
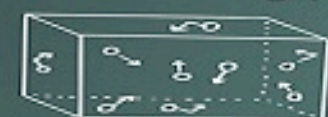


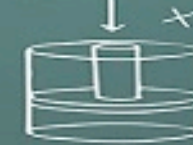


PHYS1013

Energy and Matter

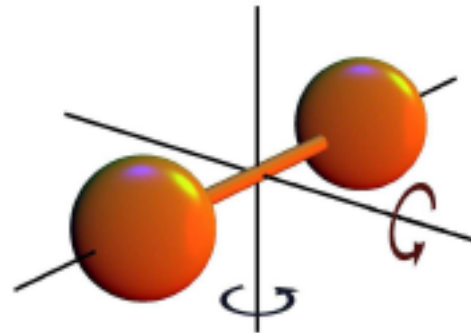
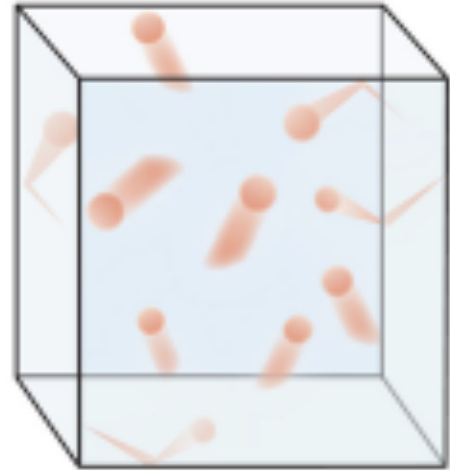
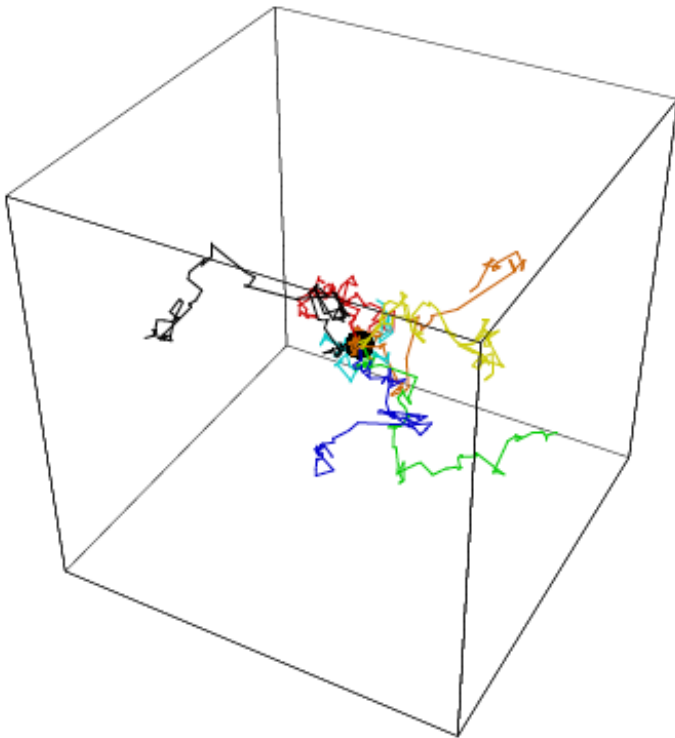
$U_i (n_i, P_i, V_i, \dots)$ $U_f (n_f, P_f, V_f, \dots)$ $W = -nRT \int_{V_i}^{V_f} \frac{dV}{V} = -nRT \ln\left(\frac{V_f}{V_i}\right)$ $H = U + pV$ $T(K) = T(^{\circ}C) + 273.15$
 $dH = dU + d(pV)$ $dH = dU + pdV + Vdp$ $C_p = (\Delta H / \Delta T)_p$ $\Delta U = Q - W$ $\Delta S = nRT \ln\left(\frac{V_f}{V_i}\right)$
 $dU = dq + dw$ $dH = dq - pdV + Vdp$ $C_p = \left(\frac{\partial H}{\partial T}\right)_p$ $W = P \Delta U$ $W = \int_{V_1}^{V_2} P dV$
 $H = U + P V$ $dH = C_p dT$ $\Delta H = q_p = C_p \times \Delta T$ $C_v = (\Delta U / \Delta T)_v$ $ds \geq \frac{dq}{T}$
 $dw = -pdv$ $\Delta S = \frac{\Delta_{\text{trns}} H}{T}$ $ds \geq \frac{dq}{T}$ 
 $C_v = \left(\frac{\partial U}{\partial T}\right)_v$ $\Delta S = \int_1^f \frac{dq_{\text{rev}}}{T}$

 $\Delta U = m(U_2 - U_1) \Delta KE = \frac{1}{2} m(v_2^2 - v_1^2) \Delta PE = mg(z_2 - z_1)$

 $W_L = \frac{P_f V_f - P_i V_i}{1 - \gamma}$ $\eta_{\text{th}} = \frac{W_{\text{net}}}{Q_{\text{in}}} = 1 - \frac{Q_{\text{out}}}{Q_{\text{in}}}$ $Q = \Delta U + P \Delta V$
 $dH = (dq)_p$ $\Delta H = q_p$ $T_R = \frac{T}{T_{\text{cr}}}$ $dU = C_v dT$ $\Delta U = q_v = C_v \times \Delta T$  
 $dU = (dq)_v$ $\Delta U = q_v$ $\Delta U = U_f - U_i = q(\text{heat}) + w(\text{work})$
 $P_R = \frac{P}{P_{\text{cr}}}$ $W_L = P_i V_i \ln \frac{V_f}{V_i} = P_i V_i \ln \frac{P_i}{P_f} = RT_i \ln \frac{P_i}{P_f}$ $x = \frac{m_g}{m_f + m_g}$ $v_{\text{cr}} = \frac{v_{\text{PCR}}}{RT_{\text{cr}}}$



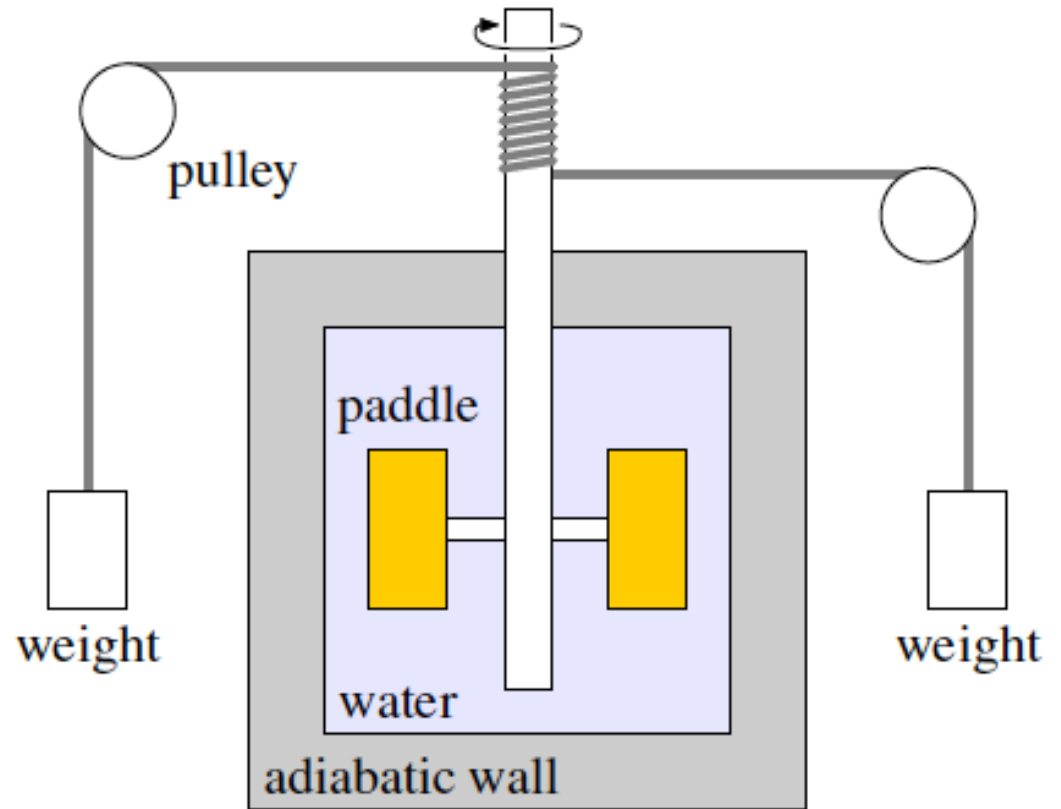
THERMODYNAMICS



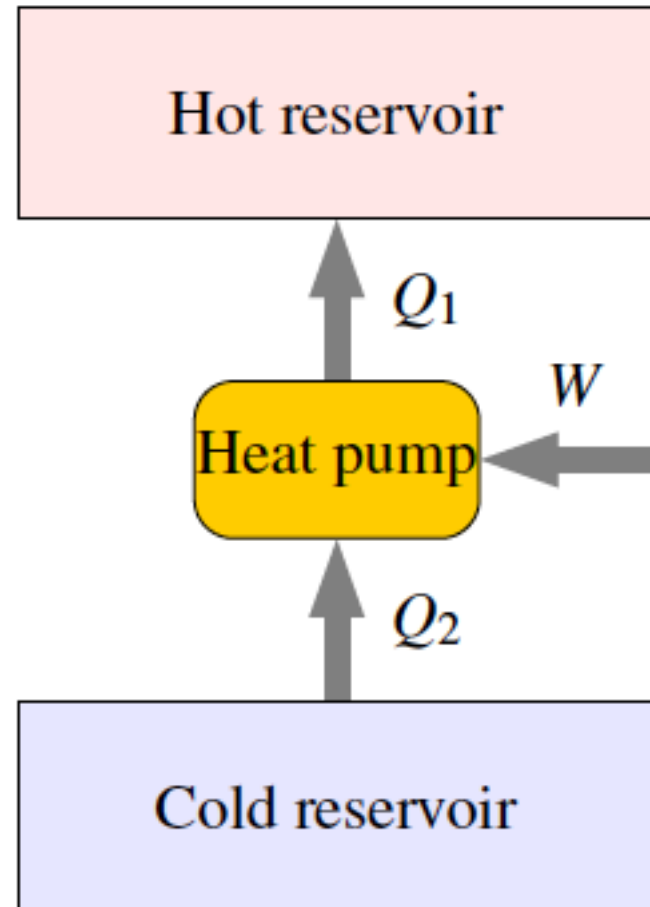
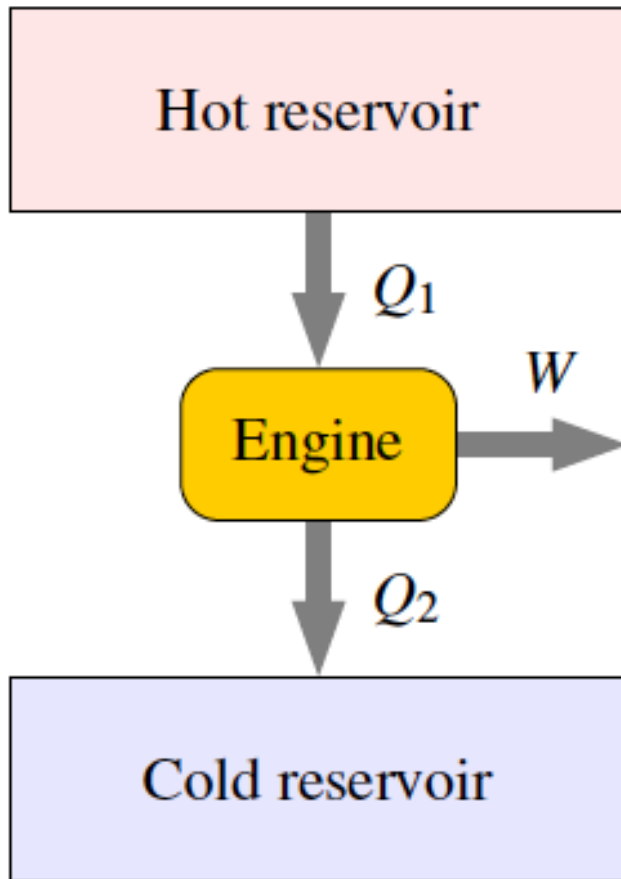
Kinetic Theory of gases



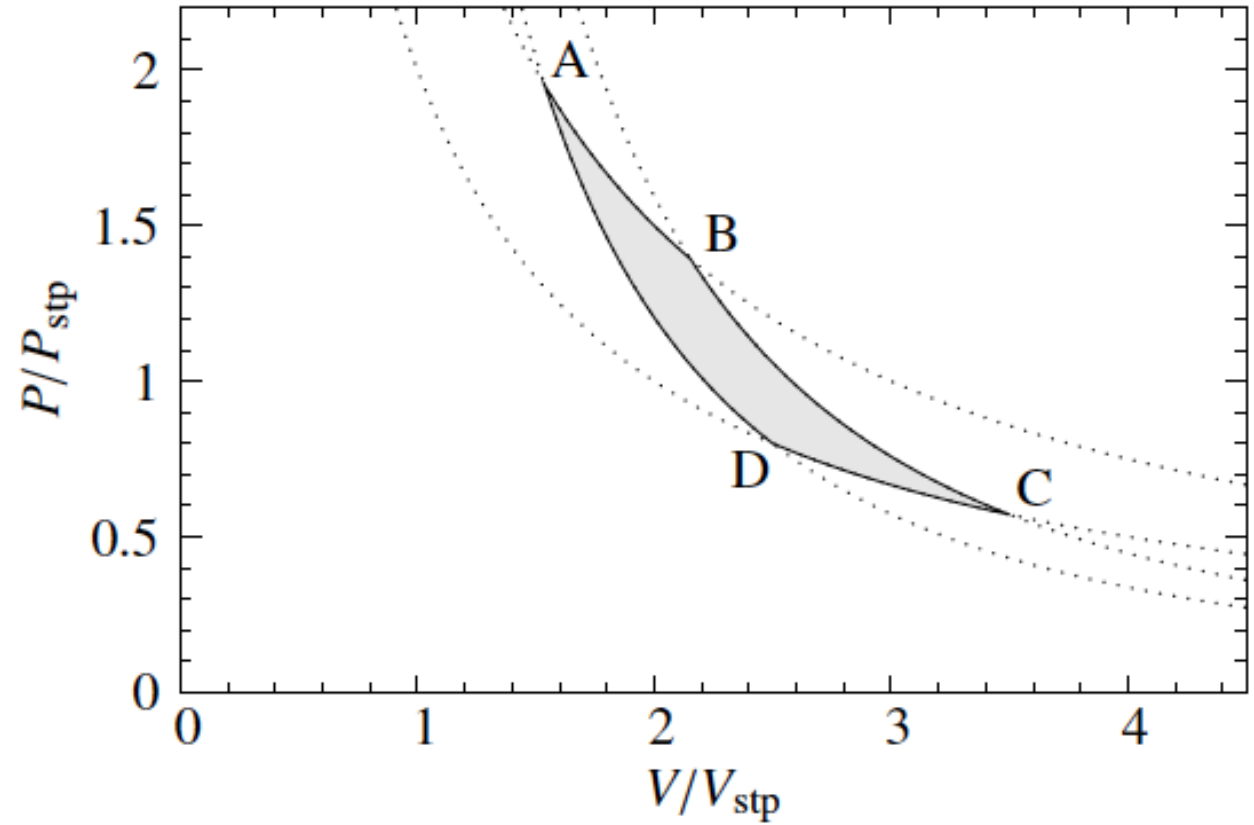
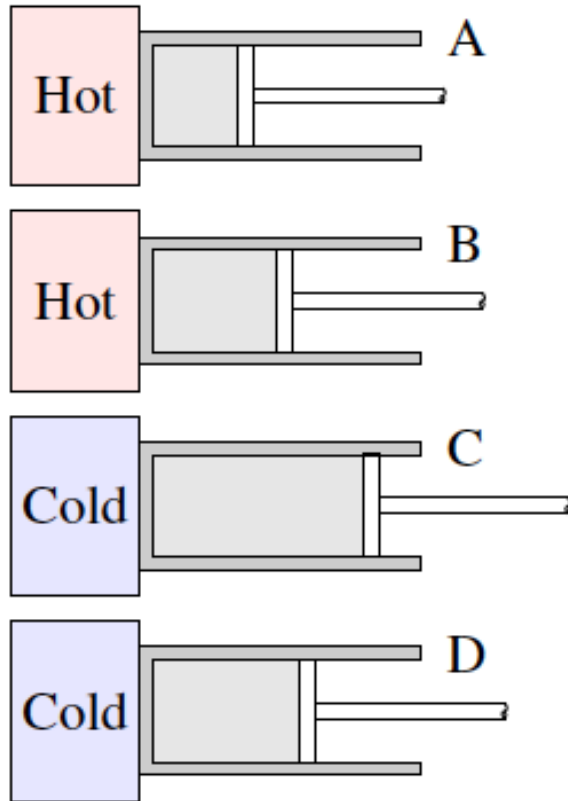
Work, heat, internal energy, heat capacities



Engines and efficiencies

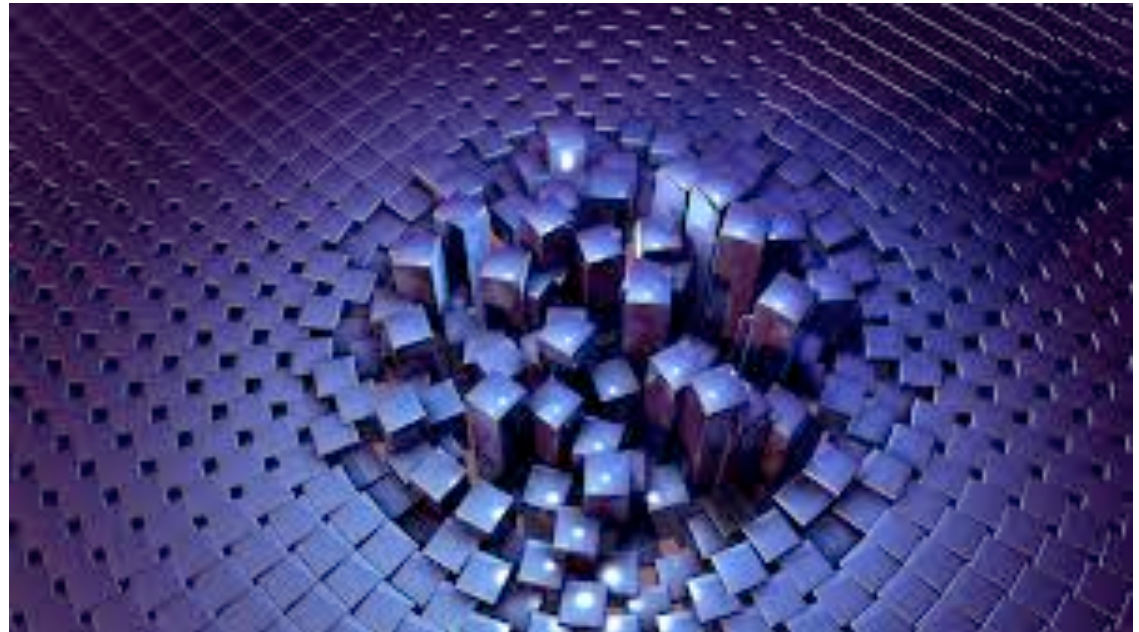


Indicator diagrams

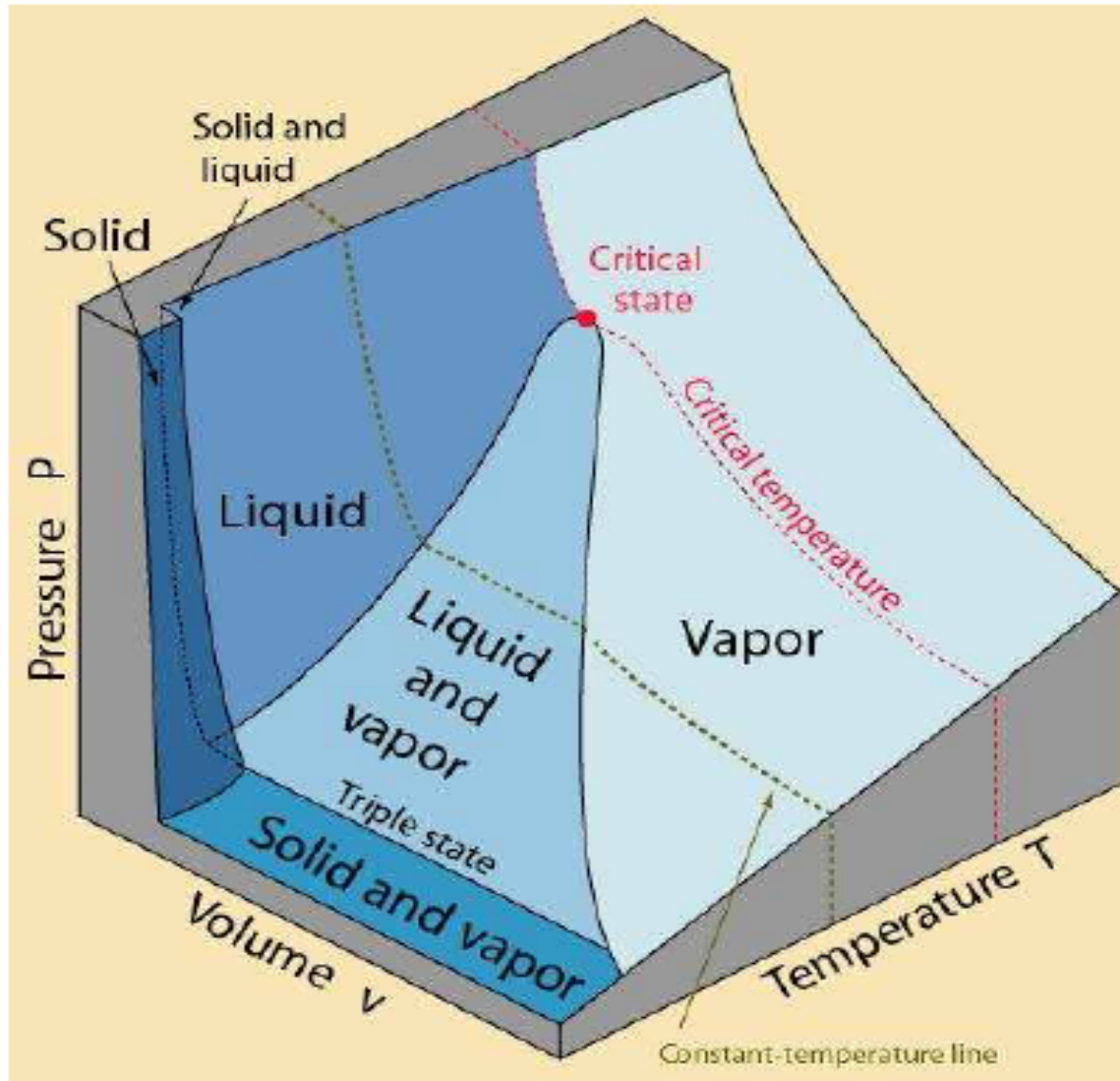


Entropy

Boltzmann's tomb with his definition of entropy engraved on it.



Phase transitions



WEEK	DATES	CHAPTER	PROBLEM SHEET	MASTERING PHYSICS HOMEWORK	DUE DATE	
1	01-05 Feb	1				
2	08-12 Feb	2	1	1	14-Feb	
3	15-19 Feb	3	2	2	21-Feb	
4	22-26 Feb	3	3	3	28-Feb	
5	01-05 Mar	4	4	4	07-Mar	
6	08-12 Mar	5	5			mid-semester exam
7	15-19 Mar	6	6	5	21-Mar	
8	12-16 Apr	7	7	6	18-Apr	
9	19-23 Apr	7	8	7	25-Apr	
10	26-30 Apr	8	9	8	02-May	
11	03-07 May	9 and 10	10	9	09-May	
12	10-14 May	revision				

Lecture recordings and slides will be made available on Fridays the week before.
Office hour and Forum classes to ask questions on Mondays and Thursdays (9-10am)

Problem sheets will be made available on Monday mornings,
one week before the week of the corresponding problem class.
Problem classes on Tuesdays (4-5pm) and Fridays (2-3pm)
Solutions available on Mondays.

Mastering Physics Homeworks will be made available on Monday mornings,
two weeks before the deadline

COMPONENT	WHEN	MARK
10 Problem sheets	Weekly	
9 Mastering Physics Homeworks	Weekly	20%
Mid-semester exam	Week 6	10%
Final exam	Exam week	70%

Office hour:

9-10am on Mondays

Blackboard Collaborate and/or individual calls

Forum:

9-10am on Thursdays

Blackboard Collaborate

For any questions, clarifications, comments, suggestions, complaints, ...

Feel free to contact me at : L.Sapienza@soton.ac.uk

For any questions related to problem sheets, problem classes, mastering physics homeworks, exams and tests, deadlines, ...

Please contact Maria Georganti at : M.Georganti@soton.ac.uk