FACULTY OF SCIENCE

SYLLABI

FOR

B.Sc.(Hons.) BIOINFORMATICS
(SEMESTER SYSTEM)

1st to 6th SEMESTER

EXAMINATIONS 2017-2018

--:O:--
OUTLINES OF TESTS, SYLLABI AND COURSES OF READING FOR  
B.Sc. (Hons.) BIOINFORMATICS  
SEMESTER – I (SESSION: 2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
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<tbody>
<tr>
<td>BIN-1001</td>
<td>3</td>
<td>English – I</td>
<td>45 (40+5)</td>
<td>05</td>
</tr>
<tr>
<td>BIN-1002/ BIN-1003</td>
<td>3</td>
<td>Punjabi-I/ HCP-I</td>
<td>45 (40+5)</td>
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<tr>
<td>BIN-1004 / BIN-1005</td>
<td>6+3</td>
<td>Life Sciences / Mathematics</td>
<td>75 (60+15)</td>
<td>BIN-1054/ BIN- 1055 25 (20+5)</td>
</tr>
<tr>
<td>BIN-1006</td>
<td>6+3</td>
<td>Chemistry-I</td>
<td>75 (60+15)</td>
<td>BIN-1056 25 (20+5)</td>
</tr>
<tr>
<td>BIN-1007</td>
<td>6+3</td>
<td>Introduction to Biochemistry</td>
<td>75 (60+15)</td>
<td>BIN-1057 25 (20+5)</td>
</tr>
<tr>
<td>BIN-1008</td>
<td>6+3</td>
<td>Physics</td>
<td>75 (60+15)</td>
<td>BIN-1058 25 (20+5)</td>
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Total Marks (Semester – I) 395 105

B. Sc. (Hons.) BIOINFORMATICS  
SEMESTER – II (SESSION: 2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
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<tbody>
<tr>
<td>BIN-2001</td>
<td>3</td>
<td>English-II</td>
<td>45 (40+5)</td>
<td>05</td>
</tr>
<tr>
<td>BIN-2002/ BIN-2003</td>
<td>3</td>
<td>Punjabi-II / HCP-II</td>
<td>45 (40+5)</td>
<td>-</td>
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<tr>
<td>BIN-2004</td>
<td>6+3</td>
<td>Statistics and Computer Fundamentals</td>
<td>75 (60+15)</td>
<td>BIN-2054 25 (20+5)</td>
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<tr>
<td>BIN-2005</td>
<td>6+3</td>
<td>Chemistry-II</td>
<td>75 (60+15)</td>
<td>BIN-2055 25 (20+5)</td>
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<tr>
<td>BIN-2006</td>
<td>6+3</td>
<td>Introduction to Bioinformatics</td>
<td>75 (60+15)</td>
<td>BIN-2056 25 (20+5)</td>
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<tr>
<td>BIN-2007</td>
<td>6+3</td>
<td>C-Language and programming</td>
<td>75 (60+15)</td>
<td>BIN-2057 25 (20+5)</td>
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</table>

Total Marks (Semester – II) 395 105

The Environment, Road Safety Education & Violence against Women & Children is a compulsory qualifying paper, which the students have to study in the B.Sc. 1st year (2nd Semester). If the student/s failed to qualify the paper during the 2nd Semester, he /she/they be allowed to appear/qualify the same in the 4th or 6th Semester/s.
### SEMESTER – III (SESSION: 2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
</tr>
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<tbody>
<tr>
<td>BIN-3001</td>
<td>6+3</td>
<td>Fundamentals of Molecular Biology</td>
<td>75 (60+15)</td>
<td>BIN-3051 25 (20+5)</td>
</tr>
<tr>
<td>BIN-3002</td>
<td>6+3</td>
<td>Computational Methods in Biomolecular Sequence and Phylogenetic Analysis</td>
<td>75 (60+15)</td>
<td>BIN-3052 25 (20+5)</td>
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<tr>
<td>BIN-3003</td>
<td>6+3</td>
<td>Computer Operational System and Organization</td>
<td>75 (60+15)</td>
<td>BIN-3053 25 (20+5)</td>
</tr>
<tr>
<td>BIN-3004</td>
<td>6+3</td>
<td>Statistical Methods</td>
<td>75 (60+15)</td>
<td>BIN-3054 25 (20+5)</td>
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<tr>
<td>BIN-3005</td>
<td>6+3</td>
<td>Object Oriented Programming In C++</td>
<td>75 (60+15)</td>
<td>BIN 3055 25 (20+5)</td>
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Total Marks (Semester –III) 375 125

### SEMESTER – IV (SESSION: 2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIN-4001</td>
<td>6+3</td>
<td>rDNA technology and Biochemical techniques</td>
<td>75 (60+15)</td>
<td>BIN-4051 25 (20+5)</td>
</tr>
<tr>
<td>BIN-4002</td>
<td>6+3</td>
<td>Computational Methods in Biomolecular Sequence and Structure Analysis</td>
<td>75 (60+15)</td>
<td>BIN-4052 25 (20+5)</td>
</tr>
<tr>
<td>BIN-4003</td>
<td>6+3</td>
<td>Cell Biology and Microbiology</td>
<td>75 (60+15)</td>
<td>BIN-4053 25 (20+5)</td>
</tr>
<tr>
<td>BIN 4004</td>
<td>6+3</td>
<td>Introduction to Database Management System</td>
<td>75 (60+15)</td>
<td>BIN-4054 25 (20+5)</td>
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<tr>
<td>Project Work</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>BIN-4055 100</td>
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Total Marks (Semester –IV) 300 200
### SEMESTER – V (SESSION: 2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
</tr>
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<tbody>
<tr>
<td>BIN-5001</td>
<td>6+3</td>
<td>Internet Programming</td>
<td>75(60+15)</td>
<td>BIN-5051 25 (20+5)</td>
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<tr>
<td>BIN-5002</td>
<td>6+3</td>
<td>Fundamentals of Genomics</td>
<td>75(60+15)</td>
<td>BIN-5052 25 (20+5)</td>
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<tr>
<td>BIN-5003</td>
<td>6+3</td>
<td>Biosafety and IPR</td>
<td>75(60+15)</td>
<td>BIN-5053 25 (20+5)</td>
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<tr>
<td>BIN-5004</td>
<td>6+3</td>
<td>Genetics and Evolution</td>
<td>75(60+15)</td>
<td>BIN-5054 25 (20+5)</td>
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<tr>
<td>BIN 5005</td>
<td>6+3</td>
<td>Molecular Modeling and Computer Aided Drug Design</td>
<td>75(60+15)</td>
<td>BIN-5055 25 (20+5)</td>
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<tr>
<td><strong>Total Marks (Semester –V)</strong></td>
<td></td>
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<td><strong>375</strong></td>
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### SEMESTER – VI (SESSION: 2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIN-6001</td>
<td>6+3</td>
<td>Introduction to Perl Programming</td>
<td>75(60+15)</td>
<td>BIN-6051 25 (20+5)</td>
</tr>
<tr>
<td>BIN-6002</td>
<td>6+3</td>
<td>Proteins and Proteomics</td>
<td>75(60+15)</td>
<td>BIN-6052 25 (20+5)</td>
</tr>
<tr>
<td>BIN-6003</td>
<td>6+3</td>
<td>Immunology</td>
<td>75(60+15)</td>
<td>BIN-6053 25 (20+5)</td>
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<tr>
<td></td>
<td></td>
<td>Project Work</td>
<td>-</td>
<td>BIN-6054 200</td>
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<tr>
<td><strong>Total Marks (Semester –VI)</strong></td>
<td></td>
<td></td>
<td><strong>225</strong></td>
<td><strong>275</strong></td>
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</table>
Note: (i) There will be one paper of **40 marks**, **5 marks** are reserved for the Internal assessment and **5 for the Practical work. Total is 50.**

(ii) The paper shall consist of Two Units, Unit I will be text specific and Unit II shall deal with different aspects of Communication and Language Skills.

(iii) For Unit I, the prescribed text is **Varieties of Expression** Ed. A.H.Tak. Foundation Books. Only four Prose chapters and two dramas have been recommended for study. The relevant sections, however, are as follows:

(iv) Practical marks (5) will be based on project work of the candidate.

**UNIT I**

**Prose:** Chapters 1-4  
**Drama:** Dramas 1-2

**UNIT II**

**Note (iv)** No text book is recommended for Unit II, but a few books that may be used for this Unit are listed towards the end. Unit II shall consist of the following:

*Business Communication:* It shall focus on different aspects of communication in general and business communication in particular, communication within organizations, types of communication, and significance of positive attitude in improving communication.  
*Writing Skills:* This section shall focus on letters of all kinds, tender notices, auction notices, public notices; and memos.

**Note:** *In case of private candidates and students of School of Open Learning, the marks obtained by them out of 40 will be proportionately increased out of 50.***

**Testing Scheme:**
The examination paper shall be divided into two sections, corresponding to two units already proposed in the syllabus. The distribution of questions and marks in Unit I shall be as follows:

Section I (It is text-based and corresponds to Unit I in the syllabus)

Q.1 It shall consist of six short questions. Three from Prose and three from drama (not exceeding 50-60 words) out of which a student will be expected to attempt any **two** from **Prose** and **two** from **Drama**. This question shall be based upon the prescribed text **Varieties of Expression** and cover a wide range of issues, topics and problems.

10 marks

Q.2 It shall consist of four long questions- **Two** from **Prose** and **two** from **Drama** (not exceeding 100-150 words) out of which a student will be expected to attempt **two-one** from Prose and one from Drama.

5 marks
Note:- The question 1 & 2 should be so designed as to cover all the chapters. Prescribe (Prose & Drama)
Q.3. It shall exclusively be a test of vocabulary, but designed strictly on the lines of various exercises given at the end of each chapter in the prescribed text. The candidate shall be given five words in one column and asked to match them with words/meanings in the next column.  

5 marks

UNIT II
Q.4 This question shall test a student’s ability to write letter of various kinds (not more than 200 words). Again, there will be internal choice here.  

5 marks


10 marks

Q.6 One short question to test the students’ understanding of various aspects of Business Communication.  

5 Marks
अभ्यास-अध्याय (वहित उो बना मंचारित)
मूलपत्र प्रम, प्रविष्टपत्र सम्पथ जे प्रम, बहिनाप मिली मंच
पुस्तक: गुप्त रघुवंश एवं गुप्तीकषण, विभाग, 2006
अभ्यास-अध्याय पुस्तक वहित उो पर वेड़ना विच वो परंपरा विभागिता (हे एं हिंदि)
1 1/2 मंच
अभ्यास-अध्याय पुस्तक विचरणों वहित उो पर विच विच वेड़ना हें मंच (हे एं हिंदि)
4 मंच
वेड़ना विचरण पठ-पुस्तक (अभ्यास-अध्याय) दोनों वहित उो पर विचरण वेड़ना विच विच विच वेड़ना पुस्तकें मंच (7 एं 5)
3 1/2 मंच
सत्राली में अभ्यास वें मूलपत्र हूँ पुस्तक भाषिकीय बातें पुस्तक हिंदिक (हे एं हिंदि)
5 मंच
विभेदक: विशेष विदेश
4) विशेष विदेश
4) एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं एवं
पुस्तक विच भाषिक बातीय सारं तथा, वास्तव एं पुस्तक विच 6 मंच
Paper – BIN-1003  HISTORY AND CULTURE OF PUNJAB – I

Instructions for the paper-setter and candidates: (for paper in Semester I & II)

1. The syllabus has been divided into four Units. There shall be 9 questions in all. The first question is compulsory and shall be short answer type containing 10 short questions spread over the whole syllabus to be answered in about 25 to 30 words each. The candidates are required to attempt any 5 short answer type questions. Each question will carry 1 mark. Rest of the paper shall contain 4 units. Each Unit shall have two essay type questions and the candidate shall be given internal choice of attempting one question from each Unit-IV in all. Each question will carry 10 marks.

2. For private candidates, who have not been assessed earlier for internal assessment, the marks secured by them in theory paper will proportionately be increased to maximum marks of the paper in lieu of internal assessment.

The paper-setter must put note (2) in the question paper.

3. One question from Unit-IV shall be set on the map.

Explanation:

1. Each essay type question would cover about one-third or one-half of a topic detailed in the syllabus.
2. The distribution of marks for the map question would be as under:
   - Map : 06 Marks
   - Explanatory Note : 04 Marks
   - In case a paper setter chooses to set a question of map on important historical places, the paper setter will be required to ask the students to mark 6 places on map of 1 mark each and write explanatory note on any two of 2 marks each.
3. The paper-setter would avoid repetition between different types of question within one question paper.

PAPER : HISTORY AND CULTURE OF PUNJAB FROM THE EARLIEST TIMES TO 1849

Max. Marks : 50
Theory : 45
Internal Assessment : 05
Time : 3 Hours

Objectives: To introduce the students to the history of the Punjab region.
Pedagogy: Lectures, library work and discussions.

UNIT I


UNIT II

4. Society and Culture under Maurayas
5. Society and Culture under Gupta
6. Cultural Reorientation: main features of Bhakti; origin and development of Sufism

**UNIT III**
9. Institution of Khalsa: new baptism; significance

**UNIT IV**
10. Changes in Society in 18th century: social unrest; emergence of misls and institutions-rakhi, gurmata, dal khalsa.
11. Society and Culture of the people under Maharaja Ranjit Singh

**Suggested Readings:**
5. Basham, A.L : The Wonder That was India, Rupa Books, Calcutta (18th rep.), 1992
6. Sharma, B.N : Life in Northern India, Munshi Ram Manohar Lal, Delhi, 1966
7. Singh, Kirpal : History and Culture of the Punjab, Part II (Medieval Period), Publication Bureau, Punjabi University, Patiala 1990(3rd edn.).

Note: The following categories of the students shall be entitled to take option of History & Culture of Punjab in lieu of Punjabi as compulsory subject:
A. That the students who have not studied Punjabi upto class 10th.
B. Ward of / and Defence Personnel and Central Govt. Employee/Employees who are transferrable on all India basis.
C. Foreigners
Objective
It introduces the students of Non-medical background to the concepts of biological sciences which are integral understanding and application of Bioinformatics.

General Instruction
• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

General Biology: The nature of life, definition of life, Characteristics of life. Differences between animals and plants. Principal divisions in Biology. Importance of Biology
Introduction to Various systems in human body: Digestive system, Respiratory system, endocrine system, Reproductive system
Basic anatomy of flowering plants

Basics of Cell Biology: Definition of cell, fundamental cell types, differences between prokaryotic and eukaryotic cell types, cell structure, cell wall, plasma membrane
Different organelles and their functions. Cell division, cell cycle and its regulation.

UNIT II


General microbiology: A brief history of microbiology. Microbes in our lives, Definition of microorganisms, naming and classification of microorganisms (Bacteria, Viruses). The diversity of microorganisms – Bacteria, Fungi, Protozoa, Algae, Viruses, Multicellular Animal
Microorganisms living in humans and animals, their role, microorganisms used to produce food and chemicals,, Disease causing microorganisms.

Recommended books:
BIN-1054  LIFE SCIENCES (Practical Course)                      Max Marks 25 (20+5)

1. Preparation of Media, Cotton Plugging and Sterilization
3. Gram staining, other staining methods
4. Growth curve of bacteria
5. To study cell structure from onion leaf peels
6. Examination of various stages of mitosis and meiosis

BIN-1005  MATHEMATICS

Theory : 60
Int. ass. : 15
Time : 3 Hours

Objective
The objective is to introduce students about basic Mathematics including real members, functions, complex numbers, Trigonometric, Matrices and Determinates, Calculus, Differential Equations and Linear Programming. These techniques are useful in solving Bioinformatics Problems.

General Instruction
• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I
Set, relation and functions:
Set, Product of sets, relations, Functions (Polynomials, Trigonometric, Exponential, logarithmic, modulus) and their Graphs.

Permutations, Combinations, Binomial Theorem: Fundamental Principle of Counting, Permutations, Binomial theorem for positive integral indices, General and Middle terms etc.

UNIT II
Limit, Continuity and Differentiability: Limit and continuity of the functions, Differentiability of functions, Chain rule, Derivatives of Functions in Parametric Forms.
Simple application of Derivatives: Rate of Change of Quantities, Increasing and Decreasing Functions.

Integration (Definite and indefinite): Integration as an Inverse Process of Differentiation, Methods of Integration, Fundamental theorem of Calculus, Area under simple curves.

Recommended books:
2. Textbook of NCERT (For class XI & XII), 2006.

BIN-1055 MATHEMATICS (PRACTICAL) Max Marks 25 (20+5)

1. Sets (Venn-Diagram, Union, Intersection, Difference of sets, Symmetric Difference of sets, Complement of sets).
2. Relations (graphical representation of relation from set A to set B or set A to set A).
3. Functions(Graph of standard functions, modulus, greatest, integer, exponential, log_{e}x, signum, sin, cos, tan, cot, sec, cosec)
4. Increasing and Decreasing (Polynomial functions)

BIN-1006 CHEMISTRY- I

Objective To introduce the basic concepts of Chemistry with application in biological Sciences

General Instruction
• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

Periodic properties
Position of elements in the periodic table, effective nuclear charge and its calculations, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination trends in periodic table and applications in predicting and explaining behaviour
Coordination compounds
Introduction, Wener’s coordination theory, naming of coordination compounds, Stereochemistry, Geometrical isomerism and optical isomerism in compounds having coordination number 4 and 6. Bonding in metal complexes

Chemical bonding
Valence bond theory and its limitations.
Molecular Orbital Theory.
Weak interactions; Hydrogen bonding and Van der waals forces.

Fundamental aspects of organic chemistry, inductive effect, electrometric effect, resonance, hyperconjugation, types of reagents, electrophiles and nucleophiles, types of organic reactions. Reaction intermediates – carbocations, carbanions, free radicals, carbenes (with examples)
Mechanisms and stereochemistry of nucleophile substitution reactions of alkyl halides, SN2 and SN1 reactions with energy diagram. The elimination-Addition mechanism (benzyne mechanism) and nucleophilic aromatic substitution reactions.

UNIT II

Physical properties and molecular structure
Optical activity, Polarization, orientation of dipoles in an electric field, dipole moment, magnetic properties.

Solutions
Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient, Dilute solution, Osmotic pressure, its law and measurements. Elevation of boiling point and depression of freezing point.

Chemical kinetics
Scope, rate of reaction, influencing factors such as concentration, temperature, pressure, solvent etc., theories of chemical kinetics, Arrhenius Equation, Concept of Activation energy.
Acids and Bases, pH, buffer action, pK. Acids and Bases strengths, acidity and basicity of solvents. Acid-base reaction

Recommended books:

BIN-1056 CHEMISTRY I (Practical Course) Max Marks 25 (20+5)

Inorganic qualitative analysis: Four ions.

Volumetric analysis
Iodimetry, iodometry, redox titrations using ceric sulphate, potassium dichromate and potassium permanganate
Complexometric titrations using EDTA of Ca++, Mg++, and Zn++.
BIN-1007   INTRODUCTION TO BIOCHEMISTRY

Theory : 60
Int. ass. : 15
Time : 3 Hours

Objective
Introduction to Biochemistry exposes the students to study chemistry of biomolecules.

General Instruction
• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT - I
Chemical Foundations:
Water. Chemistry of water, ionization of water, equilibrium constant and concepts of weak acid and base, pH, pI, pKa, Henderson-Hasselbach equation and concepts of buffers in biology in brief.


UNIT – II
Introduction to Proteins & Protein Structure: Primary, Secondary, Tertiary and Quarternary Structure.

Enzymes:
General properties, specificity, classification, efficiency, regulation of enzyme activity (rate, concentration, time, pH, temperature), enzyme kinetics---rate equations, steady state, Michaelis – Menten equation.


Recommended Books:

BIN-1057 INTRODUCTION TO BIOCHEMISTRY – PRACTICAL

Max Marks: 25 (20+5)

1. Verification of Beer Lambert law for p-nitrophenol or cobalt chloride
2. Determination pKa value of p-nitrophenol
3. Estimation of carbohydrate in given solution by Anthrone method
4. Protein estimation by Lowry’s method
5. Separation of lipids by Thin layer chromatography

BIN-1008 PHYSICS

Theory : 60
Int. ass. : 15
Time : 3 Hours

Objectives: -
Physics is one of the important basic sciences. Introduction to basic course of Physics will enhance the grasping of subject.

General Instruction

- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT – I
Science, Physics and Life Sciences- An introduction to apparent differences and the underlying overlap (atomic nature of matter). Units of measurement and ranges (from the smallest to the largest known) for different physical quantities viz. mass, length, time, current, temperature, luminosity, etc. with suitable examples from bio/physical sciences.
Coulomb’s law for point charges; electric field due to point charge and electric dipole (on axial line and equator line- Qualitative only), electric flux; Gauss’s theorem and its applications (line of charge and sheet of charge).

Electric potential due to point charge, group of charges and dipole (on axial line and equatorial line), potential difference as line integral of electric field- Qualitative only , capacitance; series and parallel arrangements, energy stored in the electric field of capacitor, current, current density, equation of continuity, Ohm’s law in vector form.

**UNIT – II**

Interference of waves, phase and path differences, theory of interference fringes, Young’s experiment, coherent sources.

Diffraction of light, rectilinear propagation, Resolving power of telescope and microscope, Compound Microscope ( Principle, construction, ray diagram , only formula for magnifying power- No derivation), fluorescent microscope(concept only). Polarization, introduction,

Quantum theory of light, X-rays diffraction, electron microscope, Uncertainty Principle (statement only), applications of Uncertainty Principle (particle in a box, existence of electron in Nucleus and atom).

Radioactivity and its laws; half-life and mean life, uses of radioactivity.

**Reference Books:**
2. Electricity and Magnetism : Berkeley physics course vol. II.

**BIN-1058 PHYSICS – PRACTICAL**

Max Marks:25 (20+5)

1. Introduction and practice the concepts of proper measurement, data recording, and data presentation; stress to be laid on use of proper units, least count, error & its propagation, graph plotting & least square fitting. (Simple measuring devices available in the lab may be used to create basic data).
2. Resolving power of Telescope/Microscope.
3. Rotation of the plane of polarization of a solution using a Polarimeter.
4. Use of C.R.O. as a display & measuring device.
5. Capacitance by flashing and quenching of a neon lamp.

**Reference Books:**
1. Laboratory Manual of Physics for Undergraduate classes by D. P.Khandelwal
### OUTLINES OF COURSES FOR B. Sc. (Hons) BIOINFORMATICS
#### SEMESTER II (2017-2018)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIN-2001</td>
<td>3</td>
<td>English-II</td>
<td>45 (40+5)</td>
<td>05</td>
</tr>
<tr>
<td>BIN-2002/</td>
<td>3</td>
<td>Punjabi-II /</td>
<td>50</td>
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<tr>
<td>BIN-2003</td>
<td></td>
<td>HCP-II</td>
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<td>-</td>
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<tr>
<td>BIN-2004</td>
<td>6+3</td>
<td>Statistics and Computer Fundamentals</td>
<td>75 (60+15)</td>
<td>BIN-2054 25 (20+5)</td>
</tr>
<tr>
<td>BIN-2005</td>
<td>6+3</td>
<td>Chemistry-II</td>
<td>75 (60+15)</td>
<td>BIN-2055 25 (20+5)</td>
</tr>
<tr>
<td>BIN-2006</td>
<td>6+3</td>
<td>Introduction to Bioinformatics</td>
<td>75 (60+15)</td>
<td>BIN-2056 25 (20+5)</td>
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<tr>
<td>BIN-2007</td>
<td>6+3</td>
<td>C-Language and programming</td>
<td>75 (60+15)</td>
<td>BIN-2057 25 (20+5)</td>
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<tr>
<td><strong>Total Marks (Semester – II)</strong></td>
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<td><strong>395</strong></td>
<td><strong>105</strong></td>
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</tbody>
</table>
Note:-
(i) There will be one paper of 40 marks. 5 marks are reserved for the Internal assessment and 5 for the Practical work. Total is 50.
(ii) The paper shall consist of Two Units, Unit I will be text specific and Unit II shall deal with different aspects of Communications and Language Skills.
(iii) For Unit I, the prescribed text is Varieties of Expression Ed. A.H.Tak. Foundation Books. Only four Prose chapters and two dramas have been recommended for study. The relevant sections, however, are as follows:
(iv) Practical marks (5) will be based on project work of the candidate.

Unit I
Prose: Chapters 5-8
Drama: Dramas 3-4

Unit II

Note (iv) No text book is recommended for Unit II, but a few books that may be used for this Unit are listed towards the end. Unit II shall consist of the following:

Writing Skills: This section shall focus on précis-writing, letters of all kinds; curriculum vitae; short, formal reports (not exceeding 200 words) and advertisements relating to product promotion etc.,

Modern Forms of Communication: Here special emphasis shall be given to teaching the format of E-mails, Fax Messages, Telegrams, Audio-Visual Aids and Power-Point Presentations. Apart from this, the students shall also be given basic lessons in Effective Listening, Non-Verbal Communication, How to Prepare for an Interview & Group Discussion etc.

Practical Work:
Teacher should assign some project or practical work to the students. This should be in the nature of guided activity, which the students shall have to complete under the direct supervision of the teacher. The students may be given projects on a variety of subjects relating to their discipline i.e. business, commerce, accounts etc. Preferably, they should be given minor projects (to be completed within less than two weeks, and length not exceeding 20 pages) in consultation with teachers of commerce. However, the evaluation of the projects should be done only by the Language Teachers, who must keep all the basic criteria of good writing in mind while doing so.

Note: In case of private candidates and students of School of Open Learning, the marks obtained by them out of 40 will be proportionately increased out of 50.

Testing Scheme: The examination paper shall be divided into two sections, corresponding to two units already proposed in the syllabus. The distribution of questions and marks in Section I shall be as follows:

Unit I (It is text-based and corresponds to Unit I in the syllabus)
Q.1 It shall consist of six short questions. Three from Prose and three from drama (not exceeding 50-60 words) out of which, a student will be expected to attempt any four. Two from Prose and two from Drama. This question shall be based upon the prescribed text Varieties of Expression and cover a wide range of issues, topics and problems.

10 marks
Q.2 It shall consist of four long questions-Two from Prose and two from Drama(not exceeding 100-150 words) out of which a student will be expected to attempt two-one from Prose and one from Drama. 5 marks

Note: The question 1 &2 should be so designed as to cover all the chapters prescribe (Prose & Drama)

Q.3. It shall exclusively be a test of vocabulary, but designed strictly on the lines of various exercises given at the end of each chapter in the prescribed text. The candidate shall be given five words in one column and asked to match them with words/meanings in the next column. 5 marks

UNIT II

Q.4 Short Survey Report (150-200 words) with internal choice. 5 marks

Q.5. Precis of 200 words. 10 marks

Q.6 Definition/Format of modern forms of communication to be tested. (e-mail, fax, videoconferencing). 5 Marks
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OR

BIN-2003  HISTORY AND CULTURE OF PUNJAB-II

Instructions for the paper-setter and candidates: (for paper in Semester I & II)

1. The syllabus has been divided into four Units.
   There shall be 9 questions in all. The first question is compulsory and shall be short answer type containing 10 short questions spread over the whole syllabus to be answered in about 25 to 30 words each. The candidates are required to attempt any 5 short answer type questions. Each question will carry 1 mark. Rest of the paper shall contain 4 units. Each Unit shall have two essay type questions and the candidate shall be given internal choice of attempting one question from each Unit-IV in all. Each question will carry 10 marks.

2. For private candidates, who have not been assessed earlier for internal assessment, the marks secured by them in theory paper will proportionately be increased to maximum marks of the paper in lieu of internal assessment.
   The paper-setter must put note (2) in the question paper.

3. One question from Unit-IV shall be set on the map.

Explanation:
   1. Each essay type question would cover about one-third or one-half of a topic detailed in the syllabus.
   2. The distribution of marks for the map question would be as under:
      Map : 06 Marks
      Explanatory Note : 04 Marks
      In case a paper setter chooses to set a question of map on important historical places, the paper setter will be required to ask the students to mark 6 places on map of 1 mark each and write explanatory note on any two of 2 marks each.
   3. The paper-setter would avoid repetition between different types of question within one question paper.

PAPER: HISTORY AND CULTURE OF PUNJAB IN THE COLONIAL AND POST INDEPENDENCE TIMES

Max. Marks : 50
Theory : 45
Internal Assessment : 05
Time : 3 Hours

Objectives: To introduce the students to the history of Punjab region in the Modern times.
Pedagogy: Lectures, library work and discussions.

UNIT I
1. Introduction of Colonial Rule in Punjab: Annexation of Punjab, Board of Administration
2. Western Education: Growth of Education and rise of middle classes
3. Agrarian Development: Commercialization of agriculture; canalization and colonization.
UNIT II
5. Socio Religious Reform Movements: activities of Arya Samaj; Singh sabhas; Ahmadiyas.
6. Development of Press & literature: growth of press; development in literature

UNIT III
7. Emergence Of Political Consciousness: Agrarian uprising 1907; Ghadar Movement.
8. Gurudwara Reform Movement: Jallianwala Bagh; foundation of SGPC and Akali Dal; Morchas; Activities of Babbar Akalis.
9. Struggle for Freedom: activities of revolutionaries - Naujawan Bharat Sabha; Kirti Kissan Movement; participation in mass movements – non co-operation, civil disobedience, Quit India.

UNIT IV
10. Partition and its Aftermath: resettlement; rehabilitation
12. MAP(Physical geographical map of undivided Punjab): Major Historical places: Delhi, Kurukshetra, Jaito, Ferozepur, Ambala, Amritsar, Lahore, Ludhiana, Qadian, Jalandhar, Lyallpur, Montgomery.

Suggested Readings:
1. Singh, Kirpal :History and Culture os the Punjab, Part II(Medieval Period), Publication Bureau, Punjabi University, Patiala 1990(3rd edn.).
BIN-2004 STATISTICS AND COMPUTER FUNDAMENTALS

Theory : 60
Int. ass. : 15
Time : 3 Hours

Objective
To introduce students about basic concepts of Biostatistics including Distributions and Probability and also Introduction to computers and their Systems/Storage.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I
Statistical Methods
Introduction to biostatistics, types of data, methods of data collection, classification and tabulation of data. Diagrammatic and graphical representation of data, frequency distribution, cumulative frequency distribution and their graphical representation, histogram, frequency polygon, frequency curve and ogives.
Concept of Central tendency and their measures, dispersion and their measures, Central moments, Skewness, kurtosis and their measures, Box and whisker plot.
Basic concepts of probability theory, Baye’s theorem and conditional probability. Random Variables (discrete and continuous), probability mass function, probability density function, cumulative distribution function and their properties.
Mathematical expectation (single and bivariate), expectation of sum of random variables, Variance and Covariance, moment generating and probability generating functions.
Uniform, Bernoulli, Binomial and Poisson distributions and Normal distributions. Fitting of binomial, poisson and normal distributions.

UNIT II
Computer Fundamentals
Computers: General introduction to computers, organization of computers, digital and analogue computers, computer algorithms.
Introduction to computers and its uses: milestones in hardware and software – batch oriented / online/realtime applications
Computers as a system: Basic concepts, stored programs, functional units, and their interrelation: communications with computer.

Data storage devices primary storage: storage addressed and capacity, type of Memory:
Secondary storage devices : Magnetic tape – data representation and R/W: Magnetic disks, fixed and removable, data representation and R/W : Floppy and Hard disks, Optical disks, CD-ROM,

Recommended books:
1. Introductory probability and statistical applications, P.L. Meyer, 1970
5. Introduction to Biostatistics (1973) Sokal & Rohif – Toppan Co Japan

BIN-2054 STATISTICS AND COMPUTER FUNDAMENTALS (PRACTICAL)
Max Marks :25 (20+5)
1. Presentation of data by frequency tables, diagrams, graphs
2. Calculation of measures of central tendency
3. Calculation of measures of dispersion
4. Calculation of measures of skewness and kurtosis
5. Fitting of binomial distribution
6. Fitting of Poisson distribution

BIN-2005 CHEMISTRY-II
Theory : 60
Int. ass. : 15
Time : 3 Hours

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

energy, chemical potential, dependence upon concentration, activity, Relation between free energy change and equilibrium constants.

**Electrochemistry and Redox reactions:** Half-reactions, oxidation/reduction potential, electrochemical cell, reversibility, reference electrodes, Nernst equation, chemical potential from Nernst equation. Handerson Haselbach Equation, Decomposition Potential, Liquid junction potential, Overvoltage and polarisation, Corrosion

**UNIT II**

**Photochemistry:** Photochemical principles, Quantum yield, Fluorescence and phosphorescence
IR spectroscopy: The theory of stretching and bending modes, the selection rules and how to use them to predict number of IR active bands.
Raman spectra- brief introduction. Rotational Raman and Rotational Vibrational spectra
Magnetic resonance spectroscopy: NMR –Basic concepts including chemical shifts and coupling. Differences between NMR and ESR. Applications

**Molecular Spectroscopy:** Differences between Atomic and molecular spectroscopy. Absorption and emission spectroscopy. Wavelength and relative energies.
UV/Vis spectroscopy: Beer Lamberts law, extinction coeffecieints

**Recommended Books:**
8. Physical Chemistry by PW Atkins

**BIN-2055 CHEMISTRY-II (PRACTICAL)**

Maximum marks 25 (20+5)

1. Study of distribution law by iodine distribution between water and CCl₄. Given standard solution Na₂S₂O₃.
2. Surface tension: Determination of surface tension of a given liquid by Stalgmimeter
3. Viscosity: Determination of viscosity of a pure liquid (Acetone, ethanol, propanol, butanol, glycol) (Effect of hydrogen bonding on viscosity)
4. Refractometry: Determine refractive index of a given liquid as a criterion for its purity (Benzene i.e. commercial benzene + A.R. acetone)
5. Polarimetry: Determination of the percentage composition of and optically active solution.
6. Conductometry:
Objective

Introduction to Bioinformatics exposes the students to study biomolecules and their integration in information technology which is the basis of Bioinformatics.

General Instruction

- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT – I

Sequence databases: Primary, secondary databases and specialized database, Nucleotide sequence database, Protein Sequence Database: PIR, SwissProt, Uniprot.
Sequence formats: Genbank & Genpept flat file, FASTA, ASN.1.
Information retrieval from The NCBI resource: Gquery.
Structural databases: PDB, SCOP, CATH and PDBsum.

UNIT – II

Sequence Alignment:
Pairwise sequence alignment: Global alignment, Local alignment, Scoring functions, concepts behind General gap, affine gap penalty and amino acid substitution matrices (PAM, BLOSUM,GONNET), Statistical significance.
BLAST: Algorithm, types, Blast output and applications. FASTA, Difference between BLAST & FASTA.

Multiple Sequence alignment: SP (Sum of Pairs) measure to determine scoring function, Tree alignments, Motifs and Profile, Alignment representation and Applications, ClustalW, ClustalX and T-coffee.

Recommended Books:


BIN-2056  INTRODUCTION TO BIOINFORMATICS (PRACTICAL)  
Max Marks:25 (20+5)

2. Understanding and using Sequence information resources on web:
   EMBL, Genbank, Entrez
3. Understanding and using Protein information resources on web:
   Swissprot, TrEMBL
4. Performing BLASTp/n and interpreting its results.
5. Multiple sequence alignment using ClustalW
6. Understanding the PDB and its file format
7. Downloading and visualizing protein structure from PDB.

BIN-2007  “C” LANGUAGE AND PROGRAMMING

Theory :  60
Int. Ass. :  15
Time:     3 Hours

Objective
To introduce basic concepts of “C” Language, which is required to do programming and solve problems related to Bioinformatics.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

Introduction to ‘C’ Language
Character set, variable and Identifiers, Built-in data types, Variable Definition, Arithmetic operations and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement
Simple ‘C’ Programs
Conditional statement and Loops
Decision making, Conditions, Relational Operators, Logical connectives
If Statement, If-else statement
Loops: while loop, do while loop, for loop, Nested loops, Switch statement, structural programming
Programs related to decision making statements, loops

Arrays
One dimensional arrays, Array manipulation; Searching, Insertion, Deletion of an element from an array. Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix, Null terminated strings as array of characters, Representation sparse matrices, Strings, operation on strings

UNIT II

Functions
Top-down approach of problem solving, Modular programming and functions, Standard library of C functions, Prototype of a function: Formal parameter list, Return Type function Call, Block Structure, Passing arguments to a function: Call by reference, call by value, Recursive functions, Arrays as function arguments

Structure and Unions
Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays, arrays of structures, structures containing arrays, unions

Pointers
Address Operators, Pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, Pointer arrays
File Processing: Concept of Files, Files operating in various modes and closing of a file, Reading from a file, writing to a file.

Recommended books:

BIN 2057 “C” LANGUAGE AND PROGRAMMING - (PRACTICAL)
Max Marks :25 (20+5)
1. Write a program to calculate a prime number even and odd numbers
2. Write a function to read a matrix of size m x n from the keyboard
3. Write a program to add and subtract a two-three matrix simultaneously
4. Write a program to print the following output using for loops
5. Programming problems on Array, Pointer and Files
ENVIRONMENT, ROAD SAFETY EDUCATION AND VIOLENCE AGAINST WOMEN AND CHILDREN (SEMESTER – II)

Note: The syllabus has 15 topics to be covered in 25 hour lectures in total, with 2 lectures in each topic from 2 to 11 and one each for the topics 1 and 12 to 15.

1. Environment Concept:
Introduction, concept of biosphere – lithosphere, hydrosphere, atmosphere; Natural resources – their need and types; Principles and scope of Ecology; concepts of ecosystem, population, community, biotic interactions, biomes, ecological succession.

2. Atmosphere:
Parts of atmosphere, components of air; pollution, pollutants, their sources, permissible limits, risks and possible control measures.

3. Hydrosphere:
Types of aquatic systems; Major sources (including ground water) and uses of water, problems of the hydrosphere, fresh water shortage; pollution and pollutants of water, permissible limits, risks and possible control measures.

4. Lithosphere:
Earth crust, soil – a life support system, its texture, types, components, pollution and pollutants, reasons of soil erosion and possible control measures.

5. Forests:
Concept of forests and plantations, types of vegetation and forests, factors governing vegetation, role of trees and forests in environment, various forestry programmes of the Govt. of India, Urban Forests, Chipko Andolan.

6. Conservation of Environment:
The concepts of conservation and sustainable development, why to conserve, aims and objectives of conservation, policies of conservation; conservation of life support systems – soil, water, air, wildlife, forests.

7. Management of Solid Waste:
Merits and demerits of different ways of solid waste management– open dumping, landfill, incineration, resource reduction, recycling and reuse, vermicomposting and vermiculture, organic farming.

8. Indoor Environment:
Pollutants and contaminants of the in-house environment; problems of the environment linked to urban and rural lifestyles; possible adulterants of the food; uses and harms of plastics and polythene; hazardous chemicals, solvents and cosmetics.

9. Global Environmental Issues:
Global concern, creation of UNEP; Conventions on climate change, Convention on biodiversity; Stratospheric ozone depletion, dangers associated and possible solutions.
10. **Indian Laws on Environment:**
Indian laws pertaining to Environmental protection: Environment (Protection) Act, 1986; General information about laws relating to control of air, water and noise pollution. What to do to seek redressal.

11. **Biodiversity:**
What is biodiversity, levels and types of biodiversity, importance of biodiversity, causes of its loss, how to check its loss; Hotspot zones of the world and India, Biodiversity Act, 2002.

12. **Noise and Microbial Pollution:**
Pollution due to noise and microbes and their effects.

13. **Human Population and Environment:**

14. **Social Issues:**
Environmental Ethics: Issues and possible solutions, problems related to lifestyle, sustainable development; Consumerisms and waste generation.

15. **Local Environmental Issues:**
Environmental problems in rural and urban areas. Problem of Congress Grass & other weeds, problems arising from the use of pesticides and weedicides, smoking etc.

**Practical**
Depending on the available facility in the college, a visit to vermi composting units or any other such non-polluting eco-friendly site or planting/caring of vegetation/trees could be taken.

**Examination Pattern:**
A qualifying paper of 50 marks comprising of fifty multiple choice questions (with one correct and three incorrect alternatives and no deduction for wrong answer or un-attempted question), and of 1 hour duration.

The students have to obtain 33% marks to qualify the paper. The marks are not added / included in the final mark sheet.

**UNIT II (ROAD SAFETY)**

1. Concept and Significance of Road Safety.
2. Role of Traffic Police in Road Safety.
3. Traffic Engineering – Concept & Significance.
5. How to obtain Driving License.
7. Common Driving mistakes.
8. Significance of First-aid in Road Safety.
9. Role of Civil Society in Road Safety.

Note: Examination Pattern:
- The Environment and Road Safety paper is 70 marks.
- Seventy multiple choice questions (with one correct and three incorrect alternatives and no deduction for wrong or un-attempted questions).
- The paper shall have two units: Unit I (Environment) and Unit II (Road Safety).
- Unit II shall comprise of 20 questions with minimum of 1 question from each topics 1 to 10.
- The entire syllabus of Unit II is to be covered in 10 hours.
- All the questions are to be attempted.
- Qualifying Marks 33 per cent i.e. 23 marks out of 70.
- Duration of examination: 90 minutes.
- The paper setter is requested to set the questions strictly according to the syllabus.

Suggested Readings
2. Road Safety Signage and Signs (2011), Ministry of Road Transport and Highways, Government of India.

Websites:
(a) www.chandigarhpolicenic.in
(b) www.punjabpolice.gov.in
(c) www.haryanapolice.gov.in
(d) www.hppolicenic.in

SYLLABUS ON “VIOLENCE AGAINST WOMEN & CHILDREN” AT UNDER-GRADUATE LEVEL

UNIT III OF COMPULSORY PAPER ON ENVIRONMENT & ROAD SAFETY EDUCATION

AS PART OF SEMESTER - II

Unit – III

VIOLENCE AGAINST WOMEN & CHILDREN

1. Concept and Types of Violence: Meaning and Definition of violence; Types of Violence against women – domestic violence, sexual violence (including rape), sexual harassment,
emotional/psychological violence; Types of Violence against children – physical violence, sexual violence, verbal and emotional abuse, neglect & abandonment.

2. Protective Provisions of IPC on Domestic Violence & Sexual Violence against Women:

- **Dowry Death** – Section 304B;
- **Rape** – Sections 375, 376(1), 376A, 376B, 376C, 376D and 376E;
- **Cruelty** – Section 498A;
- **Insult to Modesty** – The Indian Penal Code does not define the word eve-teasing; there are three sections which deal with crime of eve-teasing. These are Sections, 294, 354 and 509 of Indian Penal Code. Section 509 of the Indian penal code defines (Word, gesture or act intended to insult the modesty of a woman), Section 294 – (Obscene acts and songs) and Section 354 (Assault or criminal force to woman with intent to outrage her modesty);
- **Hurt & Grievous Hurt Provisions** – Sections 319 to 326;
- **Acid Attacks** – Sections 326A and 326B;
- **Female Infanticide** – Section 312, Section 313 of Indian Penal Code (Causing miscarriage without women’s consent) and section 314;
- **Sexual Harassment** – For providing protection to working women against sexual harassment, a new section 354 A is added; 354 B (Assault or use of criminal force to women with intent to disrobe); 354 C Voyeurism; 354 D (Stalking). All these provisions are added in IPC to protect women against acts of violence through Criminal Law (Amendment) Act, 2013; Human Trafficking and Forced Prostitution- Sections 370 and 370A

3. Protective Laws for Women:


- **3.2 The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013** – Definition, Internal Complaint Committee, Local Complaint Committee, Procedure adopted by Committee for punishing accused.

4. Protective Provisions of IPC regarding Sexual Violence against Children:

- **Section 293** (sale etc. of obscene objects to young persons); 294 (obscene acts & songs); 305 (abetment of suicide of child); 315 to 317 (act causing death after birth of a child etc.); 361 (kiding from lawful guardianship); 362 (abduction); 363 (punishment for kidnapping); 363A (kinding or maiming a minor for purposing of begging); 364A (kinding for ransom etc.); 366 (kinding etc. to compel woman for marriage etc.); 366A (procuration of minor girl for illicit forced intercourse); 366B (importation of girl from foreign country); 367 (kinding/abduction in order to subject person to grievous hurt, slavery etc.); 369 (kinding adductive child under 10 year with intent to steal from its person); 372 & 373 (selling & buying minor for purposes of prostitution etc.).

- **4.1 The Protection of Children from Sexual Offences Act, 2012**; An overview of the POCSO, relevant legal provisions and guidelines for the protection of children against sexual offences along with punishments; role of doctors, psychologists & mental experts as per rules of POCSO.
Note: Instructions for Examination:

- Unit III of the paper dealing with Violence against Women and Children is of 30 Marks.
- It shall have 30 multiple-choice questions (with one correct and three incorrect choice options and no deduction of marks for wrong or un-attempted questions).
- Minimum two questions from each topic must be covered.
- All the questions are to be attempted
- Qualifying Marks 33 percent
- Duration of Examination 30 Minutes
- The Paper Setter is requested to set the questions strictly according to the syllabus.

Pedagogy:

- The entire syllabus of Unit III is to be covered in ten hours in total, with each lecture of one-hour duration.
- The purpose behind imparting teaching-learning instructions is to create basic understanding of the contents of the Unit III among the students.

RELEVANT READING MATERIAL

Ahuja, Ram (1998), Violence against Women, New Delhi: Rawat Publication
NRHM, Child Abuse, A Guidebook for the Media on Sexual Violence against Children
The Protection of Children from Sexual Offences Act, 2012
The Protection of Women from Domestic Violence Act 2005
The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013
UNO, United Nations Secretary-General’s Study on Violence against Children, adapted for Children and Young People

Unit IV( Drug Abuse)

Drug Abuse: Problem, Prevention and Management

Note: This is a compulsory qualifying paper, which the students have to study and qualify during three year of degree course.

The paper/Topic “Drug Abuse: Problem, Prevention and Management” having 2 credit/50 marks (40 theory+10 Internal) at undergraduate level, as a fourth part of the paper ‘Environment, Road Safety Education and Violence against Women and Children’ from the academic session 2017-18.

Main Objective

This module introduces to the students the problem of drug abuse and its adverse consequences for the society. The students would get an understanding of why drug abuse is such a serious problem to our society. The course also apprises them of how to prevent and manage this menace.
Learning objectives of the course

1. Understand the meaning of the term drug.
2. Understand the difference between use, misuse and abuse of drugs.
3. Differentiate between commonly abused legal and illegal drugs.
5. Understand the causes and consequences of drug abuse.
6. Identify and access safety measures for support to stay away/give up drug abuse.

Pedagogy of the course work

1. 70% Lectures (Including expert lectures)
2. 30% assignments, discussion, seminars and class tests.
   - A visit to drug de-addiction centre could also be undertaken

Course content

UNIT I: Problem of Drug Abuse


b) Types of drugs often abused and their effects

**Stimulants**: tobacco Amphetamines: dl-amphetamine (Benzedrine ®), dextroamphetamine (Dexedrine®). Cocaine.

**Depressants**: Alcohol. Barbiturates: phenobarbitone (Nembutal®), secobarbital (Seconal®), Benzodiazepenes: diazepam (valium ®), alprazolam (Xanax®), flunitrazepam (Rohypnol®)

**Narcotics**: Morphine, heroin (‘Chitta’/ ‘Brown Sugar’), pethidine, oxycodone.

**Hallucinogens**: cannabis ['Bhang’, marijuana (‘Ganja’), hashish (‘Charas’), hash oil]. MDMA (3,4- methylenedioxy methamphetamine) /’Ecstasy’/ ‘Molly’. LSD (lysergic acid diethylamide).

**Miscellaneous**: cough/cold medicines: diphenhydramine (Benadryl®), chlorpheneramine maleate+ codeine+alcohol (Corex®). Iodex®, Vicks®, Amrutanjan® and correction fluid (Whitener).

UNIT II: Theories of consequences of drug abuse

a) Theories of drug abuse: Physiological theory. Psychological theory. Sociological theory.

b) Consequences of drug abuse: For individuals, families, society and economy.
Unit III: Extent and nature of the problem


UNIT IV: Prevention and management of drug abuse


Suggested readings:

5. 2003 National Household survey of Alcohol and Drug Abuse. New Delhi, Clinical Epidemiological Unit, AIIMS, 2004

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<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
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<td>BIN-3001</td>
<td>6+3</td>
<td>Fundamentals of Molecular Biology</td>
<td>75 (60+15)</td>
<td>BIN-3051</td>
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<td>BIN-3002</td>
<td>6+3</td>
<td>Computational Methods in Biomolecular Sequence and Phylogenetic Analysis</td>
<td>75 (60+15)</td>
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<td>BIN-3003</td>
<td>6+3</td>
<td>Computer Operational System and Organization</td>
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<td>BIN-3004</td>
<td>6+3</td>
<td>Statistical Methods</td>
<td>75 (60+15)</td>
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<td>25 (20+5)</td>
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<tr>
<td>BIN-3005</td>
<td>6+3</td>
<td>Object Oriented Programming In C++</td>
<td>75 (60+15)</td>
<td>BIN 3055</td>
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</tr>
</tbody>
</table>
Objective
The Contents are related to the fundamental of molecular biology and their application in recombinant DNA technology.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I
Introduction to Molecular Biology:
Properties of DNA polymerases, Synthesis of Leading and lagging strands
DNA Repair: Photo-reactivation, excision repair, post replication repair, SOS repair etc.

Transcription: RNA polymerase in prokaryotes – its molecular composition, role of each component of RNA polymerase, mechanism of transcription, Eukaryotic transcription
Modification of RNA: 5’ – CAP formation, 3 – end processing polyadenylation, Splicing, Editing, Nuclear export of mRNA & mRNA stability.

UNIT II
Translation: The genetic code, Wobble hypothesis. Mechanism of Prokaryotic and Eukaryotic Translation, structure and function of tRNA, rRNA, Frameshift errors, Mutagenesis: types of mutants, mutagenic agents, isolation and characterization of mutants, reversion, suppression, transposable elements.

Regulation of gene expression in prokaryotes and eukaryotic: Transcriptional control; enzyme induction and repression, constitutive synthesis of enzymes and catabolite repression. The lac operon. The trp operon.

Recommended books
BIN-3051    FUNDAMENTALS OF MOLECULAR BIOLOGY (PRACTICAL)

Max Marks 25 (20+5)

1. Isolation of Genomic DNA (Microbial)
2. Isolation of DNA from WBC
3. Quantitation of DNA
4. Isolation of bacterial plasmid DNA
5. Agarose gel electrophoresis of DNA

BIN-3002    COMPUTATIONAL METHODS IN BIOMOLECULAR SEQUENCE AND PHYLOGENETIC ANALYSIS

Theory      : 60
Int. ass.  : 15
Time       : 3 Hours

Objective
In this paper, sequence and phylogenetic analysis of proteins and nucleotides using various computational tools which are important to study conservation in different species is covered.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

Motif and Domains: Basic concept, types of motifs and domains

Sequence patterns and profiles: Basic concept and definition of sequence patterns and profiles, various types of pattern representations viz. consensus, regular expression (Prosite-type) and sequence profiles; PSSM, profile-based database searches using PSI-BLAST.

Domain databases: CDD, SMART, ProDom

Tools for searching pattern and profile: InterPro, Pfam, Prosite, and PRATT

UNIT II

Phylogenetic analysis: Basic terminology in Phylogenetics
Introduction to phylogenetic analysis and its application, Phylogenetic tree terminology and topologies
Methods of Phylogenetic Tree Construction:
Distance Based Methods: NJ, FM & UPGMA
Character Based Methods: Maximum Parsimony & Maximum Likelihood
Brief introduction to Bootstrapping & Jackknifing.
Introduction to Phylip and MEGA packages.

Recommended books:


BIN-3052 COMPUTATIONAL METHODS IN BIOMOLECULAR SEQUENCE AND PHYLOGENETIC ANALYSIS (PRACTICAL)

Max Marks 25 (20+5)

1. Searching Domain Databases: CDD, ProDOM
2. Searching Motif Databases: Prosite and InterPro
3. Searching Motif and domain using: ScanProsite, InterProScan and PRATT
4. Building Phylogenetic tree using distance based method & character based methods by PHYLIP or MEGA
5. Tree evaluation
Objective
To make students familiar with Evolution of Computers, Organization of Computers, Concepts of Assembly language and System maintenance.

General Instruction
• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I
Computer Organisation:
Evolution of computers, stored program concept and Von Neumann Architecture, Information representation and codes, Building blocks and computer;
Combinatorial Block:
Gates, Multiplexes, decoders, Encoders etc. Sequential Building Block: Flip Flop, Registers, Counters, Random access memory; Register Transfer Language and micro-operations; concept of Bus, data movement among registers, Language to represent conditional data transfer, data movement from/to memory, Arithmetic and logical operations along with register transfer.

Architecture of a simple processor:
A simple computer Organization and instruction set, instruction execution in terms of Microinstructions, Concepts of interrupt and simple I/O organization, Implementation of the processor using building blocks; CPU organization with large registers, stacks and handling of interrupts and subroutines, instruction pipelining.

UNIT II
Concepts of Assembly Language Programming: Machine and assembly language, Pseudo operations, subroutines in assembly language, interrupt and I/O programming

I/O Organization:
Handshake based communication, vector and priority interrupts, DMA based data transfer; memory Organisation: basic cell of static and dynamic RAM, building large memories using chips associative memory, Cache memory organization, Virtual memory organization.

System Maintenance:
Introduction to various physical components of a computer, Physical Inspection of a PC and internal cards, Diagnostics on a PC, Functional description of various modules and cards. Various
types of display and other peripherals used in a PC. Installing a software. Detection of viruses and protection on a PC.

**Recommended Books:**

**BIN-3053 COMPUTER OPERATIONAL SYSTEM AND ORGANIZATION (PRACTICAL)**

Max Marks 25 (20+5)

Part I: Studying various physical components of computer system

1. Study of system configuration (System settings)
2. Inspection and functional description of hardware components
   - I/O Devices: Monitor, Keyboard, Mouse, Speaker, Printer, Microphone, Scanner
   - Memory: Primary – RAM, BIOS ROM
   - Secondary- Hard Disk (HDD), CD Drive, Floppy Disk (FDD)
   - Mother board with Add on (Internal) cards
   - BUS: PCI, ISA etc.
   Parallel and Serial Transfer

Part II: Installing a Software
1. MS DOS: Commands, Formatting, Partitioning of Hard disk, Booting, Starting system with bootable disk
2. Installation of Software:
   - Windows operating system
   - MS office, Antivirus, Photoshop, C/C++ and other utility software
   - Adding / Removing new hardware devices (device drivers detection and installation)

Part III: System Maintenance
1. Disk Utilities: Defragmentation, Scanning
2. System Protection: Antivirus check for system; fixed and removable disk
3. Diagnostics on a PC
4. PC Troubleshooting
Objective
To study the concepts of correlation, Regression, Estimation and Testing of parametric and non-parametric Hypotheses.

General Instruction
• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT-I
Bivariate data, scattered diagram, Karl Pearson’s and Spearman’s rank correlation coefficient. Linear regression analysis including two variables.

Sampling distributions, Estimation of population means and proportions, confidence intervals for the parameters of normal distribution under different conditions (two sample problems also). Determination of sample size for estimating means and proportions.

UNIT-II
The basic idea of significance test. Tests of hypotheses for the parameters of a normal distribution (two sample problems also). Tests for the significance of correlation coefficient.
Categorical data: Proportions and their testing for large samples, Tests of association, goodness-of-fit using Chi-square test, Yates correction.

Analysis of variance, one-way and two-way classifications. Brief exposure of three basic principles of design of experiments, treatment, plot and block. The analysis of completely randomized design, randomized complete Block Design.
Introduction to non-parametrics: Sign test, Wilcoxon signed- rank test and mann-whitney test.

Recommended Books:
1. Practical Problems based on correlation coefficient, spearman’s rank correlation
2. Problems based on simple regression
3. Practical based on z-test and t-test (i.e. Testing of Mean in both cases when variance is known and when variance is unknown (one sample problem). Also to find the confidence interval of population mean.
4. Practical based on testing of single proportion and difference of proportions
5. Practical on association
6. Practical on Chi-square test of goodness of fit.
7. Practical on Sign test or Wilcoxon signed-rank test and mann-whitney test

**Objective**

To introduce the concept of object oriented programming in C++ which is helpful in writing programs to solve the problems in Bioinformatics.

**General Instruction**

- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

**UNIT-I**

**Methodologies:** Concept of structured and object-oriented programming, Advantages of OOPs methodologies.


Operator overloading and Function overloading, Inheritance: Extending classes, Types of inheritance, Virtual base class, Problems with multiple inheritance, Containership, Virtual function.
UNIT-II

Polymorphism: Compile and Runtime, Pure Virtual Function, this pointer.

Files and streams, building class Libraries in C++, File Handling in C++, Reading and Writing text files, Reading and writing binary files, Template classes and functions, Exception Handling.

Introduction to data structures like Arrays, Linked-list and stack and their implementation, Data Searching and Sorting algorithms.

Recommended Books:
3. The C++ Programming Languages by Stroustrup, Addison Wesely, 2001
6. Data structures by Tanenbaum, PHI, 1997

BIN-3055 OBJECT ORIENTED PROGRAMMING IN C++ (PRACTICAL)

Max Marks 25 (20+5)

1. Create a class employee and calculate gross salary. Demonstrate how private member functions can be accessed within a class.
2. Write a program to add, subtract, multiply and divide two complex numbers using classes.
3. Write program to illustrate the concept of various types of constructors.
4. Write program to overload binary + operator using member function.
5. Write program to demonstrate the concept of multiple inheritance.
6. Write program that implements run time polymorphism using virtual function.
7. Program to perform reading/writing operations on a file using stream classes.
8. Program to demonstrate exception handling.
9. Program to search a given number from a given list of numbers using linear as well as binary search.
10. Program to demonstrate various sorting algorithms.
# OUTLINES OF TESTS, SYLLABI AND COURSES OF READING FOR
## B. Sc. (Hons.) BIOINFORMATICS
### SEMESTER – IV (SESSION: 2017-2018)

<table>
<thead>
<tr>
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<th>Theory</th>
<th>Practical</th>
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<td>rDNA technology and Biochemical Techniques</td>
<td>75 (60+15)</td>
<td>BIN-4051 25 (20+5)</td>
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<tr>
<td>BIN-4002</td>
<td>6+3</td>
<td>Computational Methods in Biomolecular Sequence and Structure Analysis</td>
<td>75 (60+15)</td>
<td>BIN-4052 25 (20+5)</td>
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<tr>
<td>BIN-4003</td>
<td>6+3</td>
<td>Cell Biology and Microbiology</td>
<td>75 (60+15)</td>
<td>BIN-4053 25 (20+5)</td>
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<tr>
<td>BIN 4004</td>
<td>6+3</td>
<td>Introduction to Database Management System</td>
<td>75 (60+15)</td>
<td>BIN-4054 25 (20+5)</td>
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<td>Project Work</td>
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<td>BIN-4055 100</td>
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<td><strong>300</strong></td>
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Objective
To familiarize the students with important tools and techniques based on biochemical principles, protocols/methodology with their application in applied science.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

Recombinant DNA: History and scope of recombinant DNA technology, DNA modifying enzymes
Cloning and expression vectors:
Characteristics of cloning and expression vectors; plasmid, phages, and cosmid vectors, multipurpose cloning vectors, shuttle vectors, bacterial, yeast, plant and mammalian expression vectors. BACs and YACs.

Cloning strategies: Screening of libraries from clones, identification of desired recombinants by alpha complementation, colony & plaque hybridization, Immuno screening. Construction of genomic library and cDNA library; Screening of libraries.

Polymerase Chain Reaction: Principle, Components & applications.

UNIT II

Chromatography: Principle, Techniques and Applications- Paper, Thin-Layer, Adsorption, Gas, Reverse Phase Chromatography, HPLC.

Separation and analysis by electrophoresis: General principle, Support Media, types of electrophoresis.
Electrophoresis of proteins: Native and SDS-PAGE, Gradient Gels, Iso-Electric Focusing, 2D-PAGE, Molecular weight determination.

Electrophoresis of nucleic acid: Agarose-gel electrophoresis of DNA and RNA. Pulse field, Gel Electrophoresis, Molecular weight determination
Centrifugation, Ultracentrifugation for protein and nucleic acids preparation and fractionation.

**Recommended Books:**

**BIN-4051 RECOMBINANT DNA TECHNOLOGY AND BIOCHEMICAL TECHNIQUES (PRACTICAL)**

Max Marks 25 (20+5)

1. Demonstration of PCR
2. Thin Layer Chromatography of Lipids & Amino Acids
3. Paper Chromatography
4. SDS PAGE
5. NATIVE PAGE
6. Differential Centrifugation
7. Molecular Sieve Chromatography
Objective
In this paper, structure analysis of proteins and nucleotides using various computational tools is covered.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT-I

Gene prediction methods: Searching by Signal, Searching by Content, Homology Based Predictions, Markov Models, Hidden Markov Models In Gene Prediction.
Gene prediction tools: Genscan, Glimmer, Grail.

Promoter analysis: Concept of Promoter, predictions of promoter in prokaryotic and eukaryotic Genomes.
RNA structure prediction: Types of RNA secondary structure Methods of RNA secondary structure prediction: Ab-initio and Homology based.

UNIT II

Tools of RNA secondary structure prediction: Mfold, Sfold and Vienna RNA package.
Protein structure determination methods: Principle and Applications of X-ray crystallography and NMR.
Protein Structure Prediction:
Secondary Structure Prediction methods: CHAU FASMAN, GOR, Neural Network

Recommended books:

BIN-4052 COMPUTATIONAL METHODS IN BIOMOLECULAR SEQUENCE AND STRUCTURE ANALYSIS (PRACTICAL)

Gene Prediction Tools:
1. GenScan
2. Glimmer

Protein Structure Modeling Using:
3. SPDB viewer (Helix)
4. SPDB viewer (Sheets)
5. Modeller

BIN-4003 CELL BIOLOGY & MICROBIOLOGY

Objective
Students are exposed to the underlying concepts and phenomena of Cell Biology

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions from each unit and the first compulsory question.

UNIT I

Cell: Introduction and classification of organisms by cell structure

Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model.
UNIT II

Fundamentals, History and Evolution of Microbiology.

**Classification of microorganisms**: Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria.

**Microbial Diversity**: Distribution and characterization Prokaryotic and Eukaryotic cells, Morphology and cell structure of major groups of microorganisms eg. Bacteria, Algae, Fungi, Protozoa and Unique features of viruses.

**Microbial growth**: Growth curve, Generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria.

**Bacterial Reproduction**: Transformation, Transduction and Conjugation. Endospores and sporulation in bacteria.

**Recommended books:**

**BIN-4053 CELL BIOLOGY & MICROBIOLOGY (PRACTICAL)**

Max Marks 25 (20+5)

1. Preparation of Media, Cotton Plugging and Sterilization
3. Staining methods: simple staining, Gram staining, negative staining.
4. Isolation of bacteria from different sources.
5. Enumeration of microorganism - total & viable count.
Objective

• To implement an entity relationship diagrams (ERD) to express requirements and demonstrates skills to model data requirements and create data models in to normalized designs
• To develop understanding of database systems theory in order to apply that knowledge to any particular database implementation using SQL
• To learn and understand various Database Architectures

General Instruction

• The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
• The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
• A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT-I

Introduction: Basic concepts, Advantages of a DBMS over file-processing systems, Data abstraction, Database Languages, Data Models: Introduction to Hierarchical, Network, ER, and Object Relational Model, Data Independence, Components of a DBMS and overall structure of a DBMS, Multi-User DBMS Architecture, System Catalogs
Data Modeling: Basic Concepts, entity, attributes, relationships, constraints, keys, E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables

UNIT-II

Relational Algebra & SQL
Relational Query Languages: Relational Algebra
Introduction to SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, Nulls
SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries, union, intersection, minus etc. in SQL queries, sub-queries, equivalence of queries.
Database Architectures: Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Introduction to Distributed Database systems

Recommended Books:
3. Database Systems, Connally T., Begg C., Pearson Education.
4. An Introduction to Database Systems, Date C., Pearson Education.
5. Database Management System, B.C. Desai
6. Database Concept, Korth.

**BIN-4054  INTRODUCTION TO DATABASE MANAGEMENT SYSTEM (PRACTICAL)**

Max Marks 25 (20+5)

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER,UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT()
6. Write the query to implement the concept of Integrity constraints / create the views
7. Using the following tables:
   - PET-OWNER (ownerID, name, phone, email, street, city, state, zip)
   - PET (petID, name, type, breed, DOB, ownerID).

Write SQL Statements to do the following:
   i. Write Create Table statements to create the tables shown above
   ii. Write SQL statements to add at least 3 rows to the PET-OWNER table.
   iii. Write a SQL statement to display the Name, Breed and type of all pets on file.

**BIN-4055  Project Work**

Max Marks: 100

Every student will submit a project report based on the work carried out under the guidance of Department faculty, pertaining to the syllabi. The report will be evaluated in terms of quality of written work, experimental and performance in the viva-voce by internal and/or external examiner(s).
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<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
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<td>BIN-5051 25 (20+5)</td>
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<td>Fundamentals of Genomics</td>
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<td>BIN-5052 25 (20+5)</td>
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<td>BIN-5003</td>
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<td>Biosafety and IPR</td>
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<td>BIN-5005</td>
<td>6+3</td>
<td>Molecular Modeling and Computer Aided Drug Design</td>
<td>75(60+15)</td>
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Objective: To explain Internet Programming concepts and related programming and scripting languages. To describe basic Internet Protocols. Explain JAVA and HTML tools for Internet programming. Describe scripting languages – Java Script. Explain dynamic HTML programming.

General Instruction

- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT- I


HTML and Common tags: Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting; Lists: ordered list Unordered List, definition List; Anchor tag, Hyperlink tags, Absolute and relative path, Tables and its attributes, Image and Image maps; Frames: Frame Tag, Nesting Frame Tag, Targeting named frames, creating floating frames, Using Hidden frames; Forms: Form Elements, Form Attributes – Action Attribute, Method Attribute, Name Attribute; Form Input Types and Input Restrictions; Form Input Attributes.

DHTML: Moving elements and Images, changing colors and hiding elements, moving between layers, mouse rollovers, Difference between HTML and DHTML.

STYLE SHEETS: Cascading style sheet, Different approaches to style sheets, Using Multiple approaches, Linking to style information in separate file using the <LINK> tag, embedded style information, Using <STYLE> tag, Cascading Order.

UNIT- II


DHTML with java script, Object model collection, events in java script, filters and transitions-Flip filter, Image mask, shadow filter, alpha filter, Blur filter.
**Event Handlers:** General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload

**Recommended books:**
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
5. Beginning web programming HTML, XHTML and CSS, Duckett John, Wiley.

**BIN-5051 INTERNET PROGRAMMING (PRACTICAL)**
1. Design a web page using different text formatting tags.
2. Design a web page with links to different pages and allow navigation between pages.
3. Design a web page with Imagemaps.
4. Design a web page with different tables.
5. Design a webpage using frames.
6. Design a website using style sheets so that the pages have uniform style.
7. Using Java Script design a web page that prints factorial / Fibonacci series / any given series.
8. Design a form with a test box and a command button. Using Java Script write a program whether the number entered in the text box is a prime number or not.
9. Design a form and validate all the controls placed on the form using Java Script.

**BIN-5002 FUNDAMENTALS OF GENOMICS**

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<td>Int. Ass.</td>
<td>15</td>
</tr>
<tr>
<td>Teaching Hours</td>
<td>60</td>
</tr>
</tbody>
</table>

**Objective**
The fundamentals of genomics dealing with gene structures and elements are covered.

**General Instruction**
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt **five questions** in all by selecting two questions, from each unit and the **first compulsory question**.
UNIT I

**Human Genome as a model**: History of Genome sequencing project. The human Genome project. Organization of the Human genome.

**The human genome sequence**: annotation – Repeats, coding regions, non-coding regions. Genome sizes. Genome Annotation. Single Nucleotide Polymorphisms (SNPs)

**DNA sequencing methods** – manual & automated: Maxam and Gilbert and Sangers method. Chain termination method, Pyrosequencing

**Next Generation Sequencing**: Principle and Applications of Solexa, 454.

UNIT II

**Genome Sequencing methods**: Shotgun & Hierarchical (clone contig) sequencing, Computer tools for sequencing projects: Genome sequence assembly- De novo and Reference assembly, Genome assembly software.

**Managing and Distributing Genome Data**: Web based servers and softwares for genome analysis: ENSEMBL, VISTA, UCSC Genome Browser, NCBI genome. Selected Model Organismal Genomes and Databases.

**Recommended books**:

BIN 5052 FUNDAMENTALS OF GENOMICS (PRACTICAL)  
Max. Marks 25 (20+5)

1. Use of SNP databases (dbSNP)
2. Use of OMIM database
3. Using ENSEMBL, NCBI Genome
4. Detection of Open Reading Frames using ORF Finder
5. Use of Saccharomyces Genome Database (SGD)
Objective:

**General Instruction**

- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt **five questions** in all by selecting two questions, from each unit and the **first compulsory question**.

**UNIT I**

**Biosafety**: Biosafety and risk assessment issues; Regulatory framework; National biosafety policies and law, The Cartagena protocol on biosafety, WTO and other international agreements related to biosafety.

General principles for the laboratory and environmental biosafety.

**Biosafety from GMOs and LMOs**: Procedures for GMOs intended for direct use-risk assessment-risk management-handling, transport, packaging and identification of GMOs - Biosafety Clearing House unintentional trans-boundary movement of GMOs.

**UNIT II**

**IPR**: Meaning, need of IPR, Relevance, Protection of Intellectual Property, International treaties for protection of IP – Bern, Paris, TRIPS, WIPO treaties, Biodiversity convention, etc

**Nature of Intellectual Property**: Patents, Designs, Trademarks and Copyright and Geographical Indications.


**Patent information and databases**.

**Recommended books**:
6. IPR, Biosafety and Bioethics by Deepa Goel and Shomini Parash.
BIN 5053 BIOSAFETY AND IPR (PRACTICAL)

Max. Marks 25 (20+5)

1. Exploring Patent Databases:
   a. PATENTSCOPE
   b. EPO
   c. InPASS
2. Proxy filing:
   a. Proxy filing of Indian Product patent
   b. Proxy filing of Indian process patent

BIN-5004 GENETICS AND EVOLUTION

Theory : 60
Int. Ass. : 15
Time : 3 Hours

Objective
Introduction to the Principles of genetics will help students to acknowledge the phenomena which results in gene diversity and evolution.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

Introduction: Historical developments in the field of genetics. Organisms suitable for genetic experimentation and their genetic significance.

Mendelian Genetics: Mendel’s experimental design, monohybrid, di-hybrid and tri hybrid crosses, Law of segregation & Principle of independent assortment. Verification of segregates by test and back crosses, Chromosomal theory of inheritance

Allelic interactions: Incomplete dominance, co-dominance, semi-dominance, pleiotropy, multiple allele, pseudo-allele, essential and lethal genes, penetrance and expressivity.

Non allelic interactions: Interaction producing new phenotype complementary genes, epistasis (dominant & recessive), duplicate genes and inhibitory genes.

Genetic organization of prokaryotic, eukaryote and viral genome.
UNIT II

Chromosome Morphology: Concept of euchromatin and heterochromatin, packaging of DNA molecule into chromosomes, chromosome banding pattern, karyotype, giant chromosomes.

Chromosome and gene mutations: Definition and types of mutations, causes of mutations, Ames test for mutagenic agents, screening procedures for isolation of mutants and uses of mutants.

Variations in Chromosomes Structure: deletion, duplication, inversion and translocation.

Evolution and population genetics: In breeding and out breeding, Hardy Weinberg law (prediction, derivation), allelic and genotype frequencies, changes in allelic frequencies, evolutionary genetics, natural selection.

Recommended books:

BIN-5054  GENETICS AND EVOLUTION (PRACTICAL)

Max Marks :25 (20+5)

1. Demonstration of Law of Segregation (use of coloured beads)
2. Demonstration of Law of Independent assortment (use of coloured beads)
3. Calculation of variance in respect of pod length and numbers of seeds/pods.
4. Calculation of gene frequencies (use of coloured beads)
5. Numerical based on Gene Interactions
Objective:
To understand the basic concepts of molecular modeling and computational approaches of drug design.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT – I

Introduction to Chemoinformatics: Aim & Scope. Role of Chemoinformatics in pharmaceutical/chemical research
Chemical Structure representation: 1D, 2D and 3D structures representation using ChemSketch.
Molecular file formats: (SMILES, SDF, and MOL)


Concepts of Molecular Mechanics: Molecular Mechanics Force Field, Bond Stretching, Angle Bending, Torsional Terms, Non-Bonded Interactions; Energy Minimization Methods; Introduction to Molecular Dynamics Simulation and its Applications; Molecular Docking and Scoring.

UNIT – II

Introduction to Drug Designing and Discovery: An Overview of Drug Development Process, High Throughput Screening; Concept of Therapeutic Drug Targets, Hits, Leads and Drugs.

Computer Aided Drug Design: Chemical Databases, Basic Concepts of ADME (Absorption, Distribution, Metabolism and Excretion) in reference to Drug Handling by the body, Lipinski’s rule of five, Structure Based Drug Design – Active Site Prediction, Protein-Ligand Interactions, Virtual Screening. Difference between Structure Based and Ligand Based Drug Designing.

QSAR: Introduction to QSAR, Basic Principle & Applications of 2D and 3D QSAR. Concept of Molecular Descriptors (1D, 2D and 3D).

Recommended books:

BIN-5055 MOLECULAR MODELING AND COMPUTER AIDED DRUG DESIGN (PRACTICAL)

Max Marks 25 (20+5)

1. Chemical structure representation and storage in SMILES file formats
2. Structure representations of Carbohydrates and Amino Acids using ChemSketch
3. Exploring Therapeutic Drug Targets Database (PDTD)
4. Exploring Database of Chemical Compounds
5. Protein-Ligand Docking
### OUTLINES OF TESTS, SYLLABI AND COURSES OF READING FOR

**B. Sc. (Hons.) BIOINFORMATICS**

**SEMESTER – VI (SESSION: 2017-2018)**

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Lectures/week (Th+Prac)</th>
<th>Name of paper</th>
<th>Theory</th>
<th>Practical</th>
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<tbody>
<tr>
<td>BIN-6001</td>
<td>6+3</td>
<td>Introduction to Perl Programming</td>
<td>75(60+15)</td>
<td>BIN-6051 25 (20+5)</td>
</tr>
<tr>
<td>BIN-6002</td>
<td>6+3</td>
<td>Proteins and Proteomics</td>
<td>75(60+15)</td>
<td>BIN-6052 25 (20+5)</td>
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<tr>
<td>BIN-6003</td>
<td>6+3</td>
<td>Immunology</td>
<td>75(60+15)</td>
<td>BIN-6053 25 (20+5)</td>
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<tr>
<td></td>
<td></td>
<td>Project Work</td>
<td>-</td>
<td>BIN-6054 200</td>
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<tr>
<td></td>
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<td><strong>Total Marks (Semester –VI)</strong></td>
<td><strong>225</strong></td>
<td><strong>275</strong></td>
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Objective
Since Bioinformatics relies highly on Biological database and introduction to PERL Programming is necessary for better understanding the architecture of databases.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt **five questions** in all by selecting two questions, from each unit and the **first compulsory question**.

**UNIT-I**

Introduction to PERL
What is PERL; Features of PERL, Comparison with other languages like JAVA, C, PHP, Python; Installing PERL modules; Writing and running a PERL script; Types of Data (Numbers, Strings), Scalar Variable; How to store string/numbers in variables; Input/output variables;

Concept of Programming
Operators (Unary, Binary, Mathematical, Conditional, logical, Relational, String);
Control Statements: Conditional Constructs (IF, IF.. ELSE, ELSIF, UNLESS), Iterative Constructs (WHILE, UNTIL, FOR, FOREACH); NEXT Statement, LAST Statement.
List Processing; Array Creation & Handling; Array Functions (SORT, REVERSE, SPLICE, SHIFT, UNSHIFT, PUSH, POP, SPLIT); Associative Array Creation & Handling; Associative Array Functions (keys, values, each); Input from command (ARGV);
Function/Subroutine: Defining and calling functions/subroutines; Types of Functions: Scalar, String and Numerical functions including grep(), sleep(), exists() and delete().

**UNIT-II**

Pattern Matching & Regular Expressions
Introduction & Application of Regular Expressions; Regular expressions; Pattern-Matching Operators; Quantifiers; Positional & Boundary Characters; Modifier; Standard Modules; Subroutines; Using system command; Important functions (split, index, substr, chomp, length, reverse, shift, sort)


Perl and Internet
Introduction to TCP/IP protocol; Internet applications; Common Gateway Interface (CGI); Reading and processing HTML forms using Perl.
Recommended books:

BIN-6051 INTRODUCTION TO PERL PROGRAMMING (PRACTICAL)
   Max Marks :25 (20+5)

1. Write a script code to illustrate “while” and “do” operator
2. Write Perl scripts to illustrate use of Arithmetical and String operators
3. Write a Perl script that declares three arrays and assigns lists to them
4. Write Perl scripts to use array functions.
5. Write Perl scripts use regular expression operators
6. Write a Perl script to read data from the file and writing it into new file
7. Write a script code that read a HTML form via CGI
Objective
Sequence Analysis of proteins is integral to Bioinformatics and therefore introduction to the proteins and the concepts will help students to apply bioinformatics tools on biological data.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT-I
Protein Strategies: Protein Isolation, methods of solublisation, stabilization, Solubility of proteins: effects of salt concentration, organic solvent, effects of pH. Determination of covalent structures-Edman degradation

Proteomics: Definition of Proteome
High throughput techniques for proteome analysis: Protein arrays and its applications.

Mass Spectrometry: Principles, equipment used in MS analysis, MS/MS, LC/MS, GC/MS. Use of MS in structure determination – MS & Microheterogeneity in proteins, confirmation and analysis of peptide sequence, peptide mapping.

UNIT-II
Post translational modifications: Glycosylation, Phosphorylation, lipid attachment, disulphide bond formation,
Protein-Protein Interaction: Large molecular complexes-RNA polymerase II, Ribosome.
Mapping protein interactions Methods- Two hybrid, phage display, mass spectrometry, GST pull down.
Protein-Protein Interaction Databases: GRID, DIP and STRING

Recommended books:
1. Biochemistry by D.Voet and J.G Voet, John Wiley &Sons
2. Physical chemistry : Principles and applications in biological sciences by I.Tinoco Pearson Education
4. Proteomics From protein sequence to function by S.R Pennington and M.J Dunn Viva Books Private Limited
5. Lehninger A.L Nelson D.L, M.M Cox Principles of Biochemistry
BIN-6052 INTRODUCTION TO PROTEINS AND PROTEOMICS (PRACTICAL)

Max Marks 25 (20+5)

1. Building Amino acids and numbering them
2. Exploring protein conformation
3. Measuring Torsion angle
4. The alpha helix: build a peptide of 10 amino acids
5. STRING
BIN-6003 IMMUNOLOGY

Objective
This course will introduce students to the principles of modern immunology, both at the molecular and cellular levels. Further the course presents the importance of interactions between many of these molecular and cellular entities involved in immunity.

General Instruction
- The question paper will have seven questions, and each question have 12 marks. The first question would be compulsory having sub-parts covering the entire syllabus in the form of short and objective type questions.
- The remaining six questions will be set out of the Units I and II consisting of three questions from each unit.
- A candidate is required to attempt five questions in all by selecting two questions, from each unit and the first compulsory question.

UNIT I

Immune Response - An overview, components of mammalian immune system, molecular structure of Immuno-globulins or Antibodies, Humoral & Cellular immune responses, T lymphocytes & immune response (cytotoxic T-cell, helper T-cell, suppressor T-cells), T-cell receptors, genome rearrangements during B-lymphocyte differentiation, Antibody affinity maturation class switching, assembly of T-cell receptor genes by somatic recombination.

Regulation of immunoglobulin gene expression – clonal selection theory, allotypes & idiotypes, allelic exclusion, immunologic memory, heavy chain gene transcription, antibody diversity.

UNIT II

Major Histocompatibility complexes – class I & class II MHC antigens, antigen processing. Autoimmune diseases, Immunodeficiency-AIDS. Vaccines & Vaccination – adjuvants, cytokines, DNA vaccines, recombinant vaccines, bacterial vaccines, viral vaccines, vaccines to other infectious agents, passive & active immunization. Introduction to immunodiagnostics – RIA, ELISA.

Recommended Books:
BIN-6053  IMMUNOLOGY (PRACTICAL)  

Max Marks 25 (20+5)  

1. Preparation of normal serum and plasma  
2. ELISA  
3. To determine the WBC/RBC Count  
4. Radial immune diffusion analysis  
5. Agglutination reaction  

BIN-6054  PROJECT WORK  

Max Marks: 200  

Every student will submit a project report based on the work carried out under the guidance of Department / Allied Department faculty, pertaining to the syllabi of Bioinformatics. The report will be evaluated in terms of quality of written work, experimental and performance in the viva-voce by internal and/or external examiner(s).  

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