AE 459/770 : Classical Dynamics

- Course Outline

    - Constraints

        * Position constraints, configuration space, generalized coordinates
        * Velocity constraints, exactness, integrability,
        * Nonholonomic constraints
        * Unilateral constraints

    - Virtual displacements, principle of virtual work
    - Generalized forces, conservative forces
    - d'Alembert's principle
    - Lagrange's equations

        * Derivation from d'Alembert's principle
        * Special case of a conservative system
        * Systems with velocity constraints
        * Form of the equations

    - Conservation laws in dynamics

        * Cyclic coordinates, Routhian reduction
        * Jacobi integral
        * Relationship between symmetries and conservation laws, Noether's theorem

    - Calculus of variations

        * Euler-Lagrange equations

    - Hamilton's principle
    - Hamilton's equations
    - Other variational principles
    - Gibbs-Appell equations

- Text: D. T. Greenwood, *Classical Dynamics*, 1977, (on reserve in the study room section).

- References:

    - H. Goldstein, Classical Mechanics, 1980.
    - V. I. Arnold, Mathematical Methods of Classical Mechanics, 1989.
    - E. A. Desloge, Classical Mechanics, Vol. 2, John Wiley, 1982, parts 4, 6, 7 and 8. On reserve in the study room section.
    - J. V. Jose and E. J. Saletan, *Classical Dynamics: A contemporary approach*, 1998, chapters 2, 3, 5, 6 (some sections involve modern differential geometry). On reserve in the study room section.
    - J. B. Marion and S. T. Thornton, Classical dynamics of particle and systems, 4th ed., 1995, chapters 6, 7.

– L. N. hand and J. D. Finch, *Analytical Mechanics*, 1998, chapters 1, 2, 5.

- Evaluation

Quizzes	25 %
Midsem	30 %
Endsem	40 %
Class participation	5 %

- Some exams/tests/quizzes may be open notes. For such exams, only notes written in one's own handwriting will be allowed. Photocopies will not be allowed.