

B.Sc. Computer Science Regular Course Structure

Semester	Core Courses	Discipline Specific Electives	Skill Enhancement Courses	Ability Enhancement Compulsory Courses
I	DSC-1(A) DSC-2(A) DSC-3(A)			Environmental Science
II	DSC-1(B) DSC-2(B) DSC-3(B)			English/MIL
III	DSC-1(C) DSC-2(C) DSC-3(C)		SEC-1	
IV	DSC-1(D) DSC-2(D) DSC-3(D)		SEC-2	
V		DSE-1(A) DSE-2(A) DSE-3(A)	SEC-3	
VI		DSE-1(B) DSE-2(B) DSE-3(B)	SEC-4	

Core Courses (Credit: 6 Each)

DSC-1(A) -Problem solving using Computers (4 + 4)
 DSC-2(A) -
 DSC-3(A) -
 DSC-1(B) - Database Management Systems (4 + 4)
 DSC-2(B) -
 DSC-3(B) -
 DSC-1(C) - Operating System (5 + 1)
 DSC-2(C) -
 DSC-3(C) -
 DSC-1(D) - Computer System Architecture (5 + 1)
 DSC-2(D) -
 DSC-3(D) -

Discipline Specific Electives (Credit: 6 Each)

DSE-1(A) - Programming in JAVA (4 + 4)
 DSE-2(A) -
 DSE-3(A) -
 DSE-1(B) - Computer Networks (5 + 1)
 DSE-2(B) -
 DSE-3(B) -

Choice for Skill Enhancement Courses (Credit: 2 Each)

SEC-1 - Office Automation Tools (1 + 2)

SEC-2 - HTML Programming (1 + 2)

SEC-3 -

SEC-4 -

CORE COURSES

Semester I: Core Paper I [DSC-1(A)]

Problem Solving using Computers

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of Computers, Types and Generations of Computers. **(3L)**

Basic Computer Organization - Units of a Computer, CPU, ALU, Memory Hierarchy, Registers, I/O Devices. **(4L)**

Planning the Computer Program: Concept of Problem Solving, Problem Definition, Program Design, Debugging, Types of Errors in Programming, Documentation. **(3L)**

Techniques of Problem Solving: Flowcharting, Decision Table, Algorithms, Structured Programming Concepts, Programming Methodologies viz. Top-Down and Bottom-Up Programming. **(4L)**

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, Bitwise Operator, Increment and Decrement Operators). **(8L)**

Creating Python Programs: Input and Output Statements, Control statements, Loop Control, Conditional Statements, Difference between *break*, *continue* and *pass*. **(10L)**

Structures: Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, *exit()* Function, Default Arguments. **(10L)**

Reference Books:

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 Edition, 2011.
4. Python Tutorial/Documentation (<https://www.python.org/>).
5. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: Learning with Python, 2012.
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 based on Programming in Python

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.

Semester II: Core Paper II [DSC-2(A)]

Database Management Systems

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, 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)**

Reference Books:

1. R. Elmasri, S.B. Navathe, *Fundamentals of Database Systems 6th Edition*, Pearson Education, 2010.
2. R. Ramakrishnan, J. Gehrke, *Database Management Systems 3rd Edition*, McGraw Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, *Database System Concepts 6th Edition*, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe *Database Systems Models*.

Software Lab based on Database Management Systems

Note: My Access/MySQL may be used.

The following concepts must be introduced to the students:

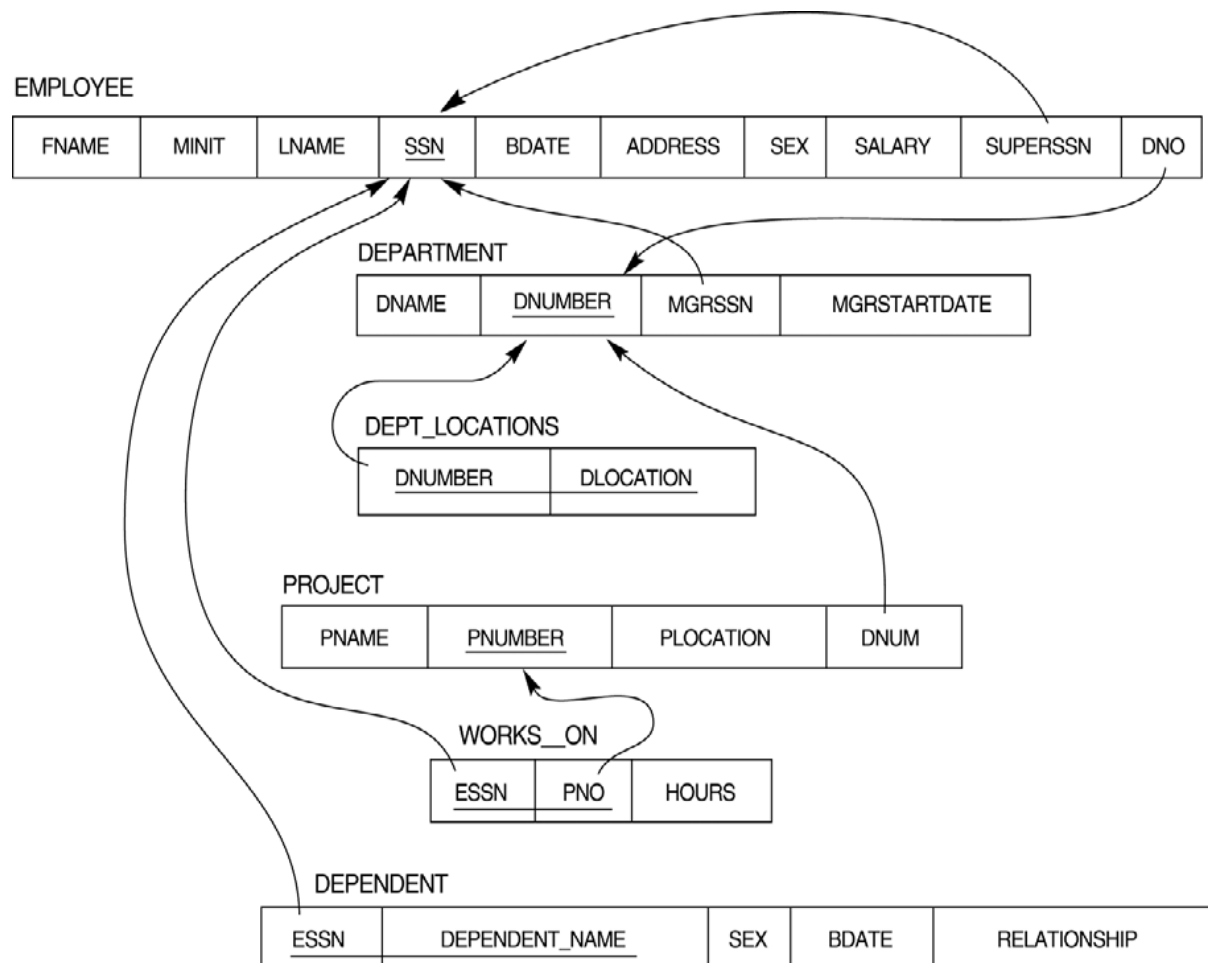
DDL Commands

- CREATE table, ALTER table, DROP table

DML Commands

- SELECT, UPDATE, DELETE, and INSERT data
- 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 same and different 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

Relational Database Schema - COMPANY



Questions to be performed on the above schema:

Create tables with relevant foreign key constraints.

Populate the tables with data.

Perform the following queries on the database:

1. Display all the details of all employees working in the company.
2. Display ssn, lname, fname, address of employees who work in department no 7.
3. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'.
4. Retrieve the name and salary of every employee.
5. Retrieve all distinct salary values.
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 'Product X' 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.

Semester III: Core Paper III [DSC-3(A)]

Operating Systems

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

Types of Operating Systems - Multiprogramming, Batch Processing, Time Sharing Systems, Single User and Multi-user Systems, Process Control & Real-Time Systems. **(2L)**

Operating System Organization: Factors in Operating System Design, Basic OS Functions, CPU 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, Threads. **(15L)**

Scheduling: Scheduling Mechanisms, Strategy Selection, Non-Preemptive and Preemptive Strategies. **(12L)**

Memory Management: Mapping Address Space to Memory Space, Memory Allocation Strategies, Fixed and Variable Partitions, Paging, Virtual Memory. **(12L)**

Introduction to Shell and Shell Scripting (7L)

Shell definition, various types of shells, various editors present in Linux

Different modes of operation in vi editor

Shell scripts, writing and executing shell scripts

Shell variables (user-defined and system variables)

System calls, using system calls

Pipes and filters

Decision making in shell scripts, loops in shell

Functions

Utility programs (cut, paste, join, tr, uniq)

Pattern matching utility (grep)

Reference Books:

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.

Semester IV: Core Paper IV [DSC-4(A)]

Computer System Architecture

Introduction: Logic Gates, Boolean Algebra, Combinational Circuits, Circuit Simplification, Flip-Flops and Sequential Circuits, Decoders, Multiplexers, 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: CPU Registers, Bus System, Instruction Set, Timing and Control, Instruction Cycle, Memory Reference, I/O and Interrupt. (18L)

Central Processing Unit: Register Organization, Arithmetic and Logical Micro-operations, Stack Organization, Microprogrammed Control. (10L)

Programming the Basic Computer: Instruction Formats, Addressing Modes, Instruction Codes, Machine Language, Assembly Language. (8L)

Input-output Organization: Peripheral Devices, I/O Interface, Modes of Data Transfer, Direct Memory Access. (4L)

Reference Books:

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, Prentice Hall of India, 2009

4. *Digital Design*, M.M. Mano, Pearson Education Asia, 1979.

DISCIPLINE SPECIFIC ELECTIVES

DSE-1: Programming in Java

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, Looping, 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, *StringBuffer* 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 and Writing Files. **(5L)**

Applet Programming: Introduction, Types Applet, Applet Life Cycle, Creating Applet, Applet Tag. **(6L)**

Reference Books:

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 Programming in 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.
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

DSE-2: Computer Networks

Basic concepts: Components of Data Communication, Standards and Organizations, Network Classification, Network Topologies, Network Protocol, Layered Network Architecture, Overview of OSI Reference Model, Overview of TCP/IP Protocol Suite. **(16L)**

Physical Layer: Cabling, Network Interface Card, Transmission Media Devices - Repeater, Hub, Bridge, Switch, Router, Gateway. **(6L)**

Data Link Layer: Framing Techniques, Error Control, Flow Control Protocols, Shared Media Protocols - CSMA/CD and CSMA/CA. **(8L)**

Network Layer: Virtual Circuits and Datagram Approach, IP Addressing Methods, Subnetting, Routing Algorithms (Adaptive and Non-Adaptive). **(8L)**

Transport Layer: Transport Services, Transport Layer Protocols (TCP and UDP). **(6L)**

Application Layer: Application Layer Protocols and Services - Domain Name System, HTTP, WWW, Telnet, FTP, SMTP. **(10L)**

Network Security: Common Terms, Firewalls, Virtual Private Networks. **(6L)**

Reference Books:

1. B.A. Forouzan: *Data Communication and Networking*, 4th Edition, Tata McGraw Hill, 2007.
2. D.E. Comer, *Internetworking with TCP/IP*, Vol. I, Prentice Hall of India, 1998.
3. W. Stalling, *Data & Computer Communication*, 8th edition, Prentice Hall of India, 2006.
4. D. Bertsekas, R. Gallager, *Data Networks*, 2nd edition, Prentice Hall of India, 1992.

SKILL ENHANCEMENT COURSES

SEC-1: Office Automation Tools

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, Handouts, Slide Shows, Using Transitions, Animations. **(4L)**

Reference Books:

1. Sushila Madan, *Introduction to Essential Tools*, JBA, 2009.
2. Anita Goel, *Computer Fundamentals*, Pearson, 2012.

Software Lab based on Office Automation Tools

MS Word

1. Prepare a Grocery List having four columns (Serial Number, Product Name, 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.

2. 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.

3. 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.

4. BPB Publications plans to release a new book designed as per your syllabus. Design the First Page of the book as per the given specification:

- The title of the book should appear in bold using 20-point Arial font.
- The name of the author and his qualifications should be in the centre of the page in 16-point Arial font.
- At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
- The details of the offices of the publisher (only location) should appear in the footer.

5. Create the following one-page documents:

- Compose a note inviting friends to a get-together at your house, including a list of things to bring with them.
- Design a certificate in landscape orientation with a border around the document.
- Design a Garage Sale sign.
- Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:

- A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
- Use a newsletter format to promote upcoming projects or events in your classroom or college.

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

Colour, Style, Item

Blue, A980, Van
Red, X023, Car
Green, YL724, Truck

Name, Age, Sex

Bob, 23, M
Linda, 46, F
Tom, 29, M

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

Salesperson	Dolls	Trucks	Puzzles
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203

In this exercise, you will add a new row to your table, place the word "Total" at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

9. Wrapping of text around the image.

MS Excel

1. Given the following worksheet:

Sl. No.	Roll No.	Name	Marks	Grade
1	1001	Sachin	99	
2	1002	Sehwag	65	
3	1003	Rahul	41	
4	1004	Sourav	89	
5	1005	Harbhajan	56	

Calculate the grade of these students on the basis of following guidelines:

Marks	Grade
≥ 80	A+
≥ 60 AND < 80	A
≥ 50 AND < 60	B
< 50	F

2. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

Allowances

HRA Dependent on Basic

- 30% of Basic if Basic ≤ 1000
- 25% of Basic if Basic > 1000 & Basic ≤ 3000
- 20% of Basic if Basic > 3000

DA Fixed for all employees

- 30% of Basic

Conveyance Allowance

- Rs. 50 if Basic is ≤ 1000
- Rs. 75 if Basic > 1000 & Basic ≤ 2000
- Rs. 100 if Basic > 2000

Entertainment Allowance

- NIL if Basic is ≤ 1000
- Rs. 100 if Basic > 1000

Deductions

Provident Fund

- 6% of Basic

Group Insurance Premium

- Rs. 40 if Basic is ≤ 1500
- Rs. 60 if Basic > 1500 & Basic ≤ 3000
- Rs. 80 if Basic > 3000

Calculate the following:

Gross Salary = Basic + HRA + DA + Conveyance + Entertainment

Total Deduction = Provident Fund + Group Insurance Premium

Net Salary = Gross Salary – Total Deduction

3. Enter the following data in Excel Sheet:

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1475

EXPENSES	JAN	FEB	MARCH	Quarter Total	Quarter Average
Rent	600.00	600.00	600.00		
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	100.00	90.00		
AV to Insurance	150.00	150.00	110.00		
Cable TV	40.75	40.75	40.75		

Calculate Quarter Total and Quarter Average:

- Calculate Monthly Total.
- Surplus = Monthly Income – Monthly Total.
- What would be Total Surplus if Monthly Income is 1500?
- How much does telephone expense for March differ from Quarter Average?
- Create a 3D column graph for Telephone and Utilities.
- Create a pie chart for monthly expenses.

SEC-2: HTML Programming

Unit I: Introduction (1 L)

Unit II: The Basics (2 L)

The Head, The Body, Colors, Attributes, Lists (Ordered and Unordered).

Unit III: Links (3 L)

Introduction, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link within a Document.

Unit IV: Images (2 L)

Putting an Image on a Page, Using Images as Links, Putting an Image in the Background.

Unit V: Tables (4 L)

Creating a Table, Table Headers, Captions, Spanning Multiple Columns, Styling Table.

Unit VI: Forms

Basic Input and Attributes, Other Kinds of Inputs, Styling Forms with CSS, Where To Go From Here.

Reference Books:

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

Software Lab based on HTML Programming

1. Create an HTML document with the following formatting options:
 - Bold
 - Italics
 - Underline
 - Headings (Using H1 to H6 heading styles)
 - Font (Type, Size and Color)
 - Background (Colored background/Image in background)
 - Paragraph
 - Line Break
 - Horizontal Rule
 - Pre tag
2. Create an HTML document which consists of:
 - Ordered List
 - Unordered List
 - Nested List
 - Image
3. Create an HTML document which implements Internal linking as well as External linking.
4. Create a table using HTML which consists of columns for Roll No, Student's name and grade.
5. Create a form using HTML which has the following types of controls:
 - Text Box
 - Option/radio buttons
 - Check boxes
 - Reset and Submit button