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| **C:\Users\20968\AppData\Local\Temp\Rar$DRa0.140\UMT Logo Blue.pngDepartment of Chemistry, School of Science**  **University of Management and Technology** | | | | |
| Course Code: CH-316  Course Title: Biochemistry-II  Outcome Based Education (OBE) | | | | |
| **Lecture Schedule** |  | | **Semester** | Fall 2024 |
| **Pre-requisite** | * Amino Acids, Proteins & Nucleic Acids * Carbohydrates & Lipids | | **Credit Hours** | 3 |
| **Instructor** |  | | **Contact** |  |
| **Office** | 3s-32 | | **Office Hours** | Monday to Friday |
| **Align with the SDGs** | SDG number 3 | | | |
| **Attendance Policy** | Participant Handbook Clause 2.10: Class Attendance – A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination/assessment.  Participant with less than 80% of attendance in a course shall be awarded grade ‘SA’ (Short attendance) and shall not be allowed to take end term exams. | | | |
| **Plagiarism Policy** | UMT follows the HEC Plagiarism policy, which is available at: <https://www.hec.gov.pk/english/services/faculty/Plagiarism/Pages/default.aspx> | | | |
| **Program Education Objectives (PEOs)** | **PEO 1:** Graduates will be able to infer recent knowledge and skills in the field of Biochemistry and allied industries**.**  **PEO 2:** Graduates will be able to organize data, scientific methods and conduct research to contribute towards advancements in biochemistry**.**  **PEO 3:** Graduates will be able to adapt effectively the contemporary Biochemistry related tools and essential skills to excel in the life long career.  **PEO 4:** Graduates will be able to adhere to the high ethical standards and professionalism towards scientific, social, economic and environmental sustainability. | | | |
| **Program Learning Outcomes (PLOs)** | **PLO 1**: ***Analyze*** the fundamental concepts integrating theories, principles and recent knowledge  **PLO 2**: ***Develop*** proficiency in research methodologies, assess their effectiveness, and explore alternative approaches to address research specific needs.  **PLO 3**: ***Analyze*** scientific literature to develop native solutions.  **PLO 4**: ***Assess*** strong analytical and problem-solving skills to draw logical conclusions.  **PLO 5**: ***Display*** expertise in the use of diverse laboratory equipment and techniques to design, execute, and troubleshoot experiments independently and as team member.  **PLO 6**: ***Analyze*** the scientific concepts, research findings, and ideas exhibiting exceptional collaborative skills, actively engaging in multidisciplinary teams and effectively contributing to project management.  **PLO 7**: ***Integrate*** cutting-edge skills, tools, and methodologies, accumulating a diverse range of experiences to propel their lifelong career trajectories.  **PLO 8**: ***Adhere*** principles of professional integrity and social responsibility with environment friendly and sustainable protocols, regulations, and industry best practices. | | | |
| **Course Learning Outcomes (CLOs)** | **CLO 1.** Understand the fundamental roles of diverse metabolic pathways in maintaining different cellular processes. (C2, PLO1)  **CLO 2.** Describe the interplay between various metabolic pathways, elucidating their impact on cellular functions and biochemical applications. (C2, PLO3)  **CLO 3.** Analyze the regulatory mechanisms controlling metabolic flux and their implications in various biochemical processes. (C4, PLO4)  **CLO 4.** Apply knowledge of metabolic pathways to understand the molecular basis of various metabolic disorders and to propose managing strategies for these disorders. (C3, PLO2) | | | |
| **Course Content** | Following topics will be included in this course (*detailed week-wise breakup is given at the end of the document*):  Introduction to metabolism and basic aspects of bioenergetics and biochemical thermodynamics (endergonic and exergonic reactions); phosphoryl group transfer and ATP production; metabolism, oxidation-reduction; carbohydrate metabolism and regulation (glycolysis, Glycogenolysis; gluconeogenesis; pentose phosphate pathway); citric acid cycle (reactions, energetics and control), electron transport chain, oxidative phosphorylation, shuttle mechanisms (glycerol-phosphate shunt), lipid metabolism (energy yield from fatty acid oxidation, ketone bodies, acyl glycerol, compound lipids, cholesterol); photosynthesis; Calvin Cycle; metabolism of nitrogenous compounds (amino acid synthesis, catabolism, purine and pyrimidine synthesis); nucleic acid metabolism and control; urea cycle; integration of metabolism. | | | |
| **Learning Resources** | Text Book | Lehninger Principles of Biochemistry, by David L. Nelson and Michael M. Cox, 7th Edition, Macmillan International Edition. | | |
| Reference Book | 1- Biochemistry by Donald Voet, Judith G. Voet, and Charlotte W. Pratt, 5th Edition, John Wiley & Sons.  2- Biochemistry by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer, 8th Edition, W. H. Freeman and Company.  3- Biochemistry by Mary K. Campbell and Shawn O. Farrell, 9th Edition, Cengage Learning.  4- Biochemistry: A Short Course by John L. Tymoczko, Jeremy M. Berg, and Lubert Stryer, 3rd Edition, W. H. Freeman and Company. | | |
| **Teaching Kits** | All didactic material will be shared on:   * PowerPoint slides and books shared on LMS * Recording (if any) on <https://www.youtube.com/playlist?list=PLFT5KfNkNc74kXoi4wcRpc8tVoit37uqn> | | | |
| **Grading Policy** | Clause 3.1 of undergraduate Participant Handbook: Evaluation/Assessment– The final standing of each participant, in each course is assessed through various assessment tools which are mentioned below:   * Assignments/Project/Presentations = 20% - 35% * Quizzes = 15% * Mid-term examination = 25%- 30% * End-term examination = 40% -50 % * There will be at least seven quizzes and two assignments, Midterm and final term for undergraduate courses. | | | |

**COURSE CALENDER**

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| --- | --- | --- | --- | --- | --- |
| **Date**  **(DD-MM-YYY)** | **Week** | **Topic** | **Chapter** | **CLOs** | **PLOs** |
|  | 1 | Introduction to metabolism  Basic aspects of bioenergetics and biochemical thermodynamics (Endergonic and Exergonic reactions) | 13 | 1 | 1 |
|  |
|  | Last date of ADD/DROP | | | |  |
|  | 2 | Oxidation-reduction  Phosphoryl group transfer and ATP production | 13 | 1 | 1 |
|  |
|  | 3 | Carbohydrate metabolism  Glycolysis, Fates of pyruvates, Feeders pathway, regulation of glycolysis  Gluconeogenesis and its regulation | 14 | 2 | 3 |
|  |
|  | 4 | Citric Acid Cycle and its regulation | 16 | 2 | 3 |
|  |
|  | 5 | Electron Transport Chain and ATP production (Oxidative Phosphorylation) | 19 | 2 | 3 |
|  |
|  | 6 | Oxidative Phosphorylation (ATP synthesis),  Glycerol-Phosphate Shunt, Malate aspartate shunt | 19 | 2 | 3 |
|  |
|  | Last date of course withdrawal | | | |  |
|  | 7 | Photosynthetic light and dark reaction  (Photophosphorylation) and Regulation of photosynthesis | 19 | 2 | 3 |
|  |
|  | 8 | Nitrogen assimilation in biological systems  Amino acid synthesis (Anabolism) | 21 | 3 | 4 |
|  |
|  | 9 | Midterm | | | |
|  |
|  | 10 | Amino acid degradation (Amino transferases), Urea Cycle and excretion of the nitrogenous wastes from the body | 22 | 4 | 2 |
|  |
|  | 11 | Pathways of Amino acid degradation (Catabolism) | 18 | 3 | 4 |
|  |
|  | 12 | Nucleic Acid metabolism (degradation and assimilation) and control  Purine and Pyrimidine synthesis | 22 | 4 | 2 |
|  |
|  | 13 | Catabolism of fatty acids, Carnitine shuttle, Beta oxidation and regulation  Ketone bodies | 17 | 2 | 3 |
|  |
|  | 14 | Pentose Phosphate pathway and its role in protection of ROS damage | 14 | 1 | 1 |
|  |
|  | 15 | Biosynthesis of fatty acids | 21 | 4 | 2 |
|  |
|  | 16 | Biosynthesis of  Cholesterol | 22 | 4 | 2 |
|  | 17 | Disease linked to the lipid metabolism | 22 | 4 | 2 |
|  | 18 | **Final Term** |  |  |  |
|  | Semester Ends | | | |  |

**Mapping of CLOs to Direct Assessments**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CLOs | Bloom Taxonomy Level | PLO | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Assign 1 | Assign 2 | Class Activity | Mid Term Exam | Final Term Exam |
| 1 | C2 | 1 | ✔ | ✔ |  |  |  |  |  | ✔ |  |  | ✔ | ✔ |
| 2 | C2 | 3 |  |  | ✔ | ✔ |  |  |  |  |  |  | ✔ | ✔ |
| 3 | C4 | 4 |  |  |  |  | ✔ | ✔ |  |  | ✔ | ✔ |  | ✔ |
| 4 | C3 | 2 |  |  |  |  |  |  | ✔ |  |  | ✔ |  | ✔ |