PH100: Mechanics and Thermodynamics (3-1-0:4)

Lecture 1

Ajay Nath

Classes

Section 1

Time Day	9:00-10:00	10:15-11:15	11:30-12:30
Tuesday	PH100		
Thursday			PH100
Friday		PH100	

Section 2

Time Day	9:00-10:00	10:15-11:15	11:30-12:30
Tuesday			PH100
Thursday	PH100		
Friday	PH100		

Time Day	Lab Batch	Tutorial/Lab 2:00-5:00 PM	
Tuesday	A1+A2	PH100 Tut	PH160 Lab
Thursday	B1+B2	PH100 Tut	PH160 Lab

Course Description and Objectives

This course provides engineering students with important foundational knowledge about mechanics, and thermodynamics and its application to common engineering systems. The course also includes weekly small-group problem-solving tutorial session.

On successful completion of this course, students should be able to:

1. demonstrate knowledge of the physical principles that describe mechanics, materials, heat transfer, and thermodynamics

2. apply physical principles to common physical systems

3. use the methods of algebra, vectors and calculus to make quantitative and qualitative predictions about the behavior of physical systems and

4. associate the correct unit with every physical quantity they use.

Syllabus

- **[A] Mechanics:**

- *Review of Newtonian Mechanics*- Vectors and their time derivatives, Inertial and non-inertial frames of reference, Centrifugal and Coriolis forces; Work-Energy Theorem; Conservation Principles, Collision problem in laboratory and centre of mass frame, Motion under Central Force and its universal features, Oscillatory Motion-Free, Damped and Driven.

- *Introduction to Quantum Mechanics*- Double-slit experiment, de Broglie's hypothesis. Uncertainty Principle, Wave-Function and Wave-Packets, Phase- and Group-velocities. Schrödinger Equation. Probabilities and Normalization. Expectation values. Eigenvalues and Eigenfunctions. Applications of Schrödinger Equation: Particle in a box, Finite Potential well, Harmonic oscillator, Hydrogen Atom problem.

[B] Thermodynamics:

Temperature and Zeroth Law of Thermodynamics, Work, Heat and First Law of Thermodynamics, Ideal Gas and Heat Capacities, Second Law of Thermodynamics, Carnot Cycle, Entropy, Thermodynamic variables and energies.

Books

An Introduction to Mechanics	D. Kleppner and R. Kolenkow, Second Edition
Concepts of Modern Physics	A. Beiser, Sixth Edition.
Heat and Thermodynamics	M. W. Zemansky and R. H. Dittman, Seventh Edition.

- The Feynman Lectures on Physics, Vol-I & III, Feynman, Leighton and Sands; Pearson Education.

- Introduction to Classical Mechanics, David Morin, Cambridge University Press, NY, 2007

- Berkeley Physics Course Vol 4: Quantum physics, Eyvind H. Wichmann, McGraw Hill, 1971.

- For the Love of Physics: From the End of the Rainbow to the Edge of Time - A Journey Through the Wonders of Physics, Walter Lewin, Warren Goldstein Taxmann Publications Private Limited

- Surely you're Joking Mr Feynman: Adventures of a Curious Character, Richard P Feynman RHUK (19 November 1992)

Tutorial

- The main purpose of the tutorial is to provide you with an opportunity to interact with a teacher.

- The teacher will assist you in clearing your doubts and answer your queries regarding the course topics.

- A problem sheet will be given to you for your practice. These problems also indicate the difficulty level of the examinations.

- Your are expected to attempt these problems before you come to tutorial class. Ask your doubts regarding these problems to your teacher during the tutorial class.

- The teacher may or may not solve all the problems in the tutorial class. In case you find a problem very difficult, do ask your teacher to help you.
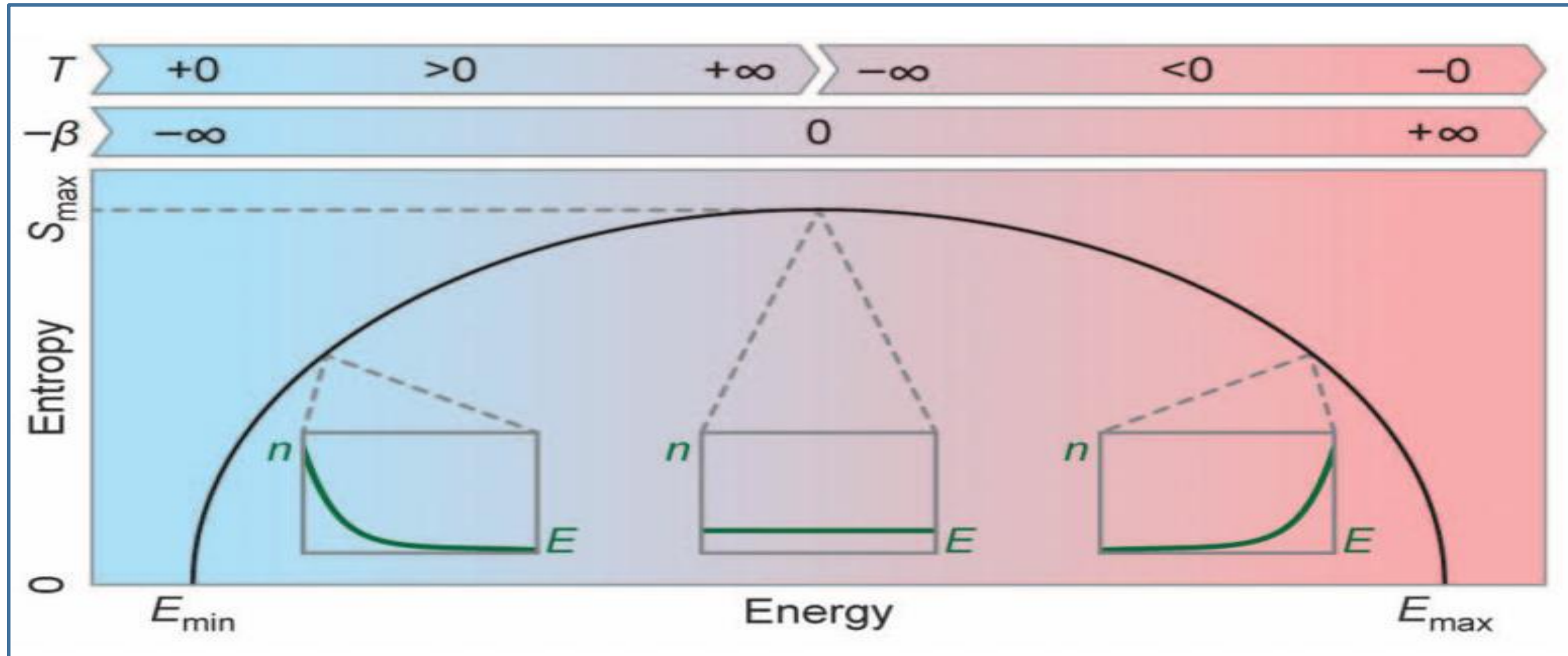
Evaluation

End-semester:	45% (15% online, 15% online, 15% remote)
Mid-semester:	30% (10% online + 10% online + 10% remote)
Continuous Evaluation:	25% (includes quizzes along with surprise tests, assignments etc.)

Mid Semester Exam (wt. = 30%)			End Semester Exam (wt. = 45%)			
Pre-Mid Sem	Mid-Sem	Total Marks	Pre-End Sem	End-Sem Online	End-Sem Remote	Total Marks
10%	20%		15%	15%	15%	
10-14 Jan 2022	7-11 Feb 2022	30	7-11 March 2022	4-9 April 2022	4-9 April 2022	ES

Class Manners

- Maintain Silence

- Attendance Rule

- Mobile Phone Policy

Negative Temperature

Thank You