

NS 541 Concepts in Physics II: Rotation and Gravitation Course Schedule

N.B.: The schedule below has not yet been adapted to the blended schedule of online and in-class meetings. Course readings may vary between course offerings.

Session 1: Uniform circular motion

Sections from Cutnell & Johnson: 5.1 – 5.4, 5.8,

Web assignment 1

Reading:

- Copernicus, N. (1989). The commentariolus. & Dedication of the revolutions of the heavenly spheres. In Matthews, M.. (Ed.) *The scientific background to modern philosophy. Selected readings.* (pp 36 –44). Indianapolis: Hackett Publishing Co.
- Newton, Principia, The Motion of Bodies, Proposition IV (Handout)
- Review Newton’s Laws of Reasoning from Shamos, page 55.

Session 2: Vertical circular motion

Sections from Cutnell & Johnson: 5.7

Philosophy/History/Education Research:

- Overview: Understanding the heliocentric model and its consequences for the development of Modern Physics
- Newton’s account of centripetal forces

Web assignment 2

Session 3: Rotational Kinematics

Sections from Cutnell & Johnson: Chapter 8

Reading:

- Cavendish, H. (1959). The law of gravitation. In Shamos (Ed.) *Great experiments in physics.* (pp. 75 – 92). New York: Holt, Rinehart and Winston.

Session 4: Torque and Rotational Inertia

Sections from Cutnell & Johnson: 9.1, 9.7

Session 5: Newton’s Second Law for Rotation

Sections from Cutnell & Johnson: 9.2, 9.3

Philosophy/History/Education Research: Cavendish and the experimental modeling of the law of gravitation

Web assignment 3

Reading:

- Novak, J. & Gowin, B. (1995). *Learning how to learn.* (pp. 14 – 34).New York: Cambridge Univ. Press
- Hesse, Mary. (1978) Action at a distance. In McMullin, E. (Ed.) *The concept of matter in modern philosophy.* (pp. 119- 125). Notre Dame: Notre Dame Univ. Press.

Session 6: Rotational Dynamics

Sections from Cutnell & Johnson: 9.4
Lab activity: Torque and Moments of Inertia

Session 7: Angular Momentum

Sections from Cutnell & Johnson: 9.6
Lab activity: Conservation of Angular Momentum
Philosophy/History/Education Activity: Understanding and discussing ‘action at a distance.’ Exploring and comparing models from Aristotle to Newton of curved motion and inertial frame through group concept-mapping.
Web assignment 4

Reading:

- Scherr, R.E. & Redish, E.F. (2005) Newton's Zeroth Law: Learning from Listening to Our Students. *Phys. Teach.* 43, 41-45.
- Trumper, R. (1996). Teaching about energy through a spiral curriculum: guiding principles. *Journal of Curriculum and Supervision*, 12, 66 –75.

Session 8: Rotational Kinetic Energy and Rolling

Sections from Cutnell & Johnson: 9.5
Midterm test

Session 9: Gravitation; Superposition of Forces

Sections from Cutnell & Johnson: 4.7
Web assignment 5

Session 10: Gravitational Field

Readings: class notes
Philosophy/History/Education Research: Misconceptions on gravitation and on energy.

Session 11: Gravitational Potential Energy

Sections from Cutnell & Johnson: 5.5 – 5.6
Web assignment 6

Session 12: Gravitational potential; Kepler’s Laws

Readings: class notes
Philosophy/History/Education Research: Students’ presentations.

Session 13: Wrap-up

Philosophy/History/Education Research: Students’ presentations.
Take-home exam.
Course evaluation.

Bibliography

Selections from primary sources

Copernicus, N. (1989). The commentariolus. & Dedication of the revolutions of the heavenly spheres. In Matthews, M. (Ed.) *The scientific background to modern philosophy. Selected readings*. (pp 36 –44). Indianapolis: Hackett Publishing Co.

Newton, I. (2002). *Principia*. (pp. 1-11). Philadelphia: Running Press.

Cavendish, H. (1959). The law of gravitation. In Shamos (Ed.) *Great experiments in physics*. (pp. 75 – 92). New York: Holt, Rinehart and Winston.

Selections from secondary sources

Hesse, Mary. (1978) Action at a distance. In McMullin, E. (Ed.) *The concept of matter in modern philosophy*. (pp. 119-125). Notre Dame: Notre Dame Univ. Press.

Selections from Physics and Science Education Research Literature

Novak, J. & Gowin, B. (1995). *Learning how to learn*. (pp. 14 – 34). New York: Cambridge Univ. Press.

Scherr, R.E. & Redish, E.F. (2005) Newton's Zeroth Law: Learning from Listening to Our Students. *Phys. Teach.* 43, 41-45.

Trumper, R. (1996). Teaching about energy through a spiral curriculum: guiding principles. *Journal of Curriculum and Supervision*, 12, 66 –75.