P207 Final Exam Topics

There will be 7 parts, each broken down into 2 or more questions. 2 parts will emphasize the topics we have covered since exam 3 (thermo and heat engines). Here is a list of sections of the textbook to focus on as you review. This list should be consistent with the reading list on the syllabus.

**Motion Diagrams (Chapter 1)**
You should be comfortable with all of this by now.

**Kinematics in 1D (Chapter 2)**
Same with this one too.

**Vectors (Chapter 3)**
And this too.

**Kinematics in 2D (Chapter 4.1, 4.2, 4.5, 4.6, 4.7)**
- Acceleration using vector notation (4.1, 4.2)
- We skipped projectile motion and relative motion
- Uniform circular motion (4.5, 4.6)
- We ended up needing this later on, so you should know (4.7)

**Force (Chapter 5)**
All of this

**Dynamics along a line (Chapter 6)**
All of this except you don’t need to know the details about drag (6.5), just that it is a force that depends on velocity.

**Newton #3 (Chapter 7)**
All of this

**Dynamics in a place (Chapter 8.2, 8.3)**
We skipped projectile motion

**Impulse and Momentum (Chapter 9)**
All of this

**Energy (Chapter 10)**
All of this except ‘using reference frames’ in 10.6

**Work (Chapter 11)**
All of this – and we came back to it in Chapter 17)

**Rotation of a Rigid Body (Chapter 12)**
You should be able to compute $I$ (12.4) and $CM$ (12.2) for collections of discrete objects and for distributed linear objects

Rotational KE (12.3)
Torque (12.5)
Rotational dynamics (12.6) $\tau_{ext} = I\alpha$
Rotation about a fixed axis (12.7)
Static equilibrium (12.8)
Rolling motion (12.9): we didn’t discuss, but it really just means that $v_{cm} = R\omega$
Vectors (12.10): right hand rule. I won’t ask you to work cross-products component by component
Angular momentum (12.11)

Oscillations (Chapter 14)
We covered 14.1 - 14.4 pretty thoroughly and you should know it.
We did not discuss vertical oscillations (14.5); all you need to know is that the resonant frequency is still $(k/m)^{1/2}$ just like a horizontal spring/mass.
We did not discuss the pendulum (14.6) but you had one review problem and you should know this, including the Physical Pendulum.
Damped oscillations (14.7)
Driven oscillations and resonance (14.8)

Fluids and Elasticity (Chapter 15)
Fluids (15.1)
Pressure (15.2) including hydrostatic pressure, pressure in closed tubes
Using pressure (15.3): you should know about barometers, hydraulics
Buoyancy (15.4)
Fluid dynamics (15.5)
  - continuity equation
  - Bernoulli’s equation and applications
Elasticity (15.6): we saw Young’s modulus before, now we have bulk modulus

Traveling Waves (Chapter 20.1 – 20.6)
Wave basics (20.1 – 20.3)
Waves in 2-D and 3-D (20.4): we didn’t discuss, but you should know this.
Sound and light (20.5): you should know this too but skip index of refraction
Power, intensity, dB (20.6): you should know this

Superposition (Chapter 21.1 – 21.4)
Principle of superposition (21.1)
Standing waves (21.2)
Transverse standing waves (21.3)
Standing sound waves (21.4)
Skip the rest of the chapter (although we had a HW problem related to interference, it will not be on the exam per se)

Work, Heat, 1st Law of Thermo (Chapter 17, except 17.6, 17.8)
Definition of $\Delta E_{th}$, Q, W - remember that here $W = W_{ext}$ (17.1, 17.2, 17.3)

$1^{st}$ Law of Thermodynamics: $\Delta E_{th} = W + Q$ (17.4)

Definition of specific heat (17.5, but skip 'phase change and heat of xformation')

Skip calorimetry

Specific heat of gases (17.7, but skip proof of eq. 17.38)

Skip heat xfer mechanisms (sadly – this is one of my favorite topics…)

Heat on the microscopic level (Chapter 18.1 – 18.6)

Molecular speeds (18.1, but don’t worry about mean free path)

Pressure in a gas (18.2, we discussed this in detail in lecture)

Temperature (18.3, we discussed this carefully as well)

Thermal energy and specific heat (18.4)

- you should know all of this section. I will provide the value of R

Thermal interactions and $2^{nd}$ law (18.5, 18.6)

- know this in a qualitative way

Heat Engines and Refrigerators (19.1- 19.5)

You should know all of this except the Carnot cycle (19.6, which we skipped)

You do not need to be able to draw the Otto or Brayton cycle, but if you are given a cycle (like problem 19.55 on the Review Problems) you should be able to analyze the various steps in the cycle.