

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

NPTEL Video Course - Mechanical Engineering - NOC:Variational Methods in Mechanics

Subject Co-ordinator - Prof. G.K. Anathasuresh

Co-ordinating Institute - IISc - Bangalore

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

- Lecture 1 - Classification of optimization problems and the place of Calculus of Variations in it - Part I
- Lecture 2 - Classification of optimization problems and the place of Calculus of Variations in it - Part II
- Lecture 3 - Genesis of Calculus of Variations - Part I
- Lecture 4 - Genesis of Calculus of Variations - Part II
- Lecture 5 - Formulation of Calculus of Variations problems in geometry and mechanics and design - Part I
- Lecture 6 - Formulation of Calculus of Variations problems in geometry and mechanics and design - Part II
- Lecture 7 - Unconstrained minimization in one and many variables - Part I
- Lecture 8 - Unconstrained minimization in one and many variables - Part II
- Lecture 9 - Constrained minimization KKT conditions - Part I
- Lecture 10 - Constrained minimization KKT conditions - Part II
- Lecture 11 - Sufficient conditions for constrained minimization - Part I
- Lecture 12 - Sufficient conditions for constrained minimization - Part II
- Lecture 13 - Mathematical preliminaries function, functional, metrics and metric space, norm and vector space
- Lecture 14 - Mathematical preliminaries function, functional, metrics and metric space, norm and vector space
- Lecture 15 - Function spaces and Gateaux variation
- Lecture 16 - First variation of a functional Frechet differential and variational derivative
- Lecture 17 - Fundamental lemma of calculus of variations and Euler Lagrange equations - Part I
- Lecture 18 - Fundamental lemma of calculus of variations and Euler Lagrange equations - Part II
- Lecture 19 - Extension of Euler-Lagrange equations to multiple derivatives
- Lecture 20 - Extension of Euler-Lagrange equations to multiple functions in a functional
- Lecture 21 - Global Constraints in calculus of variations - Part I
- Lecture 22 - Global Constraints in calculus of variations - Part II
- Lecture 23 - Local (finite subsidiary) constraints in calculus of variations - Part I
- Lecture 24 - Local (finite subsidiary) constraints in calculus of variations - Part II
- Lecture 25 - Size optimization of a bar for maximum stiffness for given volume - Part I
- Lecture 26 - Size optimization of a bar for maximum stiffness for given volume - Part II
- Lecture 27 - Size optimization of a bar for maximum stiffness for given volume - Part III
- Lecture 28 - Calculus of variations in functionals involving two and three independent variables - Part I
- Lecture 29 - Calculus of variations in functionals involving two and three independent variables - Part II

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

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- Lecture 30 - General variation of a functional, transversality conditions. Broken extremals, Wierstrass-Erdma
- Lecture 31 - General variation of a functional, transversality conditions. Broken extremals, Wierstrass-Erdma
- Lecture 32 - Variational (energy) methods in statics; principles of minimum potential energy and virtual work
- Lecture 33 - General framework of optimal structural designs - Part I
- Lecture 34 - General framework of optimal structural designs - Part II
- Lecture 35 - Optimal structural design of bars and beams using the optimality criteria method
- Lecture 36 - Invariants of Euler-Lagrange equations and canonical forms
- Lecture 37 - Noether's theorem
- Lecture 38 - Minimum characterization of Sturm-Liouville problems
- Lecture 39 - Rayleigh quotient for natural frequencies and mode shapes of elastic systems
- Lecture 40 - Stability analysis and buckling using calculus of variations
- Lecture 41 - Strongest (most stable) column
- Lecture 42 - Dynamic compliance optimization
- Lecture 43 - Electro-thermal-elastic structural optimization
- Lecture 44 - Formulating the extremization problem starting from the differential equation, self-adjointness