

Proposed Syllabus
for
B.Sc. Program Mathematical Science

Submitted

to

*Faculty of Mathematical Sciences
University of Delhi, Delhi-110007.*

Under

Choice Based Credit System

May 2015

CHOICE BASED CREDIT SYSTEM

**B.Sc. Program
Mathematical Science**

Course Structure

Details of courses under B.Sc. Program Mathematical Science

Course	*Credits	
	Theory+ Practical	Theory + Tutorial
=====		
I. Core Course		
(12 Papers)	12X4= 48	12X5=60
04 Courses from each of the 03 disciplines of choice		
Core Course Practical / Tutorial*		
(12 Practical/ Tutorials*)	12X2=24	12X1=12
04 Courses from each of the 03 disciplines of choice		
II. Elective Course		
(6 Papers)	6X4=24	6X5=30
Two papers from each discipline of choice including paper of interdisciplinary nature		
Elective Course Practical / Tutorials*	6 X 2=12	6X1=6
(6 Practicals / Tutorials*)		
Two papers from each discipline of choice including paper of interdisciplinary nature		
<ul style="list-style-type: none"> • Optional Dissertation or project work in place of one Discipline Specific Elective paper (6 credits) in 6th Semester 		
III. Ability Enhancement Courses		
1. Ability Enhancement Compulsory Courses (AECC)		
(2 Papers of 2 credit each)	2 X 2=4	2 X 2=4
Environmental Science		
English/MIL Communication		
2. Skill Enhancement Courses (SEC)		
(Minimum 2)	4 X 2=8	4 X 2=8
(4 Papers of 2 credit each)		
Total credit	120	120

Institute should evolve a system/policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own.

* wherever there is a practical there will be no tutorial and vice-versa

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN

B. Sc. Program with Computer Science

SE ME STE R	CORE COURSE (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (4)	Elective: Discipline Specific DSE (6)
I	Problem Solving using Computer			
II	Database Management Systems			
III	Operating Systems		SEC – 1	
IV	Computer System Architecture		SEC – 2	
V			SEC – 3	DSE – 1A
				DSE – 2A
				DSE – 3A
VI			SEC – 4	DSE – 1B
				DSE – 2B
				DSE – 3B

SEMESTER	COURSE OPTED	COURSE NAME	Credits
I	Ability Enhancement Compulsory Course-I	English/MIL communications/ Environmental Science	2
	Core course-I	Problem Solving using Computer	4
	Core Course-I Practical/Tutorial	Software Lab using Python	2
	Core course-II	DSC 2A	6
	Core Course-III	DSC 3A	6
II	Ability Enhancement Compulsory Course-II	English/MIL communications/ Environmental Science	2
	Core course-IV	Database Management Systems	4
	Core Course-IV Practical/Tutorial	Database Management Systems Lab	2
	Core course-V	DSC 2B	6
	Core Course-VI	DSC 3B	6
III	Core course-VII	Operating Systems	4
	Core Course-VII Practical/Tutorial	Operating Systems Lab	2
	Core course-VIII	DSC 2C	6
	Core Course-IX	DSC 3C	6
	Skill Enhancement Course -1	SEC-1	2
IV	Core course-X	Computer System Architecture	4
	Course-X Practical/Tutorial	Computer System Architecture Lab	2
	Core course-XI	DSC 2D	6
	Course-XII	DSC 3D	6
	Skill Enhancement Course -2	SEC -2	2
V	Skill Enhancement Course -3	SEC -3	2
	Discipline Specific Elective -1	DSE-1A	6
	Discipline Specific Elective -2	DSE-2A	6
	Discipline Specific Elective -3	DSE-3A	6
VI	Skill Enhancement Course -4	SEC -4	2
	Discipline Specific Elective -4	DSE-1B	6
	Discipline Specific Elective -5	DSE-2B	6
	Discipline Specific Elective -6	DSE-3B	6
Total Credits			120

Core Papers: Computer Science (Credit: 06 each) (1 period / week for tutorials or 4 periods / week of practical)

1. Problem Solving using Computer
2. Database Management Systems
3. Operating System
4. Computer System Architecture

Discipline Specific Elective Papers: (Credit: 06 each) (DSE-1, DSE -2)

Choose 2: One from each group.

Options for DSE-1:

1. Programming in JAVA
2. Analysis of Algorithms and Data Structures

Options for DSE-2:

1. Internet Technologies
2. Project Work / Dissertation

Note: Universities may include more options or delete some from this list

Skill Enhancement Courses (any four) (Credit: 02 each) – SEC1, SEC2, SEC3, SEC4

Choose one from each group.

Options for SEC1:

1. Office Automation Tools

Options for SEC2:

1. PHP Programming

Options for SEC3:

1. System Administration and Maintenance

Options for SEC4:

1. Android Programming

Note: Universities may include more options or delete some from this list

Important:

1. Each University/Institute should provide a brief write-up about each paper outlining the salient features, utility, learning objectives and prerequisites.
2. University/Institute can add/delete some experiments of similar nature in the Laboratory papers.
3. The size of the practical group for practical papers is recommended to be 10-15 students.
4. University/Institute can add to the list of reference books given at the end of each paper.

CORE PAPERS:

1. Problem Solving using Computer

Total Marks:150

Theory 75

Practical: 50

Internal Assessment: 25

5Lectures ,4 Practicals (each in group of 10 to 15)

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers. (2L)

Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices. (2L)

Programming with Python

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. **4L**

Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming. **6L**

Overview of Programming : Structure of a Python Program, Elements of Python **4L**

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement **4L**

operator)

Creating Python Programs :Input and Output Statements, Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions. **8L**

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables **8L**

Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists **8L**

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. **4L**

Data Structures: Arrays, list, set, stacks and queues. **4L**

Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting. **6L**

Books and Study Material Recommended:

1. P. K. Sinha & Priti Sinha , “Computer Fundamentals”, BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation www.python.org
5. Allen Downey, Jeffrey Elkner, Chris Meyers.How to think like a computer scientist learning with Python / 1st Edition,2012 – Freely available online.
6. <http://docs.python.org/3/tutorial/index.html>
7. <http://interactivepython.org/courselib/static/pythonds>
8. <http://www.ibiblio.org/g2swap/byteofpython/read/>

Software Lab using Python:

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user’s choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
 - Grade A: Percentage ≥ 80
 - Grade B: Percentage ≥ 70 and < 80
 - Grade C: Percentage ≥ 60 and < 70
 - Grade D: Percentage ≥ 40 and < 60

Grade E: Percentage<40

3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to find sum of the following series for n terms: $1 - 2/2! + 3/3! - \dots - n/n!$
7. WAP to calculate the sum and product of two compatible matrices.

Section: B (Visual Python):

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects
 - I. curve
 - II. sphere
 - III. cone
 - IV. arrow
 - V. ring
 - VI. Cylinder.
2. WAP to read n integers and display them as a histogram.
3. WAP to display sine, cosine, polynomial and exponential curves.
4. WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.
5. WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula $m=60/(t+2)$, where t is the time in hours. Sketch a graph for t vs. m, where $t \geq 0$.
6. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:
$$P(t) = (15000(1+t))/(15+ e)$$
where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.
7. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
 - I. velocity wrt time ($v=u+at$)
 - II. distance wrt time ($s=u*t+0.5*a*t*t$)
 - III. distance wrt velocity ($s=(v*v-u*u)/2*a$)

2. Database Management Systems

Total Marks:150

Theory 75

Practical: 50

Internal Assessment: 25

5Lectures ,4 Practicals (each in group of 10 to 15)

Introduction to Database Management Systems: Characteristics of database approach, data

models, DBMS architecture and data independence.

(10L)

Entity Relationship and Enhanced ER Modeling: Entity types, relationships, SQL-99:Schema Definition , constraints, and object modeling.

(15L)

Relational Data Model : Basic concepts, relational constraints, relational algebra, SQL queries.

(15L)

Database design: ER and EER to relational mapping, functional dependencies, normal forms up to third normal form.

(20 L)

Books Recommended:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems (5th Ed.), Pearson Education. 2010
2. R. Ramakrishanan, J. Gehrke, Database Management Systems (3rd Ed.), McGraw-Hill. 2002
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts (5th Ed.), McGraw Hill. , 2013.

Software Lab based on Database Management Systems

Note: MyAccess/MySQL may be used.

The following concepts must be introduced to the students:

DDL Commands

- Create table, alter table, drop table

DML Commands

- Select , update, delete, insert statements
- Condition specification using Boolean and comparison operators (and, or, not,=,<>,>,<,>=,<=)
- Arithmetic operators and aggregate functions(Count, sum, avg, Min, Max)
- Multiple table queries (join on different and same tables)
- Nested select statements
- Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.)
- Categorization using group by.....having
- Arranging using order by

6. Retrieve all employee names whose address is in 'Bellaire'
7. Retrieve all employees who were born during the 1950s
8. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)
9. Retrieve the names of all employees who do not have supervisors
10. Retrieve SSN and department name for all employees
11. Retrieve the name and address of all employees who work for the 'Research' department
12. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.
13. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
14. Retrieve all combinations of Employee Name and Department Name
15. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.
16. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.
17. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
18. Select the names of employees whose salary does not match with salary of any employee in department 10.
19. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
20. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
21. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.
22. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
23. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
24. For each department, retrieve the department number, the number of employees in the department, and their average salary.

25. For each project, retrieve the project number, the project name, and the number of employees who work on that project.
26. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively.
27. For each department having more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary.
28. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary insertion in the Department table.
29. Delete all dependents of employee whose ssn is '123456789'.
30. Delete an employee from Employee table with ssn = '12345'(make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees). Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL
31. Perform a query using alter command to drop/add field and a constraint in Employee table.

3. Operating Systems

Total Marks:150

Theory 75

Practical: 50

Internal Assessment: 25

5Lectures ,4 Practicals (each in group of 10 to 15)

Introduction: System Software, Resource Abstraction, OS strategies. (2L)

Types of operating systems - Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems. (2L)

Operating System Organization: Factors in operating system design, basic OS functions, implementation consideration; process modes, methods of requesting system services – system calls and system programs. (10L)

Process Management : System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model (15L)

Scheduling: Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies. (12L)

Memory Management: Mapping address space to memory space, memory allocation strategies, fixed partition, variable partition, paging, virtual memory (12L)

Shell introduction and Shell Scripting (7L)

- What is shell and various type of shell, Various editors present in linux
- Different modes of operation in vi editor
- What is shell script, Writing and executing the shell script
- Shell variable (user defined and system variables)
- System calls, Using system calls
- Pipes and Filters
- Decision making in Shell Scripts (If else, switch), Loops in shell
- Functions
- Utility programs (cut, paste, join, tr , uniq utilities)
- Pattern matching utility (grep)

Books Recommended:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Software Lab based on Operating Systems

Note: Following exercises can be performed using Linux or Unix

1. Usage of following commands:
ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands:
cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands:
chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify “cal” command to display calendars of the specified months.

6. Write a shell script to modify “cal” command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – “Entered login name is invalid”.
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of “who” command along with the total number of users .
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to find the sum of digits of a given number.
13. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
14. Write a shell script to find the LCD(least common divisor) of two numbers.
15. Write a shell script to perform the tasks of basic calculator.
16. Write a shell script to find the power of a given number.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Program to show the pyramid of special character “*”.

4. Computer System Architecture

Total Marks:150

Theory 75

Practical: 50

Internal Assessment: 25

5Lectures ,4 Practicals (each in group of 10 to 15)

Introduction: Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexors, registers, counters and memory units.

(12L)

Data Representation and basic Computer Arithmetic: Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison. (8L)

Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt. (18L)

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. (10L)

Programming the Basic Computer: Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming. (8L)

Input-output Organization: Peripheral devices, I/O interface, Modes of data transfer, direct memory access. (4L)

Books Recommended:

1. M. Mano, Computer System Architecture, Pearson Education 1992.
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition 2009, Prentice Hall of India
4. Digital Design, M.M. Mano, Pearson Education Asia

Computer System Architecture Lab

Practical: 60 Lab Periods

Programming Exercises:

1. Write a program to convert a number in Radix 'R' to radix 10 and vice versa. Test the same by
 - a. Converting an unsigned number from binary, octal, hex to decimal.
 - b. Converting an unsigned number from decimal to binary, octal, hex .
2. Write a program that will prompt for the input of two integer values. Then using the bitwise shift operators show the result of
 - a. Left shifting the first number by the second
 - b. Right shifting the first number by the second
 - c. Exclusive OR of the first number by the second bitwise
 - d. OR of the first number by the second bitwise
 - e. AND of the first number by the second bitwise
3. Write a program that will prompt for the input of a binary value. Find out following complements.
 - a. One's complement
 - b. Two's complement
4. Write a program to print the values of a 5 bit binary up-down counter. User should be able to specify the up or down nature of the counter.
5. Write a program to implement the following binary operations:
 - a. Addition
 - b. Subtraction using 2's complement

Discipline Specific Elective Papers: (Credit: 06 each) (DSE-1, DSE -2):

Choose one from each group:

Options for DSE-1:

1. Programming in JAVA
2. Analysis of Algorithms and Data Structures

Options for DSE-2:

1. Internet Technologies
2. Project Work / Dissertation

Note: Universities may include more options or delete some from this list

DSE- 1:

1.Programming in Java

Total Marks:150

Theory 75

Practical: 50

Internal Assessment: 25

5Lectures ,4 Practicals (each in group of 10 to 15)

Introduction to Java: Features of Java, JDK Environment (1L)

Object Oriented Programming Concept Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA (10L)

Java Programming Fundamental :Structure of java program, Data types, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch),Looping(for, while) ,Type Casting (10L)

Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes (10L)

Arrays and Strings: Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods. (6L)

Abstract Class, Interface and Packages: Modifiers and Access Control, Abstract classes and methods, Interfaces, Packages Concept, Creating user defined packages (8L)

Exception Handling: Exception types, Using try catch and multiple catch, Nested try, throw, throws and finally, Creating User defined Exceptions. (4L)

File Handling: Byte Stream, Character Stream, File IO Basics, File Operations, Creating file, Reading file, Writing File (5L)

Applet Programming: Introduction, Types Applet, Applet Life cycle, Creating Applet, Applet tag (6L)

Books Recommended:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. E Balagurusamy , Programming with JAVA, TMH, 2007

Software Lab based on Java

1. WAP to find the largest of n natural numbers.
2. WAP to find whether a given number is prime or not.
3. Write a menu driven program for following:
 - a. Display a Fibonacci series
 - b. Compute Factorial of a number
 - c. WAP to check whether a given number is odd or even.
 - d. WAP to check whether a given string is palindrome or not.
4. WAP to print the sum and product of digits of an Integer and reverse the Integer.
5. Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
6. Write a program that will prompt the user for a list of 5 prices. Compute the average of the prices and find out all the prices that are higher than the calculated average.
7. Write a program in java to input N numbers in an array and print out the Armstrong numbers from the set.
8. Write java program for the following matrix operations:
 - a. Addition of two matrices
 - b. Summation of two matrices
 - c. Transpose of a matrix
 - d. Input the elements of matrices from user.
9. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.
10. Write a Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
11. Write a java program to create a frame window in an Applet. Display your name, address and qualification in the frame window.
12. Write a java program to draw a line between two coordinates in a window.
13. Write a java program to display the following graphics in an applet window.
 - a. Rectangles
 - b. Circles

- c. Ellipses
 - d. Arcs
 - e. Polygons
14. Write a program that reads two integer numbers for the variables a and b. If any other character except number (0-9) is entered then the error is caught by NumberFormatException object. After that ex.getMessage() prints the information about the error occurring causes.
 15. Write a program for the following string operations:
 - a. Compare two strings
 - b. Concatenate two strings
 - c. Compute length of a string
 16. Create a class called Fraction that can be used to represent the ratio of two integers. Include appropriate constructors and methods. If the denominator becomes zero, throw and handle an exception.

2. Analysis of Algorithm and Data Structures

Total Marks: 150

Theory 75

Practical: 50

Internal Assessment: 25

5 Lectures, 4 Practicals (each in group of 10 to 15)

Introduction: Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm (4L)

Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms. (6L)

Sorting Techniques: Elementary sorting techniques-Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques-Heap Sort, Quick Sort, Sorting in Linear Time-Bucket Sort, Radix Sort and Count Sort (10L)

Searching Techniques: Linear and Binary search. (4L)

Complexity Analysis: Medians & Order Statistics. (4L)

Data Structures:

1. Arrays (4 Lectures)
Single and Multi-dimensional Arrays, Sparse Matrices

2. Stacks (5 Lectures)
Implementing stack using array and linked list, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another;

3. Queues (5 Lectures)
Array and Linked representation of Queue, De-queue, Priority Queues
4. Linked Lists (5 Lectures)
Singly, Doubly and Circular Lists, representation of Stack and Queue as Linked Lists.
5. Recursion (5 lectures)
Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion;
6. Trees (5 Lectures)
Introduction to Tree as a data structure; Binary Trees, Binary Search Tree, (Creation, and Traversals of Binary Search Trees)

Recommended Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein-Introduction to Algorithms, PHI, 3rd Edition 2009.
2. Sarabasse & A.V. Gelder Computer Algorithm –Introduction to Design and Analysis,Publisher–Pearson 3rd Edition 1999.
3. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning, 2012.
4. SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press, 2011.
5. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++:, Second edition, PHI, 2009.
6. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
7. D.S Malik, Data Structure using C++,Second edition, Cengage Learning, 2010.

Software Lab based on Analysis of Algorithms:

1. Implement Insertion Sort (The program should report the number of comparisons)
2. Implement Merge Sort(The program should report the number of comparisons)
3. Implement Heap Sort (The program should report the number of comparisons)
4. Implement Randomized Quick sort (The program should report the number of comparisons)
5. Implement Radix Sort.
6. Implement Searching Techniques
7. Implementation of Recursive function.
8. Array and Linked list implementation of Stack and Queue.
9. Implementation of Single, Double and circular Linked List
10. Creation and traversal of Binary Search Tree.

DSE 2:

1. Internet Technologies

Total Marks:150

Theory 75

Practical: 50

Internal Assessment: 25

5Lectures ,4 Practicals (each in group of 10 to 15)

Introduction to Web Design: Introduction to hypertext markup language (html) document type definition, creating web pages, graphical elements, lists, hyperlinks, tables, web forms, inserting images, frames. (6L)

Customized Features: Cascading style sheets, (css) for text formatting and other manipulations. (4L)

JavaScript: Data types, operators, functions, control structures, events and event handling. (8L)

Java: Use of Objects, Array and Array List class, Designing classes, Inheritance, Input/Output, Exception Handling. (12L)

JDBC: JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects. (10L)

JSP: Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values (20L)

Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access. (10L)

Books Recommended:

1. Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi By Ivan Bayross, BPB Publications, 2009.
2. BIG Java Cay Horstmann, Wiley Publication , 3rd Edition., 2009
3. Java 7 ,The Complete Reference, Herbert Schildt, 8th Edition, 2009.
4. The Complete Reference J2EE, TMH, Jim Keogh, 2002.
5. Java Server Pages, Hans Bergsten, Third Edition, O'Reilly Media December 2003.

Software Lab based on Internet Technologies

JAVA Script

1. Create a student registration form. Create functions to perform the following checks:
 - a. Roll number is a 7-digit numeric value
 - b. Name should be an alphabetical value(String)
 - c. Non-empty fields like DOB
2. Implement a static password protection.
3. Write a java script
 - a. To change the colour of text using SetTimeout()
 - b. To move an image across screen using setInterval()

JAVA Programs

1. WAP to find the largest of n natural numbers.
2. WAP to find whether a given number is prime or not.
3. WAP to print the sum and product of digits of an Integer and reverse the Integer.
4. Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
5. Write java program for the following matrix operations:
 - a. Addition of two matrices
 - b. Summation of two matrices
 - c. Transpose of a matrixInput the elements of matrices from user
6. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.

JDBC

1. Create a table 'Student' and 'Teacher' in 'College' database and insert two rows in this newly created table using JDBC API and do the following:

- a. Update an already created table 'Teacher' in 'College' database by updating a teacher's name, with "Dr." appended before the name, whose name is "Rita".
 - b. Repeat the same thing for all the teachers using PreparedStatement.
 - c. Delete the student with ID=3 from 'Student' database.
 - d. Insert two students to the ResultSet returned by the query which selects all students with FirstName="Ayush". The database must also get updated along with ResultSet.
2. Create a procedure in MySQL to count the number of Rows in table 'Student'. Use Callable Statement to call this method from Java code.

JSP Practical list

1. Display the pattern:

```

1
1 2
1 2 3

```

Take 'n' in a textbox from user. Display this pattern using

- Scriptlets
- <c:forEach> loop

2. Make two files as follows:

- a. main.html: shows 2 text boxes and 3 radio buttons with values "addition", "subtraction" and "multiplication"
- b. operate.jsp: depending on what the user selects perform the corresponding function (Give two implementations: using request.getParameter() and using expression language)

3. Validate User input entered in a form. The input must include Name, DOB, Email ID, Lucky Number, Favorite food etc. (Refer Chapter 8)

4. Display Good Morning <uname>, Good Afternoon <uname> or Good Evening <uname> based on the current time of the day.

5. Create your custom library which contains two tags: <hello>, <choco>.

Usage of the tags:

- <hello name="Ajay">: Output should be Hello Ajay. It contains a mandatory attribute 'name' which can accept Dynamic value.
- <choco texture="Chewy">: Output should be FiveStar, BarOne.
- <choco texture="Crunchy">: Output should be Munch. KitKat.

That means the mandatory attribute must accept a value, and based on the attributes value, it should give output. You must use a bean ChocoBean for this purpose.

2.Project Work/Dissertation

Total Marks:150

Project 100

Internal Assessment: 50

5Lectures

- This option is to be offered only in 6th Semester.
- The students will be allowed to work on any project based on the concepts studied in core/elective or skill based elective courses.
- The group size should be maximum of three (03) students.
- Each group will be assigned a teacher as a supervisor who will handle both their theory as well lab classes.
- A maximum of Four (04) projects would be assigned to one teacher.
- Theory classes will cover project management techniques.

Skill Enhancement Courses (any four: one from each group)

(Credit: 02 each) – SEC1,SEC2,SEC3, SEC4

Theory: 02, Labs: 02

Options for SEC1:

Office Automation Tools

Options for SEC2:

PHP Programming

Options for SEC3:

System Administration and Maintenance

Options for SEC4:

Android Programming

Note: Universities may include more options or delete some from this list

Detailed Syllabus:

SEC-1:

1. Office Automation Tools

Total Marks:75

Practical: 50

Internal Assessment: 25

2Lectures ,2 Practicals (each in group of 10 to 15)

Introduction to open office/MS office/Libre office (2L)

Word Processing: Formatting Text, Pages, Lists, Tables (5L)

Spreadsheets: Worksheets, Formatting data, creating charts and graphs, using formulas and functions, macros, Pivot Table (6L)

Presentation Tools: Adding and formatting text, pictures, graphic objects, including charts, objects, formatting slides, notes, hand-outs, slide shows, using transitions, animations (4L)

Books Recommended:

1. Introduction to **HTML** and **CSS** -- O'Reilly , 2010
2. Jon Duckett, **HTML** and **CSS**, John Wiely, 2012

Computer Lab Based on Office Automation:

Practical List for Text Editor:

1. Create a **telephone directory**.

- The heading should be 16-point Arial Font in bold
- The rest of the document should use 10-point font size
- Other headings should use 10-point Courier New Font.
- The footer should show the page number as well as the date last updated.

2. Design a time-table form for your college.

- The first line should mention the name of the college in 16-point Arial Font and should be bold.
- The second line should give the course name/teacher's name and the department in 14-point Arial.
- Leave a gap of 12-points.
- The rest of the document should use 10-point Times New Roman font.
- The footer should contain your specifications as the designer and date of creation.

3. Create the following one page documents.

(a) Compose a note inviting friends to a get-together at your house, including a list of things to bring with them.

(b) Design a certificate in landscape orientation with a border around the document.

4. Create the following document: A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.

5. Convert following text to a table, using comma as delimiter

Type the following as shown (do not bold).

Color, Style, Item

Blue, A980, Van

Red, X023, Car

Green, YL724, Truck

Name, Age, Sex

Bob, 23, M

Linda, 46, F

Tom, 29, M

6. Prepare a grocery list having four columns (Serial number, the name of the product, quantity and price) for the month of April, 06.

- Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
- The headings of the columns should be in 12-point and bold.
- The rest of the document should be in 10-point Times New Roman.
- Leave a gap of 12-points after the title.

7. XYZ Publications plans to release a new book designed as per your syllabus. Design the first page of the book as per the given specifications.

(a) The title of the book should appear in bold using 20-point Arial font.

(b) The name of the author and his qualifications should be in the center of the page in 16-point Arial font.

(c) At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.

(d) The details of the offices of the publisher (only location) should appear in the footer.

8. Create the following one page documents.

a) Design a Garage Sale sign.

b) Make a sign outlining your rules for your bedroom at home, using a numbered

list.

9. Enter the following data into a table given on the next page.

Salesperson	Dolls	Trucks	Puzzles
Amit	1327	1423	1193
Shivi	1421	3863	2934
Om	5214	3247	5467
Ananya	2190	1278	1928
Anupama	1201	2528	1203
Maharshi	4098	3079	2067

Add a column Region (values: S, N, N, S, S, S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:

Practical List for Spreadsheet

- Q1. Create a student worksheet containing roll numbers, names and total marks. Open a document in Word and insert the excel worksheet using:-
- Copy/Paste
 - Embedding
 - Linking
- Q2. The term wise marks for APS class of 20 students are stored in 3 separate sheets named term1, term2 and term3. Create 4th worksheet that contains student names and their total and average marks for the entire year. Give proper headings using headers. Make the column headings bold and italic. The 4th worksheet should contain college name as the first line. Make it bold, italic and center it.
- Q3. Using a simple pendulum, plot 1-T and 1-T² graph.

I	t1	t2	t3	Mean(t)	T=t/20	T ²
70						
80						
90						
100						

Q4. Consider the following employee worksheet:-

Full Name (First Last)	Grade 1/2/3	Basic Salary	HRA	PF	Gross	Net	(VA) Vehicle Allowance

--	--	--	--	--	--	--	--

HRA is calculated as follows:

Grade HRA %(of Basic)

1 40%

2 35%

3 30%

Gross = Basic + HRA + VA

Net = Gross –PF

PF is 8% for all Grades

VA is 15000, 10000 and 7000 for Grades 1, 2 and 3.

- i) Find max, min and average salary of employees in respective Grade
- ii) Count no. of people where VA>HRA
- iii) Find out most frequently occurring grade.
- iv) Extract records where employee name starts with “A” has HRA>10000
- v) Print Grade wise report of all employees with subtotals of net salary and also grand totals. Use subtotal command.
- vi) Extract records where Grade is 1 or 2 and salary is between 10000 and 20000 both inclusive.

Q5. In a meeting of a marketing department of an organization it has been decided that price of selling an item is fixed at Rs40. It was resolved to increase the sell of more of more items and getting the profit of Rs40,000/.Use Goal Seek of find out how many items you will have to sell to meet your profit figure.

Q6. To study the variation in volume with pressure for a sample of an air at constant temperature by plotting a graph for P – V and P-I/V. Sample observations are:-

Pressure(P)	Volume (V)	I/V	PV	P/V
75	20			
78.9	19			
83.3	18			
88.2	17			

Q7. Plot the chart for marks obtained by the students (out of 5) vs. frequency (total number of students in class is 50).

Q8. Create the following worksheet(s) containing an year wise sale figure of five salesmen in Rs.

Salesman	2002	2003	2004	2005
MOHAN	10000	12000	20000	50000
MITRA	15000	18000	50000	60000
SHIKHA	20000	22000	70000	70000
ROHIT	30000	30000	100000	80000
MANGLA	40000	45000	125000	90000

Apply the following Mathematical & Statistical functions:

- i) Calculate the commission for each salesman under the condition :-

- a) If total sales is greater than Rs. 3, 00,000/-, then commission is 10% of total sale made by the salesman.
- b) Otherwise, 4% of total sale.

- ii) Calculate the maximum sale made by each salesman.
- iii) Calculate the maximum sale made in each year.
- iv) Calculate the minimum sale made by each salesman.
- v) Calculate the minimum sale made in each year.
- vi) Count the no. of sales persons.
- vii) Calculate the cube of sales made by Mohan in the year 2002.
- viii) Find the difference in sales by salesman Mitra between the year 2002 and 2003.
Find the absolute value of difference.
- ix) Also calculate the Mode, Stddev, Variance, Median for the sale made by each salesman.
- ix) Calculate the year wise Correlation coefficient between the sales man Mohan and Mitra year wise

Q9. The following table gives an year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

- i) Calculate total sale year wise.
- ii) Calculate the net sales made by each salesman
- iii) Calculate the commission for each salesman under the condition :-
 - c) If total sales is greater than Rs. 4, 00,000/-, then commission is 5% of total sale made by the salesman.
 - d) Otherwise, 2% of total sale.
- iv) Calculate the maximum sale made by each salesman.
- v) Calculate the maximum sale made in each year.
- vi) Draw a bar graph representing the sale made by each salesman.
- vii) Draw a pie graph representing the sale made by salesmen in year 2001.

Q10. Consider the following worksheet for APS 1st year students:-

S.No.	Name	PH	CH	BY	MT	CS	Total Marks	%	Grade
1									
2									

Grade is calculated as follows:-

If % ≥ 90 Grade A
If % ≥ 80 & < 90 Grade B
If % ≥ 70 & < 80 Grade C
If % ≥ 60 & < 70 Grade D

Otherwise students will be declared fail.

- i) Calculate Grade using if function
- ii) Sort the data according to total marks
- iii) Apply filter to display the marks of the students having more than 65% marks.
- iv) Draw a pie chart showing % marks scored in each subject by the topper of the class.
- v) Draw the doughnut chart of the data as in (iv)
- vi) Enter the S.No. of a student and find out the Grade of the student using VLOOKUP.
- vii) Extract all records where name
 - a) Begins with "A"
 - b) Contains "A"
 - c) Ends with "A"

Practical List for presentation:

1. Create five Power point slides. Each slide should support different format. In these slides explain areas of applications of IT. Make slide transition time as 10 seconds.
2. Create five Power Point slides to give advantages/disadvantages of computer, application of computers and logical structure of computer.
3. Create five Power Point slides detailing the process of internal assessment. It should be a self running demo.

SEC 2:

PHP Programming

Total Marks:75

Practical: 50

Internal Assessment: 25

2Lectures ,2 Practicals (each in group of 10 to 15)

Introduction to PHP:

(3L)

- PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.)
- PHP with other technologies, scope of PHP
- Basic Syntax, PHP variables and constants
- Types of data in PHP , Expressions, scopes of a variable (local, global)
- PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator.
- PHP operator Precedence and associativity

Handling HTML form with PHP:

(2L)

- Capturing Form Data
- GET and POST form methods
- Dealing with multi value fields
- Redirecting a form after submission

PHP conditional events and Loops:

(3L)

- PHP IF Else conditional statements (Nested IF and Else)
- Switch case, while ,For and Do While Loop
- Goto , Break ,Continue and exit

PHP Functions:

(3L)

- Function, Need of Function , declaration and calling of a function
- PHP Function with arguments, Default Arguments in Function
- Function argument with call by value, call by reference
- Scope of Function Global and Local

String Manipulation and Regular Expression:

(2L)

- Creating and accessing String , Searching & Replacing String
- Formatting, joining and splitting String , String Related Library functions
- Use and advantage of regular expression over inbuilt function
- Use of preg_match(), preg_replace(), preg_split() functions in regular expression

Array:

(2L)

- Anatomy of an Array ,Creating index based and Associative array ,Accessing array
- Looping with Index based array, with associative array using each() and foreach()
- Some useful Library function

Reference Books:

1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'reilly, 2014.
4. Luke Welling, Laura Thompson, "PHP and MySQL Web Development", 4th Edition, Addition Paperback, Addison-Wesley Professional,2008.
5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014.

Software Lab Based on PHP:

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. WAP to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.

5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. WAP to sort an array.
8. Write a PHP script that removes the whitespaces from a string.
Sample string : 'The quick " " brown fox'
Expected Output : Thequick""brownfox
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
11. Write a PHP script that checks if a string contains another string.
12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
13. Create a script to construct the following pattern, using nested for loop.
*
* *
* * *
* * * *
* * * * *
14. Write a simple PHP program to check that emails are valid.
15. WAP to print first n even numbers.
16. \$color = array('white', 'green', 'red')
Write a PHP script which will display the colors in the following way :
Output :
white, green, red,
 - green
 - red
 - white
17. Using switch case and dropdown list display a “Hello” message depending on the language selected in drop down list.
18. Write a PHP program to print Fibonacci series using recursion.
19. Write a PHP script to replace the first 'the' of the following string with 'That'.
Sample : 'the quick brown fox jumps over the lazy dog.'
Expected Result : That quick brown fox jumps over the lazy dog.

SEC 3:

System Administration and Maintenance

Total Marks:75

Practical: 50

Internal Assessment: 25

2Lectures ,2 Practicals (each in group of 10 to 15)

Part I (Linux/Unix)

(8L)

- Basics of operating system, services,
- Installation and configuration, maintenance
- What is linux/unix Operating systems, Kernel, API, cli, gui,
- Difference between linux/unix and other operating systems
- Features and Architecture
- Linux features, advantages, disadvantages

Part II(Windows)

(8L)

- Windows as operating system, history, versions.
- PC hardware, BIOS, Devices and drivers,
- Kernal Configuration and building
- Application installation, configuration and maintenance
- Server services and Client services
- Difference between WindowsXP/windows7 and windows server 2003/2008

Books Recommended:

1. AEleen Frisch , **Essential System Administration: Tools and Techniques for Linux and Unix** O'Reilly Media,2002
2. **Mark G. Sobell, A Practical Guide to Linux, Addison Wesley, 1997**
3. **Tom Adelstein, Bill Lubanovic, Linux System Administration, O'Reilly Media,2007**
4. Tom Carpenter, **Microsoft Windows Operating System Essentials , John Weily,2012**

Software Lab Based on System Administration and Maintenance

Linux:

Linux Desktop tour. Configuring desktop environment and desktop settings.
Basic Commands :Terminal, shell,Cat, ls, cd, date, cal, man, echo, pwd, Mkdir, rm, rmdir Ps, kill
Package Installation
Synaptic package manager

Windows:

Creating users – Admin and regular.
Path of their personal files. Adding and changing passwords.
Difference between workgroup and domain. Concept of roles.
user profiles – creating and roaming Concept of Active Directory. Creating active directory in windows 2003/2008.
Process and Disk management

Windows Task manager. File systems – NTFS, FAT.
<p>Services</p> <p>Control Panel</p> <p>C:/program Files, C:/system C:/windows</p> <p>Add /remove new hardware (like printer), Add/remove new programmes.</p>
<p>Network Administration</p> <p>Ipconfig,Ping, tracert, route, hostname, net, netstat, whoami</p> <p>Set manual IP address, check connectivity – ipv4, ipv6</p>
<p>Administrator Tools</p> <p>Control Panel -> Administrative Tools</p> <p>Computer Management, Local security Policy, Performance Monitor, Task Scheduler, Antivirus and firewall.</p>
<p>Misc</p> <p>Start->Accessories->System tools -> All options (Remote desktop, backup/restore etc.)</p> <p>LAN – sharing printer, files and folder over the network.</p>

SEC 4:

Android Programming

Total Marks:75

Practical: 50

Internal Assessment: 25

2Lectures ,2 Practicals (each in group of 10 to 15)

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture. (2L)

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine. (4L)

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device. (5L)

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.(2L)

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, and Dialog. (2L)

Database: Understanding of SQLite database, connecting with the database. (2L)

Book Recommended:

1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

ONLINE READING / SUPPORTING MATERIAL:

1. <http://www.developer.android.com>
2. <http://developer.android.com/about/versions/index.html>
3. <http://developer.android.com/training/basics/firstapp/index.html>
4. <http://docs.oracle.com/javase/tutorial/index.htm> (Available in the form of free downloadable ebooks also).
5. <http://developer.android.com/guide/components/activities.html>
6. <http://developer.android.com/guide/components/fundamentals.html>
7. <http://developer.android.com/guide/components/intents-filters.html>.
8. <http://developer.android.com/training/multiscreen/screensizes.html>
9. <http://developer.android.com/guide/topics/ui/controls.html>
10. <http://developer.android.com/guide/topics/ui/declaring-layout.html>
11. <http://developer.android.com/training/basics/data-storage/databases.html>

Software Lab Based on Android Programming:

1. Create “Hello World” application. That will display “Hello World” in the middle of the screen in the emulator. Also display “Hello World” in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.