

# **Name of Course Bachelor of Computer Application (BCA)**

**Semester I**

**Name of Subject Fundamentals of Computer Science and Information Technology**

**Subject Code BCA-101**

**Marks 75 Marks**

## **Objectives**

Through this paper Student should learn basic principles of computer. The paper is designed to aim at importing basic level of Computer.

## **Outcome**

To learn Basic Function of Devices like I/O, HDD etc. To Understand the Fundamental of Software and Hardware. Understand the Concept of Operating System and Network.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester I**

**Name of Subject Office Automation**

**Subject Code BCA-102**

**Marks 75 Marks**

## **Objectives**

The main objective of Office Automation is to enhance and upgrade the existing system by increasing its efficiency and effectiveness. It will simplify the task and reduce the paper work means the software improves the working methods by replacing the existing manual system with the computer-based system.

## **Outcomes**

After completion of this course student will be able to understand the computer software, hardware, made available to simplify and automate a variety of office

operations such as data processing, data manipulating and data presentation with various application those are presents in Microsoft office tools packages.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester I**

**Name of Subject Programming in C**

**Subject Code BCA-103**

**Marks 75 Marks**

Programming in 'C' Objective

It is general purpose and procedure oriented programming language. In which we are able to develop OS and MAC operating system, application software and programming languages. Programming Language are also used to build students logic for programming.

Programming in 'C' Outcomes

To study of structure of programming languages, structure of c program. To study different keyword for making program.

To develop programs using operators and control statement. To describe an array, structure, union, string and functions. Student are able to develop application software.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester I**

**Name of Subject Elective: Element of Statistics**

**Subject Code BCA-104 A**

**Marks 75 Marks**

Objective:

Interact ideas of random variable, frequency distribution, calculate and interact various measures in statistics.

Outcomes:

1. Explain the use of data collection & statistics.
2. Recognize, examine & interact the basic principles of describing and presenting data.

Name of Course Bachelor of Computer Application (BCA)

**Semester I**

**Name of Subject Elective: Mathematical Technique in Computer Science (MTCS)**

**Subject Code BCA-104 B**

**Marks 75 Marks**

Objective:

Knowledge, skill & understanding develop understanding & fluency in mathematics through inquiry, exploring & connecting mathematical concept choosing & applying problem – solving skills.

Outcomes:

- ☑ Able to use standard mathematical techniques to solve elementary problem.
- ☑ Understand the nature of mathematical proof & be able to write clear & concise proof.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester II**

**Name of Subject Business Accounting with Tally**

**Subject Code BCA-201**

**Marks 75 Marks**

Objective:

1. To impart basic accounting knowledge

2. To understand the concept, process and importance of financial accounting.
3. To gain knowledge of business accounting
4. To help students to acquaint with application of Tally in the business world.

Outcome:

1. Students will able to do Accounting Using Tally

**Name of Course Bachelor of Computer Application (BCA)**

**Semester II**

**Name of Subject Organizational Behaviour**

**Subject Code BCA-202**

**Marks 75 Marks**

Learning Objectives:

To familiarize students with students with the basic concepts of organizational behaviour and to enhance their understanding the interaction of individual in the organization.

Learning Outcomes:

1. Students will become more self-aware and will have identifies areas of development for long term effectiveness.
2. Students will understand the role individuals play collectively to perform in the organization.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester II**

**Name of Subject Web Technology**

**Subject Code BCA-203**

**Marks 75 Marks**

Objectives:

To improve the skill to create the static web page.

To develop the ability to create the dynamic web pages.

To enhance the ability of Insert a graphic within a web page.

To improve the skills to Create, validate and publish a web page.

Outcome:

1. Be able to use HTML programming

**Name of Course Bachelor of Computer Application (BCA)**

**Semester II**

**Name of Subject Elective : E-Commerce**

**Subject Code BCA-204 A**

**Marks 75 Marks**

Objective:

The objective of this course is to provide students with an overview and understanding of e-commerce with a specific emphasis on Internet Marketing.

Specifically, students will:

- Examine the ways that marketing can be done, and is being done, using the Internet.
- Gain an understanding of networked computers and the Internet. Students will learn to use the several Internet services such as the World Wide Web, Email. Use of these services for marketing purposes.

Outcome:

At the end of the course, the students is expected to realize the problems involved in designing and building e-commerce systems; understand the need to design EC systems that fully meet the requirements of the intended users; appreciate the need to ensure that the implementation of a design is adequately tested to ensure that the completed EC system meets the specifications.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester II**

**Name of Subject Elective : Desktop Publishing (DTP)**

**Subject Code BCA-204 B**

**Marks 75 Marks**

**Objective**

This course will provide students the opportunity to learn to use basic features of desktop publishing software to create all types of publications: flyers, brochures, newsletters, and advertisements. Included in the course will be basic page layout and design principles and integrating text and graphics to create attractive business publications. The course will be taught with Adobe InDesign.

**Outcomes**

Create personal documents such as business cards and resumes.

Create business documents such as flyers and advertisements.

Create a newsletter with graphics and draw objects.

Create a course project illustrating Desktop Publishing techniques.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester III**

**Name of Subject Programming in C++**

**Subject Code BCA-301**

**Marks 75 Marks**

**Programming in C++ Objective**

The primary purpose of C++ programming was to add object orientation to the C programming language, which is one of the most powerful programming languages.

The heart of the pure object-oriented programming is to create an object, which has properties and methods.

Programming in C++ Outcomes

- ☒ Students are able to define objects which the core part of object oriented programming languages.
- ☒ It helps to develop and build logic for programming among the learners.
- ☒ Students are able to develop application software using C++.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester III**

**Name of Subject Operating System Concepts**

**Subject Code BCA-302**

**Marks 75 Marks**

Operating System Concepts Objectives

Through this paper Student should learn fundamentals of OS design, including memory, processor, device, and data management with lots of discussion on the pros and cons of design choices and problem/question sets to make the reader think through design alternatives

Operating System Concepts Outcome

To understand the different Concept of Operating System.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester III**

**Name of Subject Database Management System**

**Subject Code BCA-303**

**Marks 75 Marks**

Database Management System Objectives:

The objective of the course is to enable students to understand and use the concepts of Data,

Database Systems, DBMS, and Applications of DBMS. Understand the structure of DBMS, various Data Models, designing relational database systems, using relational algebra and Normalization.

Database Management System Outcomes:

- ☐ Able to master the basic concepts and understand the applications of database systems.
- ☐ Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.
- ☐ Able to construct unary/binary/set/aggregate queries in Relational Algebra.
- ☐ Understand and apply database normalization principles.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester III**

**Name of Subject Elective : Business Application and ERP**

**Subject Code BCA-304 A**

**Marks 75 Marks**

Business Application and ERP Objectives

1. To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
2. To focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
3. To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
4. To aim at preparing the students technological competitive and make them ready to selfupgrade with the higher technical skills.

Business Application and ERP Outcomes

After completing this course, student will be able to

1. Make basic use of Enterprise software, and its role in integrating business functions



2. Analyze the strategic options for ERP identification and adoption.
3. Design the ERP implementation strategies.
4. Create reengineered business processes for successful ERP implementation.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester III**

**Name of Subject Elective - Introduction to Multimedia**

**Subject Code BCA-304 B**

**Marks 75 Marks**

Introduction to Multimedia Objectives

Multimedia is content that uses a combination of different content forms such as text, audio, images, animations, video and interactive content. Multimedia contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or handproduced material.

Introduction to Multimedia Outcomes

Student will learn the different content forms of Multimedia such as text, audio, images, animations, video and interactive content.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester III**

**Name of Subject Numerical Aptitude**

**Subject Code BCA-305 B**

**Marks 75 Marks**

Numerical Aptitude Objectives

The main objective of numerical aptitude is to test the speed of the student along with his or her accuracy and competent to understand a question and then apply his or her knowledge base to get it solved.

Numerical Aptitude Outcomes

On successful completion of the course the students will be able to understand the basic concepts of numerical ability.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester IV**

**Name of Subject Programming in JAVA**

**Subject Code BCA-401**

**Marks 75 Marks**

Programming in JAVA Objective

- ☐ To learn Java for the design of desktop and web applications.
- ☐ To learn how to implement object-oriented designs with Java.
- ☐ To learn different concepts in Java language
- ☐ To design and program stand-alone Java applications.

Programming in JAVA Outcomes

- ☐ Students learn about the concepts like interface, packages etc.
- ☐ Students are able to develop stand-alone Java applications and web applications.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester IV**

**Name of Subject Data Structure and Algorithm**

**Subject Code BCA-402**

**Marks 75 Marks**

Data Structure and Algorithm Objectives

The data structures paper helps the students to have the practical understanding of the subject.

Data Structure and Algorithm Outcome

Students are able to create and use various data structures like Strings, Arrays, Linked Lists,

and Trees.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester IV**

**Name of Subject RDBMS**

**Subject Code BCA- 403**

**Marks 75 Marks**

RDBMS Objectives

The objective of this course is to expose the students to the fundamentals & basic concepts in relational Data Base Management Systems. This course discusses architecture of Database Systems with concept of relational model & ER model. The course discusses the SQL statements, functions and views. Concepts of PL/SQL also discussed.

RDBMS Outcomes

The course will demonstrate an understanding of the basic & advanced features of RDBMS.

The course will demonstrate the various database tables and joins them using SQL commands, able to develop structured query language (SQL) queries to create, read, update, and delete relational database data.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester IV**

**Name of Subject Operational Research**

**Subject Code BCA-404 A**

**Marks 75 Marks**

Operational Research Objectives

Objectives of Operational Research is to learn about management to develop more effective approaches to the programming and administration of socio-cultural behavior and economic factors that exist as bottleneck to effective implementation and to develop more

effective approaches to the programming.

Operational Research Outcomes

Recognize and develop operational research models from the verbal description of the real system and know the mathematical tools that are needed to solve optimization problems.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester IV**

**Name of Subject Computer Graphics**

**Subject Code Elective -BCA-404 B**

**Marks 75 Marks**

Computer Graphics Objectives:

- ☐ To understand the basics of computer graphics, different display devices and applications of computer graphics.
- ☐ To learn about algorithmic development of graphics primitives like: point, line, polygon etc.
- ☐ To impart knowledge of 2D transformations on graphics objects.
- ☐ To familiarize with 2D Viewing and different clipping methods.
- ☐ To understand rules for graphics software design.

Computer Graphics Outcomes:

- ☐ Knowledge of working of display systems.
- ☐ Skill to execute various Scan Conversion algorithms in laboratory so as to draw Graphics primitives.
- ☐ Familiarization with 2D graphics.
- ☐ Skill to execute various 2D transformations on graphics.
- ☐ Use of various graphics packages/functions on graphic.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester V**

**Name of Subject System Analysis and Design(SAAD)**

**Subject Code BCA- 501**

**Marks 75 Marks**

**Objectives:**

Develop and evaluate system requirements. Work effectively in a team environment as well as explain the

need for and value of a formalized step-by-step approach to the analysis, design, and implementation of

computer information systems. Use tools and techniques for process and data modeling.

**Outcomes:**

Upon successful completion of this course, you will be able to gather data to analyze and specify the

requirements of a system. Design system components and environments & build general and detailed

models that assist programmers in implementing a system. It also design a database for storing data, a user

interface for data input and output, and controls to protect the system and its data.

**Name of Course B.C.A. Third Year**

**Semester V Semester**

**Name of Subject Web Development and PHP Programming**

**Subject Code BCA-502**

**Marks 75**

**Objectives:**

- Learn Core-PHP, Server Side Scripting Language.
- Learn to design dynamic and interactive Web pages.

- Learn PHP-Database handling.

Outcomes:

- Able to design dynamic and interactive web pages, websites.
- Able to run PHP scripts on server and retrieve results.
- Able to handle databases like MySQL using PHP in web sites.

**Name of Course B.C.A. Third Year**

**Semester V Semester**

**Name of Subject Mobile Application Development**

**Subject Code BCA-503**

**Marks 75**

Objectives:

- To gain an understanding of the processes that are involved in an Android developed application
- To become familiar with Android development tools and user interface.
- To understand Activity and Intends
- To understand SQLite Database.
- Ability to build Many simple apps
- To understand the basic operating system command.

Outcomes:

- Install and use appropriate tools for Android development, including IDE, device emulator, and profiling tools.
- Understand the Android OS architecture.
- Understand the Android application architecture, including the roles of the task stack, activities, & services.

**Name of Course B.C.A. Third Year**

**Semester V Semester**

**Name of Subject Computer Network**

**Subject Code BCA-504 A**

**Marks 75**

Objectives:

- To develop an understanding of computer networking basics.
- To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.

Outcomes:

Upon successful completion of this course, student will be able to

- Recognize the technological trends of Computer Networking.
- Discuss the key technological components of the Network.
- Evaluate the challenges in building networks.

**Name of Course B.C.A. Third Year**

**Semester V Semester**

**Name of Subject Cloud Computing**

**Subject Code BCA -504 –B**

**Marks 75**

Learning Objectives:

- To Study basics of cloud computing, and comprehend the terminology, tools and technologies associated with today's top cloud platforms.
- To provide the programmer's perspective of working of Cloud Computing.
- Implement Simple Cloud programs to solve simple problems.

Utility of the course:

- Awareness of existing demanding trends for Clouds and Virtualizations in the IT industry in order to get placement as well as in research

**Name of Course B.C.A. Third Year**

**Semester V Semester**

**Name of Subject Linux Operating System**

**Subject Code BCA-505 B**

**Marks 75**

Objectives:

- This course shall build a platform for students to start their own enterprise
- For Making Student Job Ready
- To become familiar with open source software and user interface.
- To securely handle OS without any viruses and malwares.
- For easily use free software available on internet.
- To understand the basic operating system command.

Outcomes:

- Awareness of existing demanding trends in IT industry in order to get placement & research in open source market.
- Understand the Linux OS architecture.
- Install and use different types of distributions available in market.

**Name of Course Bachelor of Computer Application (BCA)**

**Semester VI**

**Name of Subject Software Engineering**

**Subject Code BCA- 601**

**Marks 75 Marks**

Objectives:

- To know about software engineering and its application in Software development.
- To identify, formulate, and solve software engineering problems, including the specification,



design, implementation, and

- To Learn testing of software systems that meet specification, performance, maintenance and

quality requirements

Outcomes:

- How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
- An ability to work in one or more significant application domains. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.
- Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
- Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Demonstrate an ability to use the techniques and tools necessary for engineering practice

**Name of Course B.C.A. Third Year**

**Semester VI Semester**

**Name of Subject Python**

**Subject Code BCA-602**

**Marks 75**

Objectives:

- To acquire programming skills in core Python
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Outcomes:

- Upon successful completion of this course, student will be able to
- Explain basic principles of Python programming language

- Implement object oriented concepts
- Implement database and GUI applications

**Name of Course B.C.A. Third Year**

**Semester VI Semester**

**Name of Subject Windows Programming**

**Subject Code BCA-604-A**

**Marks 75**

Objectives:

- To outline the various characteristics of c#.
- To provide the familiarity in the concept of developing window application.
- To earn an idea of creating application using ADO.Net.
- To study the idea of CLR and .Net framework.

Outcomes:

- To develop background knowledge as well as core expertise in C#.
- To develop background knowledge as well as core expertise in C#.
- To learn the object oriented concepts.

## Course Outcome - B.Lib.I.Sci. & M.Lib.I.Sci.

Name of Course	Paper Code	Paper Name	Outcome
Library Science	BLIS 101	Foundations of Library and Information Science	<ul style="list-style-type: none"> <li>• Will be learn enhance the understanding of Library and Information Science Education and Library Fields.</li> </ul>
Library Science	BLIS 102	Information Management And Organizations	<ul style="list-style-type: none"> <li>• Can apply the skills and attitudes of visioning, enterpreneurship, advocacy, planning and Management of libraries and information centers (LICS) and effective leadership in the LIS field</li> </ul>
Library Science	BLIS 103	Reference Service & Sources	<ul style="list-style-type: none"> <li>• Will learn skills of organizing information and recorded knowledge</li> <li>• Will be to provide traditional and modern information and reference services for users</li> </ul>
Library Science	BLIS 104	Information Science	<ul style="list-style-type: none"> <li>• Posses the skills to respect engage and collaborate with a diverse community in order to advocate for and construct inclusive, meaningful, and participatory library services programs and resources</li> </ul>
Library Science	BLIS 106	Knowledge Organization- I: Classification (Theory)	<ul style="list-style-type: none"> <li>• Will be Useful to understand the basic functions and principles of theory as well as Practical work in Library classification systems.</li> </ul>
Library Science	BLIS 106	Information Processing: Cataloguing - I (Theory)	<ul style="list-style-type: none"> <li>• Will be Useful to understand the basic functions and principles of theory as well as Practical work in Library Cataloguing.</li> </ul>
Library Science	BLIS 107	Information communication Technologies (ICT) in Libraries (Theory)	<ul style="list-style-type: none"> <li>• We learn the skills of ICT application in Information environment including Network and Communication systems</li> </ul>
Library Science	BLIS 201	Librarianship as a Profession	<ul style="list-style-type: none"> <li>• Will learn the skills of organizing information and recorded knowledge in Professional Associations.</li> </ul>
Library Science	BLIS 202	Management of Library System	<ul style="list-style-type: none"> <li>• Will be able to effectively administer and manage Libraries and Information Centers</li> </ul>
Library Science	BLIS 203	Information Sources and Systems	<ul style="list-style-type: none"> <li>• Will be able to provide traditional and modern information and reference services For users</li> </ul>
Library Science	BLIS 204	Organization of Information Systems and Services	<ul style="list-style-type: none"> <li>• Will be trained in Technological knowledge and professional skills</li> </ul>
Library Science	BLIS 205	Knowledge Organization- II : Classification (Theory)	<ul style="list-style-type: none"> <li>• Will be learned in Classification knowledge and practicals skills.</li> </ul>
Library Science	BLIS 206	Information Processing: Cataloguing - II (Theory)	<ul style="list-style-type: none"> <li>• Will be learned in Information Processing skills.</li> </ul>
Library Science	BLIS 208	Knowledge Organization: Classification: Practical	<ul style="list-style-type: none"> <li>• Will learn the practical skills of Dewey decimal classification and colon classification systems.</li> </ul>
Library Science	BLIS 209	Information Processing: Cataloguing: Practical	<ul style="list-style-type: none"> <li>• Will learn the Practical skills of Anglo American Cataloguing rules II R (AACR-II-R) and Classified catalogue Code ( CCC ).</li> </ul>

Library Science	BLIS 210	Information Communication Technologies (ICT) and Libraries: Practicals	Will become competent for job opportunities in LIS and related field. Will be learned in Information communication technology skills
Library Science	BLIS 211	Information Sources : Viva - Voice	to manage to the various types of Reference sources
Library Science	MLIS 101	Information, Communication and Society	to manage information resources and the information life-cycle through the processes of collection development, organization, preservation, conservation, access, and dissemination in accordance with physical, virtual, and technical infrastructure and needs
Library Science	MLIS 102	Introduction To Research Methodology	Students will be able to learning the library and information science research
Library Science	MLIS 103	Information Retrieval	Students will be able to construct a keyword search statement in order to find relevant information
Library Science	MLIS 104	Management Of Libraries and Information Centres - A	Students are able to identify & describe the characteristic of library management systems.
Library Science	MLIS 105	Information Technology: Basics (Theory)	Will be trained in Information Communication Technologies knowledge and Library automation Skills. Students will be able to choose appropriate database in order to search for scholarly articles on Their topics
Library Science	MLIS 201	Management Of Libraries And Information Centres - B	Students will be understand a theory of TQM, Management of Libraries And Information Centres
Library Science	MLIS 202	Statistical Techniques Of Research & Bibliometrics	to perform and access research based practices through the application of Information literacy, inquiry, and research methods including data discovery, Analytics and qualitative measures.
Library Science	MLIS 203	Bibliographic Control and Information Systems	Students will be able to identify the concept of Bibliographic Control and Information Systems
Library Science	MLIS 204	Information Technology Applications : Practical	Students will be able to learning library software, CD search Webpage designing.

## B. Sc. BIOTECHNOLOGY

### Program Outcomes:

#### Programme outcomes

PO1: Students develop global competencies in the area of basic and applied biological sciences.

PO2: Enhancing the subject knowledge of students by using traditional and modern ICT based teaching methods and learning by doing.

PO3: To enrich students' knowledge and train them in various branches of Biotechnology such as genetics, molecular biology, biochemistry, immunology, fermentation technology, environmental biotechnology and tissue culture techniques.

PO4: To groom the students to meet futuristic challenges and national interests

#### Programme specific outcomes

PSO1: To bestow the students with all the research skills required to work independently

PSO2: To develop scientific temperament and social responsibilities in the students.

PSO3: To inculcate nature care by imparting knowledge of advance modern techniques

PSO4: As Biotechnology is an interdisciplinary course, empower the students to acquire technological knowhow by connecting disciplinary and interdisciplinary aspects of biotechnology.

PSO5: Acquire knowledge in students of biotechnology enabling their applications in industry and research.

### Course Outcomes:

#### Semester 1

##### Course101—Fundamentals of Chemistry

After successfully completing this course, the students will be able to:

CO1: Students will learn different fundamentals of basic chemistry of different chemistry branches like organic chemistry, Inorganic, Physical etc.

CO2: Studies includes chemical bonding i.e. formation of different molecules types of bonds, hybridization, in thermodynamic studies free energy required for chemical and biochemical reactions and chemical kinetics rates of chemical reaction.

CO3: In stereo chemistry how different molecules/ bio-molecules are presented by different methods along with their stereo aspects like chirality, etc.

CO4: They will also learn electrochemical aspects during their course.

CO5: They will also perform experimental verification of some parts of theory.

### **Course-Bbt102—Fundamental of Physics**

CO1: Students will learn fluid mechanic by different measurement techniques

CO2: Using experimental, computational, and/or theoretical methods, students are able to understand geometrical optics and surface tension.

CO3: The students would developed their understanding of core Physics by learning Classical and Quantum Mechanics, Electricity and Electrodynamics,

### **Course- Bbt103- Basics of Plant and Animal Sciences**

CO1: An understanding, deep knowledge about plants and the category of the living organisms as life form its features, Importance, Introduction to plants group.

CO2: Learning and getting familiar with morphology & plant cell.

CO3: Knowledge about unique, silent features and chemical compositions of cell wall. CO4: Understanding the concept of classification and construction of animal organization of no chordates and non- chordates.

CO5: Understanding the different functional aspects of various system of animals vertebrates (frog) & invertebrates (honeybee)

CO6: Understanding the importance of parasites in human health

### **Course- Bbt104-Mathematics & Statistical Methods for Biologist**

CO1: Students should be able to solve and interpret the practical real life problem.

CO2: Problem solving skills, creative talent to convert the verbal information into mathematical form are enhanced.

CO3: Interdisciplinary approach is developed.

CO4: Theoretical concepts are strengthened by solving maximum no. of problems.

CO5: To enhance abstract thinking of students.

### **Course -Bb105- Fundamentals of Biological Chemistry**

CO1: As Biochemistry is the branch of science concerned with the chemical and physico chemical processes and substances that occur within living organisms, therefore students will be able to understand how biomolecules relate to a particular process (metabolism) within a living cell.

CO2: Students will be acquainted with the knowledge of structures, functions, and interactions of proteins, nucleic acids, carbohydrates and lipids.

CO3: The course will help the students to understand the abnormalities in the metabolism their relationship to various diseases. In addition to, it will help to understand the mechanism underlying correct disorders with dietary modifications or genetic modifications.

CO4: Students will learn about enzyme kinetics and types of inhibition as enzymes are important in catalyzing various reactions in the body

### **Course-Bb106—Biophysics and Instrumentation**

CO1: Students will develop a conceptual understanding of connections between physics and biology.

CO2: Students will be able to explain the behavior and interactions between, matter and energy at both the atomic and molecular levels by different atomic models.

CO3: Students will gain an understanding of interpreting spectra and will be able to explain how spectroscopic methods are used for quantitative analysis of biomolecules.

CO4: Students will understand and interpret the nuclear processes such as radioactivity, fission, and fusion and their use in medicine.

CO5: Students will comprehend the molecular components which constitutes the cell membrane and give its different electrical and physicochemical properties. They will understand the importance of transport in the cells.

### **Course Bb107-Microbiology**

CO1: Student understands microorganism as a model system in life science studies and its importance in biotechnology.

CO2: Students gets knowledge of Eubacteria and Archaeobacteria and differences in structure and composition of respective cell

CO3: Student learn to design artificial nutritional media for microorganisms and methods to grow them in laboratory.

CO4: Student learn different types of microorganisms, their applications in different sector. CO5: Student gets knowledge about interaction between microorganisms and plant and animal that helps them to think about its use in Agriculture, Medical and health, Environment field.

### **Course-108-Computers and Applications**

CO1: Students will get basic knowledge (handling devices, role of operating system etc.) of computers.

CO2: They will also familiar with how data gets stored through Database Management System.

CO3: They can distinguish between CUI and GUI operating system and handling the same. CO4: They will capable to create documentation, budgets and mathematical calculations and also make attractive presentations using ms word, excel and Power point respectively

CO5: They can easily do surfing on internet.

### **Course—Bbt109-Practicals in Chemistry & Biochemistry**

CO1: Ability to understand fundamental concepts of biology, chemistry and biochemistry. CO2: Ability to apply basic principles of chemistry to biological systems and molecular biology. CO3: Ability to relate various interrelated physiological and metabolic events. CO4: A general awareness of current developments at the forefront in biochemistry and allied subjects.

CO4: Ability to critically evaluate a problem and resolve to challenge blindly accepted concepts. CO5: Good experimental and quantitative skills encompassing preparation of laboratory reagents, conducting experiments, satisfactory analyses of data and interpretation of

results. CO6: Awareness of resources, and their conservation. CO7: Ability to think laterally and in an integrating manner and develop interdisciplinary approach.

CO8: Overall knowledge of the avenues for research and higher academic achievements in the field of biochemistry and allied subjects.

**Course -Bbt110-Techniques in Physics, Biophysics & Instrumentation** CO1: Students will be able to understand the working principle and working of different instruments.

CO2: Through hands on training, students are able solve the problems by understanding the principle of pH meter, centrifuge, microscopes, thermometers and their application in analyzing different biological samples.

### **Course Bbt 111-Laboratory Exercises in Biosciences**

CO1: Imparting practical knowledge on the importance of model system like *Drosophila*, honey bee, *Paramecium*.

CO2: In practical of microbiology, students would be able to handle microorganisms (bacteria and fungi), culture the microorganisms using different media, and observe them by staining the cells and observing under microscope.

CO3: Furthermore, the microbiology practicals would allow students to understand growth properties and functions of microorganisms *in vitro*.

CO4: In practices in biosciences, (Botany), students would be able to learn importance of morphological structure, classification, reproduction.

CO5: Students able to explain microscopic technique, Familiarize with the external and internal structure of lower and higher group organisms.

### **Course-112-Quantitative Methods in Biology**

CO1: Students should be able to solve and interpret the practical real life problem. CO2: Problem solving skills, creative talent to convert the verbal information into mathematical form are enhanced.

CO3: Interdisciplinary approach is developed.

CO4: Theoretical concepts are strengthened by solving maximum no. of problems. CO5: To enhance abstract thinking of students.

## **SY BSc (2019 pattern**

### **Course: BBt301—Cell Biology -I**

The objective of this course is to deliver strong foundation on cell theories, cell types and cellular diversity. It will enable the students to acquire fundamental knowledge about cytoskeleton and organellar function.



CO1: This course introduces the students to the basics of cell and its components. This will help them to comprehend detail knowledge about cell and its different types.

CO2: This gives them a strong foundation on the basic unit of life. It will help them understand about various proposed cell theory and origin of cell.

CO3: Students will acquire the knowledge of structure and functions of various cell organelles and their interaction within cell to promote cell growth, division and development.

CO4: The Students will gain in depth knowledge about cellular architecture and cytoskeletal organization.

CO5: At the end of the course, the student has a strong foundation about cellular theories functions of diverse organelles and the significance of cellular diversity.

**Course: BBt 302—Molecular Biology I**

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: This course introduces the students to the basics of central dogma of molecular biology and significance of its study. Students understand the chemical and molecular processes that occur in and between the cells.

CO2: This gives them a strong foundation on the basics structure and functions of nucleic acids proteins and their interaction within cell to promote cell growth, division and development.

CO3: Students can illustrate the structural organization of genes and will gain the knowledge of organization of genomes.

CO4: The student will demonstrate proficiency in understanding the concept of genetic code its features.

CO5: At the end of the course, the student has a strong foundation about replication of genetic material in prokaryotes and eukaryotes.

**Course: BBt 303- Genetics**

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Students are able to understand the basic concept of transmission of genetics.

CO2: Students enrich with the knowledge of Mendelian and Non-Mendelian genetics.

CO3: Understanding the concepts of gene interactions and its applications in knowing genetic disorders.

CO4: They learn about chromosomal aberrations and structure of chromosomes.

**Course: BBt304- Metabolism**

Upon successful completion of this subject student should be able to acquire a deep knowledge in

CO1: To understand the relevance, basic concepts and theories of chemistry as relevant to a biological system.

CO2: To understand the properties of biomolecules and their nature of existence in the living system.

CO3: To understand the relevance and basic concepts of experimental biochemistry.

CO4: To understand the nature and commonly used types of biochemical experiments.

CO5: To understand integration of metabolism with the help of different cycles.

### **Course: BBT305-Environmental Biotechnology**

Upon successful completion of this subject student should be able to acquire a deep knowledge in techniques and biotechnological methods in environment approach as:

CO1: They would understand and analyze environmental relationships with a better assessment of the mechanisms of environmental components like atmosphere, hydrosphere and lithosphere.

CO2: Students will become skilled at basic theoretical concepts highlighting in the field of ecology, and how these are applied to different ecological approaches.

CO3: The studies of ecology, biogeography and ecosystem structure will provide the awareness on ecological and historical foundations for understanding the distribution and abundance of species and the changes in their distribution and abundance over time and climatic impact.

CO4: Student understood the concept of environmental pollution, types of pollutants and related hazards. Acquire knowledge of bioremediation and its applications in environmental clean-up

and various waste and disaster management methods and policies.

CO5: Build awareness about environment conservation, environment protection acts. Studies on current global environmental issues will make aware to students about their causes and effect measure should be consider.

### **Course: BBt-306- Bioanalytical Techniques**

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Students will be able to diagnose a specific biochemical genetic disorder. CO2: Students will be able to develop technical aspects of analyses for a diagnostic biochemical laboratory.

CO3: Students will be able to handle various equipment's used in biochemical analysis and troubleshoot them.

CO4: Students will be able develop competence in handing various chromatographic techniques and apply them in isolating and characterizing different biological molecules.

CO5: Understanding the applications of centrifugation and chromatography in biological investigations.

### **Course: EVS231-AECC-I Environment science theory paper 1**

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Build awareness about environment, scope, and importance for sustainable development.

CO2: Students will understand ecology, biogeography, and ecosystem structure. This will provide the awareness on ecological and historical foundations for understanding the distribution and abundance of species and the changes in their distribution and abundance over time and climatic impact.

CO3: Learn importance of Natural resources i.e renewable and non-renewable.

CO4: Gaining knowledge to assess the conditions and trends of biodiversity either globally or sub globally and to understand it's necessity to measure the abundance of all organisms over space and time.

### **Course: LA231- AECC-II Language theory paper 1**

Upon successful completion of this subject student should be able to acquire:

CO1: To enable speaking and writing grammatically correct sentences in English.

CO2: To develop effective writing skills.

CO3: To build fluency in English.

CO4: Students would build spoken and written competency in English.

### **Course: BBt 309-Practicals in Cell Biology and genetics**

The objective of this course is to demonstrate significant cell biological principles, quantitative and analytical approaches that enable the students to translate the theoretical foundation in cell biology and genetics into practical understanding. The student will demonstrate proficiency in understanding mendelian and post mendelian inheritance problems.

CO1: The students get familiarized with basic principles of working of Microscopy. The students acquire practical skills in preparation and observation of slides of all prokaryotes and eukaryotes.

CO2: The course gives them a strong practical skill on use of density gradient, differential centrifugation on separation of cellular organelle's.

CO3: The student will demonstrate proficiency in understanding the basic structure of gene and interpret the inheritance of characters by using linkage and crossing over. Students will acquire the knowledge of and familiarize about pedigree and karyotyping .

CO4: Student acquire knowledge about the gene mapping methods, correlation between linkage and recombination. They learn how phenotypes are observed based on the genotypes of the organism.

CO5: Upon successful completion of practical course, students will be able to differentiate the cells of various living organisms. Students will be able to observe and correctly identify different cell types, cellular structures using different microscopic techniques.

### **Course Code: BBt-310 Practical in Bioanalytical Techniques**

At the end of the course the student will be able to understand

CO1: The basics of conventional spectroscopic and separative analytical techniques, as well as the main bioanalytical methods.

CO2: To select the most appropriate analytical method to solve a given analytical question.

CO3: To apply an analytical protocol and to analyze and interpret analytical results.

CO4: To bridge the gap between academics, research and industry as the course begins with a review of basic bio analytical technique and an introduction to general terminologies.

CO5: Students will be exposed to various biological techniques and their applications in identification, isolation of different biological molecules.

### **Course: BBt311 Practical in Molecular Biology and Environmental Biotechnology**

Upon successful completion of this subject student should be able:

CO1: Be able to understand functional significance of DNA technology.

CO2: To acquire the required laboratory skills to perform, interpret and analyze core/widely used molecular biology techniques.

CO3: Be able to apply the techniques for research applications.

CO4: To gain a hands-on experience in techniques used in molecular biology & their applications.

CO5: By studying pollution indicator plants students well understood and make aware about biomonitoring of air pollutants with plant.

CO6: Hands on training how to do sampling, collect the data to measure biodiversity index in a community. Enhance the skill techniques among the students for the study of ecosystem structure.

CO7: To understand physical and chemical properties of polluted and non-polluted soil. Students are able to relate with agricultural practices.

CO8: Imparting practical knowledge on microbial community estimation by studying different methods.

CO9: Students understood the basic concepts of testing genotoxicity of water sample. They will acquire knowledge on how to find contamination before consuming water to prevent human exposure to potential genotoxic compounds.

## **SEMESTER-IV**

### **Course: BBt401- Cell BiologyII**

Upon successful completion of this subject student should be able to understand:

CO1: Understanding concepts of cell biology.

CO2: Understanding the structural and functional aspects of cell.

CO3: Understanding about concepts on cell death and concept of ageing.

CO4: Understanding about cell division and its mechanism in plants and animals.

CO5: Understanding the concept of cell signaling and communication.

## **Course: BBt402- Molecular BiologyII**

Upon completion of the unit the student shall be able to understand:

CO1: Molecular Events of Transcription and processing of transcripts, RNA editing.

CO2: Understanding the regulation of gene expression in prokaryotes using operon concept and Eukaryotes.

CO3: Molecular Events of Translation leading to protein synthesis and Post translational modification.

## **Course: BBt 403- Immunology**

CO1: Upon completion of this course's students will be able to understand and demonstrate the basic knowledge of immunological processes at a cellular and molecular level.

CO2: The students will be able to demonstrate a capacity for problem-solving about immune responsiveness.

CO3: Students will be able to apply basic techniques for identifying antigen-antibody interactions.

CO3: The students will be able to identify the cellular and molecular basis of immune responsiveness.

CO4: Students will be able to elucidate the reasons for immunization and aware of different vaccination.

CO5: The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

CO6: The students will be able to transfer knowledge of immunology into clinical decision-making through case studies presented in class.

## **Course: BBt-404-Animal Development**

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Gaining knowledge about model organisms to understand the concepts of embryology.

CO2: Understanding the basic concepts of steps in the development of an organisms.

CO3: Students will understand about patterning in few models' organism (Drosophila).

CO4: Understanding about role of teratogens on abnormal development of an embryo.

CO5: Understanding the mechanisms on limb regeneration with gaining knowledge on few important concepts like differentiation, trans differentiation, commitment., developmental plasticity with reference to apoptosis.

## **Course: BBt-405 - Plant Development**

Upon successful completion of this subject student should be able to acquire a deep knowledge in techniques, mechanisms and biotechnological methods in plant development as:

CO1: Students well understood the principals and unique feature of development as they are able to describe the developmental process in plants.

CO2: Students will become skilled at basic theoretical concepts about pattern formation in plants at vegetative and reproductive phases. Gained knowledge of all the stages of development and are able to identify specimen easily.

CO3: The basic development pathway understood and depicted with diagrams by studying the various model system.

CO4: Student understood the concept of microsporogenesis, Megasporogenesis, double fertilization, Endosperm development by performing various practical, identified the stages

CO5: Students are able to co-relate the knowledge of developmental biology with other subjects like Molecular biology, Biochemistry, physiology and Genetics.

### **Course: BBt-406 Microbial Biotechnology**

Upon successful completion of this subject student should be able to acquire a deep understanding of:

CO1: Understands importance of microorganisms in various milk and food processing. CO2: Understand the significance and activities of microorganisms in various food and factors affecting on microbial growth in food leading to spoilage and understand the principles underlying the preservation methods.

CO3: Recognize and describe the characteristics of important food borne pathogens, pathogenesis and prevention.

CO4: Know the conceptual basis for understanding pathogenic microorganisms and mechanism of their pathogenesis, treatment and prevention.

CO5: Explains various aspects of wastewater treatment, also know various test to determine potability of water.

CO6: Acquire knowledge about application of microorganisms in bioleaching of metals, agriculture, biosynthetic and biosynthetic material production.

CO7: understands norms and regulations of GMO and its responsible use.

### **Course: EVS-241: AECC-III Environment science theory paper 2**

Upon successful completion of this subject student should be able to acquire:

CO1: Student understood the concept of environmental pollution, types of pollutants and related hazards.

CO2: Acquire knowledge on environment protection acts and understand the need to conserve environment by implementing policies with the help of different organizations. CO3: Students will understand the structure, growth and the interactions of populations in the environment. Build awareness on disaster management, environmental movements and ethics.

CO4: Field visit enhance the skill techniques among the students to document assets, study local polluted site and ecosystem structure and environmental impact.

### **Course : LA-241 AECC- IV Language theory paper 2**

CO1: The main purpose of this course is to equip the students with the nuances of the English language which includes proficiency in grammar and its effective usage in speaking and writing.

CO2: It further helps them to prepare for various competitive exams and to keep up with the increasing demand for English in Indian society and at the global level.

CO3: It will also help in developing their overall confidence and personality.

### **Course: BBt-409 Practicals in Molecular Biotechnology and microbial Biotechnology**

CO1: Students learn technique for isolation and identification of spoilage causing microorganisms.

CO2: Students can determine microbiological quality of milk and milk product.

CO3: Students get hands on experience of various test used to determine potability of water. CO4: Students get live experience of observing wastewater treatment processing stepwise in field visit, also gets knowledge of milk processing in field visit to a dairy plant.

### **Course: BBt-410: Practical in Animal and Plant Development**

Upon successful completion of this subject student should be able to:

CO1: Hands on training on different methods like dissection, sectioning and staining. Students well understood and depicted basic plant developmental diagrams.

CO2: Gained knowledge of RAM, SAM and florally induced meristem by learnings various staining techniques.

CO3: Students will understand how to perform various practical on microsporogenesis and female development by employing suitable technique.

CO4: Students understood the basic concepts of embryogenesis and well able to differential in dicots and monocot plants at embryo development stage.

CO5: Hands on training how to do seed dissection and excision of embryo and

endosperm.

### **Course: BBt-411: Practical in Cell biology and immunology**

Upon successful completion of this subject student should be able to:

CO1: To acquire the required laboratory skills to perform, interpret and analyze core/ widely used immunotechniques.

CO2: Be able to perform the techniques and relate to health care.

CO3: Be able to integrate the skill into to research and development.

CO4: Observing and learning to prepare slides to study cell division from onion root tip.

CO5: Hands on training to prepare slides to study role of colchine on mitosis.

<b>Course outcomes</b>
<b>Third Year B.Sc. Biotechnology</b>

### **Course: BBt 501—Industrial Microbiology**

After successfully completing this course, the students will be able to:

CO1: Students will learn about the different types of fermentation processes, Fermenter design , different types of equipment used and microbiological processes.

CO2: Students attain knowledge of equipment and design of sterilization cycle of large scale media in fermentation industry.

CO3: Application of microorganisms in technological operation, substrate preparation and control of fermentative process and isolation of products.

CO4: Students gets a brief idea about layout of a fermentation unit and various steps involved in bioprocess technology.

### **Course: BBt 502—R-DNA Technology**

1. The students will be competent to perform genetic manipulation experiments by learning basic and advanced techniques on plasmids, expression vectors, cloning and construct of genomic libraries.
2. The recombinant DNA technology course give emphasize to make students familiar with molecular biology in the context of the application of recombinant DNA technology in basic and applied research.
3. The most fundamental outline in a genetic engineering to impart deep knowledge among students regarding mechanism of action and the use of restriction enzymes, different probes for specific genes of interest.
4. Students will get explored to various techniques like bacterial transformation, DNA sequencing technique, restriction mapping and DNA fingerprinting in relation to their application in medical and pharmaceutical field.
5. This is courses that build up student's deep knowledge towards the modern approaches for genetically modified organisms.

### **Course: BBt 503- Plant Tissue Culture**

CO1: Students will understand the basic concepts and terminology used in plant tissue culture.

CO2- Students will understand the basic techniques to establish different types of in vitro cultures by themselves due to hand on training in the subject.

CO3- Concept and calculations for media preparation very well learnt as the media used for different types of culture were prepared by the students.

CO4: The knowledge of tissue culture techniques will help the students for designing research projects, practical and short term courses.

CO5: The knowledge of tissue culture techniques is used for designing projects, practical performance, and preparation of glassware for practical.

### **Course: BBt504- Animal Tissue Culture**

CO1: Students will understand the basic concepts and terminology used in animal tissue culture.

CO2- Students will understand and evaluate cell cultures constraints and possibilities as an in vitro model .

CO3: This course demonstrates knowledge of basic cell culture techniques

CO 4: Students will get the knowledge of how to establish a cell lines and its maintenance.



CO5: This course demonstrates knowledge on design and how to use the cell culture facilities.

CO6: Students will know the advantages and limitations of primary cell culture compared to immortalized or transformed cell lines.

### **Course: BBt505-Applied Biotechnology I**

CO1: The primary goal of this course is to give students the opportunity to learn and apply basic knowledge of various techniques they have learned in the last two years.

CO2: During this course, students have gained gist knowledge about the use of Biotechnology in agriculture waste management and recycling using various techniques like composting and biomass briquetting.

CO3: This course has benefited students in various scientific fields, applying different Biotechnological techniques in the Molecular Diagnostics field, including some crucial methods viz. Immunodiagnostic techniques, Polymerase Chain Reaction (PCR), Cellular and functional genomics in diagnostics.

CO4: Another important outcome of this subject is the introduction of students to marine resources and their applications in various fields, including pharmaceutical (secondary and Actinobacterial metabolites) use of reporter proteins (GFP and RFP) in vivo studies.

CO5: The most important outcome of this subject is introducing students to a new and advanced branch of applied science, i.e., introduction to Nanotechnology and synthesis of nanoparticles.

CO6: This course will be equally beneficial to various scientific areas, including basic science, medical microbiology, diagnostic, marine resource, and Nanotechnology, as students get explored with multiple techniques and applications.

CO7: This is a course that develops students' skills required for a competitive world in pursuing advanced degrees in biotechnology and pharmaceutical fields.

### **Course: BBt-506- Biodiversity & Systematics**

CO1: On successful completion of this course the students will be able to illustrate the importance of biodiversity for upcoming science and economy.

CO2: The main objective of this course is to provide the students with possibilities of acquiring information on biodiversity, its main principles to know measurement of biodiversity richness and abundance.

CO3: The most important outcome is that they would gain knowledge on the tools for policies, acts and laws used in nature conservation and management. Conceptual insight on protected areas management – Management Institutions, legislation and their problems, perspective biodiversity strategy.

CO4: Students will develop an understanding of biodiversity with respect to biome (terrestrial) and aquatic ecosystem.

CO5: Studies on taxonomy and systematics will provide foundation to study the diversity of living world and its evolutionary perspective to biodiversity.

CO6: Systematics provides how to study biotic and abiotic part of environment in specific way.

### **Course: BBt507-SEC I Summer Industrial Internship/Review writing/Startup design or Case study Report**

CO1 :This study aims to evaluate the impact of internship programs on the professional as well as on personal development and skills.

CO2:By integrating conceptual knowledge and training through academic internship programs, students can be facilitated to better implement their concepts at the workplace.

CO3: Academic internships are a bridge to link the theory and practice by taking part in supervised and scheduled work.

CO4: These internship programs not only improve students personal skills but also polish their professional growth and experience.

CO5: To determine the impact of internship programs on professional as well as personal growth and skills of the undergraduating students.

### **Course: BBT508- SEC-II Project formulation& presentation**

CO1: The scoping and exploring possibilities define broad parameters of project and provide the foundation for subsequent analysis. A clear scope sets boundaries for what the project will attempt to do.

CO2: The planning and organizing of project framework in the Logframe through the analysis of inputs, activities, results, purpose or outcome, and overall objective or goal as a result of strategy analysis and selection.

CO3: Formulate a project that is capable of achieving its intended purpose/objective, of addressing identified problems, of managing potential risks, of designing activities and realistic time frame.

CO4: Designing a project framework that responds to particular problem with clear objectives, expected results and activities

CO5: Project formulation helps to prepare students with clear understanding of outline of research work.

### **Course: BBT 509-Practicals in Industrial Microbiology**

CO1. Student practically learn technique of isolation, screening of microbial strain for fermentation process.

CO2. Students practices various techniques in fermentation process such as inoculum production, fermentation and purification of product.

CO3. Students gets idea of large scale production, preparation of instruments etc. by visiting to fermentation industry.

### **Course Code: BBT-510 Practical in Plant Tissue Culture & Animal Tissue Culture**

CO1: : The course will focus on practical aspects of cell culture, like design and layout of the laboratory, aseptic technique, contamination, methods for measuring viability.

CO2:Students will get the knowledge and hands on training on design and how to use the cell culture facilities.

CO3: Students will get practical hands on how to establish a cell lines and its maintenance.

### **Course: BBT511- Practical in R-DNA Technology & Biodiversity**

CO1. Students practically learn technique Plasmid isolation and agarose gel electrophoresis

CO2. Students practices various techniques in recombinant DNA technology like restriction digestion , ligation.

CO3. Students gets idea about transformation in bacterial cells and screening of transformants.

**Course: BBt601- Enzyme and Enzyme Technology**

CO1: The subject is of relevance to students from a wide range of disciplines such as health, environment and medical sciences.

CO2: Students will be able to proceed towards various concepts in biotechnology, the knowledge on enzyme and enzyme reactions.

CO3: Enzyme kinetics will provide the importance and utility of enzyme kinetics in research.

CO4: Students will learn critical analysis of scientific phenomena involving enzymes and will be able to competently work with enzyme systems in both academia and industry.

CO5: Students will get an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.

**Course: BBt602- Agriculture Biotechnology**

CO1: Students will learn introduction to agricultural biotechnology, its scope, role of it in india, world, concept of urban agriculture

CO2: Students will learn classical way of agriculture

CO3: Students will learn concept and application of e-agriculture , use of ICT in agriculture.

CO4: Student will learn hoe to make draught and herbicide tolerant varities

CO5: Students will how to use greenhouse technology and computer controlled environment

CO6: Students will learn how to produce biofertilizer and biopesticide

CO7: Students will learn how to use molecular markers in plant breeding

CO8: Students will learn how to develop transgenic plants for disease resistance using different techniques.

**BBt603- Applied Biotechnology II**

CO1: This course will help students learn about applying environmental raw materials to generations of biofuels that are renewable, sustainable, and feasible sources of fuel energy.

CO2: These things will allow students to understand current energy demand and their excessive use is the primary cause of air pollution.

CO3: The most important outcome of this subject is introducing students to new and advanced techniques in forensic science used for DNA fingerprinting.

CO4: This course will help students learn about the technical subject, which combines biological science and engineering, allowing students to understand how this work was designed and performed.

CO5: The most important outcome of this subject is introducing students to a new and advanced branch of stem cell biology, i.e., applying stem cell technologies in various life-threatening disease treatments (Neurodegenerative diseases).

**Course: BBT604- Food and Pharmaceutical Biotechnology**

CO 1: The students will understand the basics of food science and nutrition, food spoilage, and preservation, nutraceuticals also students will be able to apply the knowledge in food technology.

CO2: students will be get information about food safety laws and regulations as well as importance of packaging in food industry.

CO3: Students understands concept and methods of drug discovery and dose

designing clinical trials.

CO4: Students acquire knowledge of regulatory aspects in pharmaceutical industry, concept and importance of GMP, GLP.

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**Course: BBT605- Bioinformatics**

CO1: Introduction to bioinformatics and its role in biotechnology

CO2: Students will learn different biological databases present in bioinformatics

CO3: Students will how to generate data, tools for generation of data, classify data, manipulate data, quality analysis.

CO4: Different file formats uses in bioinformatics

CO5: Students will learn metadata concept

CO6: How to align sequence, types of alignment based on sequence length and number of sequence involved in it.

CO7: Students will learn how to search, visualize protein using different visualization tool.

**Course: BBT606- Biosafety and Bioethics**

CO1: At the end of this course, students will learn about the diverse world of Intellectual Property rights and Biosafety and Bioethics.

CO2: The course makes student understand the Regulatory bodies for Bioethics in India and International considerations.

CO3: Students will become aware of Institutional Ethical Committee and International laws on Biosafety

CO4: This course will help students acquire knowledge of containment level and Good Laboratory Practices (GLP) and Biosafety containment levels.

CO5: Students will analyse and imbibe the Objectives and role of WIPO which will also help in interpreting impact of Intellectual property and its legal protection in research

CO6: The course is designed to have applications of research in innovation and entrepreneurship by involving the significance of patents and copyrights to have sustenance at global level.

**Course: BBT607 &608- SEC-III & SECIV: Project**

**CO1:** projects is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. A project definition is a document that establishes the key objectives and terms of a project.

**CO2:** Project-based learning has proven to be one of the most effective ways to engage students and provide a practical application for what they're learning

**CO3:** Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management

**CO4:** Project is big process in which you can do some innovative ideas to implement particular research on suitable specimen.

**CO5:** Project signifies your efforts to show your exact potential whether you are handling problems in an effective way.

**Course: BBT609: Practical in Enzyme Technology**

**CO 1:** The students will able to assay the enzyme and their kinetics and also apply to this in the industry and other technological field.

**CO2:** The students estimate enzyme technology for the commercialization purpose of biotechnological products.

**CO3:** Students will be able to learn fundamentals of enzyme properties.

**CO4:** Students will be able to understand the enzyme kinetics, various factors regulating catalysis, and different models for analyzing the enzyme kinetics.

**Course: BBT610: Practical in Agriculture Biotechnology & Bioinformatics**

**CO1:** student will learn Production of Spirulina/Azolla culture

**CO2:** Estimation of chlorophyll and protein from Spirulina/Azolla culture

**CO3:** Isolation of Rhizobium from root nodules of leguminous crop and development of Rhizobium or Azotobacter Biofertilizer

CO4: Demonstration of effect of Biofertilizer (above prepared Rhizobium or Azotobacter) on plant growth using pot culture

CO5: Demonstration of effect of herbicide (anyone) on plant growth using pot culture

CO6: Visit to functional greenhouse/ Composting Unit/Mushroom cultivation unit and report writing.

**Course Code: BBT-610 Practical in Bioinformatics**

CO7: Introduction to biological databases and retrieving the information

CO8: Literature search using PubMed and Medline

CO9: Introduction of sequence alignment using tools like blast and fasta.

CO10: Introduction to multiple sequence alignment using tool like ClustalW

**Course Code: BBT-610 Practical in Agriculture Biotechnology**

CO1: student will learn Production of Spirulina/Azolla culture

CO2: Estimation of chlorophyll and protein from Spirulina/Azolla culture

CO3: Isolation of Rhizobium from root nodules of leguminous crop and development of Rhizobium or Azotobacter Biofertilizer

CO4: Demonstration of effect of Biofertilizer (above prepared Rhizobium or Azotobacter) on plant growth using pot culture

CO5: Demonstration of effect of herbicide (anyone) on plant growth using pot culture

CO6: Visit to functional greenhouse/ Composting Unit/Mushroom cultivation unit and report writing.

**Course Code: BBT-610 Practical in Bioinformatics**

CO7: Introduction to biological databases and retrieving the information

CO8: Literature search using PubMed and Medline

CO9: Introduction of sequence alignment using tools like blast and fasta.

CO10: Introduction to multiple sequence alignment using tool like ClustalW.

**Course: BBT611: Practical in Food and Pharmaceutical Biotechnology**

CO 1: Students will able to isolate and identify microorganisms involved in food fermentation.

CO2: Students learn to determine various quality parameter of processed and unprocessed food.

CO3: Student will be able to learn methods of extraction of and fractionation of bioactive components from plants by chromatographic technique.

CO4: student learn technique to check potency of antibiotic and antimicrobial activity of bioactive compounds

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# **B.Sc. Computer Science**

**Name of Course Bachelor of Science (Computer Science)**

**Semester I**

**Name of Subject Basic of Computer Science**

**Subject Code BCS-101**

Objectives

Through this paper Student should learn basic principles of computer. The paper is designed to aim at importing basic level of Computer.

Outcome

To learn Basic Function of Devices like I/O, HDD etc. To Understand the Fundamental of Software and Hardware. Understand the Concept of Operating System and Network.

**Name of Course Bachelor of Science (Computer Science)**

**Semester I**

**Name of Subject Introduction to Programming Language Using C( Part – 1)**

**Subject Code BCS-102**

Programming in 'C' Objective

It is general purpose and procedure oriented programming language. In which we are able to develop OS and MAC operating system, application software and programming languages. Programming Language are also used to build students logic for programming.

Programming in 'C' Outcomes

To study of structure of programming languages, structure of c program.

To study different keyword for making program.

To develop programs using operators and control statement.

To describe an array.

Student are able to develop application software.

**Name of Course Bachelor of Science (Computer Science)**

**Semester I**

**Name of Subject Web Technologies**

**Subject Code BCS-103**

Objectives:

To improve the skill to create the static web page.

To develop the ability to create the dynamic web pages.

To enhance the ability of Insert a graphic within aweb page.

To improve the skills to Create, validate and publish a web page.

Outcome:

At the end of the course, students should be able to: Design and implement dynamic websites with good aesthetic sense of designing.

**Name of Course Bachelor of Science (Computer Science)**

**Semester I**

**Name of Subject Elective : Office Automation**

**Subject Code BCS-104 A**

Objectives

The main objective of Office Automation is to enhance and upgrade the existing system by increasing its efficiency and effectiveness. It will simplify the task and reduce the paper work means the software improves the working methods by replacing the existing manual system with the computer-based system.

Outcomes

After completion of this course student will be able to understand the computer software, hardware, made available to simplify and automate avariety of office operations such as data



processing, data manipulating and data presentation with various application those are presents in Microsoft office tools packages.

**Name of Course Bachelor of Science (Computer Science)**

**Semester I**

**Name of Subject Elective: Fundamentals of Digital Electronics**

**Subject Code BCS-104 B**

Course Objectives:

The objectives are to study:

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronic circuits.
2. To prepare students to perform the analysis and design of various digital electronic circuits.

Course Outcomes:

After studying this course the students would gain enough knowledge:-

1. Can have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
2. To understand and examine the structure of various number systems and its applications in digital design.
3. The ability to understand, analyze and design various combinational and sequential circuits.
4. To develop skill to build and troubleshoot digital circuits.

**Name of Course Bachelor of Science (Computer Science)**

**Semester II**

**Name of Subject Operating System**

**Subject Code BCS-201**

Course Objectives:

- To introduce basic concepts and functions of modern operating systems.
- To understand the concept of process and thread management.
- To understand the scheduling of processes and threads.
- To understand various Memory Management techniques.

Course Outcomes:

- Fundamental understanding of the role of Operating Systems.
- To understand the various memory management techniques
- To apply the cons of process/thread scheduling
- To understand the concept of a process and thread.

**Name of Course Bachelor of Science (Computer Science)**

**Semester II**

**Name of Subject Introduction to Programming Language Using C Part – 2**

**Subject Code BCS-202**

Programming in 'C' Objective

It is general purpose and procedure oriented programming language. In which we are able to develop OS and MAC operating system, application software and programming languages. Programming Language are also used to build students logic for programming.

Programming in 'C' Outcomes

To describe a function, storage classes, structure, union, string and functions, Pointers, File Handling, Student are able to develop application software.

**Name of Course Bachelor of Science (Computer Science)**

**Semester II**

**Name of Subject Database Management System**

**Subject Code BCS-203**

Objective: To have basic understanding of database management system components

Outcome: students will be able to think of ER modelling and creation of own database Schema.

**Name of Course Bachelor of Science (Computer Science)**

**Semester II**

**Name of Subject Elective : Desktop Publishing**

**Subject Code BCS-204 A**

Objective

This course will provide students the opportunity to learn to use basic features of desktop publishing software to create all types of publications: flyers, brochures, newsletters, and advertisements. Included in the course will be basic page layout and design principles and integrating text and graphics to create attractive business publications. The course will be taught with Adobe InDesign.

Outcomes

Create personal documents such as business cards and resumes.

Create business documents such as flyers and advertisements.

Create a newsletter with graphics and draw objects.

Create a course project illustrating Desktop Publishing techniques.

**Name of Course Bachelor of Science (Computer Science)**

**Semester II**

**Name of Subject Elective : 8085 Microprocessor**

**Subject Code BCS-204 B**

Course Objectives:

1. To understand basic architecture of 8-bit Microprocessor.
2. To understand interfacing of 8085 Microprocessor with peripherals and Memory.

Course Outcomes:

1. To understand CICS and RISC based Microprocessor.
2. To understand techniques for faster execution of instruction and increase speed of operation of 8085 Microprocessor.
3. Write programs to run 8085 Microprocessor based system.

Paper Title -Object Oriented Programming

BCS-301

Course objective :- To understand how C++ improves C with object-oriented features.

- To learn the syntax and semantics of the C++ programming language.
- Apply the concepts of object-oriented programming
- To learn how to define classes using inheritance to promote code reuse in C++.
- Illustrate the process of data file manipulations using C++
- Learn syntax, features of Standard Template Library and how to utilize it.

Course outcome :- Ability to explain the difference between object oriented programming and procedural

programming concepts.

Ability to program using object oriented features such as inheritance and polymorphism, , operator overloading, dynamic memory allocation, file I/O, exception handling, etc

Ability to apply object oriented techniques to solve computing problems.

### **Paper Title – Computer Network**

#### **BCS-302**

Course objective:-

Introduction fundamental concepts of computer networking.

Introduce students with various concepts used in network

Introduce various technologies and standards

Allow the student to gain expertise in areas of networking

Course outcome:-After completing this course the student get the knowledge and ability to:

Understand basic computer network technology.

Students can identify the different types of network topologies and protocols.

Students can Identify the different types of network standards

### **Title of the Paper- Data Structure and Algorithms**

#### **Course code- BCS-303**

Course objective:- To teach the basic concepts of data structures and algorithms

To understand concepts about searching and sorting techniques

To understand basic concepts about stacks, queues, lists, trees and graphs

To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

Course outcome:- Ability to analyze algorithms and algorithm correctness.

- Ability to summarize searching and sorting techniques
- Ability to describe stack, queue and linked list operation.
- Ability to have knowledge of tree and graphs concepts.

**Paper Title- Discrete Mathematics**

**Code: BCS-304 A ( Elective)**

Course Objectives:

Students will develop problem-solving & critical thinking skills & use these skill to solve complex computational problems

Course Outcome:

Apply mathematical foundation to the discipline of Computer Science

**Paper Title: Mathematical Technique in Computer Science (MTCS)**

**BCS-304 B (Elective)**

Objective:

Knowledge, skill & understanding develop understanding & fluency in mathematics through

inquiry, exploring & connecting mathematical concept choosing & applying problem – solving skills.

Outcomes:

- Able to use standard mathematical techniques to solve elementary problem.
- Understand the nature of mathematical proof & be able to write clear & concise proof.

**Fourth Semester**

**Paper Title- Programming in JAVA**

**BCS -401**

Course objective:- To learn the basic concepts of java programming

- To understand how to use programming in day to day applications

- Knowledge of object-oriented paradigm in the Java programming language,
- The use of Java in a variety of technologies and on different platforms.

Course outcome:- The knowledge of the structure and model of the Java programming language.

- To use the Java programming language for various programming technologies
- To develop software in the Java programming language.

### **Paper Title – Software Engineering**

#### **BCS-402**

Course Objectives:

- To develop software engineering skills and testing plans.
- To understand system concepts and its application in Software development.
- To enhance skills of designing and testing software.
- To learn technical skills to assure production of quality software.

Course Outcomes:

- Ability to learn various methods of software development
- Ability to apply various software testing techniques

### **Paper Title :-Relational Database Management System**

#### **BCS-403**

Course Objectives:

1. To understand the features of Relational database.
2. To describe data models and schemas in DBMS.
3. To use SQL- the standard language of relational databases for database operations.
4. To understand the functional dependencies and design of the databases.

Course Outcome:

1. To study the basic concepts of relational databases

2. Learn and practice data modeling using the entity-relationship and developing database designs.
3. Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing queries.

**4. Apply normalization techniques to normalize the databases.**

**Paper Title:- Principle of Compiler Design**

**BCS-404A (Elective)**

Course Objectives

- 1) To understand overall design of compiler with their types and phases.
- 2) To understand the basic concept of essential syntactic elements and identifying those elements.
- 3) One can easily construct the recognizer system for language constructs as a input.
- 4) Understanding context free grammar.
- 5) Understanding various parsing techniques and intermediate code.

**Paper Title :- Essentials of Computer Security**

**BCS-404 B (Elective)**

Course Objective:- To understand basic principles of computer security

To understand various design approach of computer security

To understand various standards of computer security

Course Outcomes:- To develop a basic understanding of cryptography

To develop a basic understanding of security policies.

To develop a basic understanding of authentication and access control

To determine mechanism for protecting information

**Name of Course B.Sc. Computer Science (Third Year)**



**Semester V Semester**

**Name of Subject Windows Programming**

**Subject code BCS-501**

Course Objectives:

1. To learn and understand basic concepts of Windows Programming.
2. To learn basic C# programming.
3. To understand and work on desktop application development using C#.Net.
4. To expose students to current applications C#.Net.

Course Outcome:

1. Review the fundamental concepts of Windows Programming in C#.Net
2. Evaluate the logic of different programming concepts.
3. Evaluate the techniques of application development in windows environment.
4. To develop database connectivity application.
5. To evaluate different techniques to develop windows applications.

**Name of Course B.Sc. (Computer Science) Third Year**

**Semester V Semester**

**Name of Subject Python**

**Subject code BCS-502**

Course objective:

3. To understand programming constructs in Python.
4. To acquire Object Oriented Skills in Python
5. To develop the ability to write database applications in Python

Course Outcome:

After successful completion of this course, learner will be able to-1. Write programs using Python programming constructs.

2. Design and Develop applications using Python programming.
3. Design object oriented programs with Python classes.
4. Use exception handling in Python applications for error handling.
5. Design and Develop applications connecting with database.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester VI Semester**

**Name of Subject Data Science**

**Subject code BCS-503**

Course Objectives:

1. To learn and understand fundamental concepts of Data Science
2. To learn basic Data Science operations.
3. To understand and work on different algorithms for Data Science
4. To expose students to current applications and opportunities in Data Science emerging field.

Course Outcome:

1. Review the fundamental concepts of Data Science
2. Evaluate the techniques for better Data Science understanding.
3. Evaluate the techniques for perfect Data Analysis
4. To develop applications/algorithms in the field of Data Science
5. To evaluate different Data Science techniques & tools.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester VI Semester**

**Name of Subject Software Testing (Elective)**

**Subject code BCS- 504A**

Course Objectives:

- i. To develop software testing skills and test plans execution skills.
- ii. To understand software testing techniques and its application in Software development.
- iii. To enhance skills of designing and testing software.
- iv. To learn technical skills required for quality assurance of software.

Course Outcomes:

- i. Ability to learn various methods of software development.
- ii. Ability to apply various software testing techniques.
- iii. Ability to evaluate cost of software testing.
- iv. Ability to implement different software testing according to types of software.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester V Semester**

**Name of Subject Basics of Linux (Elective)**

**Subject code BCS-504 B**

Course Objectives:

- This course shall build a platform for students to start their own enterprise
- For Making Student Job Ready
- To become familiar with open source software and user interface.
- To securely handle OS without any viruses and malwares.
- For easily use free software available on internet.
- To understand the basic operating system command.
- To understand the basic concept of Linux operating system

Course Outcomes:

- Awareness of existing demanding trends in IT industry in order to get placement & research in open source market.
- Understand the Linux OS architecture.

- Install and use different types of distributions available in market.
- Understand the different Linux basic commands.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester VI Semester**

**Name of Subject System Analysis and Design(SAD)—Open  
elective**

**Subject code BCS-505 B**

- Course Objective :-
1. System analysis helps in discovering means to design systems.
  2. System analysis helps in discovering sub-system may have apparently conflicting objectives.
  3. It helps in achieving inter compatibility and unity of purpose of sub-systems.
  4. It offers a means to create understanding of the complex structures
  5. It helps to understand writing system proposals, system development scheduling, and cost-benefits analysis etc. also dealing with quality assurance

Course Outcome :-

1. To learn basic things of systems, System development Life cycle, and System

Analyst.

2. To determine specific needs of system.
3. Discuss approaches and tasks of system. Planning for developing system
4. Evaluate tools and techniques.
5. Use appropriate methods and techniques to design software.
6. Implementation of Developed System, Evaluation and Testing of system.

**Name of Course B.Sc. CS Third Year**

**Semester VI**

**Name of Subject Mobile Application Development**

## **Subject Code BCS-601**

Course Objectives:

- This course shall build a platform for students to start their own enterprise
- For Making Student Job Ready
- To gain an understanding of the processes that are involved in an Android developed application
- To become familiar with Android development tools and user interface.
- To understand Activity and Intends
- To understand SQLite Database.
- To Understand Web view control
- Ability to build Many simple apps that you can share with your friends

Course Outcome:

- Awareness of existing demanding trends in IT industry in order to get placement & research
- Understand the Android OS architecture.
- Install and use appropriate tools for Android development, including IDE, device emulator, and profiling tools.
- Understand the Android application architecture, including the roles of the task stack, activities, & services.
- Build user interfaces with fragments, views, form widgets, text input, lists, tables, and more.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester VI Semester**

**Name of Subject Fundamentals of Image Processing**

**Subject code BCS-602**

Course Objectives:

- 1 To learn and understand fundamental concepts of digital image processing.
- 2 To learn basic image processing operations.
- 3 To understand and work on different image analysis algorithms
- 4 To expose students to current applications of digital image processing system.

Course Outcome:

- 1 Review the fundamental concepts of digital image processing system.
- 2 Evaluate the techniques for image enhancement.
- 3 Evaluate the techniques for Image restoration.
- 4 To develop color based image processing applications.
- 5 To evaluate different filtering method.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester VI Semester**

**Name of Subject Software Process Management (Elective)**

**Subject code BCS-604 A**

Course Objectives:

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development.
3. To understand software economics

Course Outcomes:

1. Analyze software process maturity, its framework and the reference models .
2. Understand the Capability Maturity Model and learn about conventional software management.
3. Understand how to manage software projects and project planning.
4. Analyze project tracking and control.
5. Understand the role of project closure analysis.

**Name of Course B.Sc. Computer Science (Third Year)**

**Semester VI Semester**

**Name of Subject Linux Administration (Elective)**

**Subject code BCS-604 B**

Course Objectives:

- This course shall build a platform for students to start their own enterprise
- For Making Student Job Ready
- To become familiar with open source software and user interface.
- To securely handle OS without any viruses and malwares.
- For easily use free software available on internet.
- To understand the basic operating system command.
- To understand the basic concept of Linux operating system administration

Course Outcomes:

- Awareness of existing demanding trends in IT industry in order to get placement & research in open source market.
- Understand the Linux OS architecture.
- Install and use different types of distributions available in market.
- Understand the different Linux administration commands.

## **M.Sc. (Computer Science)**

### **Program Outcome**

- Provides technology-oriented students with the knowledge and ability to develop creative solutions.
- Develop skills to learn new technology.
- Apply computer science theory and software development concepts to construct computing-based solutions.
- Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, Artificial Intelligence, Mobile applications.

### **Course Outcome**

#### **M.Sc. (Computer Science) Sem - I**

##### **Design and Analysis of Algorithm Course Outcomes:-**

- To design efficient algorithms using various algorithm designing strategies
- To analyze the problem and develop the algorithms related to these problems
- To classify the problem and apply the appropriate design strategy to develop algorithm
- To design algorithm in context of space and time complexity and apply asymptotic notation

##### **Database Technologies Course Outcomes:-**

- To study types of NoSQL databases (Document oriented, keyValue pairs, Column-oriented and Graph)
- To understand detailed architecture, define objects, load data, query data and performance tune NoSQL databases.
- Able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

##### **Cloud computing Course Outcomes:-**

- To understand the principles and paradigm of Cloud Computing
- Ability to design and deploy Cloud Infrastructure
- Understand cloud security issues and solutions



- Ability to understand role of Virtualization Technologies
- Design & develop backup strategies for cloud data based on features

**Artificial Intelligence Course Outcomes:-**

- To analyze and formalize the problem as a state space, graph, design heuristics
- Ability to represent solutions for various real-life problem domains using logic- based techniques
- Understand the numerous applications and huge possibilities in the field of AI
- Ability to express the ideas in AI research and programming language related to emerging technology.

**Web Services**

**Course Outcomes:-**

- To understand the details of web services technologies like WSDL, UDDI, SOAP
- Ability to learn how to implement and deploy web service client and server
- Learn how to explore interoperability between different frameworks
- Understand architectural elements of a RESTful system

**M.Sc. (Computer Science) Sem - II**

**Advanced Operating System**

**Course Outcomes:-**

- To design and understand the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.
- To evaluate, and compare OS components through instrumentation for performance analysis.
- To analyze the various device and resource management techniques for timesharing and distributed systems
- To develop and analyze simple concurrent programs using transactional memory and message passing, and to understand the trade-offs and implementation decisions

**Mobile Technologies Course Outcomes:-**

- To gain knowledge of installing Android Studio and Cross Platform Integrated Development Environment.
- An ability to use the techniques, skills, and modern technology.
- To develop the different applications that mobile computing offers to people, employees, and businesses
- To develop high levels of technical competence in the field of mobile technology.

**Software Project Management Course Outcomes:-**

- To identify the impact of IT projects on the performance of the organizations
- To understand, manage and develop IT infrastructure in different projects
- To develop strategies to calculate risk factors involved in IT projects
- To use project management software to control the design, implementation, closure, and evaluation of IT projects
- To estimate, plan, calculate, and adjust project variables.
- Apply project management practices to launch new programs, initiatives, products, services, and events relative to the needs of stakeholders.

**Project****Course Outcomes:-**

- To demonstrate a depth of knowledge of modern technology.
- To complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings, and patents.
- Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
- Students will be able to learn on their own, reflect on their learning and take appropriate actions to improve it.

**Advanced OS & Mobile Technologies Course Outcomes:-**

- Student can understand internal structure and operations of OS along with various processes including threading, inter process communication and synchronization with I/O operations.
- Awareness of computational issues, resources in distributed environment.
- To develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools.
- To understand how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support.

**M.Sc. (Computer Science) Sem - III****Mobile Computing Course Outcomes:-**

Student will able to:

- Get familiar with various generations of mobile communications.
- Understand the concept of cellular communication
- Understand the basics of wireless communication
- Get the Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations.

- Develop ability to develop Android Application

### **Project (Elective)**

#### **Course Outcomes:-**

- On successful completion of the course students will be able to:
- Demonstrate a sound technical knowledge of their selected project topic.
- Undertake problem identification, formulation and solution.
- Design engineering solutions to complex problems utilizing a systems approach.
- Conduct an engineering project
- Communicate with engineers and the community at large in written or oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.
- Project-based learning connects students to the real world.
- Prepares students to accept and meet challenges in the real world, mirroring what professionals do every day.

#### **Database and System Administration Course Outcomes:-**

Student will able to:

- Establish a basic understanding of the process of Database Development and Administration using MySQL.
- Student will implement the concepts of both Operating Systems & Database Administration skills.
- Retrieve any type of information from a data base by formulating complex queries in MySQL
- Describe the important role of Linux operating system.

## **M.Sc. (Computer Science) Sem - IV**

### **Industrial Training Course Outcomes:-**

- On successful completion of the course students will be able to:
- Capability to acquire and apply fundamental principles of engineering.
- Become master in specialized technology
- Become updated with all the latest changes in technological world.
- Ability to communicate efficiently.
- Ability to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
- Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
- Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
- Awareness of the social, cultural, global and environmental responsibility as an engineer.

## M.Sc.BT COURSE OUTCOME:-

### I SEMESTER

Title of paper: GENERAL BIOCHEMISTRY Course code: BT020101 The student is exposed to: CO1: The biochemical composition of the cell. CO2: The structure and types of nutrient components. CO3: The major metabolic pathways and their significance. CO4: The coordination of metabolic pathways.

Title of paper: CELL BIOLOGY AND GENETICS Course code: BT020102 CO1: The student can understand how the cell is equipped with machineries to conduct activities as the basic structural and functional unit of life. CO2: The structural features of cell organelles/machineries. CO3: The functional mechanisms of cellular phenomena. CO4: The fundamental principles of heredity and deviations from mendelian behavior. CO5: The effect of mutations and mutational analysis. Principles of behavioural and population genetics.

Title of paper: INSTRUMENTATION AND BIostatISTICS Course code: BT020103 The student gets awareness in: CO1: The techniques used in the visualization of cellular components and macromolecules. CO2: Analytical techniques used in detection and quantification of biological compounds and the separation techniques used in biology. CO3: The application of statistical principles in biological studies. CO4: The research methodology and documentation.

Title of paper: BIOPHYSICS AND BIOINFORMATICS Course code: BT020204 An exposure is given to students in : CO1: The bioenergetics of cell and the basic architecture of macromolecules. CO2: The interaction between macromolecules. CO3: The role of bioinformatics in biological data storage. CO4: The applications of bioinformatics tools in analyzing biological data.

Title of paper: LABORATORY COURSE 1 Course code: BT020105 The students are able to understand: CO1: The basic principles of preparation of solutions. CO2: The detection, assay and purification of biological compounds. CO3: Design experiments and analyse results. CO4: Handling of required equipments. (Biochemistry, Cell biology & Genetics).

II SEMESTER Title of paper: MICROBIOLOGY Course code: BT020201 The students get an exposure in: CO1: Microbial grouping and its taxonomical significance. CO2: Cultivation and identification of microorganisms. CO3: The Organization of Bacterial Cell CO4: Maintenance and preservation of bacterial cultures. CO5: General characteristics of Archaeobacteria and their phylogenetic overview CO6: Overview of Bacterial Diversity: Morphology, Metabolism, Ecological Significance and Economic importance

Title of paper: IMMUNOLOGY Course code: BT020202 CO1: The students have knowledge of: CO2: The cells and organs associated with immune system. CO3: The details of immune system functioning. CO4: Analytical techniques based on immunological reactions. CO5: The after effects of defects in immune system.

Title of paper: MOLECULAR BIOLOGY Course code: BT020203 The student gets a comprehensive knowledge of : CO1: The structural and functional organization of genome. CO2: The molecular phenomena of DNA copying and transmission of informations. CO3: The regulation of gene function and associated phenomena.

Title of paper: METABOLISM AND ENZYMOLOGY Course code: BT020204 CO1: The characteristics of enzymes as biological catalysts, enzyme kinetics, enzyme classification. CO2: The role of nucleic acids in synthesis of macromolecules, particularly proteins and enzymes. CO3: The structure and physico chemical properties of carbohydrates from monosaccharide to polysaccharides. CO4: The difference between the water soluble and fat soluble vitamins and their key role in the metabolism as coenzymes. CO5: The rate of reactions and order of reactions, and inhibitions and their kinetics.

Title of paper: LABORATORY COURSE-II Course code: BT020205 The student can learn: CO1: The cultivation, observation and identification of microorganisms. CO2: The design of immunological experiments. CO3: The detection of compounds of interest in biological samples.

Title of paper: BIOPROCESS TECHNOLOGY Course code: BT020301 The students are trained in: CO1: Screening for microbial strains from different samples. CO2: Types of Bioprocess and standard lab practices. CO3: Bioreactor designing and control. CO4: Industrial production conditions through fermentation

Title of paper: RECOMBINANT DNA TECHNOLOGY Course code: BT020302 CO1: The student is exposed to the basic requirements to perform genetic engineering experiments. CO2: The techniques involved in the preparation and introduction of r DNA to the host. CO3: Applications of r DNA technology. CO4: Regulations in carrying out r DNA experiments.

Title of paper: ENVIRONMENTAL BIOTECHNOLOGY Course code: BT020303 The student is able to understand: CO1: The role of biotechnology in environmental applications. CO2: Degradation of recalcitrant compounds by biological agents. CO3: Treatment technologies involved in the processing of solid and liquid waste. CO4: Alternate green energy sources and green technologies.

Title of paper: ANIMAL AND PLANT BIOTECHNOLOGY Course code: BT020304 Students get familiarized with the: Fundamental requirements and design of lab to carry out plant and animal cell culture experiments. CO2: The different approaches and techniques involved in creating recombinant plant and animals. CO3: The applications and demerits of genetic modification in plants and animals.

Title of paper: LABORATORY COURSE III Course code: BT020305 Students are trained in: CO1: Characterizing waste water. CO2: Bacteriological analysis of water and food. CO3: Plant tissue culture techniques and other lab scale bioprocesses. IV SEMESTER Title of paper: Laboratory Course IV Course code: BT020401 Students are trained in: CO1: Isolation of genetic material, purification. CO2: Different tools and techniques of gene manipulation CO3: The techniques to clone genes. CO4: Modification of genetic material, generation and introduction of r DNA, analysis of genome.

Title of paper: BIOTECHNOLOGY AND PHYSIOLOGY Course code: BT840401 The students become familiar with: CO1: The functional significance of organ systems. CO2: Role of plant metabolic pathways and their steps. CO3: Applications of biotechnology in human cell and organ culture.

Title of paper: MICROBIAL FOOD TECHNOLOGY Course code: BT840402 The student is able to understand: CO1: The role of microbial fermentation in food production and factors affecting it. CO2: Role of biotechnology in food production and modification.

Title of paper: IPR,& BIOTECHNOLOGY Course code: BT80403 The student will be able to understand: CO1: Intellectual property and its different forms. CO2: The National and international approaches to protect the IPR. CO3: The guidelines for biosafety. CO4: Genetic modification of food crops and animals and the ethical issues.