Faculty of Sports Medicine & Physiotherapy

SYLLABUS

FOR

M.Sc. SPORTS BIOCHEMISTRY
(SEMESTER: I – IV)
(Credit Based Evaluation and Grading System)

Session: 2019-20

GURU NANAK DEV UNIVERSITY
AMRITSAR

Note:  (i) Copy rights are reserved.
Nobody is allowed to print it in any form.
Defaul ters will be prosecuted.

(ii) Subject to change in the syllabi at any time.
Please visit the University website time to time.
M.Sc. (Sports Biochemistry) (Semester System)
(Credit Based Evaluation and Grading System)

**Semester-I**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>C/E/I</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Core Courses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBL401</td>
<td>C</td>
<td>Biomolecules</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL402</td>
<td>C</td>
<td>Molecular Biology</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL403</td>
<td>C</td>
<td>Human Physiology</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL404</td>
<td>C</td>
<td>Biostatistics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBP410</td>
<td>C</td>
<td>Practicals in Molecular Biology</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>15</td>
<td>1</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

**Semester-II**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>C/E/I</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Core Courses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBL451</td>
<td>C</td>
<td>Thermodynamics and Bioenergetics</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL452</td>
<td>C</td>
<td>Metabolism of Carbohydrates and Lipids</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL453</td>
<td>C</td>
<td>Essentials of Genetics</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL454</td>
<td>C</td>
<td>Computer Applications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>SBP461</td>
<td>C</td>
<td>Practical in Clinical Biochemistry-I</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Elective Course (3 Credits)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Elective Course/Optional Course</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>18</td>
<td>0</td>
<td>6</td>
<td>24</td>
</tr>
</tbody>
</table>

*List of Elective Courses:*
1. Evidence Based Practice in Allied Health Sciences - SPL690
2. Women Health and Exercise - SPL691

**Note:-**

PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory Paper) Students can opt. in any semester except Semester 1st. This ID Paper is one of the total ID Papers of this course.
M.Sc. (Sports Biochemistry) (Semester System)
(Credit Based Evaluation and Grading System)

**Semester-III**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>C/E/I</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBL501</td>
<td>C</td>
<td>Enzymology</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL502</td>
<td>C</td>
<td>Metabolism of Proteins and Nucleic Acids</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBP510</td>
<td>C</td>
<td>Practical in Microbiology</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Interdisciplinary Course</td>
<td>I</td>
<td>Interdisciplinary Course</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>12</td>
<td>0</td>
<td>8</td>
<td>20</td>
</tr>
</tbody>
</table>

**Semester-IV**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>C/E/I</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBL551</td>
<td>C</td>
<td>Molecular Cell Biology</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBL552</td>
<td>C</td>
<td>Medical Biochemistry</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SBP561</td>
<td>C</td>
<td>Practical in Clinical Biochemistry-II</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>SBD562</td>
<td>C</td>
<td>Dissertation</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>8</td>
<td>0</td>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>
A. Theory (Examination)

Instructions to Paper Setters:
The paper setters should set 8 questions (of equal marks), two in each of the four sections (Section A to D, corresponding to the distribution in the syllabi). Further, the paper setters shall be instructed to make sub-sections (not exceeding 4) of the questions and allocate appropriate marks to each section. The candidates shall be asked to attempt five questions by selecting one question from each section and the fifth question may be attempted from any section.

* 1 hr of theory and dissertation is counted as 1 credit. 2 hr of practical /clinical training is counted as 1 credit.

B. Practical Examination - 24 Credits

Practical examination of 24 credits will be conducted at the end of 4th semester which includes patient evaluation and management, viva-voce etc.

C. Dissertation – 24 Credits

The topic of dissertation will be allocated in Second Semester and candidate will work for 2 semesters and submit a written thesis in 4th semester. The student will be awarded grade for the total number of credits earned in dissertation in II, III and IV semesters of study at the end of the IV semester.

Practical Attachments

To enable the students to acquire practicing in hand on skills, maximum emphasis will be laid on regular practical classes, demonstration and clinical practice. The students will undergo Clinical /Field training in GNDU Campus / Sports Authority of India (Various Centres), National institutes of Physiotherapy, Government Medical College Amritsar, other sporting centers and to the coverage of various tournaments as and when required and decided by BOC.

* The credits earned by a candidate in practical and dissertation during different semesters will be evaluated at the end of the 4th semester and the grade will be determined accordingly.

* A candidate shall be required to maintain minimum of 5.62 SGPA at the end of each semester. A student getting ‘C’ or lower grade in any course in this discipline will be treated as having failed in that course and shall have to repeat the core/elective courses/or repeat/opt. another course in lieu of interdisciplinary/optional department course with approval of Board of Control, and will have to obtain at least ‘C+’ grade in that course within specified period as per the prevailing rules. The weights of ‘C’ and lower grades will not be counted in SGPA or CGPA (according to syndicate proceeding, dated: 24.5.2010, para no. 34).

Interdisciplinary/Optional Course: to be offered from outside the department.
M.Sc. (Sports Biochemistry) (Semester-I)
(Credit Based Evaluation and Grading System)

SBL401: BIOMOLECULES

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Introduction:
Biological fitness of organic compounds, dimensions and shape of biomolecules, supramolecular assemblies and cell organelles. Structure of atoms, molecules and chemical bonds.

Carbohydrates:
Definition, importance and functions, families of monosaccharides and structure of carbohydrates, stereoisomerism and mutarotation, derivatives of monosaccharides, disaccharides, trisaccharides and polysaccharides (starch, glycogen, cellulose, dextrins), sugars of bacterial cell wall.

Section – B
Water:
Physical properties and structure of water, hydrogen bonding, solvent properties of water, ionization of water, fitness of aqueous environment for living organisms.

Lipids:
Definition, importance and functions, classification of lipids, fatty acids and essential fatty acids, general structure and functions of major lipid subclasses, acylglycerols, phosphoglycerides, sphingolipids, terpenes, steroids, eicosanoids.

Vitamins and Minerals:
Definition, chemistry and functions of water and fat soluble vitamins, major trace minerals, their bound forms and functions.

Section – C
Proteins:

Section – D
Porphyrins:
Nucleus and classification of porphyrins, important metallo porphyrins occurring in nature, chemical nature and physiological significance of bile pigment.
M.Sc. (Sports Biochemistry) (Semester-I)
(Credit Based Evaluation and Grading System)

Recommended Books:
M.Sc. (Sports Biochemistry) (Semester-I)
(Credit Based Evaluation and Grading System)

SBL402: MOLECULAR BIOLOGY

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Structure and Functions of Nucleic Acids:

Section – B
DNA replication, repair and recombination:
Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms.

Section – C
RNA synthesis and processing: Structure and function of RNA polymerases. Transportation in prokaryotes Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.

Section – D
Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post- translational modification of proteins.
M.Sc. (Sports Biochemistry) (Semester-I)
(Credit Based Evaluation and Grading System)

Recommended Books:
M.Sc. (Sports Biochemistry) (Semester-I)
(Credit Based Evaluation and Grading System)

SBL403: HUMAN PHYSIOLOGY

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
1. Introduction to human physiology, cells, tissues, organs and system organization.
2. Cell structure, transport through cell membrane, Classification of tissue.

Section – B
3. Nervous system, central and autonomic nervous system, organization, Structure and properties of nerve, transmission of impulse, resting and action potential, Reflex action, reflex arc.
4. Endocrine system - Different endocrine glands and their hormones, major functions, mode of action, feedback mechanism.
5. Digestive system- organs of GI tract and their major functions.

Section – C
6. Cardiovascular system- anatomy of heart and blood vessels, conduction system in heart, Normal ECG. Systemic, coronary and pulmonary circulation. Cardiac cycle, cardiac output and blood pressure.
7. Respiratory system- anatomy, mechanism of respiration, lung volume and capacities, external and internal respiration, transport of O2 and CO2
8. Excretory system - anatomy, function, renal circulation, auto regulation of the circulation, Structural and functional unit, Urine formation.

Section – D
10. Immune system - Innate, acquired and active immunity, cell mediated and humoral mediated immunity. Auto immune disease and Immune deficiency disorders.

References:
SBL404: BIOSTATISTICS

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Contents

Section – A
Statistical Method: Collection of data, Frequency distribution and its graphical representation, Measures of central tendency, Dispersion, Skewness and Kurtosis moments

Correlation and Regression: Relationship between variables, covariance, Karl-Pearson’s correlation coefficient, Spearman’s rank correlation coefficient, Least square technique for regression lines (without proof), regression coefficients, relationship between correlation analysis and regression analysis.

Section – B
Probability: Mathematical definitions of probability of an even, Use of permutations and combinations in calculations of probability, conditional probability, additive and multiplication law of probability, random variables and its pmf, pdf, cdf, mathematical expectation and variances, Theoretical Distribution: Binomial, Poisson and Normal Properties of these distributions (applications only)

Section – C
Hypothesis Testing: Sample, population, statistics and parameters, null hypothesis, level of significance. Definitions of Chi-square ‘t’ and ‘F’ variates and their pdf only, Application of these distributions in testing of hypothesis. (10 Lectures)

Section – D
Analysis of Variance: Meaning of analysis of variance with linear models, Analysis of variance for one way classified data, analysis of variance for two way classified data with one observation for cell, analysis of variance for two-way classified data with multiple but equal number of observations per cell (data analysis only).

Recommended Books:
1. Raghavarao, D.: Statistical Techniques in Agricultural and Biological research (1983), Oxford and IBH Publishing Co. [Chapters: 2,3,4,5,7,8,9 and 10].
M.Sc. (Sports Biochemistry) (Semester-I)
(Credit Based Evaluation and Grading System)

SBP410: PRACTICALS IN MOLECULAR BIOLOGY

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Contents
Isolation of genomic DNA from bacteria (E.coli) and human blood, Quantification of DNA using spectrophotometric method, Isolation of plasmid DNA from bacteria, Transformation of bacteria using CaCl₂ heat shock method, Digestion of DNA using restriction endonucleases, Resolution and molecular weight estimation of fragmented DNA using agarose gel electrophoresis, Construction of restriction map by single and double digestion, Amplification of known DNA sequences by Polymerase Chain Reaction.

Recommended Books:
M.Sc. (Sports Biochemistry) (Semester-II)
(Credit Based Evaluation and Grading System)

L T P
4 0 0

SBL451: THERMODYNAMICS AND BIOENERGETICS

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A


Section – B

Section – C

Section – D


Recommended Books:

M.Sc. (Sports Biochemistry) (Semester-II)
(Credit Based Evaluation and Grading System)

SBL452: METABOLISM OF CARBOHYDRATES AND LIPIDS

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Introduction to Metabolism: Types of Metabolic Pathways, Experimental approaches to study metabolism, Basic principles/mechanisms of metabolic regulation. Basic concepts and design of metabolism. Some activated carriers in metabolism.

Section – B
Carbohydrate Catabolism: Digestion and absorption of carbohydrates, glycolysis, citric acid cycle, oxidative phosphorylation, pentose phosphate and other pathways, Degradation of di and polysaccharides.

Section – C
Carbohydrate Anabolism: Gluconeogenesis, Role of nucleotide diphosphate sugars, Biosynthesis of di and polysaccharides, Regulation of carbohydrate metabolism, photosynthesis.

Section – D
Lipid Catabolism: Digestion and absorption of lipids; transport of lipoproteins, Oxidation of fatty acids, Degradation of triacylglycerols, phosphoglycerides. Sphingolipids, Regulation of lipid Metabolism. Lipid Anabolism: synthesis of fatty acids, triacylglycerols, phosphoglycerides, sphingolipids, cholesterol, prostaglandins and other protanoids.

Recommended Books:
SBL453: ESSENTIALS OF GENETICS

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A

Introduction to Genetics; Mitosis and Meiosis
Mendel’s work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information. Interrelation between the cell structure and the genetics function, Mitosis, Meiosis (explaining Mendel’s ratios).

Mendelian Genetics and its Extension
Principles of Inheritance, Chromosome theory of inheritance, Laws of Probability, Pedigree analysis, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex linked inheritance.

Section – B

Extrachromosomal Inheritance
Chloroplast mutation/Variegation in Four o’ clock plant and Chlamydomonas, Mitochondrial mutations in Neurospora and yeast, Maternal effects, Infective heredity, Kappa particles in Paramecium.

Genetic Analysis and Mapping in Bacteria and Bacteriophages
Conjugation; Transformation; Transduction, Recombination.

Section – C

Linkage, Crossing Over and Chromosomal Mapping
Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics –an alternative approach to gene mapping.
Section – D

Mutations
Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy. Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations, Molecular basis of Mutations in relation to UV light and chemical mutagens, DNA repair mechanisms.

Transposable genetic elements
Prokaryotic transposable elements- IS elements, Composite transposons, Tn-3 elements; Eukaryotic transposable elements- Ac-Ds system in maize and P elements in Drosophila; Uses of transposons; Eukaryotic Viruses.

Recommended Books:

M.Sc. (Sports Biochemistry) (Semester-II)
(Credit Based Evaluation and Grading System)

SBL454: COMPUTER APPLICATIONS

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A

Computer fundamentals and MS word
Introduction to digital computers, Organization, Number system, I/O devices, Storage devices, MS-Windows basics, MS-office, MS-Word-Meaning of word- Processing, Creating, Saving, Printing Documents, Page Setup, Formatting, Spell-Check, Adding page numbers, Header and Footer, Macros, Creating tables, Converting table to text and vice-versa, Mail Merge Ms-Excel-spreadsheets, Using different types of formulae, Creating graphs and charts, Exporting charts to MS-Word, MS-Power Point, Creating presentations, Formatting, Adding effects and timings

Section – B

Data Analysis
Introduction to Data, Information, Database, DBMS (Advantages and disadvantages), MS-Access, Basics of MS Access, Introduction to SQL (Data retrieval) Data analysis and database-Brief description and tabulation of data

Section – C

Statistical Analysis Tools
Measure of central tendency and dispersion-Mean, Median, Mode, Range, Standard Deviation, Variance and Correlation coefficient using SPSS. Types of errors and level of significance, Tests of significance, (F and t-test); Chi-square tests
Section – D

Internet


Recommended Books:

M.Sc. (Sports Biochemistry) (Semester-II)  
(Credit Based Evaluation and Grading System)  

SPL590: EVIDENCE BASED PRACTICE IN ALLIED HEALTH SCIENCES (ELECTIVE)

Mid Semester Examination: 20% weightage  
End Semester Examination: 80% weightage  

Instructions for the Paper Setters:  
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A  
1. Introduction to evidence– based complementary medicine  
2. Evidence–based health care  
3. Evidence–based practices  
4. Evidence–based decision making and management

Section – B  
1. Types of evidence  
   a. Definition of evidence  
   b. Forms of evidence  
   c. Randomized controlled trials

Section – C  
1. Case–control studies  
2. Cohort studies

Section – D  
1. Applying the evidence  
   a. Pathways, guidelines and protocols  
   b. Future directions for clinical effectiveness  
2. Evaluation of effectiveness and efficiency of the process

References:  
1. Martin Dawes, Philip Davies, and Alistair Gray, Evidence–Based Practice: A Primer for Health Care Professionals. Elsevier Publication.  
M.Sc. (Sports Biochemistry) (Semester-II)
(Credit Based Evaluation and Grading System)

**SPL591: WOMEN HEALTH AND EXERCISE (ELECTIVE)**

**Mid Semester Examination:** 20% weightage  
**End Semester Examination:** 80% weightage

**Instructions for the Paper Setters:**
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section – A**
1. Gender difference in muscle morphology  
2. Diagnosis and Treatment of Urinary Incontinence and Prolapse

**Section – B**
3. Anemia  
4. Hypertension in Women

**Section – C**
2. Bone health: assessment and treatment of osteopenia and osteoporosis  
3. Evaluation and Treatment of Common Musculoskeletal Complaints

**Section – D**
1. Exercise for the childbearing year  
2. Exercise for adolescence  
3. Exercise for the older woman

**References:**
SBP 461: PRACTICALS IN CLINICAL BIOCHEMISTRY-I


Recommended Books:

M.Sc. (Sports Biochemistry) (Semester-III)
(Credit Based Evaluation and Grading System)

L T P
4 0 0

SBL 501: ENZYMOLOGY

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Introduction to Enzymes: Nomenclature, Classification and Characteristics of enzymes, Enzyme specificity, Cofactors, Co-enzyme and Prosthetic group
Mechanism of Enzyme Action: Nature of active site, identification of functional groups at active site, enzyme substrate complex, Factors responsible for catalytic efficiency of enzymes: Proximity and orientation, covalent catalysis, Acid base catalysis, Strain and distortion theory, Induced fit hypothesis.

Section – B
Mechanism of Action of Selected Enzymes: Chymotrypsin, Lysozyme, Carbonic anhydrase, Ribonuclease, Involvement of co-enzymes in enzyme catalyzed reactions, RNA molecules as enzymes
Enzyme Kinetics:A brief concept of bioenergetics and kinetics, Kinetics of single and bi-substrate enzyme catalyzed reactions, Michaelis Menten equation. Derivation of Michaelis Menten equation and determination of Km and Vmax values

Section – C
Enzyme Inhibition: reversible and irreversible inhibition, Kinetics of competitive, uncompetitive and non-competitive inhibition, Random, Ordered, Theorell & Chance, and Ping-pong mechanism, their rate equations and diagnostic plots, Substrate inhibition and activation, Effect of pH and temperature on rate of enzyme catalyzed reactions
Regulation of Enzyme Activity: Allosteric enzymes, control of metabolic pathways, Mechanism of Aspartate transcarbamylase, Sigmoidal behavior, sequential and concerted models, Reversible covalent modification and zymogen activation, Isozymes and their importance
M.Sc. (Sports Biochemistry) (Semester-III)
(Credit Based Evaluation and Grading System)

Section – D

Enzyme Technology: Extraction and purification of enzymes, Enzymes as analytical reagents, Immobilized enzymes, Biotechnological applications of enzymes, Application of enzymes in medicine and industry.

Recommended Books:

M.Sc. (Sports Biochemistry) (Semester-III)
(Credit Based Evaluation and Grading System)

**SBL 502: METABOLISM OF PROTEINS AND NUCLEIC ACIDS**

**Mid Semester Examination: 20% weightage**
**End Semester Examination: 80% weightage**

**Instructions for the Paper Setters:**
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents**

**Section – A**

**Metabolism of Nitrogen:**
Digestion and absorption of proteins, Nitrogen fixation and its mechanism, Assimilation of ammonia, Nitrogen cycle.

**Catabolism of Amino Acids:**
General reactions of amino acids metabolism i.e. transamination, deamination, decarboxylation, Urea cycle, Catabolism of individual aminoacids.

**Section – B**

**Anabolism of amino acids:**
Biosynthesis of essential and non-essential amino acids, Regulation of amino acid biosynthesis

**Metabolism of amino acids precursors:**
Metabolism of Porphyrins: Biomedical importance, Heme biosynthesis, Genetic disorders of heme metabolisms catabolism of heme bilirubin: its conjugation and secretion, Hyperbilirubinoemia.

**Section – C**

**Degradation of Nucleotides:**
Degradation of purines and pyrimidines, Salvage pathways

**Biosynthesis of Nucleotides:**
Biosynthesis of purine and pyrimidine nucleotides, Biosynthesis of deoxyribonucleotides, Biosynthesis of nucleotide coenzymes, Regulation of nucleotide biosynthesis.
Integration of Metabolism:
Recurring motifs in biochemistry, regulation of major metabolic pathways, metabolic fates of glucose-6-phosphohate, pyruvate and acetyl CoA, Metabolic profiles of brain, muscle, adipose tissue, liver and kidney, Hormonal regulation of metabolism, metabolic adaptations.

Recommended Books:
M.Sc. (Sports Biochemistry) (Semester-III)  
(Credit Based Evaluation and Grading System)  

**SBP 510: PRACTICALS IN MICROBIOLOGY**

**Course Contents**
Preparation of solid media and liquid media, pour plating, streaking plate method, serial dilution, CFU count, staining techniques like simple staining, Gram’s Staining, Differential staining, Motility test, Hanging drop, Bacterial transformation, plasmid isolation and purification, restriction digestion.

**Recommended Books:**
SBL 551: MOLECULAR CELL BIOLOGY

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A
Membrane Structure and Function:
Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Section – B
Structural Organization and Function of Intracellular Organelles:
Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.

Section – C
Cell Signaling:
Hormones and their receptors, cell surface receptor, signaling through G- protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing.

Section – D
Cellular Communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.
M.Sc. (Sports Biochemistry) (Semester-IV)  
(Credit Based Evaluation and Grading System)

**Microscopic Techniques:** Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

**Recommended Books:**
SBL552: MEDICAL BIOCHEMISTRY

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Contents

Section – A
Introduction: Definition and scope of clinical biochemistry in diagnosis, use of clinical laboratory and interpretation of results
Body Fluids: Biochemistry of urine, blood and cerebrospinal fluid, normal and abnormal constituents and clinical entities in body fluids.
Water and Electrolyte: Distribution of water in body, water turnover and balance, electrolyte composition of body fluids, regulation of electrolyte balance

Section – B
Acid Base Balance: Production of acids and bases by the body, maintenance of body pH, disorders of acid base balance
Disorders of carbohydrate metabolism: Disorders of carbohydrate metabolism: Diabetes mellitus, ketoacidosis, hypoglycemia, glycogen storage diseases, galactosemia, lactose intolerance, and lactic acidosis. Disorders of lipids: lipid mal-absorption and steatorrhea, sphingolipidosis, clinical interrelationships of lipids, lipoproteins and apolipoproteins; Disorders of amino acid metabolism: inborn errors of amino acid metabolism-alkaptonuria, phenylketouria, albinism, gout, hyperglycemia, phenylalaninemia, homocystineuria, tyrosinemia, aminoacidurias; Disorders of nucleic acid metabolism (Purine and Pyrimidine metabolism); Disorders of iron, porphyrin and mineral metabolism; Metabolism under stress conditions.

Section – C
Clinical Enzymology: Principles of diagnostic enzymology, clinical significance of alkaline and acid phosphatase, SGOT, SGPT, LDH, CPK, aspartate aminotransferase, alanine aminotransferase, Creatine kinase.
Section – D

**Detoxification**: Mechanism of detoxification: oxidation, reduction, hydrolysis and conjugation, clinical aspects of detoxification.

**Organ Function Tests**: Renal function test, liver function test, gastric function test and thyroid functions test.

**Recommended Books**

SBP561: PRACTICALS IN CLINICAL BIOCHEMISTRY-II


Recommended Books: