

Year-2023-2024

Syllabus of B.Sc. Programme: [Subject Name: Biochemistry]

In accordance with NEP-2020

| Year                           | Semester | Course Code                               | Title of Paper                    | Theory/<br>Practical | Credits   | Max.<br>Marks |  |
|--------------------------------|----------|---|-----------------------------------|----------------------|-----------|---------------|--|
| 1                              | I        | UGBCH -101N                               | Introduction to biochemistry      | Theory               | 2         | 100           |  |
|                                |          | UGBCH -101(P)N                            | Practical Work                    | Practical            | 2         | 100           |  |
|                                | II       | UGBCH -102N                               | Nutritional biochemistry          | Theory               | 2         | 100           |  |
|                                |          | UGBCH -102(P)N                            | Practical Work                    | Practical            | 2         | 100           |  |
| 2                              | III      | UGBCH -103N                               | Intermediary metabolism           | Theory               | 2         | 100           |  |
|                                |          | UGBCH -103(P)                             | Practical Work                    | Practical            | 2         | 100           |  |
|                                |          | <b>Skill Enhancement Course</b>           |                                   |                      |           |               |  |
|                                |          | SBSBCH- 01N                               | Bio-analytical techniques         | Theory               | 2         | 100           |  |
|                                | IV       | UGBCH -104N                               | Enzymology                        | Theory               | 2         | 100           |  |
|                                |          | UGBCH -104(P)N                            | Practical Work                    | Practical            | 2         | 100           |  |
| 3                              | V        | <b>Discipline Centric Elective Course</b> |                                   |                      |           |               |  |
|                                |          | DCEBCH -105N                              | Microbiology                      | Theory               | 2         | 100           |  |
|                                |          | DCEBCH -106N                              | Spectroscopy                      | Theory               | 2         | 100           |  |
|                                |          | DCEBCH -107(P)N                           | Practical Work Based on 105 & 106 | Practical            | 2         | 100           |  |
|                                | VI       | <b>Discipline Centric Elective Course</b> |                                   |                      |           |               |  |
|                                |          | DCEBCH -108N                              | Plant biochemistry                | Theory               | 2         | 100           |  |
|                                |          | DCEBCH -109N                              | Immunology                        | Theory               | 2         | 100           |  |
|                                |          | DCEBCH -109(P)N                           | Practical Work Based on 108 & 109 | Practical            | 2         | 100           |  |
|                                |          | <b>Skill Enhancement Course</b>           |                                   |                      |           |               |  |
|                                |          | SBSBCH-04N                                | Clinical biochemistry             | <b>Theory</b>        | 4         | 100           |  |
| <b>Total Credit/Max. Marks</b> |          |   |                                   |                      | <b>34</b> | <b>1600</b>   |  |

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| Programme: <b>B.Sc.</b>   | Year: <b>First</b>   | Semester: <b>I</b> |
| Subject: <b>Biochemistry</b>  |  |                    |
| Course Code: <b>UGBCH-101N</b>  | Course Title: <b>Introduction to Biochemistry</b>  |                    |
| <b>Course Objectives:</b>   |  |                    |
| <ul style="list-style-type: none"> <li>• To discuss the basics of outline of biochemistry</li> <li>• To discuss the solvent properties of water of biochemical reactions</li> <li>• To discuss the protein that is the building block of living being</li> <li>• To discuss the basic concept of cell organelles and its role in biochemical functions</li> </ul> |  |                    |
| <b>Course Outcomes:</b>   |  |                    |
| CO 1: Able to understanding of history and scope of Biochemistry in brief.  |  |                    |
| CO 2: Learn about water properties and role of it in living beings.   |  |                    |
| CO 3: To know about cell structure and their functions  |  |                    |
| CO 4: Able to understanding the structure and functions of various cell organelles.   |  |                    |
| CO 5: Also able to understand the amino acid structure and its classification, and also know how amino acids play important role in proteins formation.   |  |                    |
| Credits: 2  | <b>Type of Course:</b> Core  |                    |
| Max. Marks: 100   | Min. Passing Marks: 36   |                    |
| <b>Block 1</b>  | <b>Life History and Cell Structure</b>   |                    |
| Unit I  | <b>Introduction to biochemistry:</b><br>The origin of biochemistry and unity of life- History, scope and current prospective of biochemistry, unique properties of water, weak interactions in aqueous systems, ionization of water, buffers |                    |
| Unit II   | <b>Cell structure and functions</b><br>Prokaryotic and eukaryotic cell, animal and plant cells, units of measurement, light microscope and electron microscope, centrifugation for subcellular fractionation.                                |                    |
| Unit III  | <b>Cell organelles:</b><br>Structure and functions of cell nucleolus, Endoplasmic reticulum, Golgi complex, Lysosome, mitochondria, chloroplasts and peroxisomes.  |                    |
| <b>Block 2</b>  | <b>Amino Acids, Proteins and Carbohydrate</b>  |                    |
| Unit IV   | <b>Amino Acids:</b> General introduction, classification, structure and functions of amino acids, basic properties of amino acids.   |                    |
| Unit V  | <b>Proteins the basic molecules:</b><br>Nature, classification and types of protein structure, Peptides classification and conformational structure  |                    |
| Unit VI   | <b>Carbohydrates:</b><br>General introduction, classification and structure, monosaccharides - structure of aldoses and ketoses, ring structure of sugars, formation of disaccharides, polysaccharides.                                      |                    |
| <b>Block 3</b>  | <b>Lipids, Nucleic Acids and Vitamins</b>  |                    |
| Unit VII  | <b>Lipids:</b>   |                    |

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|   | General introduction, classification, building blocks of lipids - fatty acids, glycerol, ceramide, structure of fatty acids and their derivatives. |
| Unit VIII   | Nucleic acids: Nucleotides and nucleosides-structure and properties, nitrogenous bases: purines and pyrimidines, structure of DNA and RNA.         |
| Unit IX   | <b>Vitamins:</b> Types and functions, structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms.      |
| <b>Suggested Text Book Readings:</b>  |  |
| <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, "Lehninger Principles of Biochemistry" International Edition-2021.</li> <li>2. Dr J L Jain, "Fundamentals of Biochemistry" S. Chand and Company-2020.</li> <li>3. P S Verma and V K Agarwal, "Cell Biology (Cytology, Biomolecule and Molecular Biology" S. Chand Publication-2016.</li> <li>4. Talwar and Srivastava, "Textbook of Biochemistry and Human Biology" Eastern Economy Edition, Prentice Hall, India-2002.</li> <li>5. Satyanarayana U., "Biochemistry" Elsevier India,2021</li> </ol>              |  |
| <b>Suggested online link:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Cell Organelles: <a href="http://gwisd.us">Cell Organelles Notes.pdf (gwisd.us)</a></li> <li>2. Carbohydrates: <a href="http://dHINGCOLLEGEONLINE.CO.IN">CARBOHYDRATES (dHINGCOLLEGEONLINE.CO.IN)</a></li> <li>3. Amino Acids: <a href="http://SRMIST.EDU.IN">Microsoft Word - Amino Acids Peptides Proteins Notes (srmist.edu.in)</a></li> <li>4. Vitamins:<br/><a href="https://www.pearsonhighered.com/assets/samplechapter/0/1/3/2/0132181630.pdf">https://www.pearsonhighered.com/assets/samplechapter/0/1/3/2/0132181630.pdf</a></li> </ol> |  |
| This course can be opted as an elective by the students of following subjects: NA   |  |
| Suggested equivalent online courses (MOOCs) for credit transfer: NO   |  |
| <b>Electronic media and other digital components in the curriculum:</b>   |  |
| <b>Choose any one or more than one:</b> (Electronic Media: Audio/Video Lectures, Online Counseling/VirtualClasses/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)  |  |
| Name of electronic media: Youtube   | Year of incorporation: 2023-24   |

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| Programme: <b>B.Sc.</b>  | Year: <b>First</b>  | Semester: <b>II</b> |
| Subject: <b>Biochemistry</b>   |   |                     |
| Course Code: <b>UGBCH-102N</b>   | Course Title: <b>Nutritional Biochemistry</b>   |                     |
| <b>Course Objectives:</b>  |   |                     |
| <ul style="list-style-type: none"> <li>• To discuss the basic elements of nutrition.</li> <li>• To discuss the basal metabolic rate and measurement of fuel value of foods.</li> <li>• To discuss the biological oxidation of foodstuff.</li> <li>• To discuss the basic concept of micro and macro nutrition</li> </ul> |   |                     |
| <b>Course Outcomes:</b>  |   |                     |
| CO 1: Able to know the basic concept of different nutrition and energy in brief.   |   |                     |
| CO 2: Able to understand the role of different nutrients in growth of living beings.   |   |                     |
| CO 3: Learn about cell structure and their functions.  |   |                     |
| CO 4: Learn about the concept of digestion of carbohydrates, proteins and fats.  |   |                     |
| CO 5: Also know the structure of proteins, carbohydrates and lipids.   |   |                     |
| Credits: 2   | <b>Type of Course:</b> Core   |                     |
| Max. Marks: <b>100</b>   | Min. Passing Marks: <b>36</b>   |                     |
| <b>Block 1</b>   | <b>Nutrition and oxidation of foodstuff</b>   |                     |
| Unit I   | <b>Elements of Nutrition:</b><br>Dietary requirements of carbohydrates, lipids and proteins. Essential amino acids, essential fatty acids, Malnutrition.  |                     |
| Unit II  | <b>Basal Metabolic Rate (BMR):</b><br>Concept of BMR, factors affecting BMR, measurement of fuel value of foods. basal and resting metabolism, physical activity, energy balance.                                       |                     |
| Unit III   | <b>Biological oxidation of foodstuff:</b><br>Measurement of energy content of food, physiological energy value of foods, measurement of energy expenditure, factors affecting thermogenesis.                            |                     |
| <b>Block 2</b>   | <b>Nutrition of carbohydrates, Proteins and Vitamins</b>  |                     |
| Unit IV  | <b>Dietary carbohydrate:</b><br>Functions, digestion, absorption, storage and utilization of carbohydrates, hormonal regulation of blood glucose.   |                     |
| Unit V   | <b>Proteins:</b><br>Sources, functions, digestions and absorptions, essential and nonessential amino acids, antagonism, toxicity and imbalance, effects of deficiency and kwashiorkor.                                  |                     |
| Unit VI  | <b>Minerals and Vitamins:</b><br>Nutrition importance of dietary calcium; phosphorus; magnesium; iron; iodine; zinc and copper, requirements and deficiency diseases associated with vitamin B Complex, C A,D, E and K. |                     |
| <b>Block 3</b>   | <b>Food and drugs integration</b>   |                     |
| Unit VII   | <b>Lipids and fats:</b>   |                     |

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|   | Role of lipid in dietary supplement. Dietary fiber, role of fibre in lipid metabolism, blood glucose level and GI tract functions, role of saturated fat. Sources, functions, digestions and absorptions of fats, types of fats dietary fats, role of omega-3 fatty acids in living human body, essential and nonessential fatty acids. |
| Unit VIII   | <b>Food and drug interactions:</b><br>Nutrient interactions affecting ADME of drugs, alcohol and nutrient deficiency, antidepressants, psychoactive drugs and nutrient interactions.  |
| Unit IX   | <b>Nutritional status:</b><br>Anthropometric measurements, biochemical assessment, reactive oxygen species (ROS), glycosylated Hb, differential diagnosis of B <sub>12</sub> and foliate.   |
| <b>Suggested Text Book Readings:</b>  |   |
| <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, "Lehninger Principles of Biochemistry" International Edition-2021.</li> <li>2. Sharma D C, Nutritional Biochemistry, CBS Publications</li> <li>3. P S Verma and V K Agarwal, "Cell Biology (Cytology, Biomolecule and Molecular Biology)" S. Chand Publication-2016.</li> <li>4. Tom Brody, Nutritional Biochemistry, Second edition, University of California at Berkely</li> <li>5. Satyanarayana U., "Biochemistry" Elsevier India,2021</li> </ol>  |   |
| <b>Suggested online link:</b>   |   |
| <ol style="list-style-type: none"> <li>1. Metabolism: <a href="#">Instruction Metabolism 1 Medicine V1.Pdf (Umed.Wroc.Pl)</a></li> <li>2. Bmr: <a href="#">Basal Metabolic Rate (Upsmfac.Org)</a></li> <li>3. Minerals and vitamins: <a href="https://sightandlife.org/wp-content/uploads/2017/03/sal_mvlex_web.pdf">https://sightandlife.org/wp-content/uploads/2017/03/sal_mvlex_web.pdf</a></li> <li>4. Food and drug interactions: <a href="https://www.omjournal.org/images/75_m_deatials_pdf_.pdf">https://www.omjournal.org/images/75_m_deatials_pdf_.pdf</a></li> <li>5. Nutritional status: <a href="#">PowerPoint Presentation (zmchdahod.org)</a></li> </ol> |   |
| This course can be opted as an elective by the students of following subjects: NA   |   |
| Suggested equivalent online courses (MOOCs) for credit transfer:  |   |
| 1. Nutritional and Clinical Biochemistry - Course (swayam2.ac.in)   |   |
| <b>Electronic media and other digital components in the curriculum:</b>   |   |
| <b>Choose any one or more than:</b> (Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)   |   |
| Name of electronic media: YouTube   | Year of incorporation: 2023-24  |

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| Programme: <b>B.Sc.</b>  | Year: <b>Second</b>  | Semester: <b>III</b> |
| Subject: <b>Biochemistry</b>   |  |                      |
| Course Code: <b>UGBCH-103N</b>   | Course Title: <b>Intermediary Metabolism</b>   |                      |
| <b>Course Objectives:</b>  |  |                      |
| <ul style="list-style-type: none"> <li>• To discuss the basic outline of bioenergetics</li> <li>• To discuss the concept of metabolism.</li> <li>• To discuss the concept of thermodynamics</li> <li>• To discuss the basic concept of metabolism of proteins, carbohydrates and lipids</li> </ul> |  |                      |
| <b>Course Outcomes:</b>  |  |                      |
| CO 1: Able to understanding the concept of bioenergetics and metabolism  |  |                      |
| CO 2: Know to the concept of phosphorylation, and ATP cycle  |  |                      |
| CO 3: Able to know Glycolysis and Kreb's cycle   |  |                      |
| CO 4: Learn about the structure and functions of chloroplast and mitochondria.   |  |                      |
| CO 5: Able the understand the concept of photosynthesis and photosystem I and II.  |  |                      |
| Credits: 2   | <b>Type of Course:</b> Core  |                      |
| Max. Marks: 100  | Min. Passing Marks: 36   |                      |
| <b>Block 1</b>   | <b>Bioenergetics and Thermodynamics</b>  |                      |
| Unit I   | <b>Bioenergetics:</b><br>Introduction to bioenergetics, photochemical reaction in plants, chemical energy of organic substance.  |                      |
| Unit II  | <b>Thermodynamics:</b> Notions and laws of thermodynamics, state functions, equilibrium constant, coupled reactions, free energy charge, and application to chemical reaction. |                      |
| Unit III   | <b>ATP:</b><br>ATP cycle and formation of ATP by phosphorylation, importance of ATP and other compounds of high energy potential.  |                      |
| <b>Block 2</b>   | <b>Metabolism of Biomolecules</b>  |                      |
| Unit IV  | <b>Metabolism of carbohydrates:</b><br>Glycolysis, Kreb's cycle, electron transport system in mitochondria, Oxidative phosphorylation and mechanism of ATP synthesis           |                      |
| Unit V   | <b>Metabolism of lipids;</b><br>Catabolism of triglycerides, biosynthesis of cholesterol, B-oxidation of fatty acids.  |                      |
| Unit VI  | <b>Nitrogen metabolism:</b><br>Nitrogen fixation and assimilation, amino acid metabolism, the urea cycle, chlorophylls.  |                      |
| <b>Block 3</b>   | <b>Phosphorylation and Photosynthesis</b>  |                      |
| Unit VII   | <b>Oxidative phosphorylation:</b>  |                      |

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|   | Mitochondria, electron transport chain-its organization and function, regulation of oxidative phosphorylation, alternative respiratory pathways in plants.               |
| Unit VIII   | <b>Photophosphorylation:</b><br>Photophosphorylation in plants - structure of chloroplast, molecular architecture of Photosystem I and Photosystem II. Photo inhibition. |
| Unit IX   | <b>Photosynthesis:</b> Pigments of Photosynthesis, Oxygenic and anoxygenic Photosynthesis, adsorption of light by chlorophyll, Calvin cycle.                             |
| <b>Suggested Text Book Readings:</b>  |  |
| <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, “Lehninger Principles of Biochemistry” International Edition-2021.</li> <li>2. Simmi Kharb, Intermediary Metabolism</li> <li>3. P S Verma and V K Agarwal, “Cell Biology (Cytology, Biomolecule and Molecular Biology” S. Chand Publication-2016.</li> <li>4. Talwar and Srivastava, “Textbook of Biochemistry and Human Biology” Eastern Economy Edition, Prentice Hall, India-2002.</li> </ol>   |  |
| <b>Suggested online link:</b>   |  |
| <ol style="list-style-type: none"> <li>1. <b>Bioenergetics:</b> <a href="#">Microsoft PowerPoint - 426L4Bioen.ppt [Compatibility Mode] (unm.edu)</a></li> <li>2. Metabolism of Biomolecules: <a href="#">76633_ch07_5589.pdf (jpub.com)</a></li> <li>3. <b>Nitrogen metabolism:</b> <a href="#">Nitrogen Metabolism (wou.edu)</a></li> <li>4. Photophosphorylation:</li> <li>5. <a href="http://ppup.ac.in/download/econtent/pdf/Photophosphorylation.pdf">http://ppup.ac.in/download/econtent/pdf/Photophosphorylation.pdf</a></li> <li>6. Photosynthesis:<a href="https://www.rsb.org.uk/images/15_Photosynthesis.pdf">https://www.rsb.org.uk/images/15_Photosynthesis.pdf</a></li> </ol> |  |
| This course can be opted as an elective by the students of following subjects: NA   |  |
| Suggested equivalent online courses (MOOCs) for credit transfer: NO   |  |
| <b>Electronic media and other digital components in the curriculum:</b>   |  |
| <b>Choose any one or more than one:</b> (Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)   |  |
| Name of electronic media: YouTube   | Year of incorporation: 2023-24   |

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| Programme: <b>B.Sc.</b>  | Year: <b>Second</b>   | Semester: <b>III</b> |
| Subject: <b>Biochemistry</b>   |   |                      |
| Course Code: <b>SBSBCH-01N</b>   | Course Title: <b>BIO ANALYTICAL TECHNIQUES</b>  |                      |
| <b>Course Objectives:</b>  |   |                      |
| <ul style="list-style-type: none"> <li>• To discuss the basics concepts of bioanalytical techniques</li> <li>• To discuss the pH, buffer and biological importance</li> <li>• To discuss the about concept of chromatography and spectroscopy.</li> <li>• To discuss the basic concept of electrophoresis</li> </ul> |   |                      |
| <b>Course Outcomes:</b>  |   |                      |
| CO 1: Able to understanding the concept of normality, molarity and molality.   |   |                      |
| CO 2: Know the properties of light, optical rotation and optical rotator.  |   |                      |
| CO 3: Able to know about visible and UV spectroscopy.  |   |                      |
| CO 4: Learn the basic principle of FT-IR and NMR spectrometer.   |   |                      |
| CO 5: Discuss the principle of centrifugation and its applications.  |   |                      |
| Credits: 4   | <b>Type of Course:</b> Skill Enhancement Course   |                      |
| Max. Marks: 100  | Min. Passing Marks: 36  |                      |
| <b>Block 1</b>   | <b>Basics of bio-analytical techniques</b>  |                      |
| Unit I   | <b>Basic introductions:</b><br>Basic concept of bio analytical techniques, normality, morality and molality, brief about purification, centrifugation, filtration, dialysis, homogenization |                      |
| Unit II  | <b>pH and buffer:</b><br>Hydrogen ion concentration, Buffer- definition, types and its preparation, buffers of biological importance such as carbonate bicarbonate, phosphate and acetate.  |                      |
| Unit III   | <b>Properties of Light:</b> light spectra, wave length, plane polarized light, optical rotation, optical rotatory, absorbance-chromospheres, auxochrome,                                    |                      |
| <b>Block 2</b>   | <b>Block II- Chromatography and spectroscopy</b>  |                      |
| Unit IV  | <b>Chromography:</b> Principals of partition chromatography, exchange, gel filtration chromatography, high performance liquid chromatography (HPLC).  |                      |
| Unit V   | <b>Spectroscopy-I:</b><br>Concepts of spectroscopy, Beer-Lambert's law, Visible and UV Spectroscopy, applications of colorimetry.   |                      |
| Unit VI  | <b>Spectroscopy-II</b> Basic principle of FT-IR and NMR spectrometer and their role in detection of organic molecules detection.  |                      |
| <b>Block 3</b>   | <b>Electrophoresis and Centrifugation</b>   |                      |
| Unit VII   | <b>Electrophoresis:</b> Principles of electrophoresis, separation of proteins by PAGE and SDS-PAGE.   |                      |
| Unit VIII  | <b>Centrifugation:</b> Principles of centrifugation, differential centrifugation, applications of centrifugation and density gradient.  |                      |

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| Unit IX  | <b>Microbial techniques:</b> Isolation of bacteria, antimicrobial activity by using DISC diffusion techniques, use of different solvent system for amino acid, carbohydrate and lipid separation. |
| <p><b>Suggested Text Book Readings:</b></p> <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, “Lehninger Principles of Biochemistry” International Edition-2021.</li> <li>2. Sabari Ghosal and Anupama Sharma Awasthi, Fundamentals of Bioanalytical Techniques and Instrumentation, Second edition.</li> <li>3. Abhilasha Shourie (Author), Shilpa S. Chapadgaonkar Bioanalytical Techniques</li> <li>4. Sabro Ghosal a. K. Srivastava, Fundamentals of Bioanalytical Techniques and Instrumentation</li> <li>5. Talwar and Srivastava, “Textbook of Biochemistry and Human Biology” Eastern Economy Edition, Prentice Hall, India-2002.</li> </ol> <p><b>Suggested online link:</b></p> <ol style="list-style-type: none"> <li>1. pH and buffer: <a href="#">pH and Buffers.ppt (csun.edu)</a></li> <li>2. Properties of Light: <a href="#">ACL7 light.ppt (umd.edu)</a></li> <li>3. spectroscopy: <a href="#">Spectroscopy.pdf (osti.gov)</a></li> <li>4. Chromatographic Techniques: <a href="#">222 Chapter 4.pdf (unipune.ac.in)</a></li> <li>5. Microbiological Laboratory Techniques <a href="#">Microbiological Laboratory Techniques (mowr.gov.in)</a></li> </ol> |   |
| This course can be opted as an elective by the students of following subjects: NA  |   |
| <p>Suggested equivalent online courses (MOOCs) for credit transfer:</p> <ol style="list-style-type: none"> <li>1. Analytical techniques: by Dr. Moganty r. Rajeswari <a href="#">Analytical Techniques - Course (swayam2.ac.in)</a></li> </ol>   |   |
| <p><b>Electronic media and other digital components in the curriculum:</b></p> <p><b>Choose any one or more than one:</b>(Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)</p>   |   |
| Name of electronic media: YouTube  | Year of incorporation: 2023-24  |

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| Programme: <b>B.Sc.</b>   | Year: <b>Second</b>   | Semester: <b>IV</b> |
| Subject: <b>Biochemistry</b>  |   |                     |
| Course Code: <b>UGBCH-104N</b>  | Course Title: <b>Enzymology</b>   |                     |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• To discuss the basics of enzymology.</li> <li>• To discuss the effects of various factors on enzymatic-catalyzed reactions</li> <li>• To discuss the enzyme cofactors and inhibition</li> <li>• To discuss the regulation of enzyme activity and its importance.</li> </ul>  |   |                     |
| <b>Course Outcomes:</b> <p>CO 1: Learn the enzyme classification and kinetics<br/> CO 2: known the reversible and irreversible inhibition<br/> CO 3: Able to discuss the mechanism of action of chymotrypsin<br/> CO 4: Know the enzymes used in clinical biochemistry as reagents,<br/> CO 5: Able to discuss the principle of co-enzymes, prosthetic groups and allosteric activators</p> |   |                     |
| Credits: 3  | <b>Type of Course:</b> Core/Elective(Core)  |                     |
| Max. Marks: 100   | Min. Passing Marks: 21  |                     |
| <b>Block 1</b>  | <b>Enzyme classification and kinetics</b>   |                     |
| Unit I  | <b>Introduction to enzymes:</b><br>Basic concept and classification of enzymes, enzymes as biocatalysts, effects of various factors on enzymatic-catalyzed reactions.                             |                     |
| Unit II   | <b>Enzyme cofactors and inhibition:</b> Role cofactors, mode of action of coenzymes, principle co-enzymes, prosthetic groups, allosteric activators and inhibitors.                               |                     |
| Unit III  | <b>Enzymes kinetics:</b> enzymes classification, concept of ES complex, Michaelis-Menten equation, KM constant.   |                     |
| <b>Block 2</b>  | <b>Enzyme action and mechanism</b>  |                     |
| Unit IV   | <b>Enzyme inhibition:</b> Reversible and irreversible inhibition, competitive, non-competitive and un-competitive inhibition.   |                     |
| Unit V  | <b>Mechanism of enzyme action:</b> Acid-base catalysis, chemical modification of active site group; mechanism of action of chymotrypsin and lysozyme.   |                     |
| Unit VI   | <b>Enzyme mechanism:</b><br>Mechanism of action of chymotrypsin, inhibitors of enzymes - antibiotics, regulation of enzyme activity and its importance.   |                     |
| <b>Block 3</b>  | <b>Multienzyme System and its role in medicine</b>  |                     |
| Unit VII  | <b>Enzyme regulation:</b><br>General mechanisms of enzyme regulation, inhibition, allosteric enzymes, positive and negative cooperatively with special reference to aspartate, transcarbamoylase. |                     |
| Unit VIII   | <b>Multienzyme System:</b><br>Mechanism of enzyme action and regulation of pyruvate dehydrogenase, isoenzymes.  |                     |

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| Unit IX  | <b>Enzymes in medicine:</b> Enzymes used in clinical biochemistry as reagents, diagnostics and therapy, role of immobilized enzymes in industry. |
| <p><b>Suggested Text Book Readings:</b></p> <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, “Lehninger Principles of Biochemistry” International Edition-2021.</li> <li>2. Nicholas C. Price, Fundamentals Of Enzymology, 3rd Edition</li> <li>3. P S Verma and V K Agarwal, “Cell Biology (Cytology, Biomolecule and Molecular Biology” S. Chand Publication-2016.</li> <li>4. Talwar and Srivastava, “Textbook of Biochemistry and Human Biology” Eastern Economy Edition, Prentice Hall, India-2002.</li> <li>5. Lewis Stevens and Nicholas Price, Fundamentals of Enzymology: Cell and Molecular Biology of Catalytic Proteins</li> </ol> <p><b>Suggested online link:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to Enzymes: <a href="https://ufsc.br">Microsoft Word - Introduction (ufsc.br)</a></li> <li>2. Enzyme Kinetics: <a href="https://columbia.edu">ENZYME KINETICS (columbia.edu)</a></li> <li>3. Regulation of Enzyme Activity: <a href="https://mgcub.ac.in">Slide 1 (mgcub.ac.in)</a></li> <li>4. Multienzyme Complexes: <a href="https://mlsu.ac.in">Multienzyme Complexes (mlsu.ac.in)</a></li> </ol> |  |
| This course can be opted as an elective by the students of following subjects: Any one   |  |
| Suggested equivalent online courses (MOOCs) for credit transfer:   |  |
| <b>Enzymology:</b> <a href="https://swayam2.ac.in">Enzymology - Course (swayam2.ac.in)</a>   |  |
| <p><b>Electronic media and other digital components in the curriculum: Choose any one or more than one:</b>(Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)</p>   |  |
| Name of electronic media: Youtube  | Year of incorporation: 2023-24   |

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| Programme: <b>B.Sc.</b>   | Year: <b>Third</b>  | Semester: <b>V</b> |
| Subject: <b>Biochemistry</b>  |   |                    |
| Course Code: <b>DCEBCH-105N</b>   | Course Title: <b>Microbiology</b>   |                    |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• To discuss the diversity of microbial world.</li> <li>• To discuss the classification of microbiology, and their nomenclature.</li> <li>• To discuss the genetic engineering and recombination of bacteria.</li> <li>• To discuss the basic concept of bacterial cell, gram positive and negative bacteria.</li> </ul> |   |                    |
| <b>Course Outcomes:</b><br>CO 1: Learn the history of microbial world and development in biology.<br>CO 2: Able to know about bacteria, viruses and algae.<br>CO 3: Know the biological nitrogen fixation and biofertilizers<br>CO 4: Learn the structure and functions of flagella.<br>CO 5: Able to know the role of bacteria in N, P, S and C cycle.                                   |   |                    |
| Credits: 2  | <b>Type of Course:</b> Elective   |                    |
| Max. Marks: 100   | Min. Passing Marks: 36  |                    |
| <b>Block 1</b>  | <b>Microbial world their development</b>  |                    |
| Unit I  | <b>Diversity of Microbial world:</b><br>Classification of microbiology, and their nomenclature. Whittaker's five kingdom classification systems and their utility.  |                    |
| Unit II   | <b>Development of microbiology:</b><br>Spontaneous generation vs. biogenesis, general characteristics of different groups, acellular microorganisms (Viruses, Viroids, Prions).                                     |                    |
| Unit III  | <b>Isolation and Cultivation:</b><br>Culture media, nutritional requirements and growth characteristics of bacteria, development of various microbiological techniques.   |                    |
| <b>Block 2</b>  | <b>Genetic engineering and Microorganism</b>  |                    |
| Unit IV   | <b>Genetic:</b><br>Recombination of bacteria conjugation, transduction, and transformation, significance of genetic recombination in bacteria.  |                    |
| Unit V  | <b>Bacteria:</b><br>Structure of bacterial cell, gram positive and gram negative bacteria, microscopy-simple, compound, applications of bacteria and archaea in industry, environment and food.                     |                    |
| Unit VI   | <b>Viruses:</b><br>General structure and classification, properties of viruses, structure and replication of poliovirus and HIV. Protozoa- General characteristics with special reference to Amoeba and Paramecium. |                    |
| <b>Block 3</b>  | <b>Microorganism and their agriculture</b>  |                    |

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| Unit VII   | <b>Algae:</b><br>Types and occurrence, thallus organization, algae cell ultra structure, pigments, flagella, eyespot food reserves.  |
| Unit VIII  | <b>Fungi:</b><br>General classification, occurrence, habitat of fungi, distribution, nutritional requirements, fungal cell ultra- structure, role of fungi in agriculture, environment, Industry, medicine and food. |
| Unit IX  | <b>Role of microorganism in Agriculture:</b><br>Biological nitrogen fixation, microbes as bio fertilizers, role of bacteria in N, P, S, C cycle, role of bacteria in nutrient cycle                                  |
| <b>Suggested Text Book Readings:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Donald L. Pavia (Author) Introduction to Spectroscopy</li> <li>2. Gauglitz, John Wiley Handbook Of Spectroscopy 2Nd Edition 4 Volume Set</li> <li>3. David L. Nelson and Michael Cox, "Lehninger Principles of Biochemistry" International Edition-2021.</li> <li>4. Banwell (Author), Fundamentals of Molecular Spectroscopy   4th Edition</li> <li>5. P. S Kalsi, Spectroscopy of Organic Compounds</li> </ol>       |  |
| <b>Suggested online link:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Microbial Diversity And Systematic: <a href="#">1075x_Ch03_025.Qxd (Jblearning.Com)</a></li> <li>2. Microbiological Laboratory Techniques: <a href="#">Microbiological Laboratory Techniques (Mowr.Gov.In)</a></li> <li>3. Micro-Organism: <a href="#">Pdf (Usda.Gov)</a></li> <li>4. Beneficial microorganisms in Agriculture: <a href="#">Microsoft Word - Lecture 25 Bio fertiliser.docx (eagri.org)</a></li> </ol> |  |
| This course can be opted as an elective by the students of following subjects: NA  |  |
| Suggested equivalent online courses (MOOCs) for credit transfer: NO  |  |
| <b>Electronic media and other digital components in the curriculum:</b>  |  |
| <b>Choose any one or more than one:</b> (Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)  |  |
| Name of electronic media: YouTube  | Year of incorporation: 2023-24   |

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| Programme: <b>B.Sc.</b>  | Year: <b>Third</b>  | Semester: <b>V</b> |
| Subject: <b>Biochemistry</b>   |   |                    |
| Course Code: <b>DCEBCH-106N</b>  | Course Title: <b>Spectroscopy</b>   |                    |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• To discuss the basics of UV-visible and IR spectroscopy.</li> <li>• To discuss the fundamental law of spectroscopy, electromagnetic radiation and atomic adsorption spectroscopy.</li> <li>• To discuss the NMR, atomic spectroscopy and atomic emission spectroscopy</li> <li>• To discuss the basic concept of luminescence and electron spectroscopy.</li> </ul> |   |                    |
| <b>Course Outcomes:</b> <p>CO 1: Able to know the history spectroscopy and electromagnetic radiation in brief.</p> <p>CO 2: Able to know the principle and instrumentation of UV-Visible and applications</p> <p>CO 3: Able to know the principle of electron spectroscopy and its applications.</p> <p>CO 4: Able to know the principle of flame photometry.</p> <p>CO 5: Learn the enzymatic kinetics reactions.</p>                 |   |                    |
| Credits: 2   | <b>Type of Course:</b> Elective   |                    |
| Max. Marks: 100  | Min. Passing Marks: 36  |                    |
| <b>Block 1</b>   | <b>UV-Visible and IR spectroscopy</b>   |                    |
| Unit I   | <b>Spectroscopy:</b><br>Fundamental law of spectroscopy, electromagnetic radiation, origin of spectra, application of spectroscopy in biochemistry.   |                    |
| Unit II  | <b>UV Visible spectroscopy:</b><br>Principle and instrumentation of UV-Visible, Beer-Lambert law, qualitative and quantitative analysis by UV-Visible spectroscopy. Origin of spectra and electronic transition, composition of color complex, application of UV-Visible spectrometer in enzyme kinetics reaction |                    |
| Unit III   | <b>Spectroscopy:</b><br>Theory and principle of infrared spectroscopy, components of IR spectroscopy, application of FTIR in biochemistry.  |                    |
| <b>Block 2</b>   | <b>NMR and Atomic Spectroscopy Amino Acids, Proteins and Carbohydrate</b>   |                    |
| Unit IV  | <b>NMR Spectroscopy:</b><br>Principle of NMR spectroscopy, NMR spectra measurement, types of NMR, chemical shift, application of NMR in biochemistry  |                    |
| Unit V   | <b>Atomic adsorption spectroscopy:</b><br>Principle of adsorption spectroscopy, instrumentation and application of adsorption spectroscopy.   |                    |
| Unit VI  | <b>Atomic Emission Spectroscopy:</b><br>Principle of emission spectroscopy, Instrumentation Emission spectroscopy, principle of flame photometry  |                    |
| <b>Block 3</b>   | <b>Luminescence and Electron spectroscopy</b>   |                    |

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| Unit VII  | <b>ICP-atomic emission spectroscopy:</b> Principle of plasma spectroscopy, application of adsorption spectroscopy, comparison of ICP-AES with ASS |
| Unit VIII   | <b>Luminescence spectroscopy:</b><br>Luminescence and chemiluminescence, principle of fluorescence, application of Fluorimetry                    |
| Unit IX   | <b>Electron spectroscopy:</b><br>Principle of electron spectroscopy, electron spectroscopy for chemical analysis (ESCA), chemical shift in ESCA.  |
| <b>Suggested Text Book Readings:</b>  |   |
| <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, "Lehninger Principles of Biochemistry" International Edition-2021.</li> <li>2. Dr J L Jain, "Fundamentals of Biochemistry" S. Chand and Company-2020.</li> <li>3. P S Verma and V K Agarwal, "Cell Biology (Cytology, Biomolecule and Molecular Biology" S. Chand Publication-2016.</li> <li>4. Talwar and Srivastava, "Textbook of Biochemistry and Human Biology" Eastern Economy Edition, Prentice Hall, India-2002.</li> </ol> |   |
| <b>Suggested online link:</b>   |   |
| <ol style="list-style-type: none"> <li>1. Spectroscopy: <a href="#">Spectroscopy.pdf (osti.gov)</a></li> <li>2. Nuclear Magnetic Resonance: <a href="#">Nuclear Magnetic Resonance (NMR) (brown.edu)</a></li> <li>3. Electronic Spectroscopy: <a href="#">MSc Chemistry Paper-IX Unit-4.pdf (nou.ac.in)</a></li> </ol>  |   |
| This course can be opted as an elective by the students of following subjects: NA   |   |
| Suggested equivalent online courses (MOOCs) for credit transfer: NO   |   |
| <b>Electronic media and other digital components in the curriculum:</b>   |   |
| <b>Choose any one or more than one:</b> (Electronic Media: Audio/Video Lectures, Online Counselling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)  |   |
| Name of electronic media: Youtube   | Year of incorporation: 2023-24  |

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| Programme: <b>B.Sc.</b>  | Year: <b>Third</b>  | Semester: <b>VI</b> |
| Subject: <b>Biochemistry</b>   |   |                     |
| Course Code: <b>DCEBCH -108N</b>   | Course Title: <b>PLANT BIOCHEMISTRY</b>   |                     |
| <b>Course Objectives:</b>  |   |                     |
| <ul style="list-style-type: none"> <li>• To discuss the plant biochemistry and electron transport system in plants.</li> <li>• To discuss the nitrogen metabolism and nitrogen fixation and assimilation.</li> <li>• To understand the carbon assimilation, respiration and plant growth regulator</li> <li>• To understand basic concept of hill reaction, photorespiration and photosynthesis</li> </ul> |   |                     |
| <b>Course Outcomes:</b>  |   |                     |
| CO 1: Able to know the oxidative phosphorylation   |   |                     |
| CO 2: know the concept of chlorophyll, pigments, and light harvesting complexes.   |   |                     |
| CO 3: To know cyclic and non cyclic photophosphorylation.  |   |                     |
| CO 4: Able to understanding the regulation of plant glycolysis   |   |                     |
| CO 5: Also know about abiotic and biotic stress, salinity, water stress and pathogenesis.  |   |                     |
| Credits: <b>2</b>  | <b>Type of Course:</b> Elective   |                     |
| Max. Marks: 100  | Min. Passing Marks: 36  |                     |
| <b>Block 1</b>   | <b>Electron Transport System and nitrogen metabolism</b>  |                     |
| Unit I   | <b>Electron Transport System in Plants:</b><br>Oxidative phosphorylation, mitochondrial respiratory complexes.  |                     |
| Unit II  | <b>Nitrogen Metabolism:</b> Assimilation of nitrate, enzyme of nitrate reduction and their regulation and assimilation of ammonia into organic compounds.   |                     |
| Unit III   | <b>Nitrogen fixation and assimilation:</b><br>Biological nitrogen fixation by free living and in symbiotic association, structure and function of enzyme nitrogenase, nitrate assimilation.   |                     |
| <b>Block 2</b>   | <b>Photosynthetic process and carbon assimilation</b>   |                     |
| Unit IV  | <b>Photosynthetic process:</b><br>Chlorophylls, photoperiodism, photosynthetic membranes and organelles, z scheme, light dependant reactions. Photosynthetic apparatus and pigments involved in photosynthesis, Hill reaction, generation of NADPH and ATP, light harvesting complexes.         |                     |
| Unit V   | <b>Synthesis of photochemicals:</b> Classification and biosynthesis of Terpenes, Lignins, Waxes and Alkaloids   |                     |
| Unit VI  | <b>Carbon assimilation:</b><br>Cyclic and non cyclic photophosphorylation, Calvin cycle, and photorespiration<br>General introduction, classification and structure, monosaccharides - structure of aldoses and ketoses, ring structure of sugars, formation of disaccharides, polysaccharides. |                     |
| <b>Block 3</b>   | <b>Plant stress growth regulators</b>   |                     |

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| Unit VII  | <b>Stress Metabolism in Plants:</b> A biotic and biotic stress; salinity, water stress, chilling, heat, pathogenesis, heavy metals and their impact on plant growth and metabolism. |
| Unit VIII   | <b>Respiration:</b> Regulation of plant glycolysis, regulation of plant glycolysis, translocation of metabolites across mitochondrial membrane, TCA cycle.                          |
| Unit IX   | <b>Plant growth regulator:</b> Phytohormones and its effect on plant growth and development, regulation of plant morphogenetic processes by light.                                  |
| <p><b>Suggested Text Book Readings:</b></p> <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, “Lehninger Principles of Biochemistry” International Edition-2021.</li> <li>2. Dr J L Jain, “Fundamentals of Biochemistry” S. Chand and Company-2020.</li> <li>3. P S Verma and V K Agarwal, “Cell Biology (Cytology, Biomolecule and Molecular Biology” S. Chand Publication-2016.</li> <li>4. Talwar and Srivastava, “Textbook of Biochemistry and Human Biology” Eastern Economy Edition, Prentice Hall, India-2002.</li> </ol> <p><b>Suggested Online Link:</b></p> <ol style="list-style-type: none"> <li>1. Electron transport and oxidative phosphorylation: <a href="#">spring 2013 lecture 37 &amp; 38 (purdue.edu)</a></li> <li>2. Nitrogen metabolism: <a href="#">lesson-10.pdf (nios.ac.in)</a></li> <li>3. Carbon dioxide assimilation and respiration: <a href="#">chapter-2-carbon-dioxide-assimilation-and-respiration-for-pdf.pdf (asps.org.au)</a></li> </ol> |   |
| This course can be opted as an elective by the students of following subjects: Any one  |   |
| Suggested equivalent online courses (MOOCs) for credit transfer: <b>NO</b>  |   |
| <p><b>Electronic media and other digital components in the curriculum:</b></p> <p><b>Choose any one or more than one:</b>(Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)</p>  |   |
| Name of electronic media: YouTube   | Year of incorporation: 2023-24  |

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| Programme: <b>B.Sc.</b>   | Year: <b>Third</b>   | Semester: <b>VI</b> |
| Subject: <b>Biochemistry</b>  |  |                     |
| Course Code: <b>DCEBCH-109N</b>   | Course Title: <b>Immunology</b>  |                     |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• To discuss the immunology and types of immunity.</li> <li>• To discuss the diversity in immune system and types of immunoglobulin's.</li> <li>• To discuss the generation of antibody diversity, B cell activation and theory of clonal selection.</li> <li>• To discuss the basic concept of disorders of immune responses and different immunoglobulin (IgG, IgM, IgA, IgD and IgE)</li> </ul> |  |                     |
| <b>Course Outcomes:</b> <p>CO 1: Able to understanding of immune system and its types.</p> <p>CO 2: Able to understanding about antigen, antibody and their interaction.</p> <p>CO 3: know about concept of autoimmunity, ELISA and T-cell receptor diversity.</p> <p>CO 4: Also understanding about AIDS and active immunity &amp; passive immunity.</p> <p>CO 5: Brief idea about SARS, hepatitis, tolerance and hypersensitivity.</p>                            |  |                     |
| Credits: 2  | <b>Type of Course:</b> Elective  |                     |
| Max. Marks: 100   | Min. Passing Marks: 36   |                     |
| <b>Block 1</b>  | <b>Immune system</b>   |                     |
| Unit I  | Immune system, innate and acquired immunity, definitions, non-immunological barriers, cells and soluble mediators of innate immunity, cytokines.                         |                     |
| Unit II   | Antigen and Antibody: Criteria of antigenicity, haptens; classification, types and functions of antibodies, antigenic determinants of immunoglobulins                    |                     |
| Unit III  | Types of immunoglobulins, generation of antibody diversity, B cell activation, theory of clonal selection, formation of plasma and memory cells.                         |                     |
| <b>Block 2</b>  | <b>Diversity in Immune system</b>  |                     |
| Unit IV   | Diversity in Immune system: Clonal selection theory, concept of antigen specific receptor, generation of antibody diversity,   |                     |
| Unit V  | <b>Antigen-antibody:</b> Measurement of antigen-antibody interactions, agglutination, precipitations, opsonization, gel diffusion (Ouchterlony double immune diffusion). |                     |
| Unit VI   | Immune system and immunity: Enzyme linked immunosorbent assay (ELISA), T-Cell receptor diversity, concept of autoimmunity.   |                     |
| <b>Block 3</b>  | <b>Immune responses and Immunoglobulins</b>  |                     |
| Unit VII  | Disorders of immune responses: Autoimmunity, acquired immunodeficiency, immune tolerance and hypersensitivity.   |                     |
| Unit VIII   | Cell mediated immunity: T-cell development, MHC locus, structure, function and distribution of MHC glycoproteins, cell mediated immune responses.                        |                     |
| Unit IX   | Immunoglobulins: IgG, IgM, IgA, IgD and IgE, active immunity and passive immunity. Brief idea of AIDS, SARS and hepatitis.   |                     |

**Suggested Text Book Readings:**

1. David L. Nelson and Michael Cox, “Lehninger Principles of Biochemistry” International Edition-2021.
2. Dr J L Jain, “Fundamentals of Biochemistry” S. Chand and Company-2020.
3. P S Verma and V K Agarwal, “Cell Biology (Cytology, Biomolecule and Molecular Biology” S. Chand Publication-2016.
4. Talwar and Srivastava, “Textbook of Biochemistry and Human Biology” Eastern Economy Edition, Prentice Hall, India-2002.

**Suggested online link:**

1. Introduction to Immunology: [Immunology.pdf \(hmmcollege.ac.in\)](http://hmmcollege.ac.in)
2. Components of Immune system: [components of immune system \(dHINGCOLLEGEONLINE.CO.IN\)](http://dHINGCOLLEGEONLINE.CO.IN)
3. Immune System: [Immune System Handout \(Soinc.Org\)](http://Soinc.Org)
4. Antigens: [Microsoft PowerPoint - Chapter04-09 \(nau.edu\)](http://nau.edu)
5. Immunoglobulins: [Immunoglobulins.pdf \(ndvsu.org\)](http://ndvsu.org)

This course can be opted as an elective by the students of following subjects: Any one

Suggested equivalent online courses (MOOCs) for credit transfer: NO

**Electronic media and other digital components in the curriculum:**

**Choose any one or more than one:**(Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)

Name of electronic media: Youtube

Year of incorporation: 2023-24

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| Programme: <b>B.Sc.</b>  | Year: <b>Third</b>   | Semester: <b>VI</b> |
| Subject: <b>Biochemistry</b>   |  |                     |
| Course Code: <b>SBSBCH-04N</b>   | Course Title: <b>Clinical biochemistry</b>   |                     |
| <b>Course Objectives:</b>  |  |                     |
| <ul style="list-style-type: none"> <li>• To discuss the basics of clinical biochemistry and clinical enzymology.</li> <li>• To discuss the role and regulation of electrolyte content in body fluids</li> <li>• To discuss the concept disorders of carbohydrate, lipids and nitrogen metabolism.</li> <li>• To discuss the basic concept of blood clotting, nutrition, drugs and cancer.</li> </ul> |  |                     |
| <b>Course Outcomes:</b>  |  |                     |
| CO 1: Able to understanding of electrolyte, enzymes, hormones and bone disorder.   |  |                     |
| CO 2: able to know the regulation of blood sugar, glycogen, and diabetes mellitus.   |  |                     |
| CO 3: Able to learn the density of lipoproteins, cholesterol, triglycerides and phospholipids in health and disease.   |  |                     |
| CO 4: Define the concept of tube feeding, parenteral nutrition, drugs and alcohol  |  |                     |
| CO 5: Able to known the types of cancer, multiple steps of tumor development.  |  |                     |
| Credits: 4   | <b>Type of Course:</b> Skill Enhancement Course  |                     |
| Max. Marks: 100  | Min. Passing Marks: 36   |                     |
| <b>Block 1</b>   | <b>Basic in clinical chemistry and Clinical Enzymology</b>   |                     |
| Unit I   | <b>Basic introduction:</b><br>Basic concept of clinical biochemistry: A brief review of units and abbreviations used in expressing concentrations and standard solutions.              |                     |
| Unit II  | <b>Electrolytes and acid-base balance:</b><br>Role and regulation of electrolyte content in body fluids and maintenance of pH, body fluids and fluid compartments                      |                     |
| Unit III   | <b>Clinical enzymology:</b><br>Enzymes and hormones, plasma enzymes, isoenzymes with examples, liver damage, bone disorder.  |                     |
| <b>Block 2</b>   | <b>Disorders of carbohydrate, lipids and Nitrogen metabolism</b>   |                     |
| Unit IV  | <b>Disorders of carbohydrate metabolism:</b><br>Regulation of blood sugar, glycogen storage diseases, diabetes mellitus, glucose and galactose tolerance tests, sugar levels in blood. |                     |
| Unit V   | <b>Disorders of lipids:</b><br>Low and high density lipoproteins, cholesterol, triglycerides and phospholipids in health and disease, Gaucher's and Tay-Sach's disease                 |                     |
| Unit VI  | <b>Disorders Nitrogen metabolism:</b><br>Abnormalities in nitrogen metabolism: Uremia, hyperuricemia, porphyria and factors affecting nitrogen balance.                                |                     |
| <b>Block 3</b>   | <b>Nutrition, drugs and blood clotting</b>   |                     |
| Unit VII   | <b>Nutrition and drugs:</b>  |                     |

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|  | Routine hospital diets, special feeding methods, tube feeding, parenteral nutrition, drugs, alcohol and toxicants   |
| Unit VIII  | <b>Diagnostic Enzymes:</b><br>Enzymes in health and diseases. Biochemical diagnosis of diseases by enzyme assays- SGPT, CPK, LDH.   |
| Unit IX  | <b>Blood Clotting:</b><br>Blood clotting mechanism-hemorrhagic disorders-hemophilia, thrombotic thrombocytopenic purpura, blood groups, antigen and antibodies, circulating anticoagulants. |
| Unit X   | <b>Cancer:</b><br>Types of cancer, multiple steps of tumor development, cell death and apoptosis, carcinogens and cancer therapy.   |
| <b>Suggested Text Book Readings:</b>   |   |
| <ol style="list-style-type: none"> <li>1. David L. Nelson and Michael Cox, "Lehninger Principles of Biochemistry" International Edition-2021.</li> <li>2. Dr J L Jain, "Fundamentals of Biochemistry" S. Chand and Company-2020.</li> <li>3. P S Verma and V K Agarwal, "Cell Biology (Cytology, Biomolecule and Molecular Biology" S. Chand Publication-2016.</li> <li>4. Talwar and Srivastava, "Textbook of Biochemistry and Human Biology" Eastern Economy Edition, Prentice Hall, India-2002.</li> <li>5. Satyanarayana U., "Biochemistry" Elsevier India,2021</li> </ol>   |   |
| <b>Suggested online link:</b>  |   |
| <ol style="list-style-type: none"> <li>1. Pathophysiology of Water and Electrolyte Metabolism: <a href="https://www.bns-hungary.hu">PowerPoint Presentation (bns-hungary.hu)</a></li> <li>2. Nutrient-Drug Interactions and Food: <a href="https://colostate.edu">09361.pdf (colostate.edu)</a></li> <li>3. HANDBOOK OF DRUG-NUTRIENT INTERACTIONS: <a href="https://usp.br">Handbook of Drug-Nutrient Interactions, 2nd Edition (Nutrition and Health) (usp.br)</a></li> <li>4. Enzymes of diagnostic values: <a href="https://ndvsu.org">L12-Enzymes-of-diagnostic-values.pdf (ndvsu.org)</a></li> <li>5. Blood Clotting Notes: <a href="https://murrieta.k12.ca.us">Blood Clotting Notes (murrieta.k12.ca.us)</a></li> <li>6. Cancer: <a href="https://tmc.gov.in">book.pdf (tmc.gov.in)</a></li> </ol> |   |
| This course can be opted as an elective by the students of following subjects: NA  |   |
| Suggested equivalent online courses (MOOCs) for credit transfer: NO  |   |
| <b>Electronic media and other digital components in the curriculum:</b>  |   |
| <b>Choose any one or more than one:</b> (Electronic Media: Audio/Video Lectures, Online Counseling/Virtual Classes/E-Contents/e-SLM/OER/supplementary links for reference/Video Conferencing/Radio broadcast/Web Conferencing/ Other electronic and digital contents)  |   |
| Name of electronic media: Youtube  | Year of incorporation: 2023-24  |