**COURSE DESCRIPTION**

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| **Subject: Biochemistry** | **Department: CHEM** |
| **Lecturer:**  TRAN TUAN ANH  NGUYEN PHUONG NGA | **E-mail:**  Tran-tuan.anh@usth.edu.vn  nguyen-phuong.nga@usth.edu.vn |
| **Academic year: 2020-2021** |  |

**COURSE DESCRIPTION**

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| **Credit points** | 40 | |
| **Level** | B3 | |
| **Teaching time Location** | Semester I  University of Science and Technology of Hanoi | |
| **Prerequisites** | Organic Chemistry, General biology | |
| **Recommended background knowledge** | English reading and comprehension | |
| **Subject description:** | The course covers the following:  - Composition, structures, characteristics and biological roles of proteins, carbohydrates, lipids, and nucleic acids (DNA and RNA).  - The digestion of carbohydrates, fats, proteins in the body.  - Enzymes and ribozymes: catalysis mechanism, kinetics of enzyme catalysis, activation and inhibition of enzymatic activities, enzyme nomenclature and classification.  - Principles of bioenergetics, metabolism and energy formation, including substrate level phosphorylation and oxidative phosphorylation associated with electron transfer chain.  - General information about structural and molecular biology for chemist  - Concepts of biological ligands for metal ions  - Common methods to study metals in Biological Systems  - Enzymes-Metal structure, interaction and functions for: Sodium & Potassium, Magnesium, Calcium, Zinc, Iron, Copper, Nickel & Cobalt, Manganese and Non-metal | |
| **Objectives & Out-come** | Upon completion of the course, the student should achieve an understanding of the following:  - the composition, structure, characteristics, localization, functions of 4 main biological compounds and their degradation and biosynthesis in the living cells and organisms.  - the main metabolic pathways with energy change of the living cells and organisms  - some living phenomena on in the light of biochemistry  - general structure and molecular biology of metal-related enzymes  - common techniques to investigate metals in Biological systems  - Main concept in structures and functions of metal-related protein (relating to Sodium & Potassium, Magnesium, Calcium, Zinc, Iron, Copper, Nickel & Cobalt, Manganese and Non-metal) | |
| **Assessment/ Evaluation** | Attendance/Attitude | 10 % |
| Assay | 20 % |
| Mid-term test | 20 % |
| Final exam (oral) | 50 % |
| **Prescribed Textbook(s)** | [1] John L. Tymoczko, Jeremy M. Berg, Lubert Stryer, Biochemistry: A Short Course (2nd Edition), 2013  [2] Crichton, R. R. (2012). Biological Inorganic Chemistry: A New Introduction to Molecular Structure and Function (2nd ed.) (2nd ed.). Elsevir. Retrieved from <https://www.elsevier.com/books/biological-inorganic-chemistry/crichton/978-0-444-53782-9>  [3] Joseph J. Stephanos, A. W. A. (2014). Chemistry of Metalloproteins: Problems and Solutions in Bioinorganic Chemistry. Wiley. Retrieved from https://www.wiley.com/en-us/Chemistry+of+Metalloproteins%3A+Problems+and+Solutions+in+Bioinorganic+Chemistry-p-9781118470442 | |

**COURSE CONTENTS & SCHEDULE**

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| **Class** | **Contents** | **Hours** | | | **Ref./Resources** | **Assignment(s)** |
| **Lect.** | **Tut.** | **Lab.** |
| 1 | Introduction. Nucleic acids | 3 |  |  |  |  |
| 2 | Protein composition and structure. Enzymes. | 3 |  |  |  |  |
| 3 | C-H, Lipids. Cell membranes | 1.5 |  |  |  |  |
| 4 | Metabolism. Digestion. | 1.5 |  |  |  |  |
| 5 | C-H metabolism. | 3 |  |  |  |  |
| 6 | Metabolism of Lipids & N-containing molecules | 3 |  |  |  |  |
| 7 | Introduction to basic Coordination Chemistry and Structure of Proteins | 2 |  |  |  |  |
| 8 | Intermediary Metabolism and Methods to study metals in Biological systems | 2 |  |  |  |  |
| 9 | Sodium and Potassium - Channels and Pumps | 2 |  |  |  |  |
| 10 | Magnesium - Phosphate Metabolism and Photoreceptors & Calcium - Cellular Signaling | 2 |  |  |  |  |
| 11 | Zinc - Lewis Acid and Gene Regulator | 2 |  |  |  |  |
| 12 | Iron: Essential for Almost All Life | 2 |  |  |  |  |
| 13 | Copper - Coping with Dioxygen | 2 |  |  |  |  |
| 14 | Metals in Medicine and Metals as Drugs | 1 |  |  |  |  |
| 15 | Practice: DNA |  |  | 3 |  |  |
| 16 | Practice: Proteins |  |  | 3 |  |  |

*Notes:*

* *Abbreviation: Lect. (lecture), Tut. (Tutorial), Lab. (Lab-work).*
* *Assignments may include assignments, practical work, reports, exercises ...for each class sessions*