



Indian Association for the Cultivation of Science

School of Physical Sciences

PHS 4101/AIS 4110

INTEGRATED MASTER'S COURSE

Classical Mechanics

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Room Number: *C-421*

Teaching Assistant:

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1 Main points to remember

- **Course Webpage:** I have created a google classroom, where all the details regarding this course will be posted. You are encouraged to check the classroom in regular intervals. You can access it by clicking [here](#). You are also encouraged to check the “announcements” section located [here](#).
- **Assignments and Evaluation:** I will provide one assignment for every **five** classes and its evaluation will reflect in your internal assessment. Further evaluation will be based on a mid-semester exam of **twenty five** marks and then a final examination with **fifty** marks. Please contact the academic office for further clarifications regarding the course.
- **Communications:** The main mode of communication outside the class will be through emails. Thus I would request all of you to check emails and the google classroom at least once everyday. The assignments as well as other instructions will be handed over through emails and google classrooms only.

2 Syllabus

- Review of Lagrangian formalism, Conservation laws and symmetry, Integrable problems; Elastic collisions and classical theory of scattering.
- Small oscillations, including systems with many degrees of freedom; Rigid body motion.
- Hamilton’s equations, Canonical transformation, Poisson Bracket; Hamilton-Jacobi theory.
- Canonical perturbation theory, Adiabatic invariants.
- Classical field theory; Chaos and dynamical systems.

3 Books and Articles

- *Mechanics* — L.D. Landau and E.M. Lifschitz — Pergamon Press.
- *Classical Theory of Fields* — L.D. Landau and E.M. Lifschitz — Pergamon Press.
- *Classical Mechanics* — H. Goldstein — Narosa.
- *Classical Mechanics* — A.K. Raychaudhuri — Oxford University Press.
- *Classical Mechanics* — N.C. Rana and P.C. Joag — MacGraw Hill.
- *Classical Dynamics* — E.C.G. Sudarshan and N. Mukunda — Hindustan.
- *An introduction to Classical Mechanics* — Kleppner and Kolenkow — McGraw Hill.
- *An introduction to Classical Mechanics* — Takwale and Puranik — McGraw Hill.

4 Time Scale

The course have started from **22nd August** and will continue till **9th December**. The mid semester examination will take place within **17th - 25th October** and the final examination will happen in between **19th-27th December**. Possibly we will have around **25** classes. Below a tentative course structure has been presented, I will try to stick to this schedule.

- **Class-01** — Basics of Lagrangian formalism; Issue of total derivatives.
- **Class-02** — Examples of Lagrangians involving velocity dependent potential; Frictional forces.
- **Class-03** — Constraints in Lagrangian dynamics; Conserved quantities.
- **Assignment-01** — First assignment will be handed over.
- **Class-04** — Motion in a central force field.
- **Class-05** — Collisions and scattering problems in classical mechanics.
- **Class-06** —
- **Assignment Submission-01** — First assignment must be submitted.
- **Class-07** —
- **Class-08** —
- **Class-09** —
- **Assignment-02** — Second assignment will be handed over.
- **Class-10** —
- **Class-11** —
- **Class-12** —
- **Assignment Submission-02** — Second assignment must be submitted.
- **Class-13** —
- **Class-14** —
- **Assignment-03** — Third assignment will be handed over.
- **Class-15** —
- **Class-16** —
- **Class-17** —
- **Class-18** —
- **Assignment Submission-03** — Third assignment must be submitted.
- **Mid-Semester Examination.**
- **Class-19** —

- Class-20 —
 - **Assignment-04** — Fourth assignment will be handed over.
 - Class-21 —
 - Class-22 —
 - Class-23 —
 - Class-24 —
 - **Assignment Submission-04** — Fourth assignment must be submitted.
 - **Assignment-05** — Fifth assignment will be handed over.
 - Class-25 —
 - Class-26 —
 - **Assignment Submission-05** — Fifth assignment must be submitted.
 - **Final Examination will take place.**
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