

Readings

These are suggested readings, and they are a good start for your research and perfectly valid as assignments

1. **Science as Falsification** Karl Popper, 1963 https://www.dropbox.com/s/siwobu7fitqdrq5/KPopper_Science%20as%20Falsification.pdf?dl=0
2. Information and the Nature of Reality: From Physics to Metaphysics; Paul Davies and Neils Heinrick Gregerson, eds.
 1. **From matter to materialism and (almost) back** https://www.dropbox.com/s/z1pmhlenlr5zo5p/Information-and-the-Nature-of-Reality_EMcMullin.pdf?dl=0; Ernan McMullin. p30-54 >The matter concept has had an extraordinarily complex history, dating back to the earliest days of the sort of reflective thought that came to be called 'philosophy'. History here, as elsewhere, offers a valuable means of understanding the present, so it is with history that I will be concerned – history necessarily compressed into simplified outline.
 2. **Unsolved dilemmas: the concept of matter in the history of philosophy and in contemporary physics** https://www.dropbox.com/s/ewwe7tl4notajlv/CLAYTON_Unsolved-dilemmas-the-concept-of-matter-in-the-history-of-philosophy-and-in-contemporary-physics.pdf?dl=0; Philip Clayton. p55-79. >By the end of the modern period, a particular world view had become firmly entrenched in the public understanding. Unlike most philosophical positions, which are sharply distinguished from scientific theories, this world view was widely seen as a direct implication of science, and even as the sine qua non for all scientific activity. For shorthand, let's call this view "materialism."
3. Materials: Engineering, Science, Processing and Design; Ashby, Shercliff, Cebon
 1. **Chapter 1 Introduction: materials--history and character** https://www.dropbox.com/s/oiiuu4c5feau2z2/Materials%20Engineering_Introduction-%20materials%E2%80%94%20history%20and%20character.pdf?dl=0; p14-24 Ashby, Shurcliff, Cebon
 2. **Chapter 2 Family trees: organizing materials and processes** https://www.dropbox.com/s/okbl9q33ax7noon/Materials%20Engineering_Family%20trees-%20organizing%20materials%20and%20processes.pdf?dl=0; p26-41 Ashby, Shurcliff, Cebon
4. Materials Science and Engineering : An Introduction; Callister, William, Rethwisch, David
 1. **Chapter 3 The Structure of Crystalline Solids** https://www.dropbox.com/s/p34ufzjbhvn9hww/Materials%20Science%20and%20Engineering_The%20Structure%20of%20Crystalline%20Solids.pdf?dl=0; Callister. p79-132.
 2. **Chapter 6 Mechanical Properties of Metals** https://www.dropbox.com/s/1j0xl78vydjqxi9/Materials%20Science%20and%20Engineering_Mechanical%20Properties%20of%20Metals.pdf?dl=0; Callister. p196-243; 2014.
 3. **Chapter 14 Polymer Structures** https://www.dropbox.com/s/e5j3d0g57p02vis/Materials%20Science%20and%20Engineering_Polymer%20Structures.pdf?dl=0; Callister. p573-607; 2014.
 4. **Chapter 5.15 Plastics** https://www.dropbox.com/s/89ll6htu4srnjv7/Materials%20Science%20and%20Engineering_Plastics.pdf?dl=0; Callister. p633-635; 2014.
 5. **Chapter 18 Electrical Properties** https://www.dropbox.com/s/c0gdhkgoo50fiwp/Materials%20Science%20and%20Engineering_Electrical%20Properties.pdf?dl=0; Callister. p753-812; 2014.
 6. **Chapter 19 Thermal Properties** https://www.dropbox.com/s/ftbvqr5lpcdkpv9/Materials%20Science%20and%20Engineering_Thermal%20Properties.pdf?dl=0; Callister. p813-830; 2014.
 7. **Chapter 20 Magnetic Properties** https://www.dropbox.com/s/d83d7ktgejrp50v/Materials%20Science%20and%20Engineering_Magnetic%20Properties.pdf?dl=0; Callister. p831-865; 2014.
 8. **Chapter 21 Optical Properties** https://www.dropbox.com/s/dvo5rk3fc47hmb5/Materials%20Science%20and%20Engineering_Optical%20Properties.pdf?dl=0; Callister. p866-895; 2014.
5. **MATTER MATTERS** <https://www.dropbox.com/s/b580edckyzlkhyi/DeLanda-Manuel-Matter-Matters.pdf?dl=0> by Manuel DeLanda;
6. **On the six-cornered snowflake** https://www.dropbox.com/s/lsni2psywe8yn6c/Kepler_on-the-six-cornered-snowflake.pdf?dl=0; Kepler, 1611

Kepler writes that he had noticed a snowflake on the lapel of his coat as he crossed the Charles Bridge in Prague, and so

came to ponder on its remarkable geometry. This charming, witty work seeded the notion from which all of crystallography blossomed: that the geometric shapes of crystals can be explained in terms of the packing of their constituent particles.

7. The Chemical History of a Candle; Michael Faraday; 1861

1. [Lecture 1: A Candle: The Flame - Its Sources - Structure - Mobility - Brightness](https://www.dropbox.com/s/dcn6sewifnjwlg9/The%20Chemical%20History%20of%20a%20Candle_1.pdf?dl=0) (https://www.dropbox.com/s/dcn6sewifnjwlg9/The%20Chemical%20History%20of%20a%20Candle_1.pdf?dl=0)
2. [Lecture 2: Brightness of the Flame - Air necessary for Combustion - Production of Water](https://www.dropbox.com/s/082n6rsq8bko01l/The%20Chemical%20History%20of%20a%20Candle_2.pdf?dl=0) (https://www.dropbox.com/s/082n6rsq8bko01l/The%20Chemical%20History%20of%20a%20Candle_2.pdf?dl=0)
3. [Lecture 3: Products: Water from the Combustion - Nature of Water - A Compound - Hydrogen](https://www.dropbox.com/s/iw1kcu9ty9rbl6/The%20Chemical%20History%20of%20a%20Candle_3.pdf?dl=0) (https://www.dropbox.com/s/iw1kcu9ty9rbl6/The%20Chemical%20History%20of%20a%20Candle_3.pdf?dl=0)
4. [Lecture 4: Hydrogen in the Candle - Burns into Water - The Other Part of Water - Oxygen](https://www.dropbox.com/s/9qwfqzk9wltr7te/The%20Chemical%20History%20of%20a%20Candle_4.pdf?dl=0) (https://www.dropbox.com/s/9qwfqzk9wltr7te/The%20Chemical%20History%20of%20a%20Candle_4.pdf?dl=0)
5. [Lecture 5: Oxygen present in the Air - Nature of the Atmosphere - Its Properties - Other Products from the Candle - Carbonic Acid - Its Properties](https://www.dropbox.com/s/c1cf8xqwmxtzja/The%20Chemical%20History%20of%20a%20Candle_5.pdf?dl=0) (https://www.dropbox.com/s/c1cf8xqwmxtzja/The%20Chemical%20History%20of%20a%20Candle_5.pdf?dl=0)
6. [Lecture 6: Carbon or Charcoal - Coal Gas Respiration and its Analogy to the Burning of a Candle - Conclusion](https://www.dropbox.com/s/q8r5swmzdhftpr/The%20Chemical%20History%20of%20a%20Candle_6.pdf?dl=0) (https://www.dropbox.com/s/q8r5swmzdhftpr/The%20Chemical%20History%20of%20a%20Candle_6.pdf?dl=0)

8. Stuff Matters: Exploring the Marvelous Materials That Shape Our Man-Made World; Mark Miodownik (May 27, 2014)

1. [Chocolate](https://www.dropbox.com/s/qhpoawco88j9h7z/Stuff%20Matters_CHOCOLATE.pdf?dl=0) (https://www.dropbox.com/s/qhpoawco88j9h7z/Stuff%20Matters_CHOCOLATE.pdf?dl=0)
2. [Concrete](https://www.dropbox.com/s/sbmp91p5okym8kx/Stuff%20Matters_CONCRETE.pdf?dl=0) (https://www.dropbox.com/s/sbmp91p5okym8kx/Stuff%20Matters_CONCRETE.pdf?dl=0)
3. [Foam](https://www.dropbox.com/s/a2n7xn7654whyp4/Stuff%20Matters_FOAM.pdf?dl=0) (https://www.dropbox.com/s/a2n7xn7654whyp4/Stuff%20Matters_FOAM.pdf?dl=0)
4. [Glass](https://www.dropbox.com/s/3262j6lnmu8tgg/Stuff%20Matters_GLASS.pdf?dl=0) (https://www.dropbox.com/s/3262j6lnmu8tgg/Stuff%20Matters_GLASS.pdf?dl=0)
5. [Graphite](https://www.dropbox.com/s/47j93a6p84v8eeq/Stuff%20Matters_GRAPHITE.pdf?dl=0) (https://www.dropbox.com/s/47j93a6p84v8eeq/Stuff%20Matters_GRAPHITE.pdf?dl=0)
6. [Implants](https://www.dropbox.com/s/be6ew17akjrclt7/Stuff%20Matters_IMPLANTS.pdf?dl=0) (https://www.dropbox.com/s/be6ew17akjrclt7/Stuff%20Matters_IMPLANTS.pdf?dl=0)
7. [Paper](https://www.dropbox.com/s/e1du095jszo1ljz/Stuff%20Matters_PAPER.pdf?dl=0) (https://www.dropbox.com/s/e1du095jszo1ljz/Stuff%20Matters_PAPER.pdf?dl=0)
8. [Porcelain](https://www.dropbox.com/s/fv89jtkphfh4gj7/Stuff%20Matters_PORCELAIN.pdf?dl=0) (https://www.dropbox.com/s/fv89jtkphfh4gj7/Stuff%20Matters_PORCELAIN.pdf?dl=0)
9. [Steel](https://www.dropbox.com/s/955ow5ytkhp1pis/Stuff%20Matters_STEEL.pdf?dl=0) (https://www.dropbox.com/s/955ow5ytkhp1pis/Stuff%20Matters_STEEL.pdf?dl=0)

9. The Ten Most Beautiful Experiments, by George Johnson

1. [Galvani: Animal Electricity](https://www.dropbox.com/s/od5xlok321hg4j0/Galvani_animalelectricity.pdf?dl=0) (https://www.dropbox.com/s/od5xlok321hg4j0/Galvani_animalelectricity.pdf?dl=0)
2. [Lavoisier: Burning Diamonds](https://www.dropbox.com/s/xx4qipoue220998/Lavoisier_heat.pdf?dl=0) (https://www.dropbox.com/s/xx4qipoue220998/Lavoisier_heat.pdf?dl=0)
3. [Faraday: Electromagnets](https://www.dropbox.com/s/lzxshg3lk14yl1w/Faraday_hidden.pdf?dl=0) (https://www.dropbox.com/s/lzxshg3lk14yl1w/Faraday_hidden.pdf?dl=0)
4. [Michelson: Does movement through space effect light?](https://www.dropbox.com/s/pxi1kn9hgjkuv51/Michelson_space.pdf?dl=0) (https://www.dropbox.com/s/pxi1kn9hgjkuv51/Michelson_space.pdf?dl=0)
5. [Newton: What Color Is](https://www.dropbox.com/s/hl2ie0cwof5oma/Newton_color.pdf?dl=0) (https://www.dropbox.com/s/hl2ie0cwof5oma/Newton_color.pdf?dl=0)

Other Materials, by Subject

1. FRICTION

1. [Walter Lewin lecture on Friction](http://ocw.mit.edu/courses/physics/8-01-physics-i-classical-mechanics-fall-1999/video-lectures/lecture-8/) (http://ocw.mit.edu/courses/physics/8-01-physics-i-classical-mechanics-fall-1999/video-lectures/lecture-8/)

2. WOOD

1. [Understanding Wood Ch1: The Nature of Wood](https://www.dropbox.com/s/i852ic8ce20wr5k/UnderstandingWood_ch1.pdf?dl=0) (https://www.dropbox.com/s/i852ic8ce20wr5k/UnderstandingWood_ch1.pdf?dl=0)
2. [Understanding Wood Ch9: Machining and Bending Wood](https://www.dropbox.com/s/g0aqap2oyz48cwi/UnderstandingWood_ch9.pdf?dl=0) (https://www.dropbox.com/s/g0aqap2oyz48cwi/UnderstandingWood_ch9.pdf?dl=0)

3. BUOYANCY

1. [W Lewin on Buoyancy & Bernoulli's Equation](http://ocw.mit.edu/high-school/physics/demonstrations-on-video/fluid-mechanics/buoyancy-bernoullis-equation/) (http://ocw.mit.edu/high-school/physics/demonstrations-on-video/fluid-mechanics/buoyancy-bernoullis-equation/)

4. CONDUCTIVITY: ELECTRICITY, HEAT, SOUND, LIGHT

1. [rainbows](http://ocw.mit.edu/courses/physics/8-03sc-physics-iii-vibrations-and-waves-fall-2012/unit-iv-applications/lecture-22/) (http://ocw.mit.edu/courses/physics/8-03sc-physics-iii-vibrations-and-waves-fall-2012/unit-iv-applications/lecture-22/)

5. RESONANCE

1. [Tacoma Narrows Bridge](https://www.youtube.com/watch?v=j-zczJXSxnw) (<https://www.youtube.com/watch?v=j-zczJXSxnw>)



(<https://www.youtube.com/watch?v=j-zczJXSxnw>)

2. [Upright Bass string displacement captured by scanning camera](https://vimeo.com/4041788) (<https://vimeo.com/4041788>)
3. [Interactive Wolfram demo: Transverse Standing Waves](http://demonstrations.wolfram.com/TransverseStandingWaves/) (<http://demonstrations.wolfram.com/TransverseStandingWaves/>)
4. MIT Physics III: Vibrations and Waves N.B. This is not an easy-going class, but you may find it useful. *In addition to the traditional topics of mechanical vibrations and waves, coupled oscillators, and electro-magnetic radiation, students will also learn about musical instruments, red sunsets, glories, coronae, rainbows, haloes, X-ray binaries, neutron stars, black holes and big-bang cosmology.*
 1. [Lecture 2: Beats, Damped Free Oscillations, Quality Q](http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-2/) (<http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-2/>) Topics covered: Beats - Damped Free Oscillations (Under- Over- and Critically Damped) - Quality Q. Instructor/speaker: Prof. Walter Lewin
 2. [Lecture 3. Forced Oscillations with Damping, Destructive Resonance](http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-3/) (<http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-3/>)
 3. [Lecture 8: Traveling Waves, Sound Waves and Energy in Waves](http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-8/) (<http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-8/>) Topics covered: Traveling Waves - Boundary Conditions - Standing Waves - Sound (Longitudinal Waves) - Energy in Waves.
 4. [Lecture 9: Chladni plates](http://ocw.mit.edu/courses/physics/8-03sc-physics-iii-vibrations-and-waves-fall-2012/unit-ii-waves/lecture-9/) (<http://ocw.mit.edu/courses/physics/8-03sc-physics-iii-vibrations-and-waves-fall-2012/unit-ii-waves/lecture-9/>) Topics covered: Musical Instruments - Sound Cavities - Normal Modes
 5. [Lecture 11: Fourier Analysis, Time Evolution of Pulses on Strings](http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-11/) (<http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-11/>) Topics covered: Fourier Analysis - Time Evolution of Pulses on Strings.
 6. [Lecture 13: Electromagnetic Waves, Polarization](http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-13/) (<http://ocw.mit.edu/courses/physics/8-03-physics-iii-vibrations-and-waves-fall-2004/video-lectures/lecture-13/>) Topics covered: Electromagnetic Waves - Plane Wave Solutions to Maxwell's Equations - Polarization - Malus' Law
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