantation
Lecture 54 - Physical and Chemical Stability issues
Lecture 55 - Economic Utilization of Post Mining Structures and assets
Lecture 56 - Techniques for closing underground workings
Lecture 57 - Application of Industry 4.0 for Mine
Lecture 58 - Best mining practices for Sustainable mining - Case studies
Lecture 59 - Stability Monitoring and Enhancing tools
Lecture 60 - VR and AR Technology for Post Mining Mine site Visualization and Design

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals of Composite and Cellular Materials

Subject Co-ordinator - Dr. Siddhartha Roy, Dr. Tapas Laha

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Interfacial phenomena - Basic concept, Adhesion and Wettability
Lecture 31 - Interfacial phenomena - Factors affecting wettability
Lecture 32 - Interfacial phenomena - Interfacial bonding
Lecture 33 - Interfacial phenomena - Interfacial strength measurement
Lecture 34 - Interfacial phenomena - Case study - Al-MWCNT nanocomposite
Lecture 35 - Interfacial phenomena - Case studies: MMCs and CMCs
Lecture 36 - Interfacial phenomena - Case studies: MMCs and CMCs (Continued...)
Lecture 37 - Mechanics of Composites - Unidirectional Lamina
Lecture 38 - Mechanics: Fiber-reinforced composites - Transverse Loading
Lecture 39 - Mechanics: Fiber-reinforced composites - Problem Solving
Lecture 40 - Mechanics: Fiber-reinforced composites - Discontinuous fibers
Lecture 41 - Mechanics of Composites - Discontinuous fibers
Lecture 42 - Dependence of properties on pore structure
Lecture 43 - Mechanics of cellular solids
Lecture 44 - Mechanics of cellular solids (Continued...)
Lecture 45 - Deformation behavior of honeycomb and foams
Lecture 46 - Deformation behaviour of Foams
Lecture 47 - Deformation behaviour of Foams (Continued...)
Lecture 48 - Deformation behaviour of Foams (Continued...)
Lecture 49 - Thermal properties of foams
Lecture 50 - Other important properties of foams (Continued...)
Lecture 51 - Advanced composites - MMCs
Lecture 52 - Advanced composites - MMCs (Continued...)
Lecture 53 - Advanced composites - CMCs
Lecture 54 - Advanced composites - Advanced Processing Techniques
Lecture 55 - Advanced composites - Advanced Processing Techniques (Continued...)
Lecture 56 - Advanced composites - Advanced Processing Techniques (Continued...)
Lecture 57 - Advanced composites - Application oriented advanced composites
Lecture 58 - Microstructure and properties of natural cellular solid - wood
Lecture 59 - Advanced hybrid material - Functionally graded composite materials (FGMs)
Lecture 60 - Advanced hybrid material - Functionally graded composite materials (FGMs) (Continued...)

NPTEL Video Course - Metallurgy and Material Science - NOC:Principles of Extractive Metallurgy

Subject Co-ordinator - Prof. Tarun Kumar Kundu

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Roasting: Application of Predominance Area Diagram
Lecture 31 - Reduction Smelting and Matte Smelting
Lecture 32 - Metallurgical Slag
Lecture 33 - Slag Viscosity, Surface Tention and Theories
Lecture 34 - Slag: Masson and Molecular Theory, Numerical Examples
Lecture 35 - Copper Extraction: Matte Smelting
Lecture 36 - Copper Extraction: Flash Smelting
Lecture 37 - Cu Extraction: Cyclone Flash Smelting and Numerical Examples
Lecture 38 - Cu Extraction: Conversion
Lecture 39 - Conversion of Nickel Sulphide and Numerical Examples
Lecture 40 - TSL Smelting, Continuous Conversion and Direct Cu-Production
Lecture 41 - Reduction Smelting: Lead Extraction
Lecture 42 - Reduction Smelting: Zinc Extraction and ISP
Lecture 43 - Extraction of Thin, Tungsten, Molybdenum and Numerical Examples
Lecture 44 - Extraction of Nb, V, Ferroalloys and Titania (from llmenite)
Lecture 45 - Silicothermy: Pyrometallurgical Magnesium Extraction
Lecture 46 - Reduction Smelting: Iron Extraction in Blast Furnace
Lecture 47 - Alternative Routes of Iron Extraction
Lecture 48 - Halide Metallurgy: Extraction of Ti, Zr, Hf, U, Si Purification
Lecture 49 - Purification of Bulk Metals: Chemical Refining
Lecture 50 - Chemical Refining: Purification of Lead
Lecture 51 - Chemical Refining of Zinc, Tin, Nickel, Ti (Zr, Hf, Th)
Lecture 52 - Physical Refining: Vacuum De-gassing, Zone Melting and Distillation
Lecture 53 - Hydrometallurgy: Unit Steps, Leaching Reagents and Methods
Lecture 54 - Physiochemical Aspect of Leaching, Bacterial Leaching, S/L Separation
Lecture 55 - Hydrometallurgy: Solution Purification and Metal Ion Reduction
Lecture 56 - Hydrometallurgy: Cementation, Electrowinning, Au Extraction and Bayer Process
Lecture 57 - Electrometallurgy: Electrowinning, Electrorefining, Current and Energy Efficiency
Lecture 58 - Electrometallurgy: Extraction of Mg and Al
Lecture 59 - Environmental Concern and Sustainable Metal Extraction
Lecture 60 - New Development in Metal Extraction: Solvometallurgy, Bio-Metallurgy, Membrane Technology

NPTEL Video Course - Metallurgy and Material Science - NOC:Clean Coal Technology

Subject Co-ordinator - Prof. Barun Kumar Nandi

Co-ordinating Institute - IIT-ISM Dhanbad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Coal Quality Parameters
Lecture 2 - Coal Quality Parameters (Continued...)
Lecture 3 - Coal Quality Parameters (Continued...)
Lecture 4 - Coal Quality Parameters (Continued...)
Lecture 5 - Coal Quality Parameters (Continued...)
Lecture 6 - Coal Cleaning
Lecture 7 - Coal Cleaning (Continued...)
Lecture 8 - Coal Cleaning (Continued...)
Lecture 9 - Coal Cleaning (Continued...)
Lecture 10 - Coal Cleaning (Continued...)
Lecture 11 - Coal Cleaning Methods
Lecture 12 - Coal Cleaning Methods (Continued...)
Lecture 13 - Coal Cleaning Methods (Continued...)
Lecture 14 - Coal Cleaning Methods (Continued...)
Lecture 15 - Coal Cleaning Methods (Continued...)
Lecture 16 - Coal Combustion Fundamentals
Lecture 17 - Coal Combustion Fundamentals (Continued...)
Lecture 18 - Coal Combustion Fundamentals (Continued...)
Lecture 19 - Coal Combustion Fundamentals (Continued...)
Lecture 20 - Coal Combustion Fundamentals (Continued...)
Lecture 21 - Effects of Coal Properties on Combustion
Lecture 22 - Effects of Coal Properties on Combustion (Continued...)
Lecture 23 - Effects of Coal Properties on Combustion (Continued...)
Lecture 24 - Effects of Coal Properties on Combustion (Continued...)
Lecture 25 - Effects of Coal Properties on Combustion (Continued...)
Lecture 26 - Industrial Coal Combustion Methods
Lecture 27 - Industrial Coal Combustion Methods (Continued...)
Lecture 28 - Industrial Coal Combustion Methods (Continued...)
Lecture 29 - Industrial Coal Combustion Methods (Continued...)

NPTEL Video Course - Metallurgy and Material Science - Advanced Metallurgical Thermodynamics

Subject Co-ordinator - Prof. B.S. Murty

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Basic definitions
Lecture 2 - Free energy, Stability, equilibrium in a unary system
Lecture 3 - Effect of Pressure on equilibrium transformations
Lecture 4 - Free energy of solutions, free energy-composition diagrams
Lecture 5 - Solution models, chemical potential
Lecture 6 - Phase rule, free energy-composition diagrams and phase diagrams
Lecture 7 - Evolution of phase diagrams
Lecture 8 - Evolution of phase diagrams, miscibility gap
Lecture 9 - To concept, partition less solidification
Lecture 10 - To concept, partition less solidification (Continued...)
Lecture 11 - Eutectic solidification, glass formation
Lecture 12 - Kauzmann paradox, order of a transformation, glass forming ability
Lecture 13 - Eutectic solidification, coupled growth, heterogeneous nucleation
Lecture 14 - Peritectic solidification, metastable phase diagrams
Lecture 15 - Errors in drawing phase diagrams, Fe-C vs. Fe-Fe3C phase diagram
Lecture 16 - Free energy of undercooled liquid, shape of nucleus
Lecture 17 - Solid state phase transformations - Precipitation
Lecture 18 - Precipitation
Lecture 19 - Precipitation - quasicrystals
Lecture 20 - Precipitate coarsening, stability of a phase, spinodal decomposition
Lecture 21 - Spinodal decomposition
Lecture 22 - Eutectioid reaction
Lecture 23 - Eutectioid reaction (Continued...)
Lecture 24 - Bainitic transformation
Lecture 25 - Kinetics of eutectoid transformations
Lecture 26 - Martensitic Transformation
Lecture 27 - Martensitic transformation, order-disorder transformation
Lecture 28 - Miscibility gap in phase diagrams
Lecture 29 - Phase diagram calculations

Lecture 30 - Thermodynamics of heterogeneous systems
Lecture 31 - Thermodynamics of heterogeneous systems (Continued...)

NPTEL Video Course - Metallurgy and Material Science - Materials Characterization

Subject Co-ordinator - Dr. S. Sankaran

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 29 - Effect of crystallite size and strain on intensity of X-rays
Lecture 30 - Profile fit, Factors affecting peak brodening
Lecture 31 - Indexing of diffraction pattern, Quantitative analysis
Lecture 32 - Indexing, Quantitative analysis-continuation, Residual stress measurements
Lecture 33 - XRD and Residual stress measurement- lab demonstration
Lecture 34 - Introduction to Transmission Electron Microscopy (TEM)
Lecture 35 - Fundementals of Transmission Electron Microscopy (TEM)
Lecture 36 - Basics of Diffraction-1
Lecture 37 - Basics of Diffraction-2
Lecture 38 - TEM imaging-1
Lecture 39 - TEM imaging-2
Lecture 40 - TEM instrument demonstration
Lecture 41 - TEM sample preparation-1
Lecture 42 - TEM sample preparation-2
Lecture 43 - XRD Tutorial - 1
Lecture 44 - XRD tutorial - 2
Lecture 45 - TEM Tutorial - 1
Lecture 46 - TEM Tutorial - 2
Lecture 47 - Quantitative metallography - Tutorial 1
Lecture 48 - Quantitative metallography - Tutorial 2
Lecture 49 - Quantitative metallography - Tutorial 3
Lecture 50 - Quantitative metallography - Tutorial 4
Lecture 51 - Quantitative metallography - Tutorial 5
Lecture 52 - Quantitative metallography - Tutorial 6
Lecture 53 - Quantitative metallography - Tutorial 7

NPTEL Video Course - Metallurgy and Material Science - Physics of Materials

Subject Co-ordinator - Dr. Prathap Haridoss

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - Electronic materials, devices, and fabrication

Subject Co-ordinator - Prof. Parasuraman S

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Metals, semiconductors and insulators
Lecture 2 - Introduction to semiconductors
Lecture 3 - Density of states and Fermi-Dirac statistics
Lecture 4 - Assignment 1 - Bonding, DOS, and Fermi statistics
Lecture 5 - Intrinsic semiconductors
Lecture 6 - Intrinsic semiconductors - conductivity
Lecture 7 - Assignment 2 - Intrinsic semiconductors
Lecture 8 - Extrinsic semiconductors
Lecture 9 - Extrinsic semiconductors - Fermi level
Lecture 10 - Extrinsic semiconductors - conductivity
Lecture 11 - Assignment 3 - Extrinsic semiconductors
Lecture 12 - Metal-semiconductor junctions
Lecture 13 - Assigment 4 - Metal-semiconductor junctions
Lecture 14 - pn junctions in equilibrium
Lecture 15 - pn junctions under bias
Lecture 16 - pn junction breakdown and heterojunctions
Lecture 17 - Assignment 5 - pn junctions
Lecture 18 - Transistors
Lecture 19 - MOSFETs
Lecture 20 - Assignment 6 - transistors
Lecture 21 - Optoelectronic devices
Lecture 22 - Optoelectronic devices
Lecture 23 - Optoelectronic devices
Lecture 24 - Optoelectronic devices
Lecture 25 - Optoelectronic devices
Lecture 26 - Assignment 7 - optical properties
Lecture 27 - Assignment 8 - optoelectronic devices
Lecture 28 - Semiconductor manufacturing
Lecture 29 - Si wafer manufacturing

Lecture 30 - IC device manufacturing
Lecture 31 - Layering
Lecture 32 - Doping
Lecture 33 - Lithography
Lecture 34 - Etching and deposition (growth)
Lecture 35 - Metallization and polishing
Lecture 36 - Process and device evaluation
Lecture 37 - Productivity and process yield
Lecture 38 - Clean room design and contamination control
Lecture 39 - Devices and IC formation
Lecture 40 - IC circuit logic and packaging

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals of optical and scanning electron micr

Subject Co-ordinator - Dr. S. Sankaran

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals of electronic materials and devices

Subject Co-ordinator - Prof. Parasuraman S

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Electronic Materials
Lecture 2 - Semiconductors - Introduction
Lecture 3 - Electron statistics in a solid
Lecture 4 - Worked numericals on week 1 lessons
Lecture 5 - Intrinsic semiconductors
Lecture 6 - Intrinsic semiconductors - conductivity
Lecture 7 - Optional - worked assignment on intrinsic semiconductors
Lecture 8 - Extrinsic semiconductors - Introduction
Lecture 9 - Extrinsic semiconductors - Fermi level
Lecture 10 - Extrinsic semiconductors - Mobility
Lecture 11 - Worked assignment on extrinsic semiconductors
Lecture 12 - Metal-semiconductor junctions
Lecture 13 - pn junctions in equilibrium
Lecture 14 - Optional - worked assignment on metal-semiconductor junctions
Lecture 15 - pn junctions under bias
Lecture 16 - Junction breakdown and heterojunctions
Lecture 17 - Worked assignment on pn junctions
Lecture 18 - Transistors - overview
Lecture 19 - MOSFETs
Lecture 20 - Worked assignment on transistors
Lecture 21 - Optoelectronic devices - Introduction
Lecture 22 - Light emitting diodes
Lecture 23 - Solid state semiconductor lasers
Lecture 24 - Optional - worked assignment on optical properties
Lecture 25 - Photodetectors
Lecture 26 - Solar cells
Lecture 27 - Worked assignment on optoelectronic devices

NPTEL Video Course - Metallurgy and Material Science - NOC:Introduction to Reciprocal Space and its use in Sc

Subject Co-ordinator - Dr. Prathap Haridoss

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Reciprocal space; Definition and Properties
Lecture 2 - Condition for Diffraction
Lecture 3 - Worked out examples
Lecture 4 - Ewald Sphere and lattices in reciprocal space
Lecture 5 - Wigner Sietz cells and Brillouin Zones
Lecture 6 - Worked out exmaples
Lecture 7 - Brillouin Zones, Diffraction and allowed energy levels
Lecture 8 - E Vs K, Brillouin zones and the Origin of Bands
Lecture 9 - Week 3 Worked out examples
Lecture 10 - Reciprocal space as Fourier transform of real lattice
Lecture 11 - Alternate notation of reciprocal space

NPTEL Video Course - Metallurgy and Material Science - NOC:Analysis and Modeling of Welding

Subject Co-ordinator - Dr. G. Phanikumar

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Fundamentals of X-ray Diffraction and Transmissior

Subject Co-ordinator - Dr. S. Sankaran

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Theory and Practice of Non Destructive Testing

Subject Co-ordinator - Dr. Ranjit Bauri

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Visual optical method
Lecture 2 - Dye Penetrant Testing - 1
Lecture 3 - Dye Penetrant Testing - 2
Lecture 4 - Dye Penetrant Testing - 3
Lecture 5 - Dye Penetrant Testing - 4
Lecture 6 - Magnetic particle testing - 1
Lecture 7 - Magnetic particle testing - 2
Lecture 8 - Magnetic particle testing - 3
Lecture 9 - Magnetic particle testing - 4
Lecture 10 - Magnetic particle testing - 5
Lecture 11 - Eddy current testing - 1
Lecture 12 - Eddy current testing - 2
Lecture 13 - Eddy current testing - 3
Lecture 14 - Eddy current testing - 4
Lecture 15 - Eddy current testing - 5
Lecture 16 - Ultrasonic testing - 1
Lecture 17 - Ultrasonic testing - 2
Lecture 18 - Ultrasonic testing - 3
Lecture 19 - Ultrasonic testing - 4
Lecture 20 - Ultrasonic testing - 5
Lecture 21 - Ultrasonic testing - 6
Lecture 22 - Ultrasonic testing - 7
Lecture 23 - Ultrasonic testing - 8
Lecture 24 - Ultrasonic testing - 9
Lecture 25 - Ultrasonic testing - 10
Lecture 26 - Acoustic Emission Testing - 1
Lecture 27 - Acoustic Emission Testing - 2
Lecture 28 - Acoustic Emission Testing - 3
Lecture 29 - Acoustic Emission Testing - 4

Lecture 30 - Acoustic Emission Testing - 5
Lecture 31 - Radiography - 1
Lecture 32 - Radiography - 2
Lecture 33 - Radiography - 3
Lecture 34 - Radiography - 4
Lecture 35 - Radiography - 5
Lecture 36 - Radiography - 6
Lecture 37 - Radiography - 7
Lecture 38 - Radiography - 8
Lecture 39 - Radiography - 9
Lecture 40 - Radiography - 10

NPTEL Video Course - Metallurgy and Material Science - NOC:Defects in Materials

Subject Co-ordinator - Prof. Sundararaman M

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Twinning - 2
Lecture 31 - Martensitic Transformation - 1
Lecture 32 - Martensitic Transformation - 2
Lecture 33 - Interfaces - 1
Lecture 34 - Interfaces - 2
Lecture 35 - Defect Interaction and Strength

NPTEL Video Course - Metallurgy and Material Science - NOC:Elementary Stereology for Quantitative Metallograp

Subject Co-ordinator - Dr. S. Sankaran

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Welding of Advanced High Strength Steels for Autom

Subject Co-ordinator - Prof. Murugaiyan Amirthalingam

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Welding Processes

Subject Co-ordinator - Prof. Murugaiyan Amirthalingam

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Shielded Metal Arc Welding
Lecture 31 - Flux cored arc welding - Introduction
Lecture 32 - Electrode fluxes and process characteristics of flux cored arc welding
Lecture 33 - Flux cored arc welding - Process characteristics
Lecture 34 - Advances in gas metal arc welding - Pulsed GMAW
Lecture 35 - Advances in gas metal arc welding - Controlled dip short circuiting processes
Lecture 36 - Submerged arc welding
Lecture 37 - Resistance welding - Fundamentals
Lecture 38 - Resistance spot welding - Part 1
Lecture 39 - Resistance spot welding - Part 2
Lecture 40 - Resistance spot welding - Part 3
Lecture 41 - Resistance spot welding - Part 4
Lecture 42 - Variants in resistance welding - Part 1
Lecture 43 - Variants in resistance welding - Part 2
Lecture 44 - Laser welding process - Introduction - Part 1
Lecture 45 - Laser welding process - Part 2
Lecture 46 - Laser welding process - Part 3
Lecture 47 - Laser welding process - Part 4
Lecture 48 - Electron beam welding process
Lecture 49 - Other welding processes - Electroslag welding
Lecture 50 - Magnetically Impelled Arc Butt (MIAB) welding
Lecture 51 - Aluminothermic (thermit) welding
Lecture 52 - Introduction to solid state welding processes - Friction welding
Lecture 53 - Friction stir welding - Part 1
Lecture 54 - Friction stir welding - Part 2
Lecture 55 - Other solid state welding processes
Lecture 56 - Joining processes for Plastics - Part 1
Lecture 57 - Joining processes for Plastics - Part 2
Lecture 58 - Adhesive bonding of plastics
Lecture 59 - Welding nomenclatures

NPTEL Video Course - Metallurgy and Material Science - NOC:Creep Deformation of Materials

Subject Co-ordinator - Prof. Srikant Gollapudi

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Nanotechnology, Science and Applications

Subject Co-ordinator - Dr. Prathap Haridoss

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Powder Metallurgy

Subject Co-ordinator - Dr. Ranjit Bauri

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Interparticle friction
Lecture 31 - Powder packing
Lecture 32 - Powder mixing and blending
Lecture 33 - Powder Lubrication and Coating
Lecture 34 - Powder compaction - 1
Lecture 35 - Powder compaction - 2
Lecture 36 - Powder compaction - 3
Lecture 37 - Cold Isostatic Pressing and; Powder Injection Molding
Lecture 38 - Powder Injection Molding - 2
Lecture 39 - Slurry Techniques
Lecture 40 - Tape casting
Lecture 41 - Sintering - 1
Lecture 42 - Sintering - 2
Lecture 43 - Sintering - 3
Lecture 44 - Sintering - 4
Lecture 45 - Sintering - 5
Lecture 46 - Sintering - 6
Lecture 47 - Sintering - 7
Lecture 48 - Sintering - 8
Lecture 49 - Sintering - 9
Lecture 50 - Sintering - 10
Lecture 51 - Liquid Phase Sintering - 1
Lecture 52 - Liquid Phase Sintering - 2
Lecture 53 - Liquid Phase Sintering - 3
Lecture 54 - Liquid Phase Sintering - 4
Lecture 55 - Liquid Phase Sintering - 5
Lecture 56 - Full Density Processing - 1
Lecture 57 - Full Density Processing - 2
Lecture 58 - Full Density Processing - 3
Lecture 59 - Full Density Processing - 4
Lecture 60 - Spark Plasma Sintering (SPS)

NPTEL Video Course - Metallurgy and Material Science - NOC:Carbon Materials and Manufacturing

Subject Co-ordinator - Prof. Swati Sharma

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Carbon Black: Introduction and Properties
Lecture 31 - Carbon Black: Industrial Manufacturing
Lecture 32 - Carbon Fiber: Introduction and Properties
Lecture 33 - Melt Spinning of Petroleum Pitches
Lecture 34 - Electrospinning and Viscoelasticity
Lecture 35 - Carbonization of Polyacrylonitrile (PAN) Fibers
Lecture 36 - Mechanical Property Testing Methods for Carbon Fibers
Lecture 37 - Defects in Carbon Fibers
Lecture 38 - Introduction to Carbon Fiber Reinforced Plastic (CFRP)
Lecture 39 - Machining of Carbon Fiber Reinforced Plastic
Lecture 40 - Carbon/Carbon Composite
Lecture 41 - Carbon/Metal and Carbon/Concrete Composites: Manufacture and Properties
Lecture 42 - Graphene: Introduction and Crystal Structure
Lecture 43 - Graphene: History and Nomenclature
Lecture 44 - Chemical Vapor Deposition of Graphene - I
Lecture 45 - Chemical Vapor Deposition of Graphene - II
Lecture 46 - Defects in Graphene and the (n,m) Notations
Lecture 47 - Carbon Nanotube: Introduction and Properties
Lecture 48 - Vapor Phase Growth of Carbon Nanotube
Lecture 49 - Vapor Deposited Diamond
Lecture 50 - Diamond Like Carbon
Lecture 51 - X-Ray Diffraction Analysis of Carbon Materials
Lecture 52 - Raman Spectroscopy of Carbon Materials
Lecture 53 - Transmission Electron Microscopy of Carbon Materials
Lecture 54 - Surface Area Analysis of Carbon Materials
Lecture 55 - Numerical Problems: Carbon Manufacturing and Characterization
Lecture 56 - Large Scale Industrial Applications of Carbon Materials
Lecture 57 - Micro and Nano Scale Applications of Carbon Materials: Rigid and flexible carbon devices
Lecture 58 - Supply Chain of Industrial Carbons
Lecture 59 - Summary of NPTEL Course on Carbon Materials and Manufacturing

NPTEL Video Course - Metallurgy and Material Science - NOC:Mechanical Behavior of Materials

Subject Co-ordinator - Prof. S. Sankaran

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction
Lecture 2 - Chemical Bonding in Materials
Lecture 3 - Strength of materials - A Short Overview - Part I
Lecture 4 - Strength of materials - A Short Overview - Part II
Lecture 5 - Strength of materials - A Short Overview - Part III
Lecture 6 - Strength of materials - A Short Overview - Part IV
Lecture 7 - Strength of materials - A Short Overview - Part V
Lecture 8 - Elastic Stress- Strain Relations - Part I
Lecture 9 - Elastic Stress- Strain Relations - Part II
Lecture 10 - Elastic properties - Part I
Lecture 11 - Elastic properties - Part II
Lecture 12 - Anelasticity
Lecture 13 - Introduction to Dislocations - I
Lecture 14 - Introduction to Dislocations - II
Lecture 15 - Introduction to Dislocations - III
Lecture 16 - Introduction to Dislocations - IV
Lecture 17 - Introduction to Dislocations - V
Lecture 18 - Introduction to Dislocations - VI
Lecture 19 - Introduction to Dislocations - VII
Lecture 20 - Introduction to Dislocations - VIII
Lecture 21 - Introduction to Dislocations - IX
Lecture 22 - Introduction to Plastic deformation - I
Lecture 23 - Introduction to Plastic deformation - II
Lecture 24 - Introduction to Plastic Deformation - III
Lecture 25 - Introduction to Plastic Deformation - IV
Lecture 26 - Introduction to Plastic Deformation - V
Lecture 27 - Introduction to Plastic Deformation - VI
Lecture 28 - Strengthening Mechanisms in Crystalline Materials - I
Lecture 29 - Strengthening Mechanisms in Crystalline Materials - II

NPTEL Video Course - Metallurgy and Material Science - NOC:Aluminium based Alloys and Metal Matrix Composites

Subject Co-ordinator - Prof. Ranjit Bauri

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Geometric Dynamic Recrystallization (GDRX)
Lecture 31 - Grain boundary strenthening
Lecture 32 - Grain refinement methods
Lecture 33 - Homogeneous vs Heterogeneous Nucleation
Lecture 34 - Grain refinement by Melt inoculation
Lecture 35 - Mechanisms of grain refinement by melt inoculation - 1
Lecture 36 - Mechanisms of grain refinement by melt inoculation - 2
Lecture 37 - Melt inoculation: Fading and Poisoning
Lecture 38 - Grain refinement by melt vibration
Lecture 39 - Severe Plastic Deformation (SPD)
Lecture 40 - Dynamic recrystallization in SPD
Lecture 41 - Metal Matrix Composites
Lecture 42 - Processing of Metal Matrix Composites
Lecture 43 - Two-phase process, Insitu composites
Lecture 44 - Particle wetting and Bonding
Lecture 45 - Particle Distribution in MMCs - 1
Lecture 46 - Particle Distribution in MMCs - 2
Lecture 47 - Rule of Mixture - 1
Lecture 48 - Rule of Mixture - 2
Lecture 49 - Strengthening Mechanism in MMCs - 1
Lecture 50 - Strengthening Mechanism in MMCs - 2
Lecture 51 - Fracture Behavior of Fiber Reinforced Composites
Lecture 52 - Ductile Fracture of Metals
Lecture 53 - Fracture Behavior of Discontinuously Reinforced Composites
Lecture 54 - Fatigue
Lecture 55 - Fatigue Crack propagation and Growth
Lecture 56 - Fatigue Behavior of MMCs - 1
Lecture 57 - Fatigue Behavior of MMCs - 2
Lecture 58 - Fatigue Behavior of MMCs - 3
Lecture 59 - Fatigue Behavior of MMCs - 4
Lecture 60 - Fatigue Behavior of MMCs - 5

NPTEL Video Course - Metallurgy and Material Science - NOC:Welding Science and Technology (In Tamil)

Subject Co-ordinator - Prof. Murugaiyan Amirthalingam

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction and learning objectives
Lecture 2 - Definition of welding and necessity for welding
Lecture 3 - Classification of welding processes
Lecture 4 - Introduction to welding arc
Lecture 5 - Types of gas discharges
Lecture 6 - Characteristics of a welding arc
Lecture 7 - Role of polarity in a welding arc
Lecture 8 - Anode and cathode fall zones
Lecture 9 - Arc column - Part I
Lecture 10 - Arc column - Part II
Lecture 11 - Arc column - Part III
Lecture 12 - Characteristics of arc welding processes
Lecture 13 - Introduction to arc ignition and gas tungten arc welding
Lecture 14 - Gas tungsten arc welding - I
Lecture 15 - Shielding gases used for arc welding
Lecture 16 - Plasma welding
Lecture 17 - Consumable welding processes - I
Lecture 18 - Consumable welding processes - II
Lecture 19 - Fundamentals of resistance welding
Lecture 20 - Resistance spot welding - Part I
Lecture 21 - Resistance spot welding - Part II
Lecture 22 - Other resistance welding processes
Lecture 23 - High energy beam welding processes - Laser beam welding
Lecture 24 - High energy beam welding processes - Electron beam welding
Lecture 25 - Other welding processes - Part I
Lecture 26 - Other welding processes - Part II

NPTEL Video Course - Metallurgy and Material Science - NOC:Thermodynamics and Kinetics of Materials

Subject Co-ordinator - Prof. Saswata Bhattacharya

Co-ordinating Institute - IIT - Hyderabad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Diffusion in Solids

Subject Co-ordinator - Prof. Mayur Vaidya

Co-ordinating Institute - IIT - Hyderabad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Tutorial 6
Lecture 31 - Introduction to CALPHAD
Lecture 32 - CALPHAD implementation software and diffusion module
Lecture 33 - Thermodynamic and kinetic databases
Lecture 34 - Moving boundary and multiphase diffusion simulations
Lecture 35 - Tutorial 7
Lecture 36 - Techniques to measure diffusion coefficients, Radiotracer diffusion, Deviations from Gaussian pr
Lecture 37 - SIMS AND EPMA
Lecture 38 - Mechanical spectroscopy and Electrical Methods
Lecture 39 - Nuclear methods - 1
Lecture 40 - Tutorial 8
Lecture 41 - Nuclear Methods - 2
Lecture 42 - Grain boundary structure and fisher model
Lecture 43 - Kinetic regime of grain boundary diffusion
Lecture 44 - Disloaction pipe diffusion
Lecture 45 - Tutorial 9
Lecture 46 - Diffusion in Intermetallics
Lecture 47 - Diffusion in nanocrystalline materials
Lecture 48 - Diffusion in quasicrystalline alloys
Lecture 49 - Diffusion in metallic alloys - 1
Lecture 50 - Tutorial 10
Lecture 51 - Diffusion in metallic alloys - 2
Lecture 52 - Diffusion in high entropy alloys
Lecture 53 - Diffusion in semiconductors - 1
Lecture 54 - Diffusion in semiconductors - 2
Lecture 55 - Tutorial 11
Lecture 56 - Diffusion in glasses
Lecture 57 - Diffusion in ionic solids - 1
Lecture 58 - Diffusion in ionic solids - 2
Lecture 59 - Tutorial 12
Lecture 60 - Revision of important concepts

NPTEL Video Course - Metallurgy and Material Science - NOC:Computational Thermodynamics and Kinetics of Mater

Subject Co-ordinator - Prof. K. Guruvidyathri

Co-ordinating Institute - University of Hyderabad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Essential physical metallurgy concepts : Part 1 - Microstructure | Phase
Lecture 2 - Essential physical metallurgy concepts : Part 2 - Types of phases | Chemical order | Phase Equili
Lecture 3 - Essential physical metallurgy concepts : Part 3 - Phase diagrams - Unary | Isomorphous
Lecture 4 - Essential physical metallurgy concepts : Part 4 - Phase diagram Information
Lecture 5 - Essential physical metallurgy concepts : Part 5 - Phase diagarms - Transformations
Lecture 6 - Essential physical metallurgy concepts : Part 6 - Ternary phase diagrams: isothermal sections
Lecture 7 - Essential physical metallurgy concepts : Part 7 - Phase diagrams: Extended and emergent phases, v
Lecture 8 - Essential physical metallurgy concepts : Part 8 - Phase diagrams: Reactions, Liquidus projections
Lecture 9 - Essential physical metallurgy concepts : Part 9 - Phase fraction plots, Mechanisms and Kinetics c
Lecture 10 - Experimental methods of phase diagram determination - Cooling curve method
Lecture 11 - Essential concepts of thermodynamics : Part 1 - Scope, State, State properties
Lecture 12 - Essential concepts of thermodynamics : Part 2 - Temperature, Heat capacity, Internal energy
Lecture 13 - Essential concepts of thermodynamics : Part 3 - The first law, Reversible and Irreversible proce
Lecture 14 - Essential concepts of thermodynamics : Part 4 - Isothermal and Adiabatic processes, Path quantit
Lecture 15 - Essential concepts of thermodynamics : Part 5 - Engine, Entropy, Clausius inequality, The second
Lecture 16 - Essential concepts of thermodynamics : Part 6 - Statistical thermodynamics, Meaning of entropy
Lecture 17 - Essential concepts of thermodynamics : Part 7 - Types of Entropy, Combined laws, Enthalpy and Gi
Lecture 18 - Thermodynamics of Materials : Part 1 - Lattice stability, Enthalpy of mixing
Lecture 19 - Thermodynamics of Materials : Part 2 - Interaction Parameter, Entropy, Gibbs Energy and Chemical
Lecture 20 - Thermodynamics of Materials : Part 3 - Chemical potential | Activity | Solutions
Lecture 21 - Thermodynamics of Materials : Part 4 - G-x plots | Common tangent construction
Lecture 22 - Thermodynamics of Materials : Part 5 - G-x diagrams | G description
Lecture 23 - Thermodynamics of Materials : Part 6 - G-x curves | Driving force | T0 curve
Lecture 24 - Thermodynamics of Materials : Part 7 - G-x curves exercises | Gibbs phase rule
Lecture 25 - Computational Thermodynamics : Part 1 - Introduction, unary models and data
Lecture 26 - Computational Thermodynamics : Part 2 - Binary and higher order models, Minimization
Lecture 27 - Hands-on Thermodynamic Calculations : Part 1 - Software, Modes, Single point calculations
Lecture 28 - Hands-on Thermodynamic Calculations : Part 2 - Unary G vs T, Binary phase fraction plot
Lecture 29 - Hands-on Thermodynamic Calculations : Part 3 - Binary, Ternary and Metastable Phase Diagrams

Lecture 30 - Hands-on Thermodynamic Calculations : Part 4 - Ternary Vertical, Pseudo binary section, Console
Lecture 31 - Hands-on Thermodynamic Calculations : Part 5 - Vertical sections
Lecture 32 - Hands-on Thermodynamic Calculations : Part 6 - Quternary and higher order diagrams
Lecture 33 - Hands-on Thermodynamic Calculations : Part 7 - Property diagrams
Lecture 34 - Hands-on Thermodynamic Calculations : Part 8 - T0 curve
Lecture 35 - Hands-on Thermodynamic Calculations : Part 9 - Scheil solidification
Lecture 36 - Thermodynamic assessment : Part 1 - Outline of the method, Input thermochemical data
Lecture 37 - Thermodynamic assessment : Part 2 - Input thermochemical data
Lecture 38 - Thermodynamic Assessment : Part 3 - Input phase equilibria data, non-isothermal methods
Lecture 39 - Thermodynamic assessment : Part 4 - Input phase equilibria data, isothermal methods
Lecture 40 - Thermodynamic assessment : Part 5 - Input data collection, critical evaluation
Lecture 41 - Thermodynamic assessment : Part 6 - Models 1
Lecture 42 - Thermodynamic assessment : Part 7 - Models 2
Lecture 43 - Thermodynamic Assessment : Part 8 - Optimization guidelines
Lecture 44 - Thermodynamic Assessment : Part 9 - Hands-on G Optimization
Lecture 45 - Thermodynamic Assessment : Part 10 - Database compilation
Lecture 46 - Kinetics of Materials : Part 1 - Diffusion, Fick's laws
Lecture 47 - Kinetics of Materials : Part 2 - Phase equilibria and diffusion, Mobility
Lecture 48 - Computational Thermokinetics: Introduction and mobility assessment
Lecture 49 - Hands-on kinetic simulation : Part 1 - Homogenization
Lecture 50 - Hands-on kinetic simulation : Part 2 - Moving phase boundary problems
Lecture 51 - Hands on kinetic simulation : Part 3 - Diffusion couple, Non-isothermal diffusion
Lecture 52 - Hands on kinetic simulation : Part 4 - Modified Scheil: Back diffusion, Solute trapping
Lecture 53 - Essential concepts of overall kinetics - Nucleation, Growth
Lecture 54 - Hands-on kinetic simulation : Part 5 - Overall kinetics, TTT
Lecture 55 - Hands-on kinetic simulation : Part 6 - Precipitation aging
Lecture 56 - Compositional design - High-throughput Calphad
Lecture 57 - Insights from Calphad for alloy design and characterization
Lecture 58 - Material properties in Calphad spirit
Lecture 59 - Calphad - Size effects, Electrochemistry, Process metallurgy
Lecture 60 - Calphad - Summary, history and future

NPTEL Video Course - Metallurgy and Material Science - NOC:Surface Engineering of Nanomaterials

Subject Co-ordinator - Prof. Kaushik Pal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Material Science and Engineering

Subject Co-ordinator - Dr. Vivek Pancholi

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Strengthening mechanism - 2
Lecture 31 - Strengthening mechanism - 3
Lecture 32 - Strengthening mechanism - 4
Lecture 33 - Fracture
Lecture 34 - Fracture
Lecture 35 - Fatigue
Lecture 36 - Creep
Lecture 37 - NDT
Lecture 38 - Ceramics, polymers, composites
Lecture 39 - Electrical and magnetic properties
Lecture 40 - Alloy designation and properties

NPTEL Video Course - Metallurgy and Material Science - NOC:Structural Analysis of Nanomaterials

Subject Co-ordinator - Prof. Kaushik Pal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Thermo-Mechanical and Thermo-Chemical Processes

Subject Co-ordinator - Prof. S. R. Meka

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Welding Metallurgy

Subject Co-ordinator - Dr. Pradeep K. Jha

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Modeling of Tundish Steelmaking Process in Continu

Subject Co-ordinator - Dr. Pradeep K. Jha

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Assessment of Discretization Schemes
Lecture 31 - Elements of Mathematical Modeling in Tundish Steelmaking
Lecture 32 - Boundary Conditions
Lecture 33 - Flow Analysis in Tundish
Lecture 34 - Analysis of Fluid Flow and Mixing in Tundish
Lecture 35 - Non-isothermal Flow Considerations in Tundish
Lecture 36 - Intermixing in Tundish
Lecture 37 - Modeling Consideration For Inclusion Removal in Tundish - I
Lecture 38 - Modeling Consideration For Inclusion Removal in Tundish - II
Lecture 39 - Case Studies in Modeling of Tundish Steelmaking - 1
Lecture 40 - Case Studies in Modeling of Tundish Steelmaking - 2

NPTEL Video Course - Metallurgy and Material Science - NOC:Biomaterials for Bone Tissue Engineering Applicati

Subject Co-ordinator - Prof. Bikramjit Basu

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30 - Polymers manufacturing
Lecture 31 - Additive manufacturing
Lecture 32 - HA-Ti-Toughness, Cell functionality
Lecture 33 - HA-CaTiO 3 development
Lecture 34 - HA- BaTiO 3 Functional Prop
Lecture 35 - HA-Ag antimicrob and cell viability
Lecture 36 - HA-ZnO, Cell fate and antimicrobial
Lecture 37 - Dental ceramics processing
Lecture 38 - Sr-based glass Ceramics
Lecture 39 - Acetabular socket (Compression mold)
Lecture 40 - ZTA femoral ball head fabrication

NPTEL Video Course - Metallurgy and Material Science - NOC:Iron Making

Subject Co-ordinator - Prof Govind S Gupta

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 30
Lecture 31
Lecture 32
Lecture 33
Lecture 34
Lecture 35
Lecture 36
Lecture 37
Lecture 38
Lecture 39 - Live Session

NPTEL Video Course - Metallurgy and Material Science - NOC:Friction and Wear of Materials: Principles and Cas

Subject Co-ordinator - Prof. Dr. B. V. Manoj Kumar, Prof. Bikramjit Basu

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Materials Design for Electronic, Electromechanical

Subject Co-ordinator - Prof. Pavan Nukala

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Description of material properties
Lecture 2 - Direct and Coupled properties
Lecture 3 - Tensor algebra and property tensor
Lecture 4 - Tensor algebra (Continued...)
Lecture 5 - Property tensor: higher rank tensor and nonlinear property
Lecture 6 - Property tensor (Continued...)
Lecture 7 - Field tensor: Stress and strain
Lecture 8 - Point symmetry operation: rotation and inversion
Lecture 9 - Point symmetry operation: rotoinversion
Lecture 10 - Point symmetry operation: examples in material system
Lecture 11 - Crystal Systems, Bravais Lattices and Symmetry
Lecture 12 - Crystal Systems, Bravais Lattices and Symmetry
Lecture 13 - Crystal Systems, Bravais Lattices and Symmetry
Lecture 14 - Crystal Systems, Bravais Lattices and Symmetry
Lecture 15 - Crystal Systems, Bravais Lattices and Symmetry
Lecture 16 - Development of point group - Part 1
Lecture 17 - Development of point group - Part 2
Lecture 18 - Development of point group - Part 3 : Some visualization in real crystals
Lecture 19 - Point groups, polar groups and consequences in property
Lecture 20 - Structure-symmetry- property correlation
Lecture 21 - Ferroelectricity, polar point groups - I
Lecture 22 - Ferroelectricity, polar point groups - II
Lecture 23 - Space Groups - I
Lecture 24 - Space Groups - II
Lecture 25 - Visualizing Important Crystals (A space group perspective)
Lecture 26 - Some more popular structures and their visualization
Lecture 27 - Symmetry-property correlation - Part 1
Lecture 28 - Symmetry-property correlation - Part 2
Lecture 29 - Symmetry-property correlation - Part 3

Lecture 30 - Thermodynamics and equilibrium properties - Part 1
Lecture 31 - Thermodynamics and equilibrium properties - Part 2
Lecture 32 - Thermodynamics and equilibrium properties - Part 3
Lecture 33 - Thermodynamics and equilibrium properties - Part 4
Lecture 34 - Statistical Mechanics
Lecture 35 - Title Statistical Mechanics (Continued...)
Lecture 36 - Properties as fluctuations and correlations of order parameter
Lecture 37 - Properties as fluctuations and correlations (Continued...)
Lecture 38 - Landau Theory and Phase Transitions
Lecture 39 - Landau Theory and Phase Transitions (Continued...)
Lecture 40 - Phase transitions and enhancement of fluctuations
Lecture 41 - Dissipative properties
Lecture 42 - Dissipative properties
Lecture 43 - Dissipative properties: Onsagers linear response theory
Lecture 44 - Onsagers linear response theory (Continued...)
Lecture 45 - Onsagers theory: A few case studies
Lecture 46 - Measurement of response function
Lecture 47 - Small Signal Measurement
Lecture 48 - Atomistic picture of Dielectric constant
Lecture 49 - Relaxation vs Resonance
Lecture 50 - Resonance
Lecture 51 - Causality
Lecture 52 - Kramers-Kronig relations
Lecture 53 - Kramers-Kronig and Spectroscopy
Lecture 54 - Spectroscopy at various time scale
Lecture 55 - Spectroscopy (Continued...)
Lecture 56 - Spectroscopy (Continued...)

NPTEL Video Course - Metallurgy and Material Science - NOC:Advanced Manufacturing and Process Modelling

Subject Co-ordinator - Prof. Prosenjit Das

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Manufacturing science
Lecture 2 - Finite difference method and Finite volume method
Lecture 3 - Introduction to Finite Element Methods
Lecture 4 - Introduction to Finite Element Methods
Lecture 5 - Introduction to Boundary element methods
Lecture 6 - Introduction to casting and solidification
Lecture 7 - Solidification of metal and alloys
Lecture 8 - Introduction to casting
Lecture 9 - Introduction to casting
Lecture 10 - Introduction to casting
Lecture 11 - Introduction to casting and its types
Lecture 12 - Types of casting and defects
Lecture 13 - Introduction to die filling analysis
Lecture 14 - Porosity Modelling and Gravity die casting
Lecture 15 - Rheology
Lecture 16 - Case studies on Die filling
Lecture 17 - Introduction to welding
Lecture 18 - Principle of fusion welding
Lecture 19 - Principle of fusion welding
Lecture 20 - Welding Mechanics
Lecture 21 - Welding Mechanics, Types of welding
Lecture 22 - Types of welding
Lecture 23 - Types of welding
Lecture 24 - Types of welding
Lecture 25 - Types of welding
Lecture 26 - Procedure for numerical modelling
Lecture 27 - Procedure for solving governing equations
Lecture 28 - Procedure for solving governing equations
Lecture 29 - Solvers and Boundary conditions

NPTEL Video Course - Metallurgy and Material Science - NOC:Advances in Additive Manufacturing of Materials: C

Subject Co-ordinator - Prof. Bikramjit Basu

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

NPTEL Video Course - Metallurgy and Material Science - NOC:Advanced Material Characterization by Atom Probe T

Subject Co-ordinator - Prof. Surendra Kumar Makineni

Co-ordinating Institute - IISc Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to the course
Lecture 2 - History from electrons to field ionisation to field evaporation
Lecture 3 - Filed Ion Microscopy
Lecture 4 - Basic physics behind Field Ionisation
Lecture 5 - Field Ion Microscopy Instrumentation
Lecture 6 - Field Ionisation to Field Evaporation
Lecture 7 - Field Desorption Microscopy
Lecture 8 - Atom Probe Tomography: Variables
Lecture 9 - Instrumentation
Lecture 10 - Pulsing methods
Lecture 11 - Photon-assisted Ionisation
Lecture 12 - Experimental protocols for APT
Lecture 13 - Experimental protocols for APT
Lecture 14 - Experimental protocols for APT
Lecture 15 - Tomographic Reconstruction
Lecture 16 - Tomographic Reconstruction
Lecture 17 - Tomographic Reconstruction
Lecture 18 - Calibration of reconstruction
Lecture 19 - Common artifacts in reconstruction
Lecture 20 - Spatial resolution in reconstruction
Lecture 21 - Electropolishing
Lecture 22 - Focused Ion Beam (FIB)
Lecture 23 - Focused Ion Beam (FIB)
Lecture 24 - Focused Ion Beam (FIB)
Lecture 25 - Data analysis
Lecture 26 - Quality of data
Lecture 27 - Mounting of specimens
Lecture 28 - Ion milling of specimens
Lecture 29 - Data analysis

Lecture 30 - Specimen loading
Lecture 31 - Data acquisition
Lecture 32 - Data analysis
Lecture 33 - Basics
Lecture 34 - Basics
Lecture 35 - Basics
Lecture 36 - Electron specimen interaction
Lecture 37 - TEM column cross-section
Lecture 38 - Electron Diffraction
Lecture 39 - Diffraction Patterns
Lecture 40 - Imaging
Lecture 41 - Defect analysis
Lecture 42 - Image Formation
Lecture 43 - Detection of electrons and ECCI
Lecture 44 - Application to Materials Science
Lecture 45 - Application to Materials Science
Lecture 46 - Application to Materials Science