



भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान तिरुवनंतपुरम
Indian Institute of Science Education and Research Thiruvananthapuram

Course Information Handout

1. Course Name : Classical Mechanics
2. Course Code : PHY 312
3. Semester and Year : Varshan 2019
4. Instructor Name : Anil Shaji
5. Lecture Plan

| Sl.No. | Modules/Contents | No. of Lecture(s) |
|--------|--|-------------------|
| 1 | Review of Newtonian Mechanics, Generalized Coordinates | 1 (1 Aug 19) |
| 2 | The Principle of least action | 1 (2 Aug 19) |
| 3 | Lagrange's equation, The Lagrangian for a free particle and for a system of particles [Assignment 1] | 1 (8 Aug 19) |
| 4 | Conservation laws and Noether's theorem | 1 (9 Aug 19) |
| 5 | Conservation of energy, momentum and angular momentum [Assignment 2] | 1 (12 Aug 19) |
| 6 | Integrating the equations of motion: motion in one dimension | 1 (16 Aug 19) |
| 7 | Central force motion | 1 (22 Aug 19) |
| 8 | Kepler's problem [Quiz 1] | 1 (23 Aug 19) |
| 9 | Collisions: elastic collision | 1 (29 Aug 19) |
| 10 | Scattering and Rutherford's formula | 1 (30 Aug 19) |
| 11 | Motion of a rigid body, angular velocity | 1 (5 Sep 19) |
| 12 | Moment of Inertia | 1 (6 Sep 19) |
| 13 | Angular Momentum [Assignment 3] | 1 (12 Sep 19) |
| 14 | Euler's equations. Motion in a non-inertial frame | 1 (13 Sep 19) |

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| 15 | Small oscillations: simple harmonic Forced, Damped and anharmonic oscillations [Assignment 4] | 1 (19 Sep 19) |
| Mid-Sem, Break etc ... | | |
| 16 | The Hamilton equations of motion | 1 (17 Oct 19) |
| 17 | Legendre transformations, Cyclic coordinates, Routhian | 1 (18 Oct 19) |
| 18 | Invariance properties of the Lagrangian and Hamiltonian descriptions [Assignment 5] | 1 (24 Oct 19) |
| 19 | Poisson and Lagrange Brackets | 1 (25 Oct 19) |
| 20 | Canonical Transformations and Group properties | 1 (31 Oct 19) |
| 21 | Methods of constructing canonical transformations [Assignment 6] | 1 (1 Nov 19) |
| 22 | Hamilton-Jacobi theory, Action-angle variables | 1 (7 Nov 19) |
| 23 | Harmonic oscillator in action-angle variables | 1 (8 Nov 19) |
| 24 | Kepler problem in action angle variables [Assignment 7] | 1 (14 Nov 19) |

6. Reference Books

1. H. Goldstein, C. Poole and J. Safko, *Classical Mechanics*, 3rd Ed. Addition-Wesley, 2005
2. L. D. Landau and E. M Lifshitz, *Mechanics*, Vol 1 of course of Theoretical Physics, Pergamon Press, 2000

7. Grading Scheme

| Sl.No. | Type of Exam(s) | Marks |
|--------|---|------------|
| 1 | Quiz/Assignments | 20 |
| 2 | Midsem | 30 |
| 3 | Endsem | 50 |
| 4 | Term paper, if any, for electives only (Optional) | -- |
| | Total | 100 |