॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)
Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०—२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७—२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील **द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०—२१ पासून लागू करण्यात येत आहेत.

1. B.Sc.-II Year-Biophysics	2. B.Sc.-II Year-Bioinformatics
3. B.Sc.-II Year-Biotechnology	4. B.Sc.-II Year-Biotechnology (Vocational)
5. B.Sc.-II Year-Food Science	6. B.Sc.-II Year-Botany
7. B.Sc.-II Year-Horticulture	8. B.Sc.-II Year-Agro Chemical Fertilizers
9. B.Sc.-II Year-Analytical Chemistry	10. B.Sc.-II Year-Biochemistry
11. B.Sc.-II Year-Chemistry	12. B.Sc.-II Year-Dyes & Drugs Chemistry
13. B.Sc.-II Year-Industrial Chemistry	14. B.C.A. (Bachelor of Computer Application)-II Year
15. B.I.T. (Bachelor of Information Technology)-II Year	16. B.Sc.-II Year-Computer Science
17. B.Sc.-II Year-Network Technology	18. B.Sc.-II Year-Computer Application (Optional)
19. B.Sc.-II Year-Computer Science (Optional)	20. B.Sc.-II Year-Information Technology (Optional)
21. B.Sc.-II Year-Software Engineering	22. B.Sc.-II Year-Dairy Science
23. B.Sc.-II Year-Electronics	24. B.Sc.-II Year-Environmental Science
25. B.Sc.-II Year-Fishery Science	26. B.Sc.-II Year-Geology
27. B.Sc.-II Year-Mathematics	28. B.Sc.-II Year-Microbiology
29. B.Sc.-II year Agricultural Microbiology	30. B.Sc.-II Year-Physics
31. B.Sc.-II Year Statistics	32. B.Sc.-II Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड — ४३१ ६०६.
जा.क्र.: शैक्षणिक—१/परिपत्रक/पदवी—सीबीसीएस अभ्यासक्रम/
२०२०—२१/३३३

दिनांक : १५.०७.२०२०.

स्वाक्षरित/—
उपकुलसचिव
शैक्षणिक (१—अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) सहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University,Nanded
(NAAC Re-accredited with 'A' Grade)

Syllabus of

Second Year Bachelor of Computer Application (Revised CBCS pattern)

Introduced from Academic Year 2020-2021

Bachelor of Computer Application

Bachelor of Computer Application (3years) program / degree is a specialized program in computer applications. It builds the student on studies in applied use of computers and to become competent in the current race and development of new computational sciences. The duration of the study is of six semesters, which is normally completed in three years.

CBCS pattern

The Bachelor of Computer Application program as per CBCS (Choice based credit system) pattern, in which choices are given to the students under open electives and subject electives. The students can choose open electives from the wide range of options to them.

Eligibility and Fees

The eligibility of a candidate to take admission to **Bachelor of Computer Application** program is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the college / institution as well as on website of the University.

Credit Pattern

Every course has corresponding grades marked in the syllabus structure. There are 24 credits per semester. A total of 144 credits are essential to complete this program successfully. The Grading pattern to evaluate the performance of a student is as per the University rules.

Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 03 external credits and 01 internal credit. The university shall conduct the end semester examination for 03 external credits. For theory internal credit, student has to appear for 01 class test (15 marks) and 01 assignment (10 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations.

The open elective has 04 credits which are purely internal. If students are opting for MOOCs as open elective , then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / college level open elective or a course from University recognized MOOCs platforms as open electives.

The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible.

Under the CBCS pattern, students would graduate **Bachelor of Computer Application** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional UG program.

1. **B.Sc. Computer Application Degree** / program would be of 144 Credits. Total credits per semester= 24
2. Each semester shall consist of three core courses, one elective course, one open elective course and two practical courses. Four theory courses (core+elective) = 16 Credits
3. Two practical / Lab courses= 4 Credits in total (02 credits each) , One Open elective= 4 credit
4. One Credit = 25 marks , Two Credits = 50 Marks, Four Credits = 100 Marks

PEO, PO and CO Mappings

1. **Program Name** : Bachelor of Computer Application

2. **Program Educational Objectives**: After completion of this program, the graduates / students would

PEO I :Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEO II : Successful Career	Deliver professional services with updated technologies in **Computer application** based career.
PEO III :Hands on Technology and Professional experience	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.
PEO IV :Interdisciplinary and Life Long Learning	Undergo higher studies, certifications and research programs as per market needs.

3. **Program Outcome(s):** Students / graduates will be able to

PO1: Apply knowledge of mathematics, science and algorithm in solving Computer problems and applied use of banks.
PO2: Learn various custom software
PO3: Design component, or processes to meet the needs within realistic constraints.
PO4: Identify, formulate, and solve problems using computational temperaments.

PO5: Comprehend professional and ethical responsibility in computing profession.
PO6: Express effective communication skills.
PO7: Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
PO8: Actual hands on technology to understand it's working.
PO9: Knowledge of contemporary issues and emerging developments in computing profession.
PO10: Utilize the techniques, skills and modern tools, for actual development process
PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work
PO12: Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

5. **Mapping of PEO& PO and CO**

Program Educational Objectives	Thrust Area	Program Outcome	Course Outcome
PEO I	Technical Expertise	PO1,PO2,PO3,PO6	All core courses
PEO II	Successful Career	PO4,PO5,PO11,	All discipline specific electives courses
PEO III	Hands on Technology and Professional experience	PO8,PO10	All Lab courses
PEO IV	Interdisciplinary and Life Long Learning	PO7,PO9,PO12	All open electives and discipline specific electives

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based Credit System (CBCS)

SEMESTER PATTERN
Faculty of Science & Technology
Under Graduate (UG) Program
Program: SY Bachelor of Computer Application w.e.f. AY 2020-2021

Year	Semester	Course category	Course Code	Course Title	Credits * *(split up will be given separately)
Second	Third	Core Course	BCA-301	Programming in C++	04
		Core Course	BCA-302	Operating System Concepts	04
		Core Course	BCA-303	Data Base Management System	04
		Chose any one from the below Elective courses			
		Elective Subject	BCA-304 A	Business Application and ERP	04
			BCA-304 B	Introduction to Multimedia	
		Chose any one Open Elective courses			
		Open Elective	BCA-305 A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR	04
			BCA-305 B	Numerical Aptitude	
		Lab / Practical	BCA-306	C++ Programming	02
			BCA-307	DBMS	02
Total					**24**
Second	Fourth	Core Course	BCA-401	Programming in JAVA	04
		Core Course	BCA-402	Data Structure and Algorithm	04
		Core Course	BCA-403	RDBMS	04
		Chose any one from the below Elective courses			
		Elective Subject	BCA-404A	Operational Research	04
			BCA-404B	Computer Graphics	
		Chose any one Open Elective courses			
		Open Elective	BCA-405A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR	04
			BCA-405B	Logical Reasoning	
		Lab / Practical	BCA-406	JAVA Programming	02
			BCA-407	RDBMS	02
Total					**24**

Name of Course	Bachelor of Computer Application (BCA)
Semester	III
Name of Subject	Programming in C++
Subject Code	BCA-301
Marks	75 Marks
Lectures	50 Lectures

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++.

UNIT I

1. Introduction to OOPs and Basics of C++   **15 Lectures**

1.1 Object Oriented Programming

1.2 Basic concepts of OOPs

1.3 Benefits of OOPs.

1.4 C++ Tokens, Variables, Constants and data types

1.5 Scope Resolution Operator

1.6 Basic Input / Output Statements

1.7 Structure of a C ++ program

1.8 Control Structure

    1.8.1 Conditional Statements

    1.8.2 Looping Statements

1.8.3 Jumping Statements

1.9 Arrays, Pointer, References

1.10 Function: Call by value, Call by reference

1.11 Inline function, Default arguments

1.12 Function Overloading

UNIT II

2. Class & Object   **10 Lectures**

2.1 Defining Class, Members , Object

2.2 Visibility modes

2.3 Static members

2.4 Pointer to members

2.5 Pointer to objects

2.6 Constructors & Destructors

2.7 Friend Function

UNIT III

3. Operator Overloading, Inheritance & Polymorphism   **13 Lectures**

3.1 Concept of Operator Overloading

3.2 Rules for Overloading

3.3 Unary & Binary operator overloading

3.4 Concept of Inheritance

3.5 Types of Inheritance

3.6 Concept of Polymorphism

3.7 Virtual Base Classes

3.8 Pointer to Derived class

3.9 Virtual functions and Rules for Virtual function

3.10 Pure Virtual functions

UNIT IV

4.   C++ I/O System and File Handling   12
Lectures

4.1   C++ Streams

4.2   C++ Stream Classes

4.3   Unformatted I/O operations

4.4   Formatted I/O operations

4.5   Manipulators

4.6   Opening and closing file

4.7   file modes

References:

1. C++ Complete Reference – Herbert Schildt (Tata McGraw-Hill)

2. Object Oriented Programming With C++ – E. BALGURUSAMI (Tata McGraw-Hill)

Name of Course	Bachelor of Computer Application (BCA)
Semester	III
Name of Subject	Operating System Concepts
Subject Code	BCA-302
Marks	75 Marks
Lectures	50 Lectures

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.

Unit I

1. Introduction   **12 Lectures**

1.1 What operating system do? User view, system view, defining OS.

1.2 Importance of Operating system

1.3 Basic concepts and terminology

1.4 An Operating system Resource manager

1.5 An Operating system- Process view point

1.6 Operating system– Hierarchical And Extended machine view

1.7 Multiprocessor Systems

1.8 Operating-System Services

Unit II

2. Memory management   **12 Lectures**

2.1 Single Contiguous Allocation

2.2 Introduction to Multiprogramming

2.3 Partitioned Allocation

2.4 Relocatable Partitioned Memory Management

2.5 Paged Memory Management

2.6 Demand- Paged Memory Management

2.7 Segmented Memory management

Unit III

3. Processor Management   12
Lectures

3.1 State Model

3.2 Job Scheduling

3.3 Process Scheduling technique-FCFS,SJF, Priority scheduling, Round Robin scheduling

3.4 Multiprocessor System ,Context switch

3.5 Process Synchronization

Unit IV

4. Device Management   14
Lectures

4.1   Techniques for Device Management

4.2   Device characteristics- Hardware Consideration

4.3   Channels And Control Units

4.4   Device Allocation Consideration

4.5   I/O Traffic controller, I/O Scheduler ,I/O Device Handlers

4.6   Virtual Devices

4.7   A Simple File System

4.8   General Model of a File System

4.9   Symbolic File System

4.10 Basic File System

References:-

1. Operating Systems By William Stallings Publication
2. Operating Systems By Godbole
3. Operating Systems By John J. Donovan

Name of Course	Bachelor of Computer Application (BCA)
Semester	III
Name of Subject	Database Management System
Subject Code	BCA-303
Marks	75 Marks
Lectures	50 Lectures

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.

UNIT - I

1. **Introduction to DBMS**   **20 Lectures**

    1.1   Introduction, Definition & application area.

    1.2   Characteristics of DBMS.

    1.3   File processing system Vs DBMS.

    1.4   Advantages and Disadvantages of DBMS.

    1.5   Users of DBMS.

    1.6   Structure of DBMS.

    1.7   View of Data –Data abstraction, Instances and Schemas.

    1.8   Database Languages

    1.9   Index- Introduction, Types of Index

    1.10   File Organization-Introduction, Types of file organization.

    1.11   Data Models-Introduction, Types of Data Models.

UNIT - II

2. **E-R Data Models:**   **10**
    Lectures

2.1   Introduction

2.2   Basic Concepts-Entity and Entity Sets, Attributes and types of attributes

2.3   Relationship and relationship sets

2.4   Constraints, Keys

2.5   Entity-Relationship Diagram –Introduction and basic components of E-R diagram.

2.6   Extended E-R Features: Specialization, generalization, higher- and lower-level entity sets, attribute inheritance, and aggregation.

2.7   Example of E-R data base design.

UNIT - III

3. **Relational Data Model:**   **10**
    Lectures

3.1 Introduction to Relational Data Model.

3.2 Structure of Relational databases and Important Terms-Relation, Tuple, Attribute, Cardinality, Degree, Domain

3.3 Integrity constraints over relations

3.4 Logical Database Design: ER to Relational

3.5 The Relational Algebra: Select, Project, Union, Difference, Intersection, Cartesian Product, Natural Join

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UNIT - IV

4. **Relational Database Design:**   **10**
    Lectures

4.1 Introduction

4.2 Anomalies of un-normalized database

4.3 Dependencies in Database

4.4 Normalization

4.5 Normal Form: 1NF, 2NF, 3NF, BCNF

References:

1. Database Management Systems (ForthEdition) - by Raghu Ramkrishnan and Johannes Gehrke
2. Database System Concepts –by Abraham Silberschatz, Henry F Korth, and S. Surdarshan- MC Graw Hill publication
3. An Introduction to Database Systems - by C J date

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
Lectures	50 Lectures

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 self-upgrade 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.

UNIT – I

1. Enterprise: An Overview   **15 Lectures**

1.1 Enterprise: An Overview: Business Functions and Business Processes,

1.2 Importance of Information: Characteristics of information; Types of information,

1.3 Information System: Components of an information system;

1.4 Different types of information systems;

1.5 Management information system,

1.6 Enterprise Resource Planning: Business modeling;

1.7 Integrated data model

UNIT - II

2. Introduction to ERP   10 Lectures

2.1 Introduction to ERP: Defining ERP,

2.2 Origin and Need for an ERP System,

2.3 Benefits of an ERP System,

2.4 Reasons for the Growth of ERP Market,

2.5 Reasons for the Failure of ERP Implementation

2.6 Roadmap for successful ERP implementation

UNIT - III

3. ERP and Related Technologies   15 Lectures

3.1 ERP and Related Technologies: Business Process Re-engineering,

3.2 Management Information systems,

3.3 Decision Support Systems,

3.4 Executive Information Systems- Advantages of EIS; Disadvantages of EIS,

3.5 Data Warehousing, Data Mining,

3.6 On-Line Analytical Processing,

3.7 Product Life Cycle Management,

3.8 Supply Chain Management,

3.9 ERP Security

UNIT - IV

4. ERP Implementation   10 Lectures

4.1 ERP Implementation Life Cycle: ERP Tools and Software,

4.2 ERP Selection Methods and Criteria,

4.3 ERP Selection Process,

4.4 ERP Vendor Selection,

4.5 ERP Implementation Lifecycle,

4.6 Pros and cons of ERP implementation,

4.7 Factors for the Success of an ERP Implementation

Reference Books:

1. Enterprise Resource Planning – Alexis Leon – Second Edition – TMH

2. ERP in practice – Vaman - TMH

3. Daniel E.O'Leary, Enterprise Resource Planning Systems, Cambridge University Press, 2002.

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
Lectures	50 Lectures

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 hand-produced material.

Introduction to Multimedia Outcomes

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

UNIT – I

1. Introduction to Multimedia   **15 Lectures**

1.1 Introduction to Multimedia

1.2 Definition of Multimedia elements

1.3 Multimedia Elements

1.4 Multimedia Applications

1.5 Global structure of Multimedia

1.6 Data Compression

1.7 Basic compression techniques (Run length & Huffman encoding)

1.8 Introduction to compression techniques: JPEG, MPEG

UNIT - II

2. Optical Storage Media & Audio File Formats   **15 Lectures**

2.1 Optical Storage Media & Retrieval Technologies

2.2. Basic Technology

2.3 Video Disk & other WORMS

2.4 CD-ROM and Multimedia Highway

2.5 DVD- ROM

2.6 Basic Concept of Sound

2.7 MIDI

2.8 Digital audio

2.9 Audio file formats

UNIT - III

3. Image and Graphics   **10 Lectures**

3.1 Making Still Images: BITMAPS, Vector Drawing

3.2 Image Formats

3.3 Graphics Format

3.4 Image file format: BMP, JPEG, TIFF, PNG

UNIT - IV

4. Video & Animation   **10 Lectures**

4.1 Basic concepts of Video

4.2 Broadcast Video Standards

4.3 Television: Conventional systems, Enhanced definition systems, High Definition system

4.4 Computer based Animation

References:

1. Multimedia System Design By By P. K. Andleigh, Kiran Thakrar, Dhanpat Rai Publications

2. Multimedia : Computing Communications & Applications, By Ralf Steinmetz And Klara Nehrstedt, Pearson Education

Name of Course	Bachelor of Computer Application (BCA)
Semester	III
Name of Subject	Numerical Aptitude
Subject Code	BCA-305 B
Marks	75 Marks
Lectures	50 Lectures

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.

UNIT – I

1. Average and Equation 12 **Lectures**

1.1 **Average**: Definition of average, Formulae and theoretical problem on average

1.2 **Equation:** Simple equation, Linear equation, Quadratic equation, Cubic equation.

UNIT – II

2. Problems on Number and ages 13 **Lectures**

2.1 **Problem on number, ages:** Simultaneous equations and their applications.

2.2. Theoretical problems on number and age.

UNIT – III

2. Percentage, Profit and Loss 13 **Lectures**

2.1 **Percentage**: Concept of percentage, Application of percentage, Results on populations, Result on depreciations, Theoretical problem on percentage.

2.2. **Profit and Loss:** Definition of cost price, selling price and profit, Formulae of profit and loss, Theoretical problems on profit and loss.

UNIT - IV

3. Time and Work, Time and Distance and Problems on Train   **13 Lectures**

3.1 **Time and Work:** Concept of time and work, Relationship between time and work, Theoretical problems on time and work.

3.2 **Time and Distance:** Concept of time and distance, Formulae of time and distance, Theoretical problems on time and distance.

3.3 **Problems on Train:** Formulae of problems on train, Theoretical problems on train.

References:

1. Quantitative Aptitude by Dr.R.S Aggrawal , S. Chand and Company Publications

2. Quantitative Aptitude by Abijit Guha ,Tata McGraw Hill Publications

3. Objective Arithmetic by S.L Gulati, Cosmos book hive Pvt,5th edition 2015

Name of Course	**Bachelor of Computer Application (BCA)**
Semester	**III**
Name of Subject	**Lab-Course : C++ Programming**
Subject Code	**BCA-306**
Marks	**50 Marks**

1) Program to demonstrate C++ programming Structure.

2) Program to demonstrate use of different data types.

3) Program to demonstrate Use of Scope Resolution Operator.

4) Program to demonstrate Use of arrays.

5) Program to demonstrate Use of conditional statements.

6) Program to demonstrate Use of looping statements.

7) Program to demonstrate Use of call by value.

8) Program to demonstrate Use of call by reference.

9) Program to demonstrate the concept of inline function

10) Program to demonstrate the concept of default arguments.

11) Program to demonstrate the concept of Function Overloading

12) Program to demonstrate the concept of static members.

13) Program to demonstrate the concept of constructor and destructor.

14) Program to demonstrate the concept of friend function.

15) Program to demonstrate unary operator overloading.

16) Program to demonstrate binary operator overloading.

17) Programs to demonstrate different types of inheritance.

18) Program to demonstrate concept of virtual base class.

19) Program to demonstrate different formatted and unformatted I/O operations.

20) Program to demonstrate reading from and writing in to the files.

Name of Course	**Bachelor of Computer Application (BCA)**
Semester	**III**
Lab/Practical	**Lab Course : DBMS**
Subject Code	**BCA-307**

Marks	50 Marks

This laboratory course will comprise as exercises to supplement what is learnt under paper BCA-303: Data Base Management System. Students are required to practices following:

1) Write procedure for creating database in MS-Access.
2) Create tables in MS ACCESS using different ways.
3) Perform Import data operation in MS ACCESS.
4) Perform export data operation in MS ACCESS.
5) Create queries in MS ACCESS for selection, projection, Cartesian product.
6) Create queries in MS ACCESS for union, intersection and difference.
7) Create queries in MS ACCESS for different types of joins.
8) Generate forms and add new records in MS-Access.
9) Generate the report in MS Access.
10) Generate the report in MS Access using Report Wizard.

SRTM UNIVERSITY,NANDED
CBCS Revised Syllabus w.e.f AY: 2020-2021
Program: Bachelor of Computer Application
Second Year Fourth Semester

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	Programming in JAVA
Subject Code	BCA-401
Marks	75 Marks
Lectures	50 Lectures

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.

UNIT I

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1. Introduction and Overview of Java Language   15 Lectures

1.1 Java History

1.2 Java Features

1.3 How Java Differ from C and C++

1.4 JVM

1.5 Java Environment

1.6 Java Programming Structure

1.7 Java Tokens, Variables, Constants and Data types

1.8 Control Structure

      1.8.1 Conditional Statements

      1.8.2 Looping Statements

      1.8.3 Jumping Statements

1.9 Arrays

2. Classes, Objects and Methods — 13 Lectures

2.1 Defining Class, Fields Declaration, Methods Declaration, Creating Objects

2.2 Visibility controls

2.3 Use of 'this' Keyword

2.4 Method Parameters and Method Overloading

2.5 Constructor and Constructor Overloading

2.6 Static Members

2.7 Finializer Method

2.8 Inheritance and It's Types

2.9 Method Overriding

2.10 Final Variable, Method and Final Class

3. Interface, Package and Exception Handling — 10 Lectures

3.1 Defining and implementing interface

3.2 Package

      3.2.1 Create Package

      3.2.2 Accessing Package

3.3 Exception

      3.3.1 Types of Error

      3.3.2 Multiple catch statement

      3.3.3 Creating User defined Exception

      3.3.4 Finally clause

4. String, Stream and Applet Programming — 12 Lectures

References:

1. Complete Reference   by Herbert Schildt (Tata McGraw-Hill publishing company Ltd.)

2. Programming with Java by E Balagurusamy (Tata McGraw Hill Education Pvt. Ltd.)

3. Java 2 programming black books by Steven Horlzner (DreamTech Press)

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	Data Structure and Algorithm
Subject Code	BCA-402
Marks	75 Marks
Lectures	50 Lectures

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.

Unit I

1. **Introductions and Overview:**   **15**
   Lectures

   1.1   Introduction

   1.2   Basic technology, elementary data organization

   1.3   Data structure

   1.4   Data structure operation

   1.5   Notation and Concept of algorithm

   1.6   Complexity, time space tradeoff

   1.7   Introduction to Array

   1.8   Linear array

   1.9   Representation of linear array in memory

   1.10 Traversing linear array

   1.11 Inserting and Deleting

   1.12 Searching methods (Binary and linear search)

Unit II

2. **Sorting and Linked list :**   **10**
   Lectures

   2.1   Selection sort

   2.2   Bubble sort

   2.3   Insertion sort

   2.4   Introduction to Linked list

2.5 Representation of Linked list in memory

2.6 Searching a linked list

2.7 Memory allocation, Garbage collection

2.8 Insertion and deletion in linked list

Unit III

3. Stacks, Queues, Recursion: **15**

Lectures

3.1 Introduction

3.2 Stacks

3.3 Array representation of stacks

3.4 Arithmetic expression

3.5 Recursion

3.6 Queues :Memory Representation, Insertion, Deletion

3.7 Deques

3.8 Priority queue

Unit IV

4. Tree: **10**

Lectures

4.1 Introduction

4.2 Terminology of Binary tree

4.3 Types of Binary tree

4.4 Traversing of binary tree

4.5 Header Nodes, Threads

4.6 General Tree Introduction

References:-

1. Data Structure, By Seymour Lipschutz (Schaum's Ouline Series Incomputers) – Mcgraw Hill.

2. An Introduction To Data Structurewith Application By Jeanpaul, Tremblay Paul, G. Sorenson (Tatamcgraw Hill)

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	RDBMS
Subject Code	BCA- 403
Marks	75 Marks
Lectures	50 Lectures

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.

UNIT – I

1. Introduction and Basic Concepts   10 Lectures

1.1 Introduction to RDBMS

1.2 Characteristics of RDBMS

1.3 Applications and Advantages of RDBMS

1.4 Data models – Entity Relationship (ER), Mapping ER Model to Relational Mode, Network.

1.5 Relational and Object Oriented Data Models

UNIT - II

2. SQL Statements & Working with Tables   15 Lectures

2.1 Introduction to SQL

2.2. SQL Commands and its types (DDL, DML, DQL, DCL, Transaction Control Commands)

2.3 Data types in SQL

2.4 Creating Tables, Selecting from tables, WHERE Clause

2.5 Selecting from tables, DISTINCT Clause, Column aliasing

2.6 Manipulation Table data

2.7 Altering Table structure

2.8 Data Constraints: Unique, Not Null, Primary Key, Foreign Key, Check, Default Constraint

UNIT - III

3. Operators & SQL Functions & Views   15 Lectures

3.1 Arithmetic Operators, Relational Operators

3.2 Comparison Operators BETWEEN, IN, LIKE, IS NULL

3.3 LOGICAL Operators: AND OR NOT

3.4 SQL Functions: Single, Multiple Row Functions

3.5 Single Row Character, Single Row Number, Single Row Date, Single Row Conversion, Single Row General Functions

3.6 Multiple Row Functions

3.7 Views

UNIT - IV

4. Sorting, Grouping, Joining and PL/ SQL   10 Lectures

4.1 Introduction to Sorting

4.2 Order by Clause, Group by Clause

4.3 Join, Types of Join: Equi Joins, Non Equi Join, Outer Join: Left, Right, Full, Self Join, Cross Join, Joining three tables

4.4 Subqueries & its types

4.5 Overview of PL / SQL

         4.5.1 Declarations Section

         4.5.2 Executable Commands Section

         4.5.3 Exception Handling Section

References:

3. Database System Concepts by Sudarshan, Korth (McGraw-Hill Education)

4. An introduction to Database System – Bipin Desai, Galgotia Publications

5. Database System: concept, Design & Application by S.K.Singh (Pearson Education)

6. Database Modeling and Design: Logical Design by Toby J. Teorey, Sam S. Lightstone, and Tom Nadeau, 4thEdition, 2005, Elsevier India Publications, New Delhi

7. SQL, PL/SQL the programming language of ORACLE 4th Edition by Ivan Bayross ISBN-81-7656964-X

8. "Oracle Database 10g PL/SQL Programming" by Scott Urman , Ron Hardman, MichaleMc Laughlin, Oracle Press, TMH, ISBN-0-07-059779-0.

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	Operational Research
Subject Code	BCA-404 A
Marks	75 Marks
Lectures	50 Lectures

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.

UNIT – I

1. Introduction   **06**

Lectures

1.1 Concept and significance of operations research

1.2 Evolution of operations

1.3 Steps in designing operations research

1.4 Operations research models.

UNIT - II

2. Linear Programming Problem (LPP)   **15**

Lectures

2.1 Meaning, Assumptions, and characteristics of LPP.

2.2. Application of Linear Programming Technique

2.3 Formulation of LPP- Solution by Graphical method and simplex method

UNIT - III

3. Decision Theory   **15**

Lectures

3.1 Anatomy of Decision theory.

3.2 Decision models

3.3 Probabilistic Decision models

3.4 Maximum Likelihood Rule.

3.5 Expected Payoff Criterion-competitive Decision Models Maxmin, Minimax, Savage, Hurwicz,Laplace Decision Models.

UNIT - IV

4. Network Analysis 14
Lectures

4.1 Introduction to PERT and CPM

4.2 Application areas of PERT and CPM

References:

1. Agarwal, J.D. and Sagarika Ghosh: Quantitative Techniques for Financial Analysis, Indian Institute of Finance, New Delhi.

2. Billy, E. Gillett: Introduction to Operations Research – A Computer Oriented Algorithmic Approach, Tata McGraw Hill Publishing Ltd. New Delhi.

3. Lucey, T: Quantitative Techniques, D.P. Publication, London.

4. Sharma SC, Sehenoy GV, Srivastava VK: Quantitative Techniques for Managerial Decision Making; Wiley Western Ltd. New Delhi.

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	Computer Graphics
Subject Code	Elective -BCA-404 B
Marks	75 Marks
Lectures	50 Lectures

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.

UNIT - I

1. Introduction to Computer Graphics   **14 Lectures**

1.1 Introduction-Definition

1.2 Application areas of Computer Graphics.

1.3 Advantages of computer graphics.

1.4 Graphical user interface.

1.5 Random scan displays, Raster scan displays

1.6 Display devices: Cathode Ray Tubes, Color CRT monitors, Direct View Storage Tube.

1.7 Plotter.

1.8 Joystick, light pen.

UNIT - II

2. Raster Scan Graphics and Transformation: **13**

Lectures

2.1 Introduction

2.2 Line, Line Segment

2.3 Line drawing algorithms –

        a. Digital Differential Algorithm,

        b. Bresenham's line algorithm

2.4 Two dimensional transformation

2.5 Matrix representation.

2.6 Translation.

2.7 Rotation.

2.8 Scaling.

2.9 Reflection

2.10   Shear

UNIT - III

3. Segmented Display Files and Clipping and Windowing: **13**

Lectures

3.1 Segment table.

3.2 Functions for segmenting display file

3.3 Posting & unposting segments

3.4 Segment naming scheme

3.5 Default error conditions

3.6 Appending to segments

3.7 Viewing transformation

3.8 2-D clipping

3.9 Simple visibility algorithm

   3.10   End point codes

   3.11   Midpoint subdivision algorithm

   3.12   Polygon clipping algorithm (Sutherland-Hodgman algorithm)

UNIT - IV

4. Geometric Models and Simple Graphics Package: 10 Lectures

4.1 Simple modeling example

4.2 Geometric modeling

4.3 Symbols & instances

4.4 Implementation of Instance transformation

4.5 Ground rules for graphics s/w design

4.6 Function domains

4.7 Graphics primitives

4.8 Windowing function

4.9 Example-a graph plotting program

4.10 Implementation of the functions

References:

1. Principle of Interactive Computer Graphics -Willam Newman&Robert Sproull (TMH)
2. Procedural Elements for Computer Graphics -David F. Rogers(TMH)
3. Computer graphics -A.P.Gogse

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	Logical Reasoning
Subject Code	BCA-405 B
Marks	75 Marks
Lectures	50 Lectures

Logical Reasoning Objectives

The objectives of studying Logical Reasoning, students will acknowledge the adequate problem solving and analytical skills needed. The person have enough problem solving skills will be able to understand the problem and immediately recognize the correct solution.

Logical Reasoning Outcomes

Understand the basic concepts of logical reasoning skills. Solve campus placements aptitude papers and various competitive exams.

UNIT – I

1. Series, Analogy and Classification   **13 Lectures**

1.1 Series: Types of series, Alphabet series, Alpha numeric series, Examples on continues pattern series.

1.2 Analogy: Completing the Analogous Pair, Direct/Simple Analogy, Choosing the Analogous Pair, Double Analogy, Number analogy, Alphabet analogy, Correlation between letters/numbers.

1.3 Classification: Choosing the odd word, choosing the odd numeral, choosing the odd letter group.

UNIT - II

2. Coding-Decoding   **12 Lectures**

2.1 Coding-Decoding: Letter coding, Direct Letter Coding, Number/Symbol Coding

2.2 Substitution: Concept of substitution, Problem solving by using substitution.

2.3 Deciphering: Deciphering messages word codes, Deciphering numbers/symbol codes for messages.

UNIT - III

3. Blood Relation   **12 Lectures**

3.1 Introduction to relations.

3.2 Concepts of deciphering relations based problems.

3.3 Problems on deciphering jumbled up descriptions.

3.4 Relation puzzle.

3.5 Coded relations.

UNIT - IV

4. Direction Sense Test   **13 Lectures**

4.1 Introduction.

4.2 Problems based on angular changes in direction.

4.3 Problems on Shadows.

4.4 General Problems based on Pythagoras Theorem.

References:

1. A Modern Approach to Verbal & Non-Verbal Reasoning by Dr.R.S Aggarwal ,S. Chand and Company Publications.

2. Test of Reasoning byEdgar Thorpe, McGraw Hill Education Publications.

Name of Course	Bachelor of Computer Application (BCA)
Semester	IV
Name of Subject	Lab-Course : JAVA Programming
Subject Code	BCA-406
Marks	50 Marks

1) Program to demonstrate Java programming Structure.

2) Program to demonstrate use of different data types.

3) Program to demonstrate Use of Scope Resolution Operator.

4) Program to demonstrate Use of arrays.

5) Program to demonstrate Use of conditional statements.

6) Program to demonstrate Use of looping statements.

7) Program to demonstrate Use of 'this' Keyword

8) Program to demonstrate the concept of Method Overloading

9) Program to demonstrate the concept of static members.

10) Program to demonstrate the concept of constructor.

11) Programs to demonstrate different types of inheritance present in Java

12) Program to demonstrate the concept of Method Overriding.

13) Program to demonstrate Final variable, Method and Final Class.

14) Program to demonstrate defining and implementing interface.

15) Program to demonstrate creating and accessing package.

16) Program to demonstrate concept of exception.

17) Programs to demonstrate different string classes.

18) Program to create Applet.

19) Program to demonstrate Applet param-tag.

20) Program to demonstrate reading from and writing in to the files.

Name of Course	BCA SECOND YEAR
Semester	IV Semester
Name of Subject	Lab-Course : RDBMS
Subject Code	BCA-407
Marks	50 Marks

1) What is SQL? Types of SQL Commands

2) Study of Datatypes in ORACLE

3) Creating Tables & Retrieving, Manipulating Data from tables

4) Study of Altering Tables in ORACLE

5) Study of Data Constraints in ORACLE

6) Study of Operators

7) Study of SQL Functions

8) Study of Views in ORACLE

9) Study of Joining Tables in ORACLE

10) Study of Subqueries in ORACLE

11) Study of in PL/SQL Blocks in ORACLE