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CHM 523-01

Course: Chemistry of Mind, **Fall 2025**

Instructor: Dr. B. R. Singh

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Office hours: Thurs 10-11 AM Boston time, or by appointment.

Course objective:

Objective this course is demonstrate and practice through exercises the basis of scientific theory, principles, and laws resulting in the knowledge. By using examples of neuroscience and chemistry an attempt would be made to learn how scientific knowledge is created, and what happens to the knowledge. In the process, it is expected students will learn how to use the mind to create knowledge, and in the process learn about the mind itself.

Text: Because the topics of this course are wide-ranging, a single textbook is not available for the course. However, the following books are recommended to refer to the fundamental topics. A lot of material will be covered from published literature. Extensive references to the literature and supplementary material will be provided.

1. Fundamental Neuroscience – Zigmond, Bloom, Landis, Roberts and Squire; Academic Press, 1999; 2008

2. The Astonishing Hypothesis: The Scientific Search for the Soul – Francis Crick; Maxwell Macmillan International, New York, 1994

3. Principles of Physical Biochemistry, K. E. van Holde, W. C. Johnson and P. S. Ho; Prentice Hall, 1998

4. States of Matter States of Mind – Allan Barton; Institute of Physics Publishing, Bristol, 1997

5. What is Life? And Mind and Matter – Erwin Schrodinger, Cambridge University Press, 1967

Grading:

Final grades will be awarded based on 2 best quizzes (20%), a mid term examination (25%), the final examination (25%).

Students will be required to present two short seminars based on a hypothesis-based term paper to be written on a topic integrating the concept of mind with chemistry. The presentation and the term paper will be worth 30% of the final grade.

Course outline and tentative lecture schedules:

1. Introduction to Mind and Chemistry – chemical and philosophical concept of mind and consciousness, Crick's and Schrodinger's concept of mind and soul (Lecture 1)

2. Mind and Creation of Science - mind and matter, concepts of science, ideal gas and kinetic theory of gases, origin of thermodynamics and the concept of inefficiency (Lecture 2)

2. Models of Mind - thermodynamic (free energy and entropy) and quantum (states) models of mind (Lectures 3-5)

2. Physical Instruments of Mind – general description of nervous system, evolution of nervous system in animals, common and distinct features of different nervous systems (Lectures 6-7)

3. Tools of Mind – Sensory and motor nervous systems (inter- and intra-systemic relationships, regulatory nervous system (Lecture 8)

4. Mode of Action of Mind – electronic properties of axon and dendrites, thermodynamics of membrane potential and action potential, neurotransmitters and their release (Lectures 8-9)

4. Origin of Mind – Is the brain cause or result of mind? Mind as a creator or perceiver (Lecture 10)

7. Chemical Basis of Mind – chemical analogies, description, hypotheses and explanation of mind (student presentations) (Lectures 11-12)

8. Regulation of Mind – yoga, meditation, art, nature, and environmental influence on mind (Lecture 13)