Master Degree in Bioinformatics
M.Sc. (Bioinformatics) Semester I

| Course Code | **PT01CBIC51** | Title of the Course | **Fundamentals of Biology** |
|---|---|---|---|
| Total Credits of the Course | 4 | Hours per Week | 4 |

| Course Objectives: | •To understand the concepts of the structure of biomolecules<br>•To understand the basics of metabolism and enzyme kinetics<br>•To give a basic understanding of the forces that determine the structure of biological macromolecules<br>•To provide knowledge about the techniques used in studying biological structure and function |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage* (%) |
| 1. | **INTRODUCTION TO LIFE SCIENCES:**<br><br>Basic characteristics of life. Classification: 5 kingdom classification of life, Modern classification based on 3 domains of life, Cell as a basic unit of liIVng systems. The cell theory. Detailed classification of cell, types within an organism. Structure of prokaryotic and eukaryotic cells; Membrane structure and function and various cell organelles. | 25 |
| 2. | **MOLECULAR AND CHROMOSOMAL BASIS OF INHERITANCE:**<br><br>Molecular basis of inheritance: DNA- as genetic material experimental evidence, Organisation of Chromosome, DNA replication and repair.Chromosomal basis of Inheritance: Mendelian inheritance, Morgan'sexperiment, Sex Linked inheritance, Linked Genes, Genomic imprinting, Genetic Disorders. Cell Cycle: Cell diIVsion, phases of Cell cycle, Cell Cycle control system. | 25 |
| 3. | **CELLULAR ENERGETICS AND METABOLIC PATHWAY:**<br><br>Biological Molecules: Carbohydrates, Lipids, Proteins, DNA, RNA structure and function. Stages of Cellular respiration, Catabolic pathways (Glycolysis, TCA cycle), redox reaction, Chemiosmosis.<br><br>Signal transduction: Function and structure of inter and intra-cellular communication. Receptor ligand interactions. Structural components of signaling pathway: G-proteins, Ras proteins, | 25 |

| | | |
|---|---|---|
| | Adenylate cyclase | |
| 4. | **CONFORMATIONAL ANALYSIS AND FORCES THAT DETERMINE PROTEIN STRUCTURE:**<br>Basic problems of protein structure, Polypeptide chain geometries, estimates of potential energy, Potential energy calculations,<br>Hydrogen bonding, Hydrophobic interactions, Ionic interactions, Hydrophobic versus ionic interactions, Disulfide bonds, Formation of specific disulfide links. | 25 |

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|---|---|
| Teaching-Learning Methodology | • Regular class room teaching will be done with following tools:<br>a) Conventional black board and chalk.<br>b) ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components.<br>• Appropriate reference materials will also provided to the students as and when required from departmental library resources. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Represent and illustrate the structural organization of genes and the control of gene expression |
| 2. | Explore the prokaryotic and eukaryotic protein synthesis mechanism |
| 3. | Conceptualize mechanisms of signal transduction, cell cycle and cell death<br>Link the concepts of cell and molecular biology to a better understanding of diseases |

| Suggested References: | |
|---|---|
| Sr. No. | References |
| 1. | Cell and Molecular biology: P.K.Gupta |
| 2. | Biology of microorganisms, 9th Edition M.T. Madigan; John H.Martinko & Jack Barnes |
| 3. | Principles of Biochemistry: Lehninger |
| 4. | Genetics: P.K.Gupta |

| On-line resources to be used if available as reference material |
|---|
| On-line Resources:<br>https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookCELL2.html<br>https://microbenotes.com/cell-organelles/#ribosomes<br>https://majkf.files.wordpress.com/2010/08/molecular_cell_biology_lodish_5th_ed.pdf<br>https://nptel.ac.in/courses/102/106/102106025/ |

Master Degree in Bioinformatics
M.Sc. (Bioinformatics) Semester I

| Course Code | **PT01CBIC52** | Title of the Course | **Title of Paper: Molecular Biology & Recombinant rDNA Technology** |
|---|---|---|---|
| Total Credits of the Course | 4 | Hours per Week | 4 |

| Course Objectives: | The objective of the paper is to<br>1. To understand the concepts of the structure of biomolecules<br>2. To understand the basics of metabolism and enzyme kinetics<br>3. To give a basic understanding about the forces that determines the structure of biological macromolecules<br>4. To provide knowledge about the techniques used in studying biological structure and function |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage* (%) |
| 1. | **DNA structure & synthesis:**<br>Structure of components of DNA, mode of DNA replication,<br>Enzymes involved in DNA replication, DNA polymerase in prokaryotes and eukaryotes, origin of replication, replication fork, initiation, elongation and termination of DNA replication, telomerase and replication of ends of eukaryotic chromosomes | 25 |
| 2. | **TRANSCRIPTION AND PROCESSING OF RNA:**<br>Transcription in prokaryotes, Initiation, elongation, termination of transcription in eukaryotes, transcriptional factors.<br>Types of RNA, RNA splicing, splicosome machinery, Splicing pathways, aternative splicing, exon shuffling, RNA editing.<br>Regulation of gene expression in prokaryotes: Lac, tryp operon, eukaryotic gene expression.Translation: The cracking of Genetic Code, basic features of Genetic code, the 'Wobble hypothesis', frame shifting, structure of t-RNA, ribosomes in prokaryotes & eukaryotes, post translation modifications | 25 |
| 3. | **REGULATION OF GENE EXPRESSION IN PROKARYOTES:** Lac, tryp operon, eukaryotic gene expression. Translation: The cracking of Genetic Code, basic | 25 |

| | | |
|---|---|---|
| | features of Genetic code, the 'Wobble hypothesis', frame shifting, structure of t-RNA, ribosomes in prokaryotes & eukaryotes, post translation modifications. | |
| 4. | **TOOLS OF RECOMBINANT DNA TECHNOLOGY:** Restriction enzymes, DNA ligase, modifying<br>enzymes. Plasmid vectors, phage vectors, phagemids, cosmids, shuttle vectors, BACs & YACs. Expression vectors versus cloning vectors.Gene cloning: DNA libraries –Genomic and cDNA. Cloning strategies, Screening of libraries from clones, identification of desired recombinants by alpha complementation, insertional inactivation, complementation of mutant phenotype, immuno screening, colony hybridization. Polymerase Chain Reaction & Its Applications: Principle, components, applications, site- directed mutagenesis. | 25 |

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|---|---|
| Teaching-Learning Methodology | • Regular class room teaching will be done with following tools:<br>a. Conventional black board and chalk.<br>b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components.<br>• Appropriate reference materials will also provided to the students as and when required from departmental library resources. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Represent and illustrate the structural organization of genes and the control of gene expression |
| 2. | Explore the prokaryotic and eukaryotic protein synthesis mechanism |

| | |
|---|---|
| 3. | Conceptualize mechanisms of signal transduction, cell cycle and cell death<br>Link the concepts of cell and molecular biology to a better understanding of diseases |

| Suggested References: | |
|---|---|
| Sr. No. | References |
| 1. | Gene Cloning by T.A. Brown Blackwell sciences, (2001). |
| 2. | Genes IX by Benzamin Lewin,Pearson Education InteRNAtional (2006). |
| 3. | Lehninger A.L,Nelson D.L.Cox,Principles of Biochemistry ,CBS Publication,(2005). |
| 4. | Wolfe, Stephen L. Molecular and Cellular Biology. USA: Wadsworth, 2005.<br>Watson, James, D. Molecular Biology of the Gene. USA : The Benjamin Cummings Publishing Company, 2007 |

| On-line resources to be used if available as reference material |
|---|
| On-line Resources:-- https://nptel.ac.in/courses/104/103/104103121/<br>https://nptel.ac.in/content/storage2/courses/102103013/module1/lec1/6.html<br>https://nptel.ac.in/content/storage2/courses/102103013/module1/lec1/5.html<br>https://nptel.ac.in/courses/102/103/102103013/ |

Master Degree in bioinformatics
M. Sc. (Bioinformatics) Semester I

| Course Code | **PT01CBIC53** | Title of the Course | **IT Fundamentals** |
|---|---|---|---|
| Total Credits of the Course | 4 | Hours per Week | 4 |

| Course Objectives: | **OBJECTIVES OF THE COURSE**<br>• To facilitate the students to understand IT infrastructure hardware, Software development and Database use.<br>• To enable the students to converted ASCII code in hexadecimal<br>1. |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage* (%) |
| 1. | **COMPUTER FUNDAMENTALS:**<br>Block Structure of a computer, characteristics of computers,<br>classification of computers. Number System: Bit, byte, binary, decimal, hexadecimal and octal systems, conversion from one system to the other. Character codes (ASCII, EBDIC, BCD, Excess-3 Grey). Introduction to Programming: Algorithms, Flow Charts, Basic constructs of Programming Languages, Types of programming languages. | 25 |
| 2. | **PROCESSORS, MEMORY AND INPUT/OUTPUT**<br>CPU organization, Instruction execution, RISC Vs. CISC<br>Instruction-level parallelism: pipelining, superscalar architectures<br>Processor-level parallelism: array computers, multiprocessors, multicomputers , Microprocessor chips, Architecture of a typical microprocessor. Memory: main memory, secondary memory, types & organization. Input/Output: common types of I/O deIVces, Controllers | 25 |
| 3. | **INSTRUCTIONS AND FLOW OF CONTROL**<br>Design criteria for instruction formats, Addressing techniques, Instruction types, & Interrupts, Gates and Boolean Algebra Gates, Boolean algebra, Truth tables, Circuit equivalence, De Morgan's theorems | 25 |

| | | |
|---|---|---|
| 4. | **INTRODUCTION TO DATA STRUCTURES:**<br>Time and space efficiency of algorithms, Primitive and Composite data types Arrays, Stacks, Queues: Randomization & other Concepts:<br>Linked Lists, Binary Trees , Hashing techniques for direct files. Inverted lists, Multi-lists, Heaps. | 25 |

| | |
|---|---|
| Teaching-Learning Methodology | • Regular class room teaching will be done with following tools:<br>a. Conventional black board and chalk.<br>b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components.<br>• Appropriate reference materials will also provided to the students as and when required from departmental library resources. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Learn the how to Installing software |
| 2. | Easily differentiate between application software and system software |
| 3. | Establishing basic network connectivity |

| Suggested References: | |
|---|---|
| Sr. No. | References |
| 1. | Tanenbaum A. S. : Structured Computer Organization, 3rd Edition, Prentice-Hall of India Pvt. Ltd., 1993. |
| 2. | MalIVno A. P.: Digital Computer Electronics,2nd Edition, Tata McGraw, Hill Pub. Co. |

| | |
|---|---|
| | Ltd.,New Delhi, 1990 |
| 3. | Gothmann, William H. : Digital Electronics - An Introduction to Theory and Practice, 2nd Edition,PHI,1982. |
| 4. | Hall Douglas V. : Microprocessors and Interfacing - Programming and Hardware., McGraw Hill Book Company, 1986. |
| 5. | M.M. Mano : Computer System Architecture, 3rd Edition, Pearson Education, 2000, |

| On-line resources to be used if available as reference material |
|---|
| On-line Resources:-- https://www.javatpoint.com/data-structure-introduction#:~:text=Data%20Structure-,Introduction,%2C%20Stack%2C%20Queue%2C%20etc. https://www.javatpoint.com/computer-fundamentals-tutorial#:~:text=It%20is%20derived%20from%20the,virus%2C%20software%2C%20hardware%20etc. |

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Master Degree in Bioinformatics
M.Sc. (bioinfomatics) Semester I

| Course Code | **PT01CBIC54** | Title of the Course | Experimental method I |
|---|---|---|---|
| Total Credits of the Course | 04 | Hours per Week | 4hr |

| Course Content | | |
|---|---|---|
| Unit | Description | Weigh tage* (%) |
| 1. | 1. Preparation of different types of stains<br>2. Different types of staining techniques<br>3. Study of normal and abnormal karyotypes<br>4. Estimation of DNA and Protein: Spectrophotometric way<br>5. Cell count determination: using Hemocytometer<br>6. Examination of various stages of mitosis and meiosis<br>7. To study cell structure from onion leaf peels, Hydrilla, Spirogyra, Amoeba, Paramecium and Euglena<br>8. Preparation of Media, Streaking, Spread Plating, Pour Plating, Gram Staining<br>9. Preparation of media, cotton plugging and sterilisation techniques<br>10. Experiments on isolation, spread plates, pour plates, selective media, differential media, staining (simple, differential, Gram, endospore, capsule staining),count of microbes (standard plate count)<br>11. Isolation of chromosomal DNA from bacteria<br>12. Isolation of plasmid DNA from bacteria by alkaline lysis method<br>13. Restriction digestion of plasmid DNA<br>14. DNA agarose gel electrophoresis<br>15. Polymerase chain reaction | 100 |

| Teaching-Learning Methodology | Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure |
|---|---|

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Practical Examination (As per CBCS R.6.8.3) | 30% |
| 2. | University Practical Examination | 70% |

**PRACTICAL OUTCOMES**

- To perform a range of molecular techniques used for the isolation, estimation, purification of biomolecules
- Utilize laboratory skills to enhance understanding of cell structure and function while participating in a group environment
- Develop responsible conduct of laboratory skills appropriate to the field of cell and molecular biology
- Apply the molecular biology techniques to biotechnological approaches

**List of Practical's**

- Cell Fraction and Extraction of cell organelles
- Isolation of Sub-Cellular Organelles and Particles –Mitochondria and Chloroplast
- Extraction of DNA from Onion, Extraction of RNA from Yeast
- Estimation of DNA and RNA
- Estimation of Proteins by Lowry's Method
- Estimation of Mitochondria by Assessing The Marker Enzyme
- Denaturing Proteins and Identification of Amino Acids by Thin Layer Chromatography
- Isolation of Plasmid DNA (Demo)
- Amplification of DNA by PCR
- Electrophoretic Techniques: Agarose Gel Electrophoresis**,** SDS PAGE (Demo)
- Southern Blotting (Demo)

Master Degree in bioinformatics
M.Sc. (Bioinformatics) Semester I

| Course Code | **PT01CBIC55** | Title of the Course | Experimental methods -II |
|---|---|---|---|
| Total Credits of the Course | 06 | Hours per Week | 4hr |

| Course Objectives: | The objective of the paper is to<br>1. Understand the fundamentals how a computer works.<br>2. To learn how to take a problem, figure out the algorithm to solve it, the write the code.<br>3. Understand how to install and use a good Java development environment.<br>4. To learn basics of programming with a modern programming language, Java.<br>5. Variables, Expressions, Looping, Branching, and Exceptions<br>6. Development of Methods / Subroutines / Functions |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage * (%) |
| 1. | 1. Write a Java Program find the Area of circle.<br><br>2. Write a Java Program that will display Factorial of the given number.<br><br>3. Write a Java Program that will display the sum of 1+1/2+1/3…..+1/n.<br><br>4. Write a Java Program that will display 25 Prime nos.<br><br>5. Write a Java Program that will accept command-line arguments and display the same.<br><br>6. Write a Java Program to sort the elements of an array in ascending order. | 100 |

| | | |
|---|---|---|
| | 7. Write a Java Program which will read a text and count all occurrences of a particular word.<br><br>8. Write a Java Program which will read a string and rewrite it in the alphabetical order eg. The word "STRING" should be written a "GINRST".<br><br>9. Make an Applet that create two buttons named "Red" and "Blue" when a button is pressed the background color of the applets is set to the color named by the button's label.<br><br>10. Write a Java Applet that create some text fields and text areas to demonstrate features of each..<br><br>11. Use a Grid layout class to arrange a few instance of circle canvas.<br><br>12. Write any Java Program using new operator.<br><br>13. Write a Program to create a List Box and a Text Area. Fill up the List Box with some file names. When user double clicks on any filename of the list box, the file should be opened and its contents should be displayed in the text Area.<br><br>14. Create an applet with three text Fields and two buttons add and subtract. User will enter two values in the Text Fields. When the button add is pressed, the addition of the two values should be displayed in the third Text Fields. Same the Subtract button should perform the subtraction operation.<br><br>15. Create an applet to display the scrolling text. The text should move from right to left. When it reaches to start of the applet border, it should stop moIVng and restart from the left. When the applet is deactivated, it should stop moIVng. It should restart moIVng from the preIVous location when again activated. | |

16. Write a program to create three scrollbar and a label. The background color of the lable should be changed according to the values of the scrollbars (The combination of the values RGB)

17. Create user entry from for student data. User will enter roll no, name, dept and semester. Use combo box for dept. When user clicks on the Insert button all the values should be inserted in the Text Area in a row format for each record.

18. Develop a program that accepts five strings from the user and stored them in a vector. The program should also be able to perform following operations.

- Delete an item from the list
- Add an item at the specified location of the list.
- Add an item at the end of the list.
- Print the contents of the vector

Develop suitable GUI for the program using proper AWT controls and Layout Manager.

19. Create an application with a Text Field, a Text Area and button show. User has to enter the name of the file in the Text Field. When the button show is pressed, the contents of the file should be displayed in the Text Area.

20. Create a Text Field, a button and a list box, User has to enter a number in the Text Field. When user clicks on the button, the arithmetic table for that number should be displayed in the list box. If the user repeats this process the list box should be cleared and refilled by the latest values.

21. Develop a program to write the text "Hello, how are you" to a file "Hello.txt". Also develop a program to read this file and to display the contents of this file using suitable GUI.

| | | |
|---|---|---|
| | 22. Develop and application/appelt with a Menu File and two menu items color and font. The submenu of the menu item color will contain different colors which when selected should change the background of the applet. The submenu of the menu item font should contain the list of fonts. Create a Text Field in the center of the container. When the font is selected from the font list of menu, the Text Field text should be appeared in that font.<br><br>23. Develop a Program to create a Text Field, a List Box and two buttons add and delete. User will enter values in the Text Field. When user clicks on the add button the value should be added in the List Box. When user clicks on the delete button, the selected item from the list should be removed.<br><br>24. Create an applet to display the co-ordinates of the mouse pointer. The co-ordinates should be changed as and when the mouse pointer change its location. | |

| | |
|---|---|
| Teaching-Learning Methodology | Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Practical Examination (As per CBCS R.6.8.3) | 30% |
| 2. | University Practical Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Understand the fundamentals how a computer works. |
| 2. | To learn how to take a problem, figure out the algorithm to solve it, the write the code. |
| 3. | Understand how to install and use a good Java development environment |
| 4. | To learn basics of programming with a modern programming language, Java. |

| | |
|---|---|
| | |
| 5. | Variables, Expressions, Looping, Branching, and Exceptions<br>Development of Methods / Subroutines / Functions |

## List of Practical's

- Using Objects, Classes, Encapsulation, Inheritance, Abstraction and Polymorphism. Using Constructors, Destructors, Friend functions
- String manipulation – creating string objects, Standard Streams, String operators Manipulating String, String characteristics, Comparing and Swapping
- Working with files – File streams, Open, close, EOF, updating files and error Handling

**SARDAR PATEL UNIVERSITY**
**Vallabh Vidyanagar, Gujarat**
**(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)**
**Syllabus with effect from the Academic Year 2021-2022**

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

| Course Code | **PT01CBIC56** | Title of the Course | Comprehensive Viva |
|---|---|---|---|
| Total Credits of the Course | 01 | Hours per Week | 1hr |

| Course Objectives: | The objective of the viva is to<br>1. To check the in-depth knowledge gain by the students throughout the semester |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage * (%) |
| 1. | Evaluation of knowledge gained from three core, one elective and two practical by conducting comprehensive viva | 50 |

| Teaching-Learning Methodology | Internal Continuous Assessment in the form of Viva-voce |
|---|---|

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | University Examination | 100 |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Will be able to defend the questions related to core and elective papers studied during semester-I |

| Suggested References: | |
|---|---|
| Sr. No. | References |

| | |
|---|---|
| | NIL |
| On-line resources to be used if available as reference material | |
| On-line Resources: --- | |

Master Degree in bioinformatics
M.Sc. (Bioinformatics) Semester I

| Course Code | **PT01EBIC51** | Title of the Course | **Biocomputing Fundamentals** |
|---|---|---|---|
| Total Credits of the Course | 4 | Hours per Week | 4 |

| Course Objectives: | **OBJECTIVES OF THE COURSE**<br>• To facilitate the students in gaining programming skills.<br>• To enable the students to design and execute Java code<br>• To interpolate biological demands through programming |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage* (%) |
| 1. | **THE GENESIS OF JAVA:**<br>An overIVew of JAVA, Object Oriented Programming, Data types-Variables and Arrays, the simple types, Floating point types. Operators, Control statements. Introducing classes : Class fundamentals, Declaring objects, Assigning object reference variables, Introducing methods, Constructors, The this keyword. Garbage collection, using objects as parameters, Argument passing, Retaining objects, Recursion, Introducing Access control, Understanding static. Nested and inner classes, exploring the string class, Using command line arguments. | 25 |
| 2. | **INHERITANCE:**<br>Basics, Member access and inheritance. Using super: to call super class constructors, Creating a multilevel hierarchy, Method overriding, Dynamic method dispatch,Using abstract classes, Using final with inheritance, Using final to prevent overriding, Using final to prevent inheritance, The object class. | 25 |
| 3. | **PACKAGES AND INTERFACES :**<br>Packages, Defining a package, Understanding class path, Access protection: Importing packages, Defining an interface. Implementing interfaces, Applying interfaces, Variables in interfaces. Exception handling: Fundamentals, Exception types, Uncaught exceptions, Using try and catch, Displaying a description of an exception. Multiple catch | 25 |

| | | |
|---|---|---|
| | clauses. Nested statements, throw, throws. Java's built in exceptions, Creating own exception subclasses, Using exceptions. | |
| 4. | **I/O APPLETS:**<br>I/O basics - Streams, Byte streams and character streams. The predefined streams; Reading console Input : reading characters, reading strings, Writing files, Applets, Fundamentals, The transient and volatile modifiers, Using instance of, Native methods,<br>Problems with native methods. | 25 |

| | |
|---|---|
| Teaching-Learning Methodology | • Regular class room teaching will be done with following tools:<br>a. Conventional black board and chalk.<br>b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components.<br>• Appropriate reference materials will also provided to the students as and when required from departmental library resources. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
|---|---|
| 1. | Learn the basics of programming |
| 2. | Relate the necessity for programming in biology |
| 3. | Handling biological concepts with Java |
| 4. | Apply programing to analysis of genomic sequences<br>Understand Bio-Java and their application in bioinformatics to handle the complex data |

| Suggested References: | |
|---|---|
| Sr. No. | References |
| 1. | **v** Java 2: The Complete Reference by Patrick Naughton, Herbert Schildt, Osborne Publishing; 3rd edition (March 29, 1999) |
| On-line resources to be used if available as reference material | |
| On-line Resources:-- https://www.javatpoint.com/history-of-java | |

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Master Degree in Bioinformatics
M.Sc (Bioinformatics) Semester I

| Course Code | **PT01EBIC52** | Title of the Course | **Foundation of Biochemistry and Molecular Biology** |
|---|---|---|---|
| Total Credits of the Course | 4 | Hours per Week | 4 |

| Course Objectives: | The objective of the paper is to<br>• Through this course the students are exposed to importance of biological macromolecules<br>• They acquire knowledge in the quantitative and qualitative estimation of biomolecules<br>• It majorly emphasizes the concepts of central dogma of molecular biology |
|---|---|

| Course Content | | |
|---|---|---|
| Unit | Description | Weightage* (%) |
| 1. | **STRUCTURE, CHEMISTRY AND FUNCTION OF BIOMOLECULES**<br>Water, Different bonds -basic thermodynamic logic of bond formation; relative strengths of different bonds; Carbohydrates: Sugars, Monosaccharides, Disaccharides and polysaccharides and its metabolism. diversity of carbohydrate structure;<br>Lipids.: Fatty acids, different types of lipids, glycerol, triglycerides, sphingolipids, phospholipids and their metabolism. | 25 |
| 2. | **MENDELIAN GENETICS:**<br>Principles, Interaction of genes. modern meaning of allele; logic of segregation and logic of independent assortment; homozygosity and heterozygosity; elementary-level logic of recombination and recombination distances (theoretical); statistical determination of new combinations; statistics behind monohybrid and dihybrid crosses; use of Punnett square. | 25 |
| 3. | **CELLULAR ENERGETICS AND METABOLIC PATHWAY:**<br>Biological Molecules: Carbohydrates, Lipids, Proteins, DNA, RNA structure and function. Stages of Cellular respiration, Catabolic | 25 |

| | | |
|---|---|---|
| | pathways (Glycolysis, TCA cycle), redox reaction, Chemiosmosis.<br>Signal transduction: Function and structure of inter and intra-cellular communication. Receptor ligand interactions. Structural components of signaling pathway: G-proteins, Ras proteins, Adenylate cyclase, | |
| 4. | **NUCLEIC ACIDS:**<br>structure, chemistry and function of DNA and RNA;<br>differences between DNA and RNA; sequence as a means of encoding information; variety of sequence generation using 4 bases and logic of 3-base coding; start and stop codons; codon degeneracy; relationship between DNA sequence and protein properties; "junk" DNA and it's identification by statistical logic; identification of gene and gene-like sequences from statistical (probability) analysis of sequences | 25 |

| | |
|---|---|
| Teaching-Learning Methodology | • Regular class room teaching will be done with following tools:<br>a. Conventional black board and chalk.<br>b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components.<br>• Appropriate reference materials will also provided to the students as and when required from departmental library resources. |

| Evaluation Pattern | | |
|---|---|---|
| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learner will be able to | |
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| 1. | Explain the chemical basis of life, properties of biomolecules in water, importance of pH and biomolecular hierarchy Describe Structure-Function relationships of model proteins |
| 2. | Explain principles of enzyme catalysis and catalytic strategies with specific examples |

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| 3. | It also helps in understanding the concepts of cellular function. |
| 4. | At the end of the course, the students have a thorough understanding on the role of biomolecules and their molecular functions |
| 5. | Explore various bioinformatics tools used to study drug action and drug discovery. |

| Suggested References: | |
|---|---|
| Sr. No. | References |
| 1. | Biochemistry & Molecular Biology by T.A. Swamson. (2003) |
| 2. | Biochemistry by D. Voet and J. G. Voet , John Willy and Sons. 3rd Edition, (1995) |
| 3. | Evolution by Monroe W. StrickBerger, 3rd Edition, (2000), Jones and Bartlett Publishers. |
| 4. | Concepts in Biology by Eldon D. Enger & Fedrick C. Ross, McGraw Hill, 10th edition, 2002. |

| On-line resources to be used if available as reference material |
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| On-line Resources:<br>https://www.britannica.com/science/biomolecule<br>https://en.wikipedia.org/wiki/Mendelian_inheritance<br>https://nptel.ac.in/courses/102/104/102104063/ |