NPTEL : Advanced Chemical Reaction Engineering (PG) (Chemical Engineering)

Co-ordinators : Prof. H.S. Shankar

NPTEL : Advanced Process Control (Chemical Engineering)

Co-ordinators : Prof. Sachin C. Patwardhan

NPTEL : Chemical Reaction Engineering II (Chemical Engineering)

Co-ordinators : Prof. A.K. Suresh, Prof. Ganesh A. Viswanathan, Prof. Sanjay M. Mahajani

NPTEL : Advanced Numerical Analysis (Chemical Engineering)

Co-ordinators : Prof. Sachin C. Patwardhan

NPTEL : NOC:Introduction to Evolutionary Dynamics (Chemical Engineering)

Co-ordinators : Prof. Supreet Saini

NPTEL : NOC:Heat Transfer (Chemical Engineering)

Co-ordinators : Prof. Ganesh A. Viswanathan

NPTEL : NOC:Chemical Reaction Engineering-II (Chemical Engineering)

Co-ordinators : Prof. Ganesh Vishwanathan

NPTEL : NOC:Chemical Process Control (Chemical Engineering)

Co-ordinators : Prof. Sujit Jogwar

NPTEL : NOC:Introduction to Interfacial Waves (Chemical Engineering)

Co-ordinators : Prof. Ratul Dasgupta

NPTEL : NOC:Hydrogen Energy: Production, Storage, Transportation and Safety (Chemical Engineering)

Co-ordinators : Prof. Pratibha Sharma

NPTEL : NOC:Modeling Stochastic Phenomena for Engineering Applications: Part-1 (Chemical Engineering)

Co-ordinators : Prof. Yelia Shankaranarayana Mayya

NPTEL : Heterogeneous Catalysis and Catalytic Processes (Chemical Engineering)

Co-ordinators : Dr. K.K. Pant

NPTEL : Interfacial Engineering (Chemical Engineering)

Co-ordinators : Prof. A.N. Bhaskarwar

NPTEL : NOC:Fluid Mechanics and its Applications (Chemical Engineering)

Co-ordinators : Prof. Vijay Gupta

Lecture 65 (31A)

NPTEL : NOC:Computational Process Design (Chemical Engineering)

Co-ordinators : Prof. Manojkumar Ramteke, Prof. Hariprasad Kodamana

NPTEL : Heat Transfer (Chemical Engineering)

Co-ordinators : Prof. A.K. Ghoshal

NPTEL : Mass Transfer Operations I (Chemical Engineering)

Co-ordinators : Dr. B. Mandal

NPTEL : Process Design Decisions and Project Economics (Chemical Engineering)

Co-ordinators : Dr. Vijay S. Moholkar

NPTEL : NOC:Fluidization Engineering (Chemical Engineering)

Co-ordinators : Dr. S.K. Majumder

NPTEL : NOC:An Introduction to Cardiovascular Fluid Mechanics (Chemical Engineering)

Co-ordinators : Dr. Raghvendra Gupta

NPTEL : NOC:Multiphase Microfluidics (Chemical Engineering)

Co-ordinators : Dr. Raghvendra Gupta

NPTEL : NOC:Measurement Technique in Multiphase Flows (Chemical Engineering)

Co-ordinators : Prof. Rajesh Kumar Upadhyay

NPTEL : NOC:Multiphase Flows (Chemical Engineering)

Co-ordinators : Prof. Rajesh Kumar Upadhyay

NPTEL : NOC:Introduction to Polymer Physics (IIT-G) (Chemical Engineering)

Co-ordinators : Prof. Amit Kumar

NPTEL : NOC:Natural Gas Engineering (Chemical Engineering)

Co-ordinators : Prof. Pankaj Tiwari

NPTEL : NOC:Chemical Engineering Thermodynamics (Chemical Engineering)

Co-ordinators : Prof. Sasidhar Gumma

NPTEL : NOC:Mass Transfer Operations-I (Chemical Engineering)

Co-ordinators : Dr. B. Mandal

NPTEL : NOC:Transport Phenomena of Non-Newtonian Fluids (Chemical Engineering)

Co-ordinators : Prof. N. Kishore

NPTEL : NOC:Fluid Flow Operations (Chemical Engineering)

Co-ordinators : Dr. S.K. Majumder

NPTEL : NOC:Chemical Process Intensification (Chemical Engineering)

Co-ordinators : Dr. S.K. Majumder

NPTEL : NOC:Chemical Reaction Engineering-I (Chemical Engineering)

Co-ordinators : Dr. B. Mandal

NPTEL : NOC:Mass Transfer Operations-II (Chemical Engineering)

Co-ordinators : Dr. Chandan Das

Lecture 32 - Concluding remarks - Part 2

NPTEL : NOC:Mechanical Unit Operations (Chemical Engineering)

Co-ordinators : Prof. Nanda Kishore

NPTEL : NOC:Advanced Thermodynamics (Chemical Engineering)

Co-ordinators : Prof. Nanda Kishore

NPTEL : NOC:Membrane Technology (Chemical Engineering)

Co-ordinators : Prof. Kaustubha Mohanty

NPTEL : NOC:Computer Aided Applied Single Objective Optimization (Chemical Engineering)

Co-ordinators : Prof. Prakash Kotecha

NPTEL : NOC:Basic Principles and Calculations in Chemical Engineering (Chemical Engineering)

Co-ordinators : Prof. Subrata Kumar Majumdar

NPTEL : NOC:Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems (Chemical Engineering)

Co-ordinators : Prof. R. Anandalakshmi, Prof. Vaibhav Vasant Goud

NPTEL : NOC:Biomass Conversion and Biorefinery (Chemical Engineering)

Co-ordinators : Prof. Kaustubha Mohanty

NPTEL : NOC:Aspen PlusÂ® Simulation Software - A basic course for beginners (Chemical Engineering)

Co-ordinators : Prof. Prabirkumar Saha

NPTEL : NOC:Physical and Electrochemical Characterizations in Chemical Engineering (Chemical Engineering)

Co-ordinators : Prof. Tamal Banerjee

NPTEL : NOC:Chemical Process Technology (Chemical Engineering)

Co-ordinators : Prof. Tamal Banerjee

NPTEL : NOC:Inorganic Chemical Technology (Chemical Engineering)

Co-ordinators : Prof. Nanda Kishore

NPTEL : NOC:Organic Chemical Technology (Chemical Engineering)

Co-ordinators : Prof. Nanda Kishore

NPTEL : NOC:Solid-Fluid Operations (Chemical Engineering)

Co-ordinators : Prof. Subrata Kumar Majumder

NPTEL : NOC:Energy Conversion Technologies (Biomass and Coal) (Chemical Engineering)

Co-ordinators : Prof. Vaibhav V. Goud

NPTEL : NOC:Petroleum Reservoir Engineering (Chemical Engineering)

Co-ordinators : Dr. Pankaj Tiwari

NPTEL : NOC:Applied Statistical Thermodynamics (Chemical Engineering)

Co-ordinators : Prof. Tamal Banerjee

NPTEL : Fluid Mechanics (Chemical Engineering)

Co-ordinators : Dr. V. Shankar

NPTEL : Mass Transfer II (Chemical Engineering)

Co-ordinators : Prof. Nishith Verma

NPTEL : Plantwide Control of Chemical Processes (Chemical Engineering)

Co-ordinators : Dr. Nitin Kaistha

NPTEL : NOC:Thermodynamics Of Fluid Phase Equilibria (Chemical Engineering)

Co-ordinators : Dr. Jayant K. Singh

NPTEL : NOC:Chemical Engineering Thermodynamics (2019) (Chemical Engineering)

Co-ordinators : Dr. Jayant K. Singh

NPTEL : Biochemical Engineering (Chemical Engineering)

Co-ordinators : Dr. Saikat Chakraborty, Dr. Rintu Banerjee

NPTEL : Microscale Transport Processes (Chemical Engineering)

Co-ordinators : Dr. Somnath Ganguly, Prof. S. Dasgupta

NPTEL : Multiphase Flow (Chemical Engineering)

Co-ordinators : Prof. P.K. Das, Prof. Gargi Das

NPTEL : Novel Separation Processes (Chemical Engineering)

Co-ordinators : Prof. S. De

NPTEL : Process Control and Instrumentation (Chemical Engineering)

Co-ordinators : Dr. D. Sarkar, Dr. A.K. Jana

NPTEL : Instability and Patterning of Thin Polymer Films (Chemical Engineering)

Co-ordinators : Dr. R. Mukherjee

NPTEL : Advanced Mathematical Techniques in Chemical Engineering (Chemical Engineering)

Co-ordinators : Prof. S. De

NPTEL : NOC:Introduction to Process Modeling in Membrane Separation Process (Chemical Engineering)

Co-ordinators : Prof. S. De

NPTEL : NOC:Soft Nano Technology (Chemical Engineering)

Co-ordinators : Dr. R. Mukherjee

NPTEL : NOC:Adiabatic Two-Phase Flow & Flow Boiling in Microchannel (Chemical Engineering)

Co-ordinators : Prof. Gargi Das

NPTEL : NOC:Phase Equilibrium Thermodynamics (Chemical Engineering)

Co-ordinators : Prof. Gargi Das

Lecture 65 - Miscellaneous concepts on Reaction Equilibrium

NPTEL : NOC:Transport Phenomena (Chemical Engineering)

Co-ordinators : Prof. Sunando Dasgupta

NPTEL : NOC:Chemical Process Instrumentation (Chemical Engineering)

Co-ordinators : Prof. Debasis Sarkar

NPTEL : NOC:Optimization in Chemical Engineering (Chemical Engineering)

Co-ordinators : Prof. Debasis Sarkar

NPTEL : NOC:Heat Transfer (2018) (Chemical Engineering)

Co-ordinators : Prof. Sunando Dasgupta

NPTEL : NOC:Flow through Porous Media (Chemical Engineering)

Co-ordinators : Dr. Somnath Ganguly

NPTEL : NOC:Fundamentals of Particle and Fluid Solid Processing (Chemical Engineering)

Co-ordinators : Prof. Arnab Atta

NPTEL : NOC:Plant Design and Economics (Chemical Engineering)

Co-ordinators : Prof. Debasis Sarkar

NPTEL : NOC:Material and Energy Balance Computations (Chemical Engineering)

Co-ordinators : Prof. Arnab Atta

NPTEL : NOC:Principles and Practices of Process Equipment and Plant Design (Chemical Engineering)

Co-ordinators : Prof. Gargi Das

NPTEL : NOC:Mathematical Modelling and Simulation of Chemical Engineering Process (Chemical Engineering)

Co-ordinators : Prof. Sourav Mondal

NPTEL : NOC:Advanced Process Dynamics (Chemical Engineering)

Co-ordinators : Prof. Parag A. Deshpande

NPTEL : NOC:Metallocene and Metal-Carbene based Organometallic Compounds as Industrially Important Advanced Polyolefin Catalysts (Chemical Engineering)

Co-ordinators : Prof. Sanjib K. Patra

NPTEL : NOC:Chemical Engineering Fluid Dynamics and Heat Transfer (Chemical Engineering)

Co-ordinators : Prof. Rabibrata Mukherjee, Prof. Arnab Atta

NPTEL : NOC:Characterization of Polymers, Elastomers and Composites (Chemical Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

NPTEL : NOC:Matlab-Based Programming Lab in Chemical Engineering (Chemical Engineering)

Co-ordinators : Prof. Parag A. Deshpande

NPTEL : NOC:Petroleum Technology (Chemical Engineering)

Co-ordinators : Dr. Sonali Sengupta

NPTEL : NOC:Rheology and Processing of Paints, Plastic and Elastomer Based Composites (Chemical Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

NPTEL : NOC:Petroleum Formation Evaluation (Chemical Engineering)

Co-ordinators : Dr. Neetish Kumar Maurya, Dr. Sayantan Ghosh

NPTEL : NOC:Momentum Transfer in Fluids (Chemical Engineering)

Co-ordinators : Prof. Somenath Ganguly, Prof. Sunando DasGupta

NPTEL : NOC:Enhanced Oil Recovery Techniques (Chemical Engineering)

Co-ordinators : Prof. Ajay Mandal

NPTEL : NOC:Adsorption Science and Technology: Fundamentals and Applications (Chemical Engineering)

Co-ordinators : Prof. Sourav Mondal

NPTEL : Chemical Engineering Thermodynamics (Chemical Engineering)

Co-ordinators : Prof. M.S. Ananth

NPTEL : Computational Fluid Dynamics (Chemical Engineering)

Co-ordinators : Prof. Sreenivas Jayanti

Lecture 1 - Motivation for CFD and Introduction to the CFD approach

Lecture 2 - Illustration of the CFD approach through a worked out example

Lecture 3 - Eulerian approach, Conservation Equation, Derivation of Mass Conservation Equation and Statement of the momentum conservation equation

Lecture 4 - Forces acting on a control volume; Stress tensor; Derivation of the momentum conservation equation ; Closure problem; Deformation of a fluid element in fluid flow

Lecture 5 - Kinematics of deformation in fluid flow; Stress vs strain rate relation; Derivation of the Navier-Stokes equations

Lecture 6 - Equations governing flow of incompressible flow; Initial and boundary conditions; Wellposedness of a fluid flow problem

Lecture 7 - Equations for some simple cases; Generic scalar transport equation form of the governing equations; Outline of the approach to the solution of the N-S equations.

Lecture 8 - cut out the first 30s; Spatial discretization of a simple flow domain; Taylorâ€™s series expansion and the basis of finite difference approximation of a derivative; Central and one-sided difference approximations; Order of accuracy of finite difference ap

Lecture 9 - Finite difference approximation of pth order of accuracy for qth order derivative; cross -derivatives; Examples of high order accurate formulae for several derivatives

Lecture 10 - One -sided high order accurate approximations; Explicit and implicit formulations for the time derivatives

Lecture 11 - Numerical solution of the unsteady advection equation using different finite difference approximations

Lecture 12 - Need for analysis of a discretization scheme; Concepts of consistency, stability and convergence and the equivalence theorem of Lax ; Analysis for consistency

Lecture 13 - Statement of the stability problem; von Neumann stability analysis of the first order wave equation

Lecture 14 - Consistency and stability analysis of the unsteady diffusion equation; Analysis for two- and three -dimensional cases; Stability of implicit schemes

Lecture 15 - Interpretation of the stability condition; Stability analysis of the generic scalar equation and the concept of upwinding ; Diffusive and dissipative errors in numerical solution; Introduction to the concept of TVD schemes

Lecture 16 - Template for the generic scalar transport equation and its extension to the solution of Navier-Stokes equa tions for a compressible flow.

Lecture 17 - Illustration of application of the template using the MacCormack scheme for a three-dimensional compressible flow

Lecture 18 - Stability limits of MacCormack scheme; Limitations in extending compressible flow schemes to incompre ssible flows ; Difficulty of evaluation of pressure in incompressible flows and listing of various approaches

Lecture 19 - Artificial compressibility method and the streamfunction-vorticity method for the solution of NS equations and their limitations

Lecture 20 - Pressur e equation method for the solution of NS equations

Lecture 21 - Pressure-correction approach to the solution of NS equations on a staggered grid; SIMPLE and its family of methods

Lecture 22 - Need for effici ent solution of linear algebraic equations; Classification of approaches for the solution of linear algebraic equations.

Lecture 23 - Direct methods for linear algebraic equations; Gaussian elimination method

Lecture 24 - Gauss-Jordan method; LU decomposition method; TDMA and Thomas algorithm

Lecture 25 - Basic iterative methods for linear algebraic equations: Description of point -Jacobi, Gauss-Seidel and SOR methods

Lecture 26 - Convergence analysis of basic iterative schemes; Diagonal dominance condition for convergence; Influence of source terms on the diagonal dominance condition; Rate of convergence

Lecture 27 - Application to the Laplace equation

Lecture 28 - Advanced iterative methods: Alternating Direction Implicit Method; Operator splitting

Lecture 29 - Advanced iterative methods; Strongly Implicit Proc edure; Conjugate gradient method; Multigrid method

Lecture 30 - Illustration of the Multigrid method for the Laplace equation

Lecture 31 - Overview of the approach of numerical solution of NS equations for simple domains; Introduction to complexity arising from physics and geometry

Lecture 32 - Derivation of the energy conservation equation

Lecture 33 - Derivation of the species conservation equation; dealing with chemical reactions

Lecture 34 - Turbulence; Characteri stics of turbulent flow; Dealing with fluctuations and the concept of time-averaging

Lecture 35 - Derivation of the Reynolds -averaged Navier -Stokes equations; identification of the closure problem of turbulence; Boussinesq hypothesis and eddy viscosity

Lecture 36 - Reynol ds stresses in turbulent flow; Time and length scales of turbulence; Energy cascade; Mixing length model for eddy viscosity

Lecture 37 - One-equation model for turbulent flow

Lecture 38 - Two -equation model for turbulent flow; Numerical calculation of turbulent reacting flows

Lecture 39 - Calculation of near-wall region in turbulent flow; wall function approach; near-wall turbulence models

Lecture 40 - Need for special methods for dealing with irregular flow geometry; Outline of the Body-fitted grid approach ; Coordinate transformation to a general, 3-D curvilinear system

Lecture 41 - Transformation of the governing equations; Illustration for the Laplace equation; Appearance and significance of cross - derivative terms; Concepts of structured and unstructured grids.

Lecture 42 - Finite vol ume method for complicated flow domain; Illustration for the case of flow through a duct of triangular cross - section.

Lecture 43 - Finite volume method for the general case

Lecture 44 - Generation of a structured grid for irregular flow domain; Algebraic methods; Elliptic grid generation method

Lecture 45 - Unstructured grid generation; Domain nodalization; Advancing front method for triangulation

Lecture 46 - Delaunay triangulation method for unstructured grid generation

Lecture 47 - Co -located grid approach for irregular geometries; Pressure correction equation for a co -located structured grid; Pressure correction equation for a co-located unstructured grid.

NPTEL : Computational Techniques (Chemical Engineering)

Co-ordinators : Dr. Niket S. Kaisare

NPTEL : Particle Characterization (PG) (Chemical Engineering)

Co-ordinators : Dr. R. Nagarajan

NPTEL : Statistics for Experimentalists (Chemical Engineering)

Co-ordinators : Dr. A. Kannan

NPTEL : Multiphase flows:Analytical solutions and Stability Analysis (Chemical Engineering)

Co-ordinators : Prof. S. Pushpavanam

NPTEL : NOC:Introduction to Time-Frequency Analysis and Wavelet Transforms (Chemical Engineering)

Co-ordinators : Dr. Arun K.Tangirala

NPTEL : Chemical Engineering Principles of CVD Processes (Chemical Engineering)

Co-ordinators : Dr. R. Nagarajan

NPTEL : Chemical Reaction Engineering 1 (Homogeneous Reactors) (Chemical Engineering)

Co-ordinators : Prof K. Krishnaiah

NPTEL : Chemical Reaction Engineering 2 (Heterogeneous Reactors) (Chemical Engineering)

Co-ordinators : Prof K. Krishnaiah

NPTEL : NOC:MATLAB Programming for Numerical Computation (Chemical Engineering)

Co-ordinators : Dr. Niket S.Kaisare

NPTEL : NOC:Computational Fluid Dynamics (Chemical Engineering)

Co-ordinators : Prof. Sreenivas Jayanti

NPTEL : NOC:Introduction to Statistical Hypothesis Testing (Chemical Engineering)

Co-ordinators : Dr. Arun K.Tangirala

NPTEL : NOC:Applied Time-Series Analysis (Chemical Engineering)

Co-ordinators : Dr. Arun K.Tangirala

NPTEL : NOC:Rheology of Complex Materials (Chemical Engineering)

Co-ordinators : Dr. Abhijit P. Deshpande

NPTEL : NOC:Process Control - Design, Analysis and Assessment (Chemical Engineering)

Co-ordinators : Prof. Ragunathan Rengasamy

NPTEL : System Identification (Chemical Engineering)

Co-ordinators : Dr. Arun K.Tangirala

NPTEL : NOC:Fluid and Particle Mechanics (Chemical Engineering)

Co-ordinators : Prof. Basavaraju

NPTEL : NOC:Continuum Mechanics and Transport Phenomena (Chemical Engineering)

Co-ordinators : Prof. T. Renganathan

NPTEL : NOC:Environmental Quality Monitoring and Analysis (Chemical Engineering)

Co-ordinators : Dr. R. Ravi Krishna

NPTEL : Synthetic and Natural Supramolecular Architectures: An Approach Towards Molecular Technology (Chemical Engineering)

Co-ordinators : Prof. ChebroluPulla Rao

NPTEL : NOC:Artificial Lift (Chemical Engineering)

Co-ordinators : Prof. Abdus Samad

NPTEL : Chemical Technology - I (Chemical Engineering)

Co-ordinators : Dr. I.D. Mall

NPTEL : Process Integration (Chemical Engineering)

Co-ordinators : Dr. B. Mohanty

NPTEL : Mechanical Operations (Chemical Engineering)

Co-ordinators : Prof. Shabina Khanam

NPTEL : NOC:Waste to Energy Conversion (Chemical Engineering)

Co-ordinators : Prof. P. Mondal

NPTEL : NOC:Unit Operations of Particulate Matter (Chemical Engineering)

Co-ordinators : Prof. Shabina Khanam

NPTEL : NOC:Introduction to Polymer Physics (IIT-R) (Chemical Engineering)

Co-ordinators : Prof. Prateek Kumar Jha

NPTEL : NOC:Equipment Design: Mechanical Aspects (Chemical Engineering)

Co-ordinators : Prof. Shabina Khanam

NPTEL : NOC:Chemical Process Safety (Chemical Engineering)

Co-ordinators : Dr. Shishir Sinha

NPTEL : NOC:Technologies for Clean and Renewable Energy Production (Chemical Engineering)

Co-ordinators : Prof. P. Mondal

NPTEL : NOC:Polymer Reaction Engineering (Chemical Engineering)

Co-ordinators : Prof. Shishir Sinha

NPTEL : NOC:Process Equipment Design (Chemical Engineering)

Co-ordinators : Prof. Shabina Khanam

NPTEL : NOC:Advanced Thermodynamics and Molecular Simulations (Chemical Engineering)

Co-ordinators : Prof. Prateek Kumar Jha

NPTEL : NOC:Chemical Process Utilities (Chemical Engineering)

Co-ordinators : Prof. Shishir Sinha

NPTEL : NOC:Physico-Chemical Processes for Waste Water Treatment (Chemical Engineering)

Co-ordinators : Prof. Vimal Chandra Srivastava

NPTEL : NOC:Basic Environmental Engineering and Pollution Abatement (Chemical Engineering)

Co-ordinators : Prof. P. Mondal

NPTEL : NOC:Biological Process Design for Wastewater Treatment (Chemical Engineering)

Co-ordinators : Prof. Vimal Chandra Srivastava

NPTEL : NOC:Advanced Reaction Engineering (Chemical Engineering)

Co-ordinators : Prof. Taraknath Das

NPTEL : NOC:Polymer Process Engineering (Chemical Engineering)

Co-ordinators : Prof. Shishir Sinha

NPTEL : Chemical Reaction Engineering (Chemical Engineering)

Co-ordinators : Prof. Jayant M Modak

NPTEL : Fundamentals of Transport Processes (Chemical Engineering)

Co-ordinators : Prof. V. Kumaran

NPTEL : Fundamentals of Transport Processes - II (Chemical Engineering)

Co-ordinators : Prof. V. Kumaran

NPTEL : Modern Instrumental Methods of Analysis (Chemical Engineering)

Co-ordinators : Dr. J.R. Mudakavi

NPTEL : NOC:Transport Processes I: Heat and Mass Transfer (Chemical Engineering)

Co-ordinators : Prof. V. Kumaran

NPTEL : NOC:Atomic and Molecular Absorption Spectrometry for Pollution Monitoring (Chemical Engineering)

Co-ordinators : Dr. J.R. Mudakavi

NPTEL : NOC:Trace and Ultra-trace Analysis of Metals using Atomic Absorption Spectrometry (Chemical Engineering)

Co-ordinators : Dr. J.R. Mudakavi

NPTEL : NOC:Inductive Couple Plasma Atomic Emmission Spectrometry for Pollution Monitoring (Chemical Engineering)

Co-ordinators : Dr. J.R. Mudakavi

NPTEL : NOC:Infrared Spectroscopy for Pollution Monitoring (Chemical Engineering)

Co-ordinators : Dr. J.R. Mudakavi

NPTEL : NOC:Electrochemical Technology in Pollution Control (Chemical Engineering)

Co-ordinators : Prof. J. R. Mudakavi

NPTEL : NOC:Transport Processes (Chemical Engineering)

Co-ordinators : Prof. V Kumaran