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| Programme                                                                                                                                            | BS Chemistry                                                                                                                                                                          | Course Code | ZOOL-103 | Credit Hours                                                                             | 2 |
| Course Title                                                                                                                                         | Cell Biology                                                                                                                                                                          |             |          |                                                                                          |   |
| Course Introduction                                                                                                                                  |                                                                                                                                                                                       |             |          |                                                                                          |   |
| This course introduces cell structure and the function of prokaryotes and eukaryotes. The objectives of the course are:-                             |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 1. To explain the basic concepts of cell biology.                                                                                                    |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 2. To understand cellular structure, composition of the organelles, cell growth and cell division.                                                   |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 3. To explain how macromolecules and organelles govern the dynamic organization, function of living cells.                                           |                                                                                                                                                                                       |             |          |                                                                                          |   |
| Learning Outcomes                                                                                                                                    |                                                                                                                                                                                       |             |          |                                                                                          |   |
| On the completion of the course, the students will:                                                                                                  |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 1. <b>ACQUIRE</b> the basic concepts of cell biology.                                                                                                |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 2. <b>UNDERSTAND</b> the metabolic structure and functional processes of cells in terms of cellular organelles, membranes, and biological molecules. |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 3. <b>ABILITY</b> to understand the role of macromolecules regulating cellular processes.                                                            |                                                                                                                                                                                       |             |          |                                                                                          |   |
| 4. <b>FORMULATE</b> the critical thinking skills and knowledge on cell.                                                                              |                                                                                                                                                                                       |             |          |                                                                                          |   |
| Course Content                                                                                                                                       |                                                                                                                                                                                       |             |          | Assignments/Readings                                                                     |   |
| Week 1                                                                                                                                               | Unit-I: <ul style="list-style-type: none"><li>Introduction to cell structure and function</li><li>Cell theory</li></ul>                                                               |             |          |                                                                                          |   |
| Week 2                                                                                                                                               | Unit II <ul style="list-style-type: none"><li>Comparison of plant and animal cells</li><li>Comparison of prokaryotic and eukaryotic cells</li></ul>                                   |             |          |                                                                                          |   |
| Week 3                                                                                                                                               | Unit-III: <ul style="list-style-type: none"><li>Cell membrane</li><li>Structural models</li><li>Chemical composition and function</li></ul>                                           |             |          | Study the Experimental Pathway “The Origin of Eukaryotic Cells” Page 27                  |   |
| Week 4                                                                                                                                               | Unit-IV: <ul style="list-style-type: none"><li>Cellular transport</li><li>Diffusion and osmosis</li><li>Facilitated and active transport</li><li>Endocytosis and exocytosis</li></ul> |             |          |                                                                                          |   |
| Week 5                                                                                                                                               | Unit-V: <ul style="list-style-type: none"><li>Cell Organelles (structure and function)</li><li>Endoplasmic reticulum</li></ul>                                                        |             |          |                                                                                          |   |
| Week 6                                                                                                                                               | Unit-VI: <ul style="list-style-type: none"><li>Golgi Bodies</li></ul>                                                                                                                 |             |          |                                                                                          |   |
| Week 7                                                                                                                                               | Unit-VII: <ul style="list-style-type: none"><li>Mitochondria</li></ul>                                                                                                                |             |          | THE HUMAN PERSPECTIVE: The Role of Anaerobic and Aerobic Metabolism in Exercise Page 394 |   |
| Week 8                                                                                                                                               | Unit-VIII: <ul style="list-style-type: none"><li>Lysosomes</li></ul>                                                                                                                  |             |          | THE HUMAN PERSPECTIVE: Disorders Resulting from Defects in Lysosomal Function            |   |
| Week 9                                                                                                                                               | Unit-IX: <ul style="list-style-type: none"><li>Peroxisomes</li><li>Ribosome</li></ul>                                                                                                 |             |          |                                                                                          |   |
| Week 10                                                                                                                                              | Unit-X: <ul style="list-style-type: none"><li>Nucleus</li></ul>                                                                                                                       |             |          |                                                                                          |   |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"><li>• Structure and function</li></ul>                                                                                                                              |                                                                           |
| <b>Week 11</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"><li>• Nuclear membrane and Chromatin</li></ul>                                                                                                                      |                                                                           |
| <b>Week 12</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Unit XI <ul style="list-style-type: none"><li>• Cytoskeleton</li><li>• Microtubules</li><li>• Structure and types</li><li>• Function of MT</li></ul>                                                  |                                                                           |
| <b>Week 13</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"><li>• Intermediate Filament</li><li>• Structure and types</li><li>• Function of IFs</li><li>• Microfilaments Structure and types</li><li>• Function of MT</li></ul> |                                                                           |
| <b>Week 14</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Unit XII: <ul style="list-style-type: none"><li>• Cellular reproduction</li><li>• Cell cycle</li></ul>                                                                                                | THE HUMAN PERSPECTIVE:<br>Meiotic Nondisjunction and Its Consequences 615 |
| <b>Week 15</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"><li>• Mitosis and Stages</li></ul>                                                                                                                                  |                                                                           |
| <b>Week 16</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"><li>• Meiosis and Stages</li></ul>                                                                                                                                  |                                                                           |
| <b>Textbooks and Reading Material</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                       |                                                                           |
| Textbooks. <ol style="list-style-type: none"><li>1. Karp G, Iwasa J, Marshall W. Karp’s Cell Biology, Global Edition. John Wiley &amp; Sons; 2018. Suggested Readings</li><li>2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., Watson, J. D. 2017. Molecular Biology of the Cell. 6th Edition. Garland Publishing Inc., New York.</li><li>3. Lodish H., Berk A., Kaiser C., Krieger M., Bretscher A., Ploegh H., Martin K., Yaffe M., Amon A. 2021. Molecular Cell Biology. W. H. Freeman; 9th ed. edition (Jan. 27, 2021) 978-1319208523</li><li>4. Articles in Journal of Cell Biology ISSN: 0021-9525</li><li>5. Bain B.J., Bates I., Laffan M.A. 2016. Dacie and Lewis Practical Haematology. 12<sup>th</sup> Edition. ISBN: 9780702069307. Elsevier</li></ol> |                                                                                                                                                                                                       |                                                                           |
| <b>Teaching Learning Strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                       |                                                                           |
| <ol style="list-style-type: none"><li>1. Use of Technology resources.</li><li>2. Use of Google Classroom management and Tools Resources</li><li>3. Provision of Handouts</li><li>4. Demonstration of the concepts using animations of cellular processes</li><li>5. Group activity of the students for problem solving skills</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                       |                                                                           |
| <b>Assignments: Types and Number with Calendar</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                       |                                                                           |
| <ol style="list-style-type: none"><li>1. Assignment 1: Due by Midterm Examination</li><li>2. Lab Manual/Notebook: Due before the week of Final Term Examination</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                       |                                                                           |
| <b>Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                       |                                                                           |
| <b>As per University rules</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                       |                                                                           |