For the first time in human thought it is now possible to both measure and understand the overall distribution of matter in the Universe, and as a result to observationally determine how much matter is in the Universe as a whole, without needing to actually see it. These observations strongly support the "Concordance Model" of Hot Big Bang Cosmology, and reinforce earlier indications that ordinary matter (everything we learn about in school: atoms, nuclei and electrons) make up at present at most 4% of the total of the Universal energy density. The big surprise was that the rest consists of *two* kinds of unknown forms of matter: the so-called Dark Matter and Dark Energy. These lectures summarize the various lines of evidence for their existence, why it makes sense to trust the model despite it requiring so many unseen constituents, and some of the theoretical ideas that have been proposed to account for their properties.

Below some lecture notes on General Relativity and Cosmology aimed at undergraduate students, that can be found at

https://www.physics.mcmaster.ca/~cburgess/cburgess/?page_id=630

and Daniel Baumann has very good graduate lectures online for cosmology at:

http://cosmology.amsterdam/education/cosmology/

Some textbooks on gravity:

1. C.M. Will, Theory and Experiment in Gravitational Physics (Revised Edition), Cambridge University Press, 1993.

2. S. Carroll, An Introduction to General Relativity Spacetime and Geometry, Addison Wesley 2004. [Modern and well written]

3. S. Weinberg, Gravitation and Cosmology: Principles and Applications of the General Theory of Relativity, Wiley 1972. [The timeless classic – very physical]

4. C. Misner, K. Thorne and J. Wheeler, Gravitation, Freeman and Company 1970. [Encyclopedic, with many layers of insight]

5. R. Wald, General Relativity, University of Chicago 1984. [More mathematical, with an emphasis on modern differential geometry]

6. S. Chandrashekhar, The Mathematical Theory of Black Holes, Oxford University Press 1992.

7. S.L. Shapiro and S.A. Teukolsky, Black Holes, White Dwarfs and Neutron Stars: The physics of compact objects, Wiley 1983.

Textbooks on cosmology:

1. P.J.E. Peebles, Principles of Physical Cosmology, Princeton University Press (1993).

2. B. Ryden, Introduction to Cosmology, Pearson Education 2003. [A good undergraduate introduction to modern cosmology]

3. S. Dodelson, Modern Cosmology, Academic Press 2003. [A good, but more advanced, introduction to modern cosmology.]

4. A. Linde, Particle Physics and Inflationary Cosmology, Harwood Academic Publishers (1990).

5. E. W. Kolb and M. S. Turner, The Early Universe, Addison-Wesley (1990).

6. A. R. Liddle and D. H. Lyth, Cosmological Inflation and Large-Scale Structure, Cambridge University Press (2000).

7. S. Weinberg, Cosmology, Oxford University Press (2008).