MANGALORE UNIVERSITY

State Education Policy – 2024
[SEP-2024]

CURRICULUM STRUCTURE

FOR

BCA

BACHELOR OF COMPUTER APPLICATIONS

MANGALORE UNIVERSITY

Suggested Programme Structure for the Under Graduate Programmes

[BCA, BCA (A.I & M.L), BCA (D.A)]

Semester	Course 1	Course 2	Course 3	Elective / Optional	Course	Language	Compulsory	Total Credit	Total Working hour
I	5 (3T+2P)	5 (3T+2P)	5 T			3+3	2	23	4+4+4+4+5+4+4+2=31
II	5 (3T+2P)	5 (3T+2P)	5T			3+3	2	23	4+4+4+4+5+4+4+2=31
III	5 (3T+2P)	5 (3T+2P)	5T	2		3+3		23	4+4+4+4+5+4+4+2=31
IV	5 (3T+2P)	5 (3T+2P)	5T	2		3+3	2	25	4+4+4+4+5+2+4+4+2=33
V	8[(2x3T)+2P]	8[(2x3T)+2P]	8[(2x3T)+2P]				2	26	3+3+4+3+3+4+3+3+4+2=32
VI	3T	3T	3T		3T	Project work 12		24	3+3+3+3+24=36
Total Credits for the Programme								**144**	

Note:

- **Course1 and Course2: I to IV Semester: Theory 3 credits=4 contact hours & Practical 2 credits=4 contact hours**
- **Course3: I to IV Semester: Theory 5 credit=5 contact hours**
- **Course1, Course2 and Course3: V and VI Semester: Theory 3 credits=3 contact hours & Practical 2 credits=4 contact hours**
- **Elective/Optional: 2 credits=2 contact hours**
- **Languages: 3 credits=4 contact hours**
- **Compulsory: 2 credits=3 contact hours**

CURRICULUM STRUCTURE FOR III AND IV SEMETER BCA

Semester III								
Sl. No	**Course Code**	**TitleoftheCourse**	**Categoryof Courses**	**Teaching Hours per Week**	**SEE**	**IA**	**Total Marks**	**Credits**
1		**Language-I**	**Lang**	**4**	**80**	**20**	**100**	**3**
2		**Language-II**	**Lang**	**4**	**80**	**20**	**100**	**3**
3	**BCACACS301**	Database Management System	**Core**	**4**	**80**	**20**	**100**	**3**
4	**BCACACS302**	C# and Dotnet Framework	**Core**	**4**	**80**	**20**	**100**	**3**
5	**BCACACS303**	Computer Networks	**Core**	**5**	**80**	**20**	**100**	**5**
6	**BCACAPS304**	DBMS-Lab	**Practical**	**4**	**40**	**10**	**50**	**2**
7	**BCACAPS305**	C# and Dotnet Framework-Lab	**Practical**	**4**	**40**	**10**	**50**	**2**
8	**BCACAES301**	A) Open Source Tools B) Web Content Management System C) DEVOPS	**Elective**	**2**	**40**	**10**	**50**	**2**
Sub-Total				**31**	**520**	**130**	**650**	**23**

Semester IV								
Sl. No	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hours per Week**	**SEE**	**IA**	**Total Marks**	**Credits**
1		**Language-I**	**Lang**	**4**	**80**	**20**	**100**	**3**
2		**Language-II**	**Lang**	**4**	**80**	**20**	**100**	**3**
3	**BCACACS401**	Python Programming	**Core**	**4**	**80**	**20**	**100**	**3**
4	**BCACACS402**	Advanced JAVA and J2EE	**Core**	**4**	**80**	**20**	**100**	**3**
5	**BCACACS403**	Operating System Concepts	**Core**	**5**	**80**	**20**	**100**	**5**
6	**BCACAPS404**	Python Programming-Lab	**Practical**	**4**	**40**	**10**	**50**	**2**
7	**BCACAPS405**	Advanced JAVA and J2EE-Lab	**Practical**	**4**	**40**	**10**	**50**	**2**
8	**BCACAES401**	A) Distributed Computing B) Object Oriented Analysis & Design C) Digital Image Processing	**Elective**	**2**	**40**	**10**	**50**	**2**
9	**BCACASS401**	Basic Web Designing Skills.	**Compulsory**	**2**	**40**	**10**	**50**	**2**
Sub-Total				**33**	**560**	**140**	**700**	**25**

SEMESTER III

Program Name	**BCA-GENERAL**	Semester	**III**
Course Title	**Database Management System (Theory)**		
Course Code:	**BCACACS301**	No. of Credits	**03**
Contact hours	**52 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Understand the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and design ER diagrams for given real-world problems.
- Represent ER model to relational model and its implementation through SQL.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Understand the transaction processing and concurrency control techniques.

Unit	Description	Hours
1	**Database Architecture**: Introduction to Database system applications. Characteristics, Data models, Database schema, Database architecture, Data independence, Database languages, GUIs, and Classification of DBMS. **E-R Model**: E-R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, Roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E-R diagram.	**13**
2	**Relational Data Model**: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values. **Data Normalization**: Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	**13**

3	**Interactive SQL**: Table fundaments, oracle data types, CREATE TABLE command, Inserting data into table, Viewing Data in the table, sorting data in a table, Creating a table from a table, Inserting data into a table from another table, Delete operations, Updating the contents of a table, Modifying the structure of tables, Renaming tables, destroying tables, displaying table structure. **Data Constraints**: Types of data constraints, IO constraints-The PRIMARY KEY constraint, The FOREIGN KEY constraint, The UNIQUE KEY constraint, Business Rule Constraints- NULL value concepts NOT NULL constraints, CHECK constraint, DEFAULT VALUE concepts. **Computations on Table Data**: Arithmetic Operators, Logical Operators, Range Searching, Pattern Matching, Oracle Table – DUAL, Oracle Function- Types, Aggregate Function, Date Conversion Function. GROUPING DATA FROM TABLES IN SQL, Group By clause, Having clause, subqueries, JOINS, Using the UNION, INTERSECTION, MINUS clause	**13**
4	**Introduction To PL/SQL**: Advantages of PL/SQL, The Generic PL/SQL Block, PL/SQL The character set, Literals, PL/SQL datatypes, variables, Logical comparisons, comments. Control Structure - Conditional Control, Iterative Control **PL/SQL Transactions**: Cursor-Types of Cursors, Cursor Attributes. Explicit cursor- Explicit cursor Management, cursor for loop **PL/SQL Database Objects**: Procedures and Functions, Oracle Packages, Trigger, Error Handling in PL/SQL.	**13**

Text Book:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. Oracle and PL/SQL by Ivan Bayross, BPB publications.

Reference Books:

1. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
2. Introduction to Database System, C J Date, Pearson, 1999.
3. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S. Sudarshan, 6th Edition, McGraw Hill, 2010.
4. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/
Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA- GENERAL**	Semester	**III**
Course Title	**C# and Dotnet Framework (Theory)**		
Course Code:	**BCACACS302**	No. of Credits	**03**
Contact hours	**52 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes (COs):

At the end of the course, students will be able to:

- To learn about basic features .NET Framework.
- To understand concepts about C#
- To create an ASP.NET application using standard .NET Controls
- To learn about connecting data sources using ADO.NET and managing them.

Unit	Description	Hours
1	**Overview of .NET Framework and Introduction to C#:** Origin of .Net Technology, .NET Framework, Components of the .NET Framework, Common Language Runtime (CLR), Common type system, Common Language Specifications (CLS), Managed code and assemblies, Intermediate Language (IL) and Just-In-Time (JIT) Compilation, .NET Framework of base Classes, Visual Studio.Net, Benefits of .NET approach# and .Net **Introduction to C#:** Overview of C# language features, Namespaces, Structure of a C# program, Literals, Variables and Datatypes, Operators and expressions, Decision making and branching, Decision making and looping, Methods and Strings.	13
2	**Classes and Objects in C#:** Defining Class, Adding members and methods, member access modifiers, Accessing class members, Constructors, types of constructors in C#, constant members and read only members **Inheritance and Polymorphism:** Defining subclass, visibility control, Sub class constructors, Multilevel inheritance, Method overriding, Abstract classes, Operation Polymorphism, Interfaces- implementing interfaces Delegates- Delegate declaration, delegate methods, Delegate instantiation, Delegate invocation, Managing errors and exceptions	13
3	**Graphical user interface with Windows forms:** Visual Studio.net, Components of Visual Studio, Introduction to Windows forms, event handling, simple event driven GUI, control properties and layout, anchoring & docking, windows form controls: Label, Textbox, Buttons, groupbox, panel, checkbox, Radio Buttons, Picture box, Tooltips, NumericUpDown control, Mouse and Keyboard Event Handling. Creating	13

	Menus, Month Calendar Control, Datetime Picker Control, Linked Label control, Listbox, Checked Listbox, Combo Box control. Creating MDI forms, MDI parent and child forms. User Defined Controls	
4	**ADO.NET database Programming with C#:** Overview of ADO.NET, Data providers and their classes, ADO.NET datasets, working with data sources and datasets, handling data errors, working with data bound controls binding textbox and combo box to data source, working with data GridView control, working with connection, command and data reader objects **Web based Application on .NET** - ASP.net, Standard web controls – Text, Button, Hyperlink, dropdownlist & image. Validation Controls. Creating simple web application using ASP.NET	13

Text Books

1. E Balagurusamy Programming in C#, A Premier, Third Edition
2. C# 2010 for Programmers Paul Deitel and Harvey Deitel Fourth Edition
3. ADO.NET database programming with C#, Anne Boehm, & Ged Mead

Reference Books:

1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
3. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/
Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA- GENERAL**	Semester	**III**
Course Title	**Computer Networks (Theory)**		
Course Code:	**BCACACS303**	No. of Credits	**05**
Contact hours	**60 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

Unit	Description	Hours
1	**Introduction:** Uses of Computer Networks and its Applications- Business Applications, Home Applications, Mobile Users, Social Issues. **Network Hardware**-Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network software **Reference Models**-The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP Reference Models.	**15**
2	**The Physical Layer**: Transmission Media-Twisted Pair, Coaxial Cable, and Fiber Optics. Wireless Transmission-Radio Transmission, Microwave Transmission, Infrared, Light Transmission. Multiplexing- Frequency division, time division. **The Data Link Layer**: Data link layer design issues - Services Provided to the Network Layer, Framing, Error Control, and Flow Control. Error Detection and Correction-Error-Correcting Codes, Error – Detecting Codes.	**15**
3	**The Network Layer**: Network layer design issues-Store- and-Forward Packet Switching, Services Provided to the Transport Layer, implementation of Connectionless Service, Implementation of Connection-Oriented Service. Routing Algorithms-Flooding, Distance Vector Routing, Link State Routing, Approaches to Congestion Control, The IP Version4 Protocol, IP Address, IP Version 6.	**15**

4	**The Transport Layer:** The Transport Service-Services Provided to the Upper Layers. Elements of Transport Protocols-Addressing, Connection Establishment, and connection Release. The Internet Transport Protocols-(TCP and UDP)-UDP-Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release. **The Application Layer**: DNS–Domain Name System-The DNS Name Space, Name Servers. Electronic Mail-Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery.	**15**

Text Book:

1. Computer Networks, Andrew S. Tanenbaum, 5thEdition, Pearson Education,2010.

Reference Books:

1. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata Mc GrawHill, 2001.
2. Data and Computer Communications, William Stallings, 10thEdition, Pearson Education, 2017.
3. Data Communication and Computer Networks ,Brijendra Singh, 3rd Edition, PHI, 2012.
4. Data Communication & ,Dr.Prasad, Wiley Dreamtech.

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**III**
Course Title	**DBMS-Lab**		
Course Code:	**BCACAPS304**	No. of Credits	**02**
Contact hours	**52 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

PART-A

1. Create a table EMPLOYEE using SQL command to store details of employees such as EMPNO, NAME, DESIGNATION, DEPARTMENT, GENDER and SALARY. Specify Primary Key and NOT NULL constraints on the table. Allow only 'M' or 'F' for the column GENDER. DEPARTMENT can be SALES, ACCOUNTS, IT. Choose DESIGNATION as CLERK, ANALYST, MANAGER, ACCOUNTANT and SUPERVISOR that depends on department

   Write the following SQL queries:

   a) Display *EMPNO, NAME* and *DESIGNATION* of all employees whose name ends with RAJ.
   b) Display the details of all female employees who is earning salary within the range 20000 to 40000 in SALES or IT departments
   c) List the different DEPARTMENTs with the DESIGNATIONs in that department.
   d) Display the department name, total, average, maximum, minimum salary of the DEPARTMENT only if the total salary given in that department is more than 30000.
   e) List the departments which have more than 2 employees.

2. Create a table CLIENT to store CLIENT_NO, NAME, ADDRESS, STATE, BAL_DUE. Client no must start with 'C'. Apply the suitable structure for the columns. Specify Primary Key and NOT NULL constraints on the table. Insert 10 records.

   Write the following SQL queries:

   a) From the table CLIENT, create a new table CLIENT1 that contains only CLIENT_NO and NAME , BAL_DUE from specified STATE. Accept the state during run time.
   b) Create a new table CLIENT2 that has the same structure as CLIENT but with no records. Display the structure and records.
   c) Add a new column by name PENALTY number (10, 2) to the CLIENT

d) Assign Penalty as 10% of BAL_DUE for the clients C1002, C1005, C1009 and for others 8%. Display Records
e) Change the name of CLIENT1 as NEW_CLIENT
f) Delete the table CLIENT2

3. Create a table BOOK using SQL command to store Accession No, TITLE, AUTHOR, PUBLISHER, YEAR, PRICE. Apply the suitable structure for the columns. Specify Primary Key and NOT NULL constraints on the table.Insert 10 records.

Write the following SQL queries:

a) List the details of publishers having 'a' as the second character in their names.
b) Display Accession No., TITLE, PUBLISHER and YEAR of the books published by the specified author before 2010 in the descending order of YEAR. Accept author during run time
c) Modify the size of TITLE to increase the size 5 characters more.
d) Display the details of all books other than Microsoft press publishers.
e) Remove the records of the books published before 1990.

4. Create a table SALES with columns SNO, SNAME, MNO , JOIN_DATE, DATE_BIRTH, SALARY,SALES_AMOUNT and COMMISSION. Minimum age for joining the company must be 18 Yrs. Default value for Commission should be 0. Apply the suitable structure for the columns. Specify Primary Key and NOT NULL constraints on the table. Insert 10 records with data except commission. Manager of Manager can be NULL.

Write the following SQL queries:

a) Display the details of Sales Persons whose salary is more than Average salary in the company.
b) Update commission as 20% of Sales Amount.
c) Display SNO, SNAME, MNO, SALARY, COMMISSION, MANAGER_SALARY of the sales persons getting sum of salary and commission more than salary of manager.(Self join)
d) Display the records of employees who finished the service of 10years

5. Create a table Sales_Details with the columns SNO, MONTH, TARGET and QTY_SOLD to store the Sales Details of one year. Specify the composite primary key to the columns SNO and MONTH. TARGET and SALES must be positive numbers.

Write the following SQL queries:

a) Display the total sales by each sales person considering only those months sales where target was reached
b) If a commission of RS.50 provided for each item after reaching target, calculate and display the total commission for each sales person.
c) Display the SNO of those who never reached the target.
d) Display the SNO, MONTH and QTY_SOLD of the sales persons with SNO S0001 or S0003

6. Create the following tables by identifying primary and foreign keys. Specify the not null property for mandatory keys.
SUPPLIERS(SUPPLIER_NO,SNAME,SADDRESS,SCITY)
COMPUTER_ITEMS(ITEM_NO,SUPPLIER_NO,ITEM_NAME, IQUANTITY) Consider three suppliers. A supplier can supply more than one type of items.

Write the SQL queries for the following:

a) List ITEM and SUPPLIER details in alphabetical order of city name and in each city decreasing order of IQUANTITY.
b) List the name ,city,and address of the suppliers who are supplying keyboard.
c) List the supplier name, items supplied by the suppliers 'Cats' and 'Electrotech'.
d) Find the items having quantity less than 5 and insert the details of supplier and item of these, into another table NEWORDER

7.Create the following tables by identifying primary and foreign keys, specify the not null property for mandatory keys.

PRODUCT_DETAIL				
P_NO	**PRODUCTNAME**	**QTYAVAILABLE**	**PRICE**	**PROFIT %**
P0001	Monitor	10	3000	20
P0002	Pen Drives	50	650	5
P0003	CD Drive	100	10	3
P0004	Key Board	25	600	10

PURCHASED_DETAIL		
CUSTNO	**P_NO**	**QTYSOLD**
C1	P0003	2
C2	P0002	4

C3	P0002	10
C4	P0001	3
C1	P0004	2
C2	P0003	2
C4	P0004	1

PART B

1. Create a table Bank with the columns ACNO, ACT_NAME, ACT_TYPE and BAL. Specify the Primary Key. Initial BAL must be greater than 500.

   Write a PL/SQL program to perform debit operation by providing acct_no and amount required. The amount must be greater than 100 and less than 20000 for one transaction. If the account exist and BAL-amount>500 Bank table must be updated, otherwise "NO SUFFFICIENT BALANCE" message should be displayed. If account number is not present then display "NO SUCH ACCOUNT" message to the user.

2. Create a table STOCK_DETAIL with the columns PNO, PNAME and QTY_AVL to store stock details of computer accessories. Specify Primary Key and NOT NULL constraints on the table. QTY_AVL should be positive number.

Write the following SQL queries:

a) Display total amount spent by C2.
b) Display the names of product for which either QtyAvailable is less than 30 or total QtySold is less than 5(USE UNION).
c) Display the name of products and quantity purchased by C4.
d) How much Profit does the shopkeeper gets on C1's purchase?
e) How many 'Pen Drives' have been sold?

Write a PL/SQL Program to define a user defined exception named "LOW_STOCK" to validate the transaction. The program facilitates the user to purchase the product by providing product number and quantity required. It should display an error message "NO SUFFICIENT STOCK" when the user tries to purchase a product with quantity more than QTY_AVL, Otherwise the STOCK_DETAIL table should be updated for valid transaction.

3. Write a PL/SQL program to compute the selling price of books depending on the book code and category. Use Open, Fetch and Close. The Book_detail table contains columns: Book Code, Author, Title, Category and Price. Insert 10 records. The selling price=Price-Discount.

The discount is calculated as follows:

Book Code	Category	Discount Percentage
A	Novels	10% of Price
	Technology	12.5% of Price
B	Commerce	18% of Price
	Science	19% of Price
C	Songs	25% of Price
	Sports	24% of Price
D	All	28% of Price

Print the result in tabular form with proper alignment

Book Code	category	title	author	price	discount %	discount amount	sell price
=====	========	=====	====	=====	=======	=====	

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4. Write a PL/SQL program to display employee pay bill (using Cursor For loop) Use a Procedure to receive basic pay and to compute DA, HRA, Tax, PF, Gross Pay and Net Pay(Use OUT). Base table contains the following columns empnum, empname, basic pay. Insert 3 records.

Allowances are computed as follows.

Basic Pay	DA	HRA
<=20000	35% of Basic	8% of Basic
>20000 & <=30000	38%	9%
>30000 & <=40000	40%	10%
>40000	45%	10%

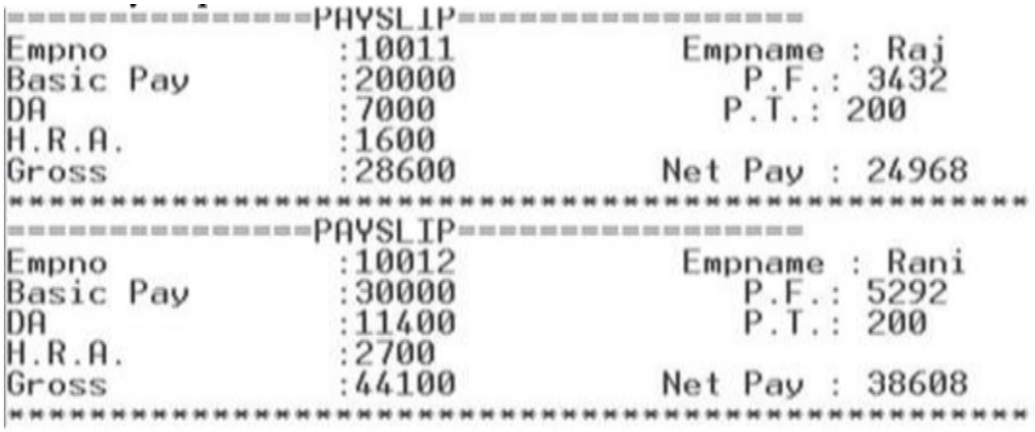
Gross=Basic+DA+HRA

PF=12% of Gross or Rs. 2000 whichever is minimum.

PT=Rs. 100 upto Gross is 25,000 else Rs. 200.

Net=Gross-(PF+PT)

Print Pay slip as follows



5. Given the following tables: ITEM_MASTER(itemno, name, stock, unit_price) [Apply the Primary key and check constraint for stock and price as >0] [Insert 5 records] ITEM_TRANS(itemno, quantity and trans_date)

   Create a **package** PCK_ITEM includes a function CHK_ITEM and a procedure PROC_ITEM.

   Function CHK_ITEM gets one argument itemno and is used to check whether the parameter itemno exists in ITEM_MASTER and should return 1 if exist. Otherwise 0 and displays proper message.

   Procedure PROC_ITEM gets two arguments itemno and quantity, and is used to perform the following if item exists. If required quantity is not available, give appropriate message. If available , insert a record of this transaction to ITEM_TRANS and modify the stock in ITEM_MASTER.

   Write a PL/SQL program to accept ITEM_NO and Quantity needed of required item. Use Package to do the transaction process(Transaction date can be current date). OUTPUT to be shown as follows:

```
Enter value for accept_itemno: 1
old   5:            X:=&accept_itemno;
new   5:            X:=1;
Enter value for quantity: 3
old   6:          M:=&quantity;
new   6:          M:=3;
Item :aa   Quantity  :3  Price  :15 Total Amount  :45
```

6. Create a package which includes a function to compute the factorial of a number, a procedure to compute the value of nCr, and another procedure to compute nPr both uses the factorial function. Execute the package program for the required calculation

7. Create a trigger to update the MASTER table when a record is inserted into SALES table and create another trigger to update the MASTER table when a record is inserted or updated or deleted in NEWSTOCK table. Assume the suitable columns for all the tables.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	**PART-A** **Writing:7 Marks Execution: 8Marks**	**15 Marks**
Program-2	**PART-B** **Writing:10 Marks Execution:10Marks**	**20 Marks**
Practical Record		**05 Marks**
Total		**40 Marks**

Program Name	**BCA-GENERAL**	Semester	**III**
Course Title	**C# and Dotnet Framework -Lab**		
Course Code:	**BCACAPS305**	No. of Credits	**02**
Contact hours	**52Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

PART A

1. Write a C# program to which reads a set of strings and then print the string having highest number of vowels.

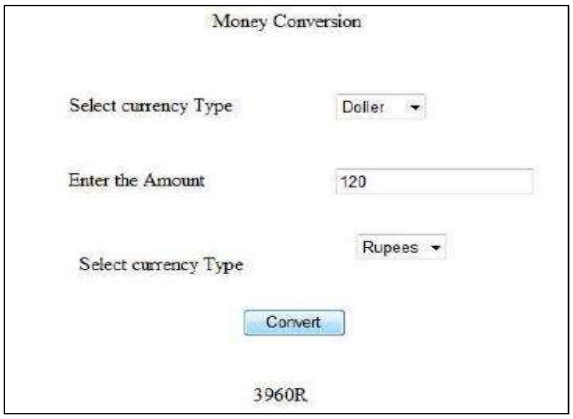
2. Write a C# program to create a lists Topics. The values are
   Topics ={"Introduction to C#", "Variables", "Data Types", "Loops", "If statements", "Jump Statements", " Class & Object", "Inheritance", "Constructors"}. Using switch case statements categorise the topics as "Basic", "Control Flow" and "OOPs Concepts"
   Sample Output:
   Topic is Introduction to C#;Category is Basic
   Topic is Variables ;Category is Basic
   Topic is Data Types; Category is Basic
   Topic is Loops; Category is Control Flow
   Topic is If Statements; Category is Control Flow
   Topic is Jump Statements; Category is Control Flow
   Topics is Class & Object; Category is OOPs Concept
   Topic is Inheritance; Category is OOPS Concept

3. Write a C# Sharp program to make such a pattern like a right-angled triangle with the number increased by 1.
   The pattern like :
   1
   2 3
   4 5 6
   7 8 9 10

4. Write a Program in C# to find addition and Multiplication operation on two complex number using operator overloading.

5. Create an application that allows the user to enter a number in the textbox named ‘getnum’. Check whether the number in the textbox ‘getnum’ is palindrome or not. Print the message accordingly in the label control named lbldisplay when the user clicks on the button ‘check’.

6. Design a Webpage of a Hotel which display different Menu as per the Time of Visit.
7. Write a program to perform money conversion

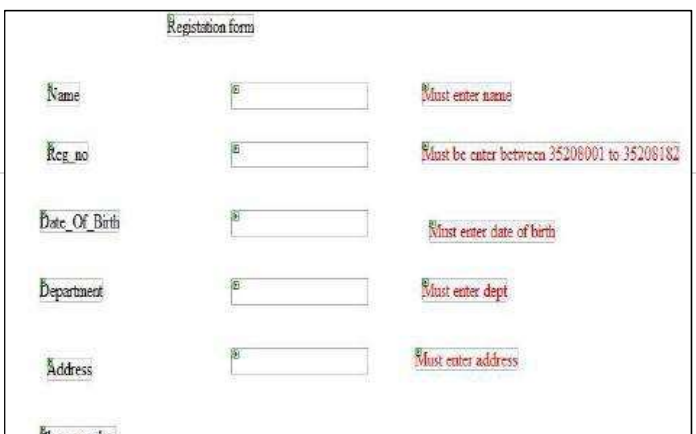


PART B

1. Create a web application that uses the AdRotator control to display a list of three advertisements using an XML file. Each ad must have an image, a navigation link, and alternate text. Also display one paragraph information about the advertisement below the AdRotator
2. Write a Program in C# define a Class "Salary" which will contain member variable Emp_no,Emp_name,Dob Basic Write a program using constructor. And method to calculate the DA, HRA, PF, IT, GROSS and NETPAY using appropriatecondition.

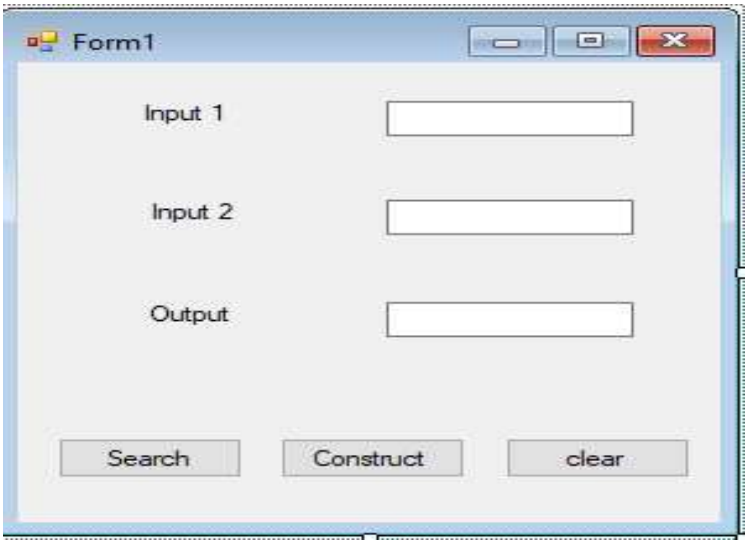
   If Basic <= 20000 D.A is 40% Basic H.R.A is 10% Basic.
   P.F 12% of Gross; PT is Rs .100
   If Basic.> 20000 D.A is 50% Basic. H.R.A 15% Basic.
   P.F 12% of Gross ; PT is Rs.150
   Gross = Basic.+D.A +HRA and Net = Gross -PT –PF

3. Write an application that receives the following information from a set of students: Student Id ,Student Name, Course Name, and Date of Birth. The application should also display the information of all the students once the data is Entered. Implement this using an Array of Structures.
4. Create a Web Form for Login Module which adds a Username and Password to the database. The username in the database should be a primary key
5. Design a Admission form with client-side validations



6. Design a webpage to enter Student information such as Student no, Student Name, marks in 3 subjects. Use the following buttons for,
    - Add -> for adding the record to the database (Insert at least 5 records). Calculate total, %, grade and store it.
    - Display – Display the records from the database

7. Create ASP .NET web application with the given user interface to input two strings(str1,str2) and performs two operations "Search" and Construct" by clicking respective buttons. The result of both operations shall be displayed on Output TextBox.
   SERACH: If the user clicks on "Search" button then appearance of str2 is searched in str1 and removed from str1. Also, the characters if str1, before and after str2 are concatenated together. Ignore the cases where there is no character in str1 before or after the str2.



Input and Outputs:
Sample1:

str1: hardmetalironissmoothwhenheatedhard
str2: hard
Output: metalironissmoothwhenheated

Sample2:
str1: mylifelessonsarebestlifequotes
str2: life
Output: mylessorsarebestquotes

CONSTRUCT: If user clicks on "Construct" button then the concatenation of first character of str1, the first character of str2, second character of str1, second character of str2 and so on.., is performed to create the new string. The remaining characters at the end of str1or str2 are concatenated to the end of the resultant string.

Input and Outputs:
Sample1:
str1: Welcome
str2: Csharp
Output: WCeslhcaormpe

CLEAR: clear button should clear all the TextBoxes.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	**PART-A** **Writing:7 Marks Execution: 8Marks**	**15 Marks**
Program-2	**PART-B** **Writing:10 Marks Execution:10Marks**	**20 Marks**
Practical Record		**05 Marks**
Total		**40 Marks**

Program Name	**BCA-GENERAL**	Semester	**III**
Course Title	**Open Source Tools (Elective)**		
Course Code:	**BCACAES301**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Understand the concept of Open-Source software.
- Know the benefits and challenges of using Open-Source tools.
- Use Open-Source tools for development and deployment.
- Make informed decisions about Open-Source tool selection.

Unit	Description	Hours
1	**Open Source Software:** **Open Source Tools**: Introduction to Open sources, Need of Open Sources, Open Source –Principles, Standard Requirements, Advantages of Open Sources. **Free Software** – FOSS **Licenses** – GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues **Application of Open Sources:** Open-Source Operating Systems: FEDORA, UBUNTU	**8**
2	**Programming Tools and Techniques:** i. Usage of design Tools like Argo UML or equivalent ii. Version Control Systems like Git or equivalent iii. Bug Tracking Systems (Trac, BugZilla) i. BootStrap	**8**
3	**Case Studies**: Apache ii. Berkeley Software Distribution iii. Mozilla (Firefox) iv. Wikipedia v. Joomla vi. GNU Compiler Collection vii. Libre Office	**10**

Text Book:

1. Kailash Vadera, Bhavyesh Gandhi, “Open-Source Technology”, Laxmi Publications Pvt. Ltd 2012, 2nd Edition.

Reference Book:

1. Fadi P. Deek and James A. M. McHugh, “Open Source: Technology and Policy”, Cambridge Universities Press 2007

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/
Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**III**
Course Title	**Web Content Management System (Elective)**		
Course Code:	**BCACAES302**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Understand content development basics.
- Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting ‘
- Host websites and develop content for social media platforms such as wiki and blog
- Understand e-publications and virtual reality
- Use of e-learning platform Moodle and CMS applications Drupal and Joomla

Unit	Description	Hours
1	**Web Content Management System**: Introduction, Types of CMS, Difference between WCMS and CMS, WCMS-Features, Advantages, Disadvantages, Types of WCMS, Content Types and Formats, Content Tools (Media-wise), Needs and Guidelines of Content Development.	**8**
2	**Static website and dynamic website**- Features, Differences; **Dynamic Web content sites :**Creating Dynamic Web Content, **Web Hosting and Managing Multimedia Content:** Types of web hosting-advantages and disadvantages, Importance of web hosting, features , steps to host a website; Multimedia content – Benefits, Best practices for creation of multimedia contents, Basic multimedia contents.	**8**
3	**WIKI SITE** – Characteristics, Working, Advantages; **Multilingual Content Development**- Key features, Advantages, Developing multilingual content, Creating multilingual content in WordPress, **Content Management System** – Joomla, WordPress, Drupal; **E- Publication Concept** – Introduction, models/approaches, categories, e-publishing tools.	**10**

Text Books:

1. Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker.
2. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
3. Using Joomla: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**III**
Course Title	**DEVOPS(Elective)**		
Course Code:	**BCACAES303**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Design and manage a scalable VDI environment, addressing challenges such as boot storms and hardware limitations.
- Apply various DevOps tools to streamline and automate the software development lifecycle, including infrastructure as code and deployment automation.
- Utilize cloud services (IaaS, PaaS, Hybrid Cloud) to enhance DevOps practices, enabling full-stack deployments and efficient resource management.
- Integrate DevOps with ALM processes to improve the development, deployment, and management of mobile and multi-tier applications, scaling Agile methodologies across the enterprise.
- Define the roles of executives and teams in setting DevOps goals, expanding Agile practices, leveraging test automation, and building efficient delivery pipelines.
- Critically analyze and debunk common myths about DevOps, highlighting its applicability across various industries, including ITIL shops, regulated industries, and large, complex systems.

Unit	Description	Hours
1	**Introduction to DevOps:** Business needs for DevOps, Business values for Devops, How DevOps works. **DevOps Capabalities:** Paths to DevOps Adoption, Plan, Devlop/Test, Deploy, Operate **Adopting DevOps:** Where to Begin, People in DevOps, Process in DevOps, Technology in DevOps	**8**
2	**Using Cloud in DevOps** Cloud as DevOps enabler, Full Stack Deployments, cloud service model for DevOps, Hybrid Cloud **Using DevOps to solve Challenges** Mobile applications, ALM processes, Scaling Agile, Multiple Tier Applications, DevOPs in the enterprise, Supply Chains, IOT.	**8**

3	**DevOps Case Study:** Executive's Role, putting together a team, setting DevOps Goals, Learning from the DevOps transformation, looking at the DevOps results. **DevOps Myths.** **Basics of DevOps tools:** Introduction to Git, Jenkins, Git hub, Docker, Kubernetes.	**10**

Text Books:

1. Real world DevOps Practices by B.Thangaraju Wiley publishers 2024.
2. "DevOps For Dummies" by Sanjeev Sharma & Bernie Coyne. 2nd IBM Limited edition.

Reference Books:

1. " The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology" by Gene Kim, Jez Humble, Patrick Debois, John Willis

2. " the Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win" by Kim, Behr, Spafford

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

SEMESTER IV

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Python Programming (Theory)**		
Course Code:	**BCACACS401**	No. of Credits	**03**
Contact hours	**52Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

Unit	Description	Hours
1	**Introduction to Features and Applications of Python**; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. **Python Basics**: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. **Python Control Flow**: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions. **Exception Handling**: Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; **Function Definition-** Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions	**13**
2	**Strings**: Creating and Storing Strings; Accessing String Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifies; Escape Sequences; Raw and Unicode Strings; Python String Methods. **Lists**: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. **Dictionaries:** Creating Dictionaries; Operations on Dictionaries; Built-in Functions	**13**

	on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. **Tuples and Sets**: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built in Functions on Sets; Set Methods.	
3	**File Handling**: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. **Object Oriented Programming**: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading. **GU Interface**: The Tkinter Module; Window and Widgets; Layout Management- pack, grid and place	**13**
4	**Python SQLite**: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records. **Data Analysis**: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary 13 and Tuples. Operations on DataFrames. **Data Visualization**: Introduction to Data Visualization; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart	**13**

Text Books:

1. Introduction to python programming by Gowrishankar S. and Veena A., CRC Press.
2. Core python programming by Dr. R. Nageswara Rao, Dreamtech.

Reference Books:

1. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
2. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015
3. Advance Core Python Programming, Meenu Kohli, BPB Publications, 2021.
4. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
5. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
6. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Advanced JAVA and J2EE(Theory)**		
Course Code:	**BCACACS404**	No. of Credits	**03**
Contact hours	**52Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes:

After the successful completion of the course, the student will be able to:

- Identify the need for advanced Java concepts like Enumerations and Collections
- Construct client-server applications using Java socket API
- Make use of JDBC to access database through Java Programs
- Adapt servlets to build server side programs
- Demonstrate the use of JavaBeans to develop component-based Java software

Unit	Description	Hours
1	**Enumerations, Autoboxing and Annotations**(metadata): Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at runtime by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations. **Java Beans:** Definition, Advantages of java beans, introspection, bound and constraint properties, persistence, customizers, java beans API,example	**13**
2	**The collections and Framework**: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working with Maps, Comparators. **MVC Architecture in Java**: What is MVC architecture in Java, Advantages of MVC Architecture, Implementation of MVC using Java, MVC Architecture Layers,	**13**
3	**String Handling** :The String Constructors, String Length, Special String Operations, StringLiterals, String Concatenation, String Concatenation with Other Data Types, StringConversion and toString() Character Extraction, charAt(), getChars(), getBytes() toCharArray(), String Comparison, equals() and equalsIgnoreCase(), regionMatches( )startsWith() and endsWith(), equals() Versus == , compareTo() Searching Strings,Modifying a String, substring(), concat(), replace(), trim(), Data Conversion Using valueOf(), Changing the Case of Characters Within a String, **Additional String Methods:-** StringBuffer, StringBuffer Constructors, length() and capacity(), ensureCapacity(),setLength(), charAt() and setCharAt(), getChars(), append(), insert(),	**13**

	reverse(), delete( )and deleteCharAt(), replace(), substring(), Additional StringBuffer Methods, StringBuilder. **RMI Distributed Applications**. How client and server communicate through remote objects. Object Persistence and Serialization, Introduction to Distributed Computing, RMI Architecture, Importance of RMI Registry, Developing Simple RMI application, Callback Implementation in RMI.	
4	**Background; The Life Cycle of a Servlet**; Using Tomcat for Servlet Development; A simpleServlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. **Java Server Pages** (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects **The Concept of JDBC**; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.	**13**

Text Books:

1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Operating System Concepts (Theory)**		
Course Code:	**BCACACS403**	No. of Credits	**05**
Contact hours	**60 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Understand the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

Unit	Description	Hours
1	**Introduction:** Operating System, Simple Batch Systems, Multi programmed Batched Systems, Time Sharing Systems, Real-Time Systems, Multi-processor Systems. **System Components, Operating System Services.** **File System:** File Concepts- Attributes, Operations and Types of Files; File Structure; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management.	**15**
2	**Memory Management:** Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging. Virtual Memory: Introduction to **Virtual Memory:** Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing **Disk Scheduling** (I/O Management): Introduction and Scheduling Algorithm	**15**
3	**Process:** Process Concept, Process Scheduling, Operation on Process, Cooperating Process. **Threads** (Thread Concept, Single and Multiple Threads, Benefits **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms: First Come First Serve, Shortest Job, Priority Scheduling, Round-Robin Scheduling, Multilevel Queue and Multilevel Feedback Queue Scheduling, Multiple-Processor Scheduling, Real-Time Scheduling	**15**

4	**Process Synchronization:** Introduction; Race Condition; Critical Section Problem, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining Philosophers Problem. **Deadlocks:** Deadlock Characterization, Methods of Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	**15**

Text Book:

1. Abraham Silberschartz and Peter Galvin, Operating System Concepts, 6th edition, TMH

Reference Books:

1. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
2. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
3. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
4. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
5. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Python Programming - Lab**		
Course Code:	**BCACAPS404**	No. of Credits	**02**
Contact hours	**52 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

PART-A

1. Write a program create list with N elements. find all unique elements in the list. If an element is found only once in the list, then add that element to the unique list.
2. Program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
3. Consider a tuple t1= (1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations:
    a) Print half the values of tuple in one line and the other half in the next line.
    b) Print another tuple whose values are even numbers in the given tuple.
    c) Concatenate a tuple t2= (11,13,15) with t1.
    d) Return maximum and minimum value from this tuple.

4. Write a function that takes a sentence as input from the user and calculates the frequency of each letter. Use a variable of dictionary type to maintain the count.
5. Write a function nearly equal to test whether two strings are nearly equal. two strings a and b are nearly equal if one character change in b results in string a.
6. Write a program to create a text file and compute the number of characters, words and lines in a file
7. Write a Pandas program to join the two given data frames along rows. Sample Data frame may contain details of student like rollno , name , Total Marks.

PART-B

1. Program to create a class Employee with empno, name, depname, designation, age and salary and perform the following function.
    i) Accept details of N employees
    ii) Search given employee using empno
    iii) Display employee details in neat format.

2. Write a program menu driven to create a BankAccount class. class should support the following methods for
    i) Deposit
    ii) Withdraw

iii) GetBalanace .

Create a subclass SavingsAccount class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest.

3.Create a GUI to input Principal amount, rate of interest and number of years, Calculate Compound interest. When button submit is pressed Compound interest should be displayed in a textbox. When clear button is pressed all contents should be cleared.

4.Write a GUI program to implement Simple Calculator

5. Create a table student table (regno, name and marks in 3 subjects) using MySQL/SQLite and perform the followings

   a. To accept the details of students and store it in database.
   b. To display the details of all the students
   c. Delete particular student record using regno.

6. Create a table employee (empno, name and salary) using MySQL/SQLite and perform the followings

   a. To accept the details of employees and store it in database.
   b. To display the details of a specific employee
   c. To display employee details whose salary lies within a certain range

7.Consider following data and draw the bar graph using matplot library.(Use CSV or Excel).

Batsman	**2017**	**2018**	**2019**	**2020**
Virat Kohli	2501	1855	2203	1223
Steve Smith	2340	2250	2003	1153
Babar Azam	1750	2147	1896	1008
Rohit Sharma	1463	1985	1854	1638
Kane Williamson	1256	1785	1874	1974
Jos Butler	1125	1853	1769	1436

Display appropriate title for axis and chart. Also show legends.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	**PART-A** **Writing:5 Marks Execution: 8Marks**	**15 Marks**
Program-2	**PART-B** **Writing:10 Marks Execution:10Marks**	**20 Marks**
Practical Record		**05 Marks**
Total		**40 Marks**

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Advanced JAVA and J2EE -Lab**		
Course Code:	**BCACAPS405**	No.of Credits	**02**
Contact hours	**52 Hours**	Duration of SEE/Exam	**3 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

PART-A

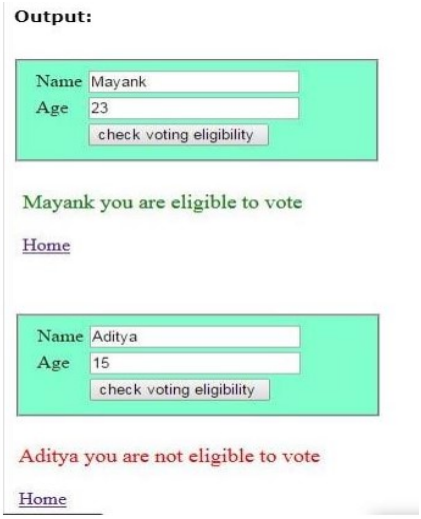
1. Write a program to convert numbers into words using Enumerations with constructors, methods and instance variables.(INPUT RANGE-0 TO 99999)

   EX: 36 THIRTY SIX

2. Find the second maximum and second minimum in a set of numbers using auto boxing and unboxing.
3. Write a menu driven program to create an Arraylist and perform the following operations
   i) Adding elements
   ii) Sorting elements
   iii) Replace an element with another
   iv) Removing an element
   v) Displaying all the elements
   vi) Adding an element between two elements
4. Write a java program to find words with even number of characters in a string, then swap the pair of characters in those words and also toggle the characters in a given string
   EX: Good Morning everyone
   Output: oGdo vereoyen
   gOOD mORNING EVERYONE

5. Write a Servlet program that accepts the age and name and displays if the user is eligible for voting or not

Output:



6. Write a JSP program to print first 10 Fibonacci and 10 prime numbers.
7. Write a java Servlet program to Download a file and display it on the screen(A link has to be provided in HTML, when the link is clicked corresponding file has to be displayed on screen).

PART-B

1. Write a menu driven JDBC program to perform basic operations with Student Table.

MENU

1. **Add new Student**
2. **Delete a specified students Record**
3. **Update Students Address specified students Record**
4. **Search for a particular Student**
5. **Exit**

Student

StRegNo	StName	Stdob	StAddress	StClass	StCourse

2. Write a menu driven JDBC program to perform basic operations with Bank Table.

MENU

1. **Add new Account Holder information.**
2. **Amount Deposit**
3. **Amount Withdrawal (Maintain minimum balance 500 Rs)**
4. **Display all information**
5. **Exit**

Bank

ACC_NO	ACC_NAME	ACC_ADDRESS	BALANCE

3. Write a Java class called Tax with methods for calculating Income Tax. Have this class as a servant and create a server program and register in the rmiregistry. Write a client program to invoke these remote methods of the servant and do the calculations. Accept inputs interactively.

<₹ 3,00,000	No Tax
₹ 3,00,001 to ₹ 6,00,000	5%
₹ 6,00,001 to ₹ 9,00,000	10%
₹ 9,00,001 to ₹ 12,00,000	15%
₹ 12,00,001 to ₹ 15,00,000	20%
>₹ 15,00,000	30%

4. Write a Java class called SimpleInterest with methods for calculating simple interest. Have this class as a servant and create a server program and register in the rmiregistry. Write a client program to invoke these remote methods of the servant and do the calculations. Accept inputs at command prompt.

5. Write a java JSP program to get student information through a HTML and create a JAVA Bean Class, populate Bean and Display the same information through another JSP

6. Write a menu driven program to create a linked list and perform the following operations.
   a. to Insert some Elements at the Specified Position
   b. swap two elements in a linked list
   c. to Iterate a LinkedList in Reverse Order
   d. to Compare Two LinkedList
   e. to Convert a LinkedList to ArrayList

7. Implement a java application based on the MVC design pattern. Input student Rolno, name, marks in three subject calculate result and grade and display the result in neat format.

Percentage of Marks	Grade
Above 90%	A
80% to 90%	B
70% to 80%	C
60% to 70%	D
Below 60%	E

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	**PART-A** **Writing:5 Marks Execution: 8Marks**	**15 Marks**
Program-2	**PART-B** **Writing:1o Marks Execution:10Marks**	**20 Marks**
Practical Record		**05 Marks**
Total		**40 Marks**

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Distributed Computing (Elective)**		
Course Code:	**BCACAES401**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):

At the end of the course the students will be able to:

- Understand concepts behind Distributed Systems.
- Design and build application programs on distributed systems
- Develop, test and debug RPC based client-server programs.

Unit	Description	Hours
1	**Introduction:** Definition, History, Different Forms Of Computing, Strengths and Weakness Interposes Communications An archetypal IPC Program interface, event synchronization, timeouts and threading, deadlocks and timeouts, data representation (Page 78 only), text based protocols, request response protocols, event diagram and sequence diagram.	**8**
2	**Distributed computing paradigms:** Paradigms and abstraction, An example application, paradigms for distributed applications, tradeoffs. The socket API Background, the socket metaphor in IPC, The datagram socket API The stream mode socket API, The socket with non-blocking I/O operations, secure socket API	**8**
3	**Group communication**- unicasting and multicasting, multicast API, connection oriented versus connectionless multicast, reliable multicast versus unreliable multicasting, the java based multicast API, **Distributed objects**-Message passing versus distributed objects, an archetypal distributed object architecture, Distributed object system, remote procedure calls, Remote method invocation.	**10**

Text Book:

1. M.L.Liu, Distributed Computing-Principles and Applications, Pearson Education, 2004.

Reference Books:

1. Mukesh Singhal, Niranjan G.Shivaratri, Advanced Concepts in Operating System, Tata McGraw Hill

2. Willaim Grosso, Java RMI, Shroff/O'reilly, 2002

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Object Oriented Analysis and Design (Elective)**		
Course Code:	**BCACAES402**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):

At the end of the course the students will be able to:

- Explain the principles and requirements of OOA and Design
- Describe the object-oriented approach to system development, modeling objects, relationships and interactions.
- Analyze Objects and Classes of the software system.
- Construct object model using object types, attributes, structures and associations.
- Analyze Functional and Dynamic Modeling

Unit	Description	Hours
1	**Introduction** Object orientation concept, OO development concept - Modeling concept, OO methodology, three methods, OO Themes - Abstraction, Encapsulation, combining data & behavior, sharing, Emphasis on the essence of an Object, Synergy **Modeling as a design Technique** Modeling, Abstraction, The three models **Class modeling** Object and class concepts - Objects, Classes, Class diagram, Values & attributes, Operation and methods, Link and Association Concepts - Link and association, Multiplicity, Association and names, Ordering, Bags & Sequences, Association Class, Qualified Association, Generalization and Inheritance- Definition, Use of generalization, Overriding features	**8**
2	**State Modeling** Events - Signal event, change event, Time event, States, Transistors and conditions State Diagrams - Sample State Diagram, one shot state Diagrams, Summary of Basic state diagram notations, State Diagram Behavior - Activity Effects, Do Activities, Entry and Exit Activities, Completion Transition, Sending Signals **Sequence Model**: Scenarios, Sequence Diagram, Communication Diagram, Activity Model - Activities, Branches, Introduction & termination, Concurrent Activities, Executable Activity diagram, Guidelines for Activity models, Deployment Diagram	**8**

3	**Class Design** Overview of Class Design, Bridging the Gap, Realizing Use Cases, Designing Algorithms - Choosing Algorithms, Choosing Data structures, Defining Internal classes and Operations, Assigning Operations to Classes, Recursing Downward - Functionality Layers, Mechanism Layers, Refactoring, Design Optimization - Adding Redundant associations for Efficient Access, Saving derived values to avoid Re-computation, Rectification of Behavior, Adjustment of Inheritance - Rearranging Classes and Operations, Abstracting out Common Behavior, Using Delegation to share Behavior	**10**

Text Book:

1. Object Oriented Modeling and Design with UML Michael R. Blaha James R. Rumbaugh, Second Edition, Pearson

Reference Books:

1. UML™ 2 ToolKit – Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY Publishing
2. Object Oriented Analysis and Design with Applications Grady Booch Second Edition (Pearson Education)
3. Object Oriented Software Engineering Bernd Brugge and Allen H. Dutoit Pearson Education

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Digital Image Processing (Elective)**		
Course Code:	**BCACAES403**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):
After the successful completion of the course, the student will be able to:
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- Remember the fundamental concepts of Image Processing
- Explain different Image enhancement techniques
- Understand and review image transforms
- Analyze and evaluate digital images.
- Apply digital image techniques in real world scenarios

Unit	Description	Hours
1	**Introduction:** What is Digital image processing, The origin of DIP, Examples of fields that use DIP, Fundamentals steps in DIP, Components of an image processing system. **Digital Image Fundamentals:** Elements of Visual perception, Light and the electromagnetic spectrum, Image sensing and acquisition, Image sampling and Quantization, Some Basic relationship between Pixels	**8**
2	**Image Enhancement in the Spatial Domain:** Background, some basic Gray Level Transformations, Histogram Processing, Enhancement using Arithmetic / Logic operations, Basics of spatial filtering, Smoothing Spatial Filters, Sharpening spatial filters.	**8**
3.	**Color Image Processing:** Color Fundamentals, Color Models, Pseudocolor Image Processing, Color transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images	**10**
Text Books: 1.Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Second Edition, PHI/Pearson **Reference Books:** 1. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.		

2. Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.
3. Education. Alexander M., Abid K., “OpenCV-Python Tutorials”, 2017.
4. Kothari, Ashish M, Digital Image Processing using SCILAB, Springer publication, 2019.

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/ Trouble Shooting.

Program Name	**BCA-GENERAL**	Semester	**IV**
Course Title	**Basic Web Designing Skills (Compulsory)**		
Course Code:	**BCACASS401**	No. of Credits	**02**
Contact hours	**26 Hours**	Duration of SEE/Exam	**2 Hours**
Formative Assessment Marks	**10**	Summative Assessment Marks	**40**

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the fundamentals of HTML5 and its evolution from previous versions.
- Identify the structure and components of an HTML5 document.
- Utilize HTML5 semantic elements to create well-structured web pages.
- Implement multimedia elements such as audio and video using HTML5.
- Demonstrate the use of HTML5 forms and input types for user data collection.
- Apply best practices for web accessibility and SEO in HTML5 documents.

Unit	Description	Hours
1	**Introduction to Computers and the Internet-**Introduction, The Internet in Industry and Research, HTML5, CSS3, Demos, Evolution of the Internet and World Wide Web, Web Basics. **Introduction to HTML5:** Introduction, Editing HTML5, First HTML5 Example, W3C HTML5 Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules, Lists, Tables, Forms, Internal Linking, meta Elements. **New HTML5 Form input Types**, input and data list Elements and autocomplete Attribute, Page-Structure Elements.	**8**
2	**Cascading Style Sheets-**Introducing CSS, Where You Can Add CSS Rules, CSS Properties-Controlling Fonts, Text Formatting, Text Pseudo-Classes, Selectors, Lengths, Percentages.	**8**
3	**More Cascading Style Sheets: -**Links, Backgrounds, Lists, Tables, Outlines, The: focus and: active Pseudo-Classes.	**10**

Text Books:

1. Deitel, Paul_Deitel, Harvey_Deitel, Abbey - Internet and World Wide Web How to Program-Pearson Education (US) (2011)
2. Jon Duckett -Beginning Web Programming with HTML, XHTML, and CSS (Wrox Beginning

Guides)-Wrox (2004)

Reference Books:

1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017.
2. Animation in HTML, CSS, and JavaScript, Kirupa Chinnathambi, 1st Edition, Create space Independent Pub, 2013
3. Web Programming with HTML5, CSS, and JavaScript-John Dean

Pedagogy: Lecture/ PPT/ Videos/ Animations/Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/Mini Projects/Problem Solving/Trouble Shooting.

Questions Paper for Pattern Core Subjects

Duration:3 Hours Max.Marks:80

Note: Answer any ten Questions from Part-A. And one full Questions from each unit in Part-B

Part-A

1. 10*2=20

a.
b.
c.
d.
e.
f.
g.
h.
i.
j.
k.
l.

Part-B

UNIT-I, II, III, IV

Each unit contain main questions and it carry 15 Marks.
Each main questions contain 2 or more sub question.

4*15=60

UNIT-I

2.

a.
b.
c.

3.

a.
b.
c.

UNIT-II

4.

a.

b.

c.

5.

a.

b.

c.

Questions Paper Pattern for Elective and Compulsory Subjects

Duration:2 Hours Max.Marks:40

Note: Answer any Five from Eight questions from Part-A. And any six Questions out of Nine Questions from Part-B

Part-A

1. 5*2=10

a.
b.
c.
d.
e.
f.
g.
h.

Part-B

Answer any Six questions out of Nine questions.

6*5=30

2.
3.
4.
5.
6.
7.
8.
9.
10.