Course Title: Physical Chemistry-II
Course Code: CH-382
Credit Hours: 3-1
Pre-requisite: Nil

Course Objectives

1. This course aims to cover advanced topics of Physical Chemistry. It will include demonstration of advanced lab work. Students will get introduction to nuclear chemistry, electro and photochemistry etc. Also they will get familiar to the renewable energy materials. CH-382, "Physical Chemistry III will provide a broader overview of important Physical Chemistry topics. It will also give students the hand on experimental determination of the physical chemistry

2. Detailed Contents

a. Nuclear Chemistry. Atomic nucleus, nuclides, nuclear stability, modes of decay, nuclear energetics, nuclear models (shell + liquid drop model), fusion and fission, non-spontaneous nuclear processes, nuclear reactors, beta decay systematic, nuclear spins.

b. Group Theory. Symmetry and symmetry operations. Point groups. Properties of groups, matrices, transformation of matrices, character tables and their applications in molecular spectroscopy.

c. Photochemistry. Principles of photochemistry. Laws of photochemistry. Einstein's law of photochemical equivalence. Rates of intramolecular processes. Chemical reactions and their quantum yields. Hydrogen – bromine and hydrogen – chlorine reactions.

d. Energy Materials. Available energy resources, Energy Crises, Fossil fuel depletion, Possible solutions. Renewable energy resources. Semiconductor photocatalysis. Applications. Interfaces. Hetero-junctions.

3. Course Outcomes. On successful completion of the course the student will be able to:

   a. Demonstrate knowledge of about nuclear chemistry, photochemistry and electrochemistry.
   b. Get idea about energy crisis possible renewable energy resources.
   c. Apply concepts of Chemistry (e.g chemical thermodynamics, kinetics, and solution, electro etc.).

4. Recommended Books

TEXT BOOKS.

   a. Chang, R., "General Chemistry: The Essential Concepts ," 5th Ed., Mc. Graw Hill, 2008.
   b. Atkins, P., de Paula, J., "Physical Chemistry ", 10th Ed., W.H. Freeman and Company, 2006.
   c. Vincent, A., "Molecular symmetry and group theory ", 2nd Ed., Willey 1988.

5. Recommended Books (Theory)

   a. Albert R.A., Robert J.S. and Moungi G.B. Physical Chemistry .4th "ed., John Wiley and Sons (2004).
   b. Ball D.W. "Physical Chemistry "1st ed., Brooks/Cole Co. Inc. (2003). 41
   c. Vertes A. "Basics of Nuclear Science" Kluwer Academic Publisher London (2003).

6. Recommended Books (Practical)

   a. Bassetts J., Denney C., Jeffery G.H. and Mendham J. "Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis " English Language Book Society. 4th ed. (1978).

b. Shoemaker D. Experimental Physical Chemistry McGraw Hill (1989).

7. Practical (CH-382) (1-Cr. Hr.)
   a. Spectroscopic determination of Cu % in the given sample.
   b. Conductometric determination of Cu (II)- EDTA mole ratio in the complex.
   c. To determine the effectiveness of an extraction of I2 solution by using SolventExtraction method.
   d. Determination of molecular weight of a polymer by viscosity method.
   e. Determination of percentage composition of KMnO4/ K2Cr2O7 in a givensolution by spectrophotometry.
   f. Evaluation of pKa value of an indicator by spectrometric method.
   g. Conductometric determination of hydrolysis constant (Kh) of conjugate base of aweak acid.
   h. Synthesis of NiO nanomaterials.
   i. Calculation of Bandgap for the above synthesized nanomaterials
   j. Synthesis of ceramic ZnO material.
   k. Thermal analysis of above mentioned synthesized material.