

8.01L FALL 2009 LECTURE SCHEDULE

v3: 02 September 2009

WEEK 1 introduction and 1D kinematics

- Sep 07 (Mon) LABOR DAY HOLIDAY
Sep 09 (Wed) #1 a) preliminaries; b) displacement and average velocity
Sep 11 (Fri) #2 a) instantaneous velocity; b) acceleration

WEEK 2 1D and 2D kinematics; circular motion

- Sep 14 (Mon) #3 a) constant acceleration
b) acceleration near the surface of a planet
Sep 16 (Wed) #4 a) adding velocities, displacements and accelerations in 2D (and 3D)
b) projectile motion
Sep 18 (Fri) #5 a) vector kinematics: general case;
b) uniform circular motion

WEEK 3 relative motion and Newton's laws

- Sep 21 (Mon) #6 frames of reference
Sep 23 (Wed) #7 quantifying pushing and pulling
Sep 25 (Fri) #8 a) if A produces a force on B then ...
b) how to pass the first exam

WEEK 4 $\vec{a} = \vec{F}/m$ for systems of interacting masses

- Sep 28 (Mon) **no class**
Sep 29 (Tue) **EXAM #1 7:30pm Walker Memorial**
Sep 30 (Wed) #9 free body diagrams: pushing and pulling a block
Oct 02 (Fri) #10 free body diagrams with tension

WEEK 5 $\vec{a} = \vec{F}/m$ with pulleys, friction, and springs

- Oct 05 (Mon) #11 free body diagrams with friction
Oct 07 (Wed) #12 spring forces
Oct 09 (Fri) #13 THE force needed to produce (uniform) circular motion

WEEK 6 work and kinetic energy

- Oct 12 (Mon) **COLUMBUS DAY HOLIDAY, no classes**
Oct 13 (Tue) #14 the scalar product of two vectors
Oct 14 (Wed) #15 "work" produces "kinetic energy"
Oct 16 (Fri) #16 storing work energy as "potential" energy

WEEK 7 potential energy and conservation of energy

- Oct 19 (Mon) #17 conservation of energy
Oct 21 (Wed) #18 solving problems using conservation of energy
Oct 23 (Fri) #19 old problems, new methods

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| WEEK 8 | a second conserved quantity |
| Oct 26 (Mon) | #20 another conserved quantity: the momentum vector |
| Oct 28 (Wed) | #21 collisions, contrived and less contrived |
| Oct 30 (Fri) | #22 collisions in 1D |
| WEEK 9 | collisions and center of momentum frame |
| Nov 02 (Mon) | no class |
| Nov 03 (Tue) | EXAM #2 7:30pm Walker Memorial |
| Nov 04 (Wed) | #23 collisions in 2D&3D |
| Nov 06 (Fri) | #24 the motion of the center of mass |
| WEEK 10 | center of mass, simple harmonic oscillator |
| Nov 09 (Mon) | #25 THE simple harmonic oscillator (SHO) |
| Nov 11 (Wed) | VETERANS DAY HOLIDAY, no classes |
| Nov 13 (Fri) | #26 the kinetic and potential energy of the SHO |
| WEEK 11 | simple harmonic motion |
| Nov 16 (Mon) | #27 simple harmonic motion near “equilibrium:” the pendulum |
| Nov 18 (Wed) | #28 rotational kinematics of “rigid” objects |
| Nov 20 (Fri) | #29 kinetic energy of potatoes rotating about a fixed axis |
| WEEK 12 | rotation |
| Nov 23 (Mon) | #30 rotational analog of $a = F/m$ |
| Nov 24 (Tue) | EXAM #3 7:30pm Walker Memorial 50-340 |
| Nov 25 (Wed) | no class |
| Nov 27 (Fri) | THANKSGIVING VACATION, no classes |
| WEEK 13 | systems with rotation |
| Nov 30 (Mon) | #31 rolling without slipping |
| Dec 02 (Wed) | #32 rotation around different but parallel axes |
| Dec 04 (Fri) | #33 a THIRD conserved quantity: angular momentum |
| WEEK 14 | rotation and angular momentum in 3D |
| Dec 07 (Mon) | #34 torque and angular momentum as vectors |
| Dec 09 (Wed) | #35 variations on $\vec{L} = \vec{r} \times \vec{p}$ |

8.01L IAP-2009 SCHEDULE

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| IAP WEEK 1 | rotation review/Kepler’s laws |
| Jan 04 (Mon) | I#1 compare/contrast rotational/translational dynamics |
| Jan 05 (Tue) | L#1 Lab #1 |
| Jan 06 (Wed) | EXAM #4 (in class) |
| Jan 07 (Thu) | L#2 Lab #2 |
| Jan 08 (Fri) | I#2 Kepler the astro-mathematician’s 3 kinematic laws |

IAP WEEK 2 from Kepler's laws to Newton's law of gravitation

- Jan 11 (Mon) I#3 acceleration calculated from Kepler's laws #1
- Jan 12 (Tue) L#3 Lab #3
- Jan 13 (Wed) I#4 "an acceleration implies a force" – Newton
- Jan 14 (Thu) L#5 Lab #4
- Jan 15 (Fri) I#5 Newton ponders Kepler's law #3 and Jupiter's moons

IAP WEEK 3 NOW I get it ...

- Jan 18 (Mon) MARTIN LUTHER KING, JR. DAY–HOLIDAY, no classes
- Jan 19 (Tue) L#5 Lab #5
- Jan 20 (Wed) I#6 loose ends
- Jan 21 (Thu) L#6 Lab #6
- Jan 22 (Fri) I#7 review

IAP WEEK 4

- Jan 25 (Mon) **FINAL EXAM**