Detailed Course Scheme

Bachelor of Science (B. Sc.)

(Biotech)

Semester- V

(2020-2021)

DOC202002250024

RNB GLOBAL UNIVERSITY
Educating stars for tomorrow

RNB GLOBAL UNIVERSITY
RNB Global City, Ganganagar Road,
Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows Semester System along with Choice Based Credit System as per latest guidelines of University Grants Commission (UGC). Accordingly, each academic year is divided into two semesters, **Odd (July-December) and Even (January-June).** Also, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy.

The curriculum for B. Sc. (Biotech) Program along with examination pattern is as follows:

Course Scheme

Semester – V

S. No.	Course Code	Course Name	L	T	P	Credits
1.	13012200	Summer Internship or Summer Project	0	0	8	4
2.	-	Discipline Specific Core Course-I Elective I	4	0	0	4
3.	-	Discipline Specific Core Course-I Elective I Lab	0	0	4	2
4.	-	Discipline Specific Core Course-II Elective I	4	0	0	4
5.	-	Discipline Specific Core Course-II Elective I Lab	0	0	4	2
6.	-	Discipline Specific Core Course-III Elective I	4	0	0	4
7.	-	Discipline Specific Core Course-III Elective I Lab	0	0	4	2
8.	13012100	Biological Databases and their Management	2	0	0	2
9.	13003100	Ability & Skill Enhancement - V	2	0	0	2
10.	13010000	Application of IT Skills in Sciences	3	0	0	3
11.	13010100	Application of IT Skills in Sciences Lab	0	0	2	1
12.	99002800	Workshops & Seminars	-	-	-	1
13.	99002700	Human Values & Social Service/NCC/NSS	-	-	-	1
Total			**19**	**0**	**22**	**32**

Discipline Specific Electives

Subject	Course Code	Course Name
Chemistry	13007000	Chemistry of Main Group Elements, Theories of Acids and Bases (DSE I)
	13007100	Chemistry of Main Group Elements, Theories of Acids and Bases Lab (DSE I)
Botany	13011500	Immunology (DSE I)
	13011600	Immunology Lab (DSE I)
Biotechnology	13011900	Bioinformatics (DSE I)
	13012000	Bioinformatics Lab (DSE I)

- Lab would be same as per theory elective paper opted by the student.

EVALUATION SCHEME - THEORY

The evaluation of the theory paper of B.Sc. program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

The distribution of Internal Assessment Marks is as follows:

Type	Details	Marks
Mid Term	Two Mid-term Sessional of 15 marks each (15+15)	30
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	15
Attendance	75%+ : 5 marks	5
TOTAL	**50**	

External Assessment

Type	Marks
Theory	50

EVALUATION SCHEME - PRACTICAL

The evaluation of the practical paper of B.Sc. program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

Internal Assessment

Type	Details	Marks
Marks obtained in various manuals, practical file, participation, any model prepared, output of practical	Average of marks obtained	45
Attendance	75%+ : 5 marks	5
TOTAL	**50**	

External Assessment

Type	Marks
Practical	50

EVALUATION SCHEME- WORKSHOPS & SEMINARS AND HUMAN VALUES & SOCIAL SERVICE/NCC/NSS

1. The evaluation of Workshops & Seminar and Human Values & Social Service/NCC/NSS will be completed from Semester I – Semester VI. It will be evaluated internally by the various Forums & Schools Concerned. The credit for this will be given at the end of each Semester.

2. The students have to join club/clubs/Forums with the active participation in different activities of club. The students would be continuously assessed from Semester-I to Semester-IV and credits and marks would be given after the end of each Semester.

CURRICULUM

Course Name: Chemistry of Main Group Elements, Theories of Acids and Bases

Course Code: 13007000

Objectives

The whole curriculum deals with the core inorganic chemistry. The syllabus coverage includes 51 hardcore lectures, tutorials for solving problems and clarification of concepts, presentations by students and brainstorming quiz session.

The main objectives of this teaching include:

1. The 'ACID AND BASES' segment includes the historical development for the definitions of acid and base and its application in whole chemistry. it deals with the explanation of the relative strength of different kind of acid and bases. 'METALLUGY' includes the understanding of the thermodynamic concept of extraction process and various extraction process involved in the elements. 's and p BLOCK ELEMENTS' helps in the understanding of various periodic properties of the s and p block elements of the periodic table. Study of the structure, preparation and properties of oxides, oxoacids, halides etc.
2. (Last segment ' INORGANIC POLYMERS ' includes the preparation, properties and structure of some inorganic polymers which are of industrial importance.

Course Outline

Unit I

Acids and Bases Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and leveling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept. Hard and soft acids and bases (HSAB concept), applications of HSAB process.

Unit II

General Principles of Metallurgy Chief modes of occurrence of metals based on standard electrode potentials, Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agents. Hydrometallurgy with reference to cyanide process for gold and silver. Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn, Au): electrolytic refining, zone refining, van Arkel-de Boer process, Parting Process, Mond's process and Kroll Process.

Unit III

s- and p-Block Elements Periodicity in s- and p-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electro negativity (Pauling scale). General characteristics of s-block metals like density, melting and boiling points, flame colour and reducing nature. Oxidation states of s- and p-block elements, inert-pair effect, diagonal relationships and anomalous behaviour of first member of each group. Allotropy in C, P and S. Complex forming tendency of s block elements and a preliminary idea of crown ethers and cryptates, structures of basic beryllium acetate, salicylaldehyde/ acetylacetonato complexes of Group 1 metals. Solutions of alkali metals in liquid ammonia and their properties. Common features, such

as ease of formation, solubility and stability of oxides, peroxides, superoxides, sulphates and carbonates of s-block metals.

Unit IV

Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis of the following compounds and their applications in industrial and environmental chemistry wherever applicable: Diborane and concept of multicentre bonding, hydrides of Groups 13 (BH_3), 14, 15, 16 and 17. Oxides of N and P, Oxoacids of P, S and Cl. Halides and oxohalides of P and S (PCl_3, PCl_5, $SOCl_2$ and SO_2Cl_2) Interhalogen compounds. A brief idea of pseudohalides.

Unit V

Noble gases: Rationalization of inertness of noble gases, clathrates, preparation and properties of XeF_2, XeF_4 and XeF_6; bonding in these compounds using VBT and shapes of noble gas compounds using VSEPR Theory.

Unit VI

Inorganic Polymers Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates. Synthesis, structural features and applications of silicones. Borazines and cyclophosphazenes – preparation, properties and reactions. Bonding in $(NPCl_2)_3$

Suggested Readings

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Greenwood, N.N. & Earnshaw. Chemistry of the Elements, Butterworth Heinemann. 1997.
5. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.
6. Miessler, G. L. & Donald, A. Tarr. Inorganic Chemistry 4th Ed., Pearson, 2010. •Atkin, P. Shriver & Atkins' Inorganic Chemistry 5th Ed. Oxford University Press (2010).

Course Name: Chemistry of Main Group Elements, Theories of Acids and Bases Lab

Course Code: 13007100

Course Outline

1. Iodometric estimation of potassium dichromate and copper sulphate.

2. Iodimetric estimation of antimony in tartaremetic.
3. Estimation of amount of available chlorine in bleaching powder and household bleaches.
4. Estimation of iodine in iodized salts.
5. Iodimetric estimation of ascorbic acid in fruit juices.
6. Estimation of dissolved oxygen in water samples.
7. Gravimetric estimation of sulphate as barium sulphate.
8. Gravimetric estimation of aluminium as oximato complex.
9. Preparation of the following: potash alum, chrome alum, tetraammine copper(II) sulphate monohydrate, potassium trioxalato ferrate(III) (any two, including one double salt and one complex).

Suggested Readings

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2000

Course Name: Immunology

Course Code: 13011500

Course Outline:

Unit I: Overview of the Immune System
Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system.

Unit II: Cells and Organs of the Immune System
Haematopoeisis, Cells of immune system and organs (primary and secondary lymphoidorgans) of the immune system.

Unit III: **Antigens**
Basic properties of antigens, B and T cell epitopes, haptens and adjuvants.

Unit IV: Antibodies
Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis.

Unit V: Working of the immune system

Structure and functions of MHC, exogenous and endogenous pathways of antigen presentation and processing, Basic properties and functions of cytokines, Complement system: Components and pathways.

Unit VI: Immune system in health and disease
Gell and Coombs' classification and brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immune deficiency. Immunological techniques – ELISA Immuno diffusion Immuno electrophoresis.

Unit VII: Vaccines
General introduction to vaccines, Various types of vaccines.

Suggested Readings

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company.
2. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition, Mosby, Elsevier Publication.
3. Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology.V Edition. Saunders Publication.

Course Name: Immunology Lab

Course Code: 13011600

Course Outline

1. Demonstration of lymphoid organs
2. Histological study of spleen, thymus and lymph nodes through slides/ photographs
3. Preparation of stained blood film to study various types of blood cells.
4. Ouchterlony's double immuno-diffusion method.
5. ABO blood group determination.
6. Cell counting and viability test from splenocytes of farm bred animals/cell lines.
7. Demonstration of a) ELISA b) Immuno electrophoresis

Course Name: Bioinformatics

Course Code: 13011900

Objective
The objective of the Bioinformatics course is to endow the students with the concepts of bioinformatics and familiarize the students with the subject .The course emphasizes on the historical ,applications ,tools and databases employed to provide the solution to the

biological problems or hidden information. This course is designed to enable you to evaluate data using bioinformatics, and to better identify potential uses and opportunities of this data within your industry context. The course will deliver descriptions of this rapidly evolving field, and facilitate user access to and manipulation of the biological data and include descriptions of genetic and biological databases and relevant tools available to retrieve and analyze the information within these.

Course Outline:

Unit I

History of Bioinformatics. The notion of Homology. Sequence Information Sources, EMBL,GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on the web.

Unit II

Protein Information Sources, PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.

Unit III

Sequence and Phylogeny analysis, Detecting Open Reading Frames, Outline of sequence Assembly, Mutation/Substitution Matrices, Pair wise Alignments, Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis.

Unit IV

Searching Databases: SRS, Entrez, Sequence Similarity Searches-BLAST,FASTA, Data Submission. Genome Annotation: Pattern and repeat finding, Gene identification tools.

Suggested Readings

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell.
3. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

Course Name: Bioinformatics Lab

Course Code: 13012000

Objectives

The aim is to provide practical understanding in Bioinformatics methods including accessing the major public sequence databases, use of the different computational tools to find sequences, analysis of protein and nucleic acid sequences by various software packages. It also provides a step by step, theoretical and practical introduction to the development of useful tools for automation of complex computer jobs and making these tools accessible on the network from a Web browser. The objectives of the course are to endow students with a practical and hands-on experience with common Bioinformatics tools and databases. Students will be trained in the basic theory and application of programs used for database searching, protein and DNA sequence analysis, prediction of protein function, and building phylogenetic trees. Through practical exercises, the course aims to give students basic competences in the use of Bioinformatical tools. The course emphasizes the learning of Bioinformatical tools in light of the student's knowledge of molecular biology.

Course Outline

1. Sequence information resource.
2. Understanding and use of various web resources: EMBL, Genbank, Entrez, Unigene, Protein information resource (PIR)
3. Understanding and using: PDB, Swissprot, TREMBL
4. Using various BLAST and interpretation of results.
5. Retrieval of information from nucleotide databases.
6. Sequence alignment using BLAST.
7. Multiple sequence alignment using Clustal W.

Suggested Readings

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition.Wiley-Blackwell.
3. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings

Course Name: Biological Databases and their Management

Course Code: 13012100

Objectives

The objective of the course is to equip the students with the requisite background in areas of modern biology and computer science. The main aim of the course is to endow information about the important public data banks that provide details of biological systems and components along with a wide range of topics including open resources in Bioinformatics, computational sequence analysis, sequence homology searching, gene finding and genome annotation, protein structure analysis and prediction, genomics, proteomics, phylogenetic analysis, biological databases etc.

This course would decipher the basic introduction to database system technologies; design, concurrency, security and backup/recovery issues of database management systems. It will help students to gather sound knowledge to the discipline of database management and to familiarize with the nuances of database environments towards an information-oriented data processing-oriented framework thus the major focus of this course is the biological database model, how they are used and how to choose an appropriate biological database for a given problem. The course focuses on the design of biological databases and students will learn about structure of databases and different types of databases.

Course Outline

Unit I : Introduction

An overview of database management system, database system Vs file system, Characteristics of database approach, DBMS architecture, data models, schema and instances, data independence **Data Modelling using Entity Relationship Model:** Entity, Entity types, entity set, notation for ER diagram, attributes and keys,
Introduction to SQL: Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals. **Types of SQL commands**: DDL, DML, DCL. Basic SQL Queries. Logical operators :BETWEEN, IN, AND, OR and NOT Null Values: **Joins**: Inner joins, Outer Joins, Left outer, Right outer, full outer joins, Equijoins Relational Data Model: Relational model terminology domains, Attributes, Tuples, Relations.

Unit-II

Biological data types, Major biological databases and its classification, sequence and structure file formats, The NCBI /GENBANK data model, SEQUIN submitting DNA sequences to the data base, structure data base, genomic mapping and mapping data bases, information retrieval from biological data bases FASTA sequence data base Nucleic acid sequence databases EMBL/DDBJ, Protein sequence databases UniProtKB, Structural Biological Databases PDB

Course Name: Applications of IT Skills

Course Code: 13010000

Objectives

The computer is often a very handy tool when solving complex technical problems in engineering and scientific explorations. Programming a computer is a fundamental task in finding solutions to such problems. This course is being offered in order to train the

undergraduate students. The course aims to provide exposure to problem-solving through programming. It aims to train the student to the basic concepts of the C-programming language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outline

Unit I

C basics, C character set, Identifiers and keywords, Data types, constants, variables and arrays, declarations, expressions statements, symbolic constants, compound statements, arithmetic, operators, unary operators, relational and logical operators, assignment operators, conditional, operators, bit operators. C constructs: If statement, if….else statement, if…..else if….else statement, while statement, do….while statement, for statement, switch statement, nested control statement, break operator, continue operator, comma operator, got statement.

Unit II

C Functions: Functions: declaration, definition & scope, recursion, call by value, call by reference. Storage Classes: automatic, external (global), static & registers.

Unit III

Arrays: Arrays, pointers, array & pointer relationship, pointer arithmetic, dynamic memory allocation, pointer to arrays, array of pointers, pointers to functions, array of pointers to functions, Pre-processor directives: #include, #define, macro's with arguments, the operators #and ##, conditional compilations.

Suggested Reading:

1. Ashok N. Kamthane, "Computer Basics and C Programming", Pearson Education.
2. E. BalaGuruswamy, "Programming in ANSI C", 2008.
3. V Rajaraman, "Computer Basics and C Programming", PHI.
4. Herbert Schildt, "C The Complete Reference" Fourth Edition, 2000.
5. YashwantKanetkar, "Let us C" eighth edition, 2002.
6. Kernighan and d. Ritchie, "The ANSI C Programming Language", 2000.
7. StephennPrata, "C Primer Plus" Fourth Edition, 2001.
8. Schaum's Outline Series, "Programming with C", 2nd Edition, 1996.

Course Name: Applications of IT Skills Lab

Course Code: 13010100

Objectives

1. Understand the fundamentals of C programming.
2. Choose the loops and decision making statements to solve the problem.
3. Implement different Operations on arrays.

4. Use functions to solve the given problem.
5. Understand pointers, structures and unions.
6. Implement file Operations in C programming for a given application

Course Outline

List of Experiments (Not limiting to)

1. Write a program sum of two numbers
2. Write a program to check either the number is even or odd
3. Write a program calculate simple interest.
4. Write a program to calculate the marks of four subject and percentage.
5. Write a program to check either the year is leap year or not.
6. Write a program to find out the grade using if/else if statement.
7. Write a program to find out the greater number between two number.
8. WAP to read base and height of a triangle, calculate the area using formula :
    i. Area =1/2*base*height
9. WAP to read marks obtained and maximum marks of a student and calculate its percentage and display it.
10. Write a program to print even number up to n.
11. Write a program to print odd number up to n.
12. Write a program to print table.
13. Handling numeric data: Spreadsheet software (Excel), creating a spreadsheet, entering and formatting information basic functions and formulae, creating charts, tables and graphs. Incorporating tables and graphs into word processing documents.

Course Name: Ability & Skill Enhancement - V

Course Code: 13003100

Objectives

The objectives of the module are to make students self-confident individuals by developing leadership and organising skills; to guide students in making appropriate and responsible decisions; to give each student a realistic perspective of work related skills and to help students prepare effective interview questions to conduct effective interviews.

Course Outline – Final Assessment - Interview with an Entrepreneur /Leader

Unit I: Leadership

What is leadership? Traits of Leadership, Identifying leaders and traits of Leadership, Movie/ Story/ Interviews of leaders: Identify leadership qualities, Debate/ Discussion/ Presentations on leaders.

Unit II: Entrepreneurship
What is Entrepreneurship, Traits of Successful Entrepreneurs, Movie/ Story/Interviews of Entrepreneurs: Identify Entrepreneurial qualities, Debate/ Discussion/Presentation on Entrepreneurs.

Unit III: Organisational Skills & Employability Skills
What are organizational skills, how to develop them, the skills needed to become a successful entrepreneur/administrator, good communication, ambition, courage, hardwork, planning, accountability. Organizational skills can be developed by discipline making a system, rules, delegation of power at workplace, etc.
How to enhance employability; skills, why do we need them, different workplaces, having different needs, different skills, how to recognize different work skills.

Unit IV: Decision making
The process of decision making, its steps, what are its basics, what are the basics of organizational decision making process, entrepreneurial decision making, how to make a right decision at right time, dilemma.

Unit V: Interview Skills
Conducting Interviews with Leaders/ Entrepreneurs, Preparing Questions, Interviewing the fellow person, do's & don'ts while taking interview.

Note: The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

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