Structure & Syllabus for Semester-III

BACHELOR OF COMPUTER APPLICATIONS (BCA) Programme

Gujarat University

2024 - 2025

As per NEP 2020 CURRICULUM AND CREDIT FRAMEWORK FOR UNDERGRADUATE PROGRAMMES, UGC

&

Resolution No. KCG/admin/2023-24/0607/kh.1

of

Education Department, Govt. of Gujarat

STRUCTURE FOR SEMESTER - 3
GUJARAT UNIVERSITY
Bachelor Of Computer Applications (B.C.A.)
(as per NEP 2020)

COURSE:	**Bachelor Of Computer Applications (B.C.A.)**
MAJOR:	**COMPUTER APPLICATIONS**

SEMESTER - 3

MAJOR

CODE	COURSE	CREDITS
DSC-C-BCA-231T	Operating System Concepts	4
DSC-C-BCA-232T	Object Oriented Concepts using Java	4
DSC-C-BCA-233P	Object Oriented Concepts using Java Practical	4

INTER DISCIPLINARY / MULTI DISCIPLINARY

(1 Theory and 1 Practical Course has to be chosen. Courses can be chosen from Basket)

CODE	COURSE	CREDITS
IDC-BCA-234T	Cloud Accounting	2
IDC-BCA-234T	Ecommerce Technologies	2
IDC-BCA-235P	Data Analysis Using Tableau	2
IDC-BCA-235P	Graphics and Animation	2

ABILITY ENHANCEMENT COURSE ()

AEC-BCA-236	(Any ONE Course to be selected from the Basket)	**2**

SKILL ENHANCEMENT COURSE

(Any ONE Course. Course can also be chosen from Basket)

SEC-237	Multimedia and Animation	**2**
SEC-237	Google Data Analytics	**2**

COMMON VALUE ADDED COURSES

VAC-BCA-238	(Any ONE Course to be selected from the Basket)	**2**

TOTAL CREDITS 22

Semester – III

BACHELOR OF COMPUTER APPLICATIONS

MAJOR : COMPUTER APPLICATION

Course Name: Operating System Concepts

Course Code: DSC-C-BCA-231T

Credits: 4

Course Outcomes:

On the completion of the course students will:

1. Know the components of an operating system
2. Understand the basics of process management and memory management.
3. Know the concepts of I/O and file systems
4. Provide information about the functions and roles of each of the components of the operating system.

Prerequisites:

Basic Knowledge of computers.

UNIT	TOPIC/SUBTOPIC	TEACHING HOURS	Credits
1	**Introduction to Operating System and Memory Management** • Introduction to Operating System o What is Operating System? o Operating system software o Types of Operating System • Memory Management: Early System o Single User Contiguous Scheme o Fixed Partitions o Dynamic Partitions o Allocation and deallocation methods o Relocatable Dynamic Partitions • Memory Management: Virtual Memory o Paged Memory Allocation o Demand Paging o Page Replacement Algorithms ▪ First In First Out ▪ Least Recently Used o Segmented Memory allocation o Segmented/Demand Paged Memory allocation o Virtual Memory	10	01
2	**Processor Management** • Job Scheduler, Process Scheduler, • Job and Process Status • Process Control Block • Process Scheduling Policies • Process Scheduling Algorithms: (Examples to be done with or without Arrival time) First Come First Serve, Shortest Job Next, Priority Scheduling, ShortestRemaining Time, Round Robin	10	01

3	**Deadlock and Process Synchronization**	**10**	**01**

- Deadlock
  - o Seven cases for deadlock
  - o Conditions for Deadlock
  - o Strategies for handling Deadlocks
  - o Starvation(Dining Philosophers Problem)

- Process Synchronization
  - o What is parallel Processing?
  - o Typical Multi processing configurations
  - o Process Synchronization Software-test and set, Wait & Signal
  - o Semaphores
  - o Process Cooperation- Producers and consumers

4	**Device Management and File Management**	**10**	**01**

- Device Management
  - o Types of System Devices
  - o Components of I/O Subsystem
  - o Communication among devices
  - o Management of I/O requests
  - o Device Handler Seek Strategies
    - ▪ FCFS
    - ▪ SSTF
    - ▪ Elevator(Look)

- File Management
  - o The File Manager
  - o Physicals to rage allocation
  - o Data Compression
  - o Access Control Verification module

Text Book :

Operating Systems
Publication: Cengage learning By Flynn/McHoes,

Reference Books:

1. OperatingSystemsConceptsPublication:PearsonHigherEducationBySilberschatz,Galvin&Gagne
2. OperatingSystems:InternalsandDesignPrinciples,5/EPublication:PearsonHigherEducation By William Stallings

Web Resources:

https://www.tutorialspoint.com
http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir/
https://users.dimi.uniud.it/~antonio.dangelo/OpSys/materials/Operating_System_Concepts.pdf
www.studytonight.com/operating-system/cpu-scheduling
https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/5_CPU_Scheduling.html
http://www2.latech.edu/~box/os/ch05.pdf

Course Name: Object Oriented Concepts with Java

Course Code: DSC-C-BCA-232T

Credits: 4

Course Outcomes:

On the completion of the course, students will:

1. Understand Object Oriented Programming concepts , platform independence and the java programming.
2. Understand the concepts of Class, Encapsulations, Inheritance, Polymorphism, Interface, Package, String, Exception handling and Multi-threading.

Prerequisites:

Basic Knowledge of DOS prompt, computer skills such as saving files in multiple versions and formats.

UNIT	TOPIC/SUBTOPIC	TEACHING HOURS	Credits
1	**Java Introduction** •Principles of Object oriented language • Java Essentials • Java Virtual Machine • Java Features • Program Structure • Java Improvements • Difference between Java and C++ • Installation of JDK 1.7 • Integrated Development Environment **Java Programming constructs** • Variables • Primitive Data Types • Identifier • Literals • Operators • Expressions • Precedence Rules and Associativity • Primitive type conversion and casting • Flow of Control **Classes and Objects** • Class, Objects, Class declaration in java, Creating Objects • Methods, Constructors, Cleaning Up Unused Objects • Class Variable and Methods - Static Keyword • this keyword	**15**	**01**
2	**Arrays** • One dimensional, Two dimensional • Using For..each with array • Passing arrays to methods and returning arrays from method • command line arguments **Inheritance** • Deriving classes using extends keyword • Overriding Method • super keyword, final keyword • Abstract class **Interface** • Variables in Interface • Extending Interfaces • Interface vs Abstract class	**15**	**01**

	Package • Creating Packages, Using Packages, Access Protection • java.lang Package • java.lang.Objects class	**15**	**01**
3	**Wrapper classes** • java.wrapper classses		
	String • String class • String Buffer Class		
	Exception Handling • Exception – Introduction • Exception Handling Techniques • User Defined Exception	**15**	**01**
4	**Multithreading** • Introduction - Multithreading in java • java.lang.Thread • Main Thread • Creation of new Threads • Thread State in java • Thread Priority • Multithreading using isAlive() and join( )		

Text Book :

Programming in Java, Oxford Publication
By Sachin Malhotra and Saurabh Choudhary

Reference Books:

1. Programming in Java 2, Jaico publishing House
   By Dr. K. Somasundaram
2. The Complete Reference Java2, TMH Publication
   By Herbert Schildt

Web Resources:

1. docs.oracle.com/javaee/6/tutorial/doc/girgm.html
2. docs.oracle.com/javaee/6/tutorial/doc/bnagi.htm
3. www.javatpoint.com/java-tutorial
4. www.tutorialspoint.com/java/index.htm
5. www.w3schools.com/java/
6. www.programiz.com/java-programming
7. www.geeksforgeeks.org/java/

Required Softwares:

1. Any editor of Windows or Linux/UNIX.
2. JVM version 1.8

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Course Name: Object Oriented Concepts with Java Practical

Course Code: DSC-C-BCA-233 P

Credits: 4

Course Outcomes:

On the completion of the course practically students will:

1. Understand the java programming and Object Oriented Programming concepts.
2. Understand the concepts of Interface, Exception handling, Multithreading, and Package.

Prerequisites:

Basic computer skills, such as saving files in multiple versions and formats.

UNIT	TOPIC / SUB TOPIC	TEACHING HOURS	Credits
1	**Java Introduction**	**30**	**01**
1	Write a program to evaluate simple interest of a given principle, rate and time.		
2	A motor cycle dealer sells two-wheelers to his customer on loan, which is to be repaid in 5 years. The dealer charges simple interest for the whole term on the day of giving the loan itself. The total amount is then divided by 60(months) and is collected as equated monthly installment (EMI). Write a program to calculate the EMI for a loan of Rs. X, where X is given from command line argument. Print the EMI value in rupees		
3	A car accessories shop assigns code 1 to seat covers, 2 to steering wheel covers , 3 to car lighting and 4 for air purifiers. All other items have code 5 or more. While selling the goods, a sales tax of 2% to seat covers ,3% to steering wheel covers, 4% to car lighting, 2.5% to air purifiers and 1.2% for all other items is charged. A list containing the product code and price is given for making a bill. Write a java program using switch statements to prepare a bill.		
4	Write a java program to scan 3 integer values from the command line argument and display the maximum number using conditional operator.		
5	Write a program to calculate the hypotenuse of right angled triangle when other sides of the triangle are given. (Hypotenuse = square root (x*x + Y *Y))		
6	Write a program to calculate the area of square and rectangle by overloading the area method.		
7	Create a complex number class. The class should have a constructor and methods to add, subtract and multiply two complex numbers and to return the real and imaginary parts.		

8	A shop during festival season offers a discount 10% for purchase made up to Rs.1,000,12% for purchase value of Rs.1,000 or more up to Rs 1,500 and 15% for purchase value of Rs.1,500 or more. Write a program to implement the above scheme for a given sales and print out the sales and print out the sales value, discount and net amount payable by a customer. Create necessary methods and constructors.		
9	A bank gives 6.5% per annum interest on deposits made in that bank. Write a program to calculate the total amount that a person will receive after the end of 5 years for a deposit of Rs.5000 for compound interest. Create necessary methods and constructors too		
10	Write a java program to display powers of 2 i.e. 2,4,8,16 etc up to 1024 using bitwise operators		
2	**Array, Inheritance and Interface**	**30**	01
1	Write a program to sort the elements of one dimensional array. Read value of array elements through command line argument.		
2	Write a program to create an array to store 5 integer values. Also initialize the array with 5 numbers and display the array Elements in reverse order.		
3	Write a program to find sum of two matrices of 3 x3.		
4	Write program to create an array of company name and another array of price quoted by the company. Fetch the company name who has quoted the lowest amount.		
5	Write an interface called numbers, with a method in Process(int x, int y). Write a class called Sum, in which the method Process finds the sum of two numbers and returns an int value. Write another class called Average, in which the Process method finds the average of the two numbers and returns an int.		
6	Create a class called NumberData that accept any array of the five numbers. Create a sub class called Numplay which provides methods for followings: 1. Display numbers entered. 2. Sum of the number. 3. Average of the numbers. 4. Maximum of the numbers. 5. Minimum of the numbers. Create a class that provides menu for above methods. Give choice from the command-line argument.		
7	Declare an abstract class Vehicle with an abstract method named numWheels().provide subclasses Car and Truck that each implements this method. Create instance of these subclasses and demonstrate the use of this method		

8	Write an interface called Exam with a method Pass(int mark) that returns a Boolean. Write another interface called Classify with a method Division(int average) which returns a string. Write a class called Result which implements both Exam and Classify. The pass method should return true if the marks is greater than or equal to 35 else false. The division method must return “First” when the parameter average is 60 or more, “second” when average is 50 or more but below 60, “no division” when average is less than 50.		
9	Create class calculation with an abstract method area( ). Create Rectangle and Triangle subclasses of calculation and find area of rectangle and triangle.		
10	The abstract Vegetable class has four subclasses named cabbage, carrot and potato. Write an application that demonstrates how to establish this class hierarchy. Declare one instance variable of type string that indicates the color of a vegetable. Create and display instances of these object. Override the toString() method of object to return a string with the name of the vegetable and its color.		
3	**Package, String and Wrapper Classes**	30	01
1	Create a package P and within that package create class PackClass which have method called findmax( ) which find maximum value from three numbers. Now import the package within another class DemoClass and now display the maximum number.		
2	Write a program that creates three different classes in three different packages and access them from default package. All the three packages should be at the same level.		
3	Create package pack1 within this package create class A which contains one instance variable and one instance method. Create another package pack2 within this package create class B. where class B is calling the method and variable of class A		
4	Write a java program to create two packages namely SUMPACKAGE and MULPACKAGE. Each of these packages contains these two methods **setdata()**:- to set values of data members **calc_data()**:- to calculate and display sum and product of two numbers. Both the packages should be at same level.		
5	Write a program that accepts a string from command line and perform following operations: 1. Display each character on separate line in reverse order. 2. Count total number of characters and display each character's position too. 3. Identify that whether the string is palindrome or not. Count total number of uppercase and lowercase characters in it.		

6	Write a program that takes a string from the user and validate it. The string should be at least 5 characters and should contain at least one digit. Display an appropriate valid message.		
7	Write a java program to store a string STR = "**Hello, Good Morning**".Find and display the length of the string. Replace the word "**Morning**" by **"Evening**" and display the new string (use StringBufffer class)		
8	Write a java program to convert an integer number into its binary and octal equivalent.		
9	Write a java program to accept a string from user and perform the following menu driven operations(using methods of String class) 1.Display string in uppercase 2.Display string in lowercase 3.Check for equality with another string 4.Display substring from a given string		
10	Write a java program that takes a string from user and display its capacity Append a new string to existing string and display string capacity after appending.		
4	**Exception Handling and Multithreading**	30	01
1	Write a Java program to input n integer numbers and display lowest and second lowest number. Also handle the different exceptions possible to be thrown during execution.		
2	Write an application that accepts marks of three different subjects from user. Marks should be between 0 to 100, if marks of any of the subject do not belong to this range, generate custom exception out of **RangeException**. If marks of each subjects are greater than or equal to 40 then display message "PASS" along with percentage, otherwise display message "FAIL". Also write exception handling code to catch all the possible runtime exceptions likely to be generated in the program.		
3	Write a program which takes the age of 5 persons from command line and find the average age of all persons. The program should handle exception if the argument is not correctly formatted and custom exception if the age is not between 1 to 100.		
4	Write an application that converts between meters and feet. Its first command- line argument is a number and second command line argument is either "centimeter" or "meter". If the argument equals "centimeter" displays a string reporting the equivalent number of meters. If this argument equals "meters", display a string reporting the equivalent number of centimeter. If unit is not given properly then generate custom exception Unitformatexception. If first argument is not proper format then generate numberformatexception. Generate other exception as per requirements. (1 meter=100 centimeter)		

5	Write a program that accepts 5 even numbers from command line , if any of the numbers is odd then throw custom exception OddException and count such invalid numbers.		
6	Write an application that starts two thread. First thread displays even numbers in the range specified from the command line and second thread displays odd numbers in the same range. Each thread waits for 300 milliseconds before displaying the next numbers. The application waits for both the thread to finish and then displays the message “Both threads completed”.		
7	Write a program that create and starts five threads. Each thread is instantiated from the same class. It executes a loop with ten iterations. Each iteration displays the character 'x' and sleep for 500 milliseconds. The application waits for all threads to complete and then display a message ‘hello’		
8	Write a java program to create 2 threads each thread calculates the sum and average of 1 to 10 and 11 to 20 respectively. After all thread finish, main thread should print message “ Task Completed”. Write this program with use of runnable interface.		
9	Create two thread. One thread print ‘fybca’ 4 times and another thread print ‘sybca’ 6 times. Set priority for both thread and when thread finished print ‘tybca’ from main.		
10	Write an application that starts two threads. Set priorities of both threads as 8 and 4 respectively. Each thread executes a loop with 5 iterations displaying its thread name. Demonstrate the execution of a high priority thread and how it delays the execution of low priority thread.		

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Reference Book:

1. Programming in Java 2
   Jaico publishing house
   By Dr. K.Somasundaram
2. The Complete Reference
   Java2 TMH Publication
   By Herbert Schildt

Web Resources:

1. docs.oracle.com/javaee/6/tutorial/doc/girgm.html
2. docs.oracle.com/javaee/6/tutorial/doc/bnagi.htm
3. www.javatpoint.com
4. www.tutorialspoint.com

Required Software's:

1. Any editor of Windows or Linux/UNIX.
2. JVM version 1.8