

NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mechanical Engineering - NOC:Tools in Scientific Computing

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Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Preliminaries and Data types
Lecture 2 - Loops and Conditionals Implementation of bubble sort
Lecture 3 - Commonly used Functions
Lecture 4 - Matrix Manipulations Mohr's circle
Lecture 5 - Nonlinear algebraic equations - Visualizing convergence
Lecture 6 - Nonlinear algebraic equations - system of equation and Newton's basin of attraction
Lecture 7 - Overview of Jupyterlab, Octave GUI, Spyder GUI
Lecture 8 - Interactivity with Python - Ipywidgets
Lecture 9 - Geometric Interpretations of ODEs
Lecture 10 - Bifurcation: Saddle node bifurcation
Lecture 11 - Bifurcation: Transcritical bifurcation
Lecture 12 - Bifurcation: Pitchfork bifurcation
Lecture 13 - Imperfect bifurcations and catastrophies
Lecture 14 - 2D flows - linear systems
Lecture 15 - 2D flows - Trajectories: spirals, star and degeneracy
Lecture 16 - Phase portraits - nonlinear systems
Lecture 17 - 2D phase portraits - limit cycles
Lecture 18 - Bifurcations and 3D flows
Lecture 19 - 1D Maps
Lecture 20 - Probability density functions and sampling
Lecture 21 - Monte-carlo simulations: Darts and Buffon's needle
Lecture 22 - 1D Random walks
Lecture 23 - 2D Random walks
Lecture 24 - Boundary Value Problems - Part 1
Lecture 25 - Boundary Value Problems - Part 2
Lecture 26 - Regular Perturbation for ODE
Lecture 27 - Singular Perturbation for ODE
Lecture 28 - 2D Boundary Values Problems
Lecture 29 - PETSc and MPI basics

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- Lecture 30 - PETSc - Creating Vectors and Matrices
- Lecture 31 - KSP object and solving a system
- Lecture 32 - Poisson equation in PETSc
- Lecture 33 - Nonlinear Solver of PETSc
- Lecture 34 - Nonlinear solver with Jacobian in PETSc
- Lecture 35 - Reaction-diffusion system in PETSc
- Lecture 36 - Time stepping in PETSc
- Lecture 37 - Heat transport using PETSc
- Lecture 38 - Solving nonlinear PDE on a periodic domain yielding different patterns
- Lecture 39 - Audio analysis - Determine motor RPM
- Lecture 40 - Spectrogram and Doppler shift
- Lecture 41 - Image processing - Preliminaries
- Lecture 42 - Balloon problem and viscous fingers
- Lecture 43 - Analyzing data files and 2D interpolation