

Course Code 300.1	Natural Sciences	Credit Hours: 03
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(For the faculties of Arts & Social Sciences, Education, Islamic Studies, Law and Management & Administrative Sciences)

Objective:

The course lays a foundation for the pedagogical knowledge of science and scientific research. It covers the core concepts in physical science, life science, and earth science, thus supports the development of conceptual understanding of science among students of diversified background.

Course Outcomes:

After the completion of this course, students will be able to:

- Clearly articulate the development of scientific methods, comparison of modern scientific methods and their role in society.
- Understand various branches of science, their core ideas, and their applications.

Course Content:

- Overview of Science and the Scientific Methods. The nature of science and scientific investigation (observations and inferences). Role of science in today's society and understand limitations of the modern scientific method. Scientific research and scientific communication. Introduction to core ideas and important theories of Science and their relationship with various professions/fields.
- Biology and its branches. Role of chemistry in biological sciences. Cell biology and mechanisms of diseases. DNA, Genes, Genomes, and Protein.
- Chemistry and its branches. Physical properties of matter, including melting point, boiling point, hardness, density, and conductivity. States of matter: solid, liquid, gas. Atoms, molecules, mixtures, elements, and compounds. Introduction to the periodic table. Atomic theories. Chemistry of carbon compound.
- Physics and its branches. Relationship among force, mass, energy, speed and motion. Non-linear motion and accelerated motion. Basic laws related to pressure, temperature and motion.
- Earth Sciences and its branches. Introduction to Solar system. Earth: an inhabitable planet. Climate and seasons. Introduction to mineral, rocks, and their basic properties. Introduction to important phenomena like magmatism, volcanism, earthquakes, weathering and erosion, deposition etc. maps. Introduction to renewable and non-renewable resources.

Recommended Books:

1. Hauptvogel, D., Sisson, V. and Comas, M., (2024). Investigating the Earth: Exercises for Physical Geology, Pressbooks, Houston, TX: UH Libraries
2. Raymond, C., (2022). Chemistry, 14th Edition, Mc Graw Hill.
3. Minnett, M., and Daniels, B.G., (2022). A practical guide to introductory geology, Mount Royal University Library.
4. Earle, S., (2019). Physical Geology, 2nd Edition. Victoria, B.C.: BCcampus. Retrieved from <https://opentextbc.ca/physicalgeology> EBOOK ISBN978-1-77420-028-5
5. Nivaldo, J., (2018). Chemistry in Focus, 7th Edition. ISBN-13: 978-1337399692, ISBN-10: 9781337399692.

6. McClellan III, J.E. and Dorn, H., (2016). Science and Technology in World History: An Introduction. Second Edition. Johns Hopkins University Press – pp 39-45, 55-62
7. Chalmers, A., (2015). *What Is This Thing Called Science?* 4th ed. Indianapolis: Hackett Publishing Company, Inc., pp.77-99.
8. Hewitt, P.G., (2015). Conceptual Physics, 12th Edition., City College of San Francisco, Pearson
9. Kelly, J., Sadeghieh, T., and Adeli, K. (2014). Peer Review in Scientific Publications: Benefits, Critiques, & A Survival Guide. EJIFCC, 25(3), 227–243.
10. Ralph, H.P., (2011). General Chemistry: Principles and Modern Applications, 10th Edition. Pearson, Canada, Toronto.
11. Brady, J.E., (1992). Chemistry: The Study of matter and its changes. John Wiley & sons, Inc.
12. Lederman, N., and Abd-El-Khalick, F. ‘Avoiding De-Natured Science: Activities That Promote Understandings of the Nature of Science’. Retrieved from: http://toolbox.learningfocused.com/data/0000/0014/2125/Teaching_the_NatOSci.pdf.
13. Understanding Science is a website that communicates what science is and how it works: <http://undsci.berkeley.edu/index.php>.

Course Code 300.1	Natural Sciences	Credit Hours: 03
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(For the faculties of Science, Engineering, and Medicine)

Objective:

The course lays a foundation for the pedagogical knowledge of science and scientific research and communication. It supports the development of conceptual understanding of science among students of diversified background.

Course Outcomes

After the completion of this course, students will be able to:

- Clearly articulate the development of scientific methods, comparison of modern scientific methods and their role in society.
- Comprehend causes and consequences of climate change, and discuss measures to curb global greenhouse gas emissions.
- Understand variable renewable systems including solar cells, wind hydro power, geothermal and bio-energy systems
- Understand the revolutionary trends in modern science.

Course Content:

- Overview of Science and the Scientific Methods. Science in personal and social perspective. The nature of science and scientific investigation (observations and inferences). Role of science in today's society and understand limitations of the modern scientific method. Scientific research and scientific communication.
- General classification of organisms. Habitats and Ecosystem. Cell biology and mechanisms of diseases. DNA, Genes, Genomes, and Protein.
- Chemistry and its branches. Physical properties of matter, including melting point, boiling point, hardness, density, and conductivity. States of matter: solid, liquid, gas. Atoms, molecules, mixtures, elements, and compounds. Introduction to the periodic table. Atomic theories. Chemistry of carbon compound. Introduction to basic analytical techniques and instruments.
- Forms of Energy, Energy Conversion. Sustainability of Energy Systems. Solar cells. Photoelectric effect. Introduction to Wind energy, Hydro Power, Bio Energy, Geothermal Energy, Tidal and Wave Energy. Energy needs, available resources, renewable vs. nonrenewable, challenges of current practices.
- Introduction to important branches of geology: paleontology, geophysics, sedimentology etc. Introduction to mineral, rocks, and their basic properties. Maps; types and applications. Geologic History and Planetary Processes.
- Climate constrains ecosystems and ecosystems impact global climate. Greenhouse effect Carbon emission scenarios and Sustainability. Introduction to renewable and non-renewable resources.
- Introduction to some emerging fields of science. Nanotechnology and its future applications in Medicine, Food, Computational Systems, Energy. Biotechnology. Future of foods: Agricultural production, consumption and nutrition. Genetic Modification: CRISPR, Gene Therapy. Exobiology – Life and humans outside of Earth.

Recommended Books:

1. Sedimentology and Stratigraphy by Nichols, G. 2023 (3rd ed.), Willy, ISBN: 978-1-119-41727-9
2. Raymond, C., (2022). Chemistry, 14th Edition, Mc Graw Hill.
3. Paleontology: An Illustrated History Hardcover by David, B. 2022, Princeton University Press; ISBN-10: 0691220921
4. Earle, S., (2019). Physical Geology, 2nd Edition. Victoria, B.C.: BCcampus. Retrieved from <https://opentextbc.ca/physicalgeology> EBOOK ISBN978-1-77420-028-5
5. Mineralogy: An Introduction to Minerals, Rocks, and Mineral Deposits by Martin O. and Frimmel, H.E. 2020, Springer: ISBN 978-3-662-57316-7
6. Nivaldo, J., (2018). Chemistry in Focus, 7th Edition. ISBN-13: 978-1337399692, ISBN-10: 9781337399692.
7. McClellan III, J.E. and Dorn, H., (2016). Science and Technology in World History: An Introduction. Second Edition. Johns Hopkins University Press – pp 39-45, 55-62
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13. Lederman, N., and Abd-El-Khalick, F. ‘Avoiding De-Natured Science: Activities That Promote Understandings of the Nature of Science’. Retrieved from: http://toolbox.learningfocused.com/data/0000/0014/2125/Teaching_the_NatOSci.pdf.
14. Understanding Science is a website that communicates what science is and how it works: <http://undsci.berkeley.edu/index.php>.
15. Timeline of important advances in medical biotechnology - <https://geneticliteracyproject.org/2020/09/08/>