

## NS 549 Everyday Applications of Physics 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: Seesaws.**

Review of rotational inertia, torque, angular velocity, angular acceleration, Newton's first and second laws of rotation, center of mass, and levers.

*Readings from Chapter 2 of How Things Work*

*Assignment:* Selected questions from chapter 2

#### **Reading assignment for next Friday:**

- De Boer, G. (1991). Process and product in science education. In *A history of ideas in science education. Implications for practice.* (pp. 190 – 214). New York: Teachers College Press.

### **Session 2: Carousels and Roller Coasters.**

Review of uniform circular motion and centripetal acceleration.

*Readings from Chapter 3 of How Things Work*

*Philosophy/History/Education Research:* Overview of the recent history of ideas on science teaching and learning methods.

*Assignment:* Selected questions from chapter 3

### **Session 3: Bicycles**

Review of unstable equilibrium, static and dynamic stability, and precession)

*Readings from Chapter 4 of How Things Work*

*Assignment:* Selected questions from chapter 4

#### **Reading assignment for next Friday:**

- Novak, J. (1979). The reception learning paradigm. *Journal of Research in Science Teaching*, 16, 481 – 488.
- Kaufmann, B. (1971). Psychological implications of learning science. *Science Education*, 55, 73 – 83.

### **Session 4: Rockets and Space Travel**

Review of reaction forces, Newton's law of gravitation, elliptical orbits, Kepler's laws, special and general relativity, and the equivalence principle.

*Readings from Chapter 4 of How Things Work*

*Philosophy/History/Education Research:* Controversies on inquired-based learning vs. non-inquiry based learning. I

*Assignment:* Selected questions from chapter 4

### **Session 5: Airplanes**

Review of streamlining, lifting wing, angle of attack, induced drag, stalled wing, and thrust.

*Readings from Chapter 6 of How Things Work*

*Assignment:* Selected questions from chapter 6

**Reading assignment for next Friday:**

- Babikian, Y. (1971). An empirical investigation to determine the relative effectiveness of discovery, laboratory and expository methods of teaching science concepts. *Journal of Research in Science Teaching*, 8, 201 – 209.
- Spears, B. & Zollman, D. (1977). The influence of structured versus unstructured laboratory on students' understanding the process of science. *Journal of Research in Science Teaching*, 14, 33 – 38.

**Session 6: Air Conditioners**

Review of the laws of thermodynamics, temperature, heat, entropy, heat pumps and thermodynamic efficiency

*Readings from Chapter 8 of How Things Work*

*Philosophy/History/Education Research: Controversies on inquired-based learning vs. non-inquiry based learning II: examining experimental data*

*Assignment: Selected questions from chapter 8*

**Session 7: Automobiles.**

Review of heat engines and thermodynamic efficiency.

*Readings from Chapter 8 of How Things Work*

*Assignment: Selected questions from chapter 8*

**Reading assignment for next Friday:**

- Kuhn, T. (2000). On learning physics. *Science and Education*, 9(1-2), 1 –10.
- Andersen, H. Learning by ostension: Thomas Kuhn on science education. *Science and Education*, 9(1-2), 91 –106.

**Session 8: Clocks**

Review of time and space, natural resonance, harmonic oscillators, simple harmonic motion, frequency.

*Readings from Chapter 9 of How Things Work*

*Philosophy/History/Education Research: Kuhn on learning physics.*

*Assignment: Selected questions from chapter 9*

**Session 9: Xerographic copiers.**

Review of electric fields and voltage gradients, relationships between shape and field, discharges, electric current, direction of current flow, charging by induction.

*Readings from Chapter 10 of How Things Work*

*Assignment: Selected questions from chapter 10*

**Session 10: Project Presentations.**

**Session 11: Project Presentations.**

**Session 12: Project Presentations.**

**Session 13: Final Examination.**

## Bibliography

### Selections from Science Education Research Literature

De Boer, G. (1991). Process and product in science education. In *A history of ideas in science education. Implications for practice.* (pp. 190 – 214). New York: Teachers College Press.

Novak, J. (1979). The reception learning paradigm. *Journal of Research in Science Teaching*, 16, 481 – 488.

Kaufmann, B. (1971). Psychological implications of learning science. *Science Education*, 55, 73 – 83.

Kuhn, T. (2000). On learning physics. *Science and Education*, 9(1-2), 1 –10.

Andersen, H. Learning by ostension: Thomas Kuhn on science education. *Science and Education*, 9(1-2), 91 –106.

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