Classical Mechanics with MATLAB Applications

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http://www.jbpub.com/catalog/0763746363/

See also the author's website: http://www.westga.edu/~jhasbun/osp/osp.htm

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These are the text's Matlab scripts and can be used to do the text's computations.

Chapter1

ho1.m	Harmonic Oscillator, position, velocity, acceleration
ho2.m	Free fall, air resistance, position, velocity, acceleration

Chapter2

foft.m	Force as a function of time
fofx.m	Force as a function of position
fofv.m	Force as a function of velocity

Chapter3

xoft.m	Position as a function of time plot
v_and_f.m	Potential and associated force plot
over_crit.m	Overdamped and critically dample HO solutions
under_damp.m	Underdampe HO solution
drive_amp.m	Amplitude of the forced HO
drive_phase.m	Phase difference between driving force and HO solution
drive_soln.m	Solution of the forced HO and driving force plot
drive_power.m	Power supplied by the driving force to the HO versus frequency

Chapter4

inter_spr1.m	Coordinate solutions, single mode coupled spring-mass system
eigenJacobi.m	Eigenvalues, eigenvectors of a real symmetric 3X3 matrix
inter_spr2.m	Coordinate solutions for single mode coupled spring-mass system

pend0.m	A1 versus initial angle non-linear approximation of the pendulum
pend1.m	Comparison of pendulum periods
pend2.m	Pendulum solutions for various approximations and analytic
Molec.m	Solution to the two atom melecular potential model

Chapter5

gradient.m	Gradient of a function
divergence.m	Divergence of a vector
curl.m	Curl of a vector

Chapter6

parabola.m	Plots parabolas with various curvatures
projectile.m	Plots free fall projectile trajectories
projectile2.m	Compares free fall with and without drag.
cycloid2d.m	Charged particle in electric and magnetic fields in 2D.
cycloid3dm.m	Charged particle in electric and magnetic fields in 3D.

Chapter7

foucault.m	The Foucault pendulum.

Chapter8

central.m	Solution for a body under a central force.
orbit_period.m	Time to go from rmin to rmax under a force F(r)=-a*r^p.
centralu.m	Solution for a body under a central force of the form -a*r^p.
simple_orbit.m	Plots the zero force case orbit u=C*sin(theta)=1/r.
ellipse.m	Draws an ellipse of minimum radius rmin and eccentricity e.
Potential.m	Attractive potential, energy, etc., for body under a central force.
kepler3rd.m	Kepler's 3rd law for planets in the solar system.
Earthorb.m	Draws Earth's elliptical orbit around the sun.

Chapter9

gaus_sphere.m	Plots the gravitational field for a sphere of mass M.
binary1.m	Binary star system given the eccentricity.
binary2.m	Binary star system solved numerically.

Chapter10

conic1.m	Plots possible conic section curves for various eccentricities.
conic2.m	Obtains the hyperbolic projectile orbit incident on a target.
conic3.m	Simulates Rutherford scattering with analytic formulas.
ruther.m	Simulates Rutherford scattering alpha particle path numerically.
ruther_cross1.m	Plots scattering cross-section versus scattering angle, fixed target.
ruther_cross2.m	Scattering cross-section versus atomic number.
gm_ruther.m	Rutherford scattering compared with experiment.

Chapter11

particle2.m	Linear & angular momenta, energies, forces, and torques.
rocket.m	Solves the variable mass rocket equation and does simulation.
molec_mu.m	Plots the coordinates of the atoms of a free falling molecule.
theta_max.m	Plots the maximum scattering angle theta_1 versus the m2/m1.
ecoll_2d.m	Velocities in two dimensional collisions.
ruthercm_cross.m	Plots scattering cross-section versus scattering angle with recoiling target.

Chapter12

fixed_axis.m	Animates the position of a rod-mass system and angular momentum.
moment_sdisk.m	Finds the integral of 4*f(x)/pi, where f(x) is associated with the moment of a disk.
cube_princ_ax.m	Draws a cube with the principal axes based on the entered

	symmetric inertia tensor.
det_soln2_2d.m	Uses cartesian coordinates to find a rectangle's inertia tensor numerically.
r_energy.m	Finds the angular momentum of a rigid body about an axis of rotation given the angular speed.
torque_free.m	Plots the frequency and angular momentum for torque free motion of a top versus time in the body (S') frame.
torque_free_s.m	Plots the frequency and angular momentum for torque free motion of a top versus time in the body (S') frame as well as in the space frame (S).
ellipso.m	Calculates an ellipsoid inertia tensor & mass numerically.
torquef2.m	Solves Euler's equations for an ellipsoid without torques.
euler_ang.m	Shows Euler angles: phi, theta, psi; the planes and the line of nodes.
top.m	Solves Euler's equations and produces plots and simulates.

Chapter13

doublep.m	Solve the double pendulum equations of motion numerically and plots their solutions & animates the motion.
least_action.m	Simulates Hamilton's Least Action principle for a particle under the action of gravity.

There are also java applications. Please refer to the author's website: http://www.westga.edu/~jhasbun/osp/osp.htm for further information. Chapter samples from this textbook are available through the publisher's website http://www.jbpub.com/catalog/0763746363/ and http://www.jbpub.com/