FACULTY OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE

B.Sc. (Honors)

Four year UG course

SYLLABUS

W.E.F. 2025-2026

DURGABAI DESHMUKH MAHILA SABHA (AMS)

ARTS AND SCIENCE COLLEGE FOR WOMEN

Autonomous NAAC Reaccredited

O.U. Road Hyderabad 500007

Andhra Mahila Sabha Arts and Science College for Women
Autonomous NAAC Re-Accredited
BSc(Hon) Computer Science Syllabi w.e.f 2025

Scheme of Evaluation

Semester-I

Code	Course Title	HPW	Credits	Internal	External	Total
AECC I	**Environmental Informatics**	2 Hrs	2	10	40	50
Eng101	**English**	4 Hrs	4	20	80	100
Hin101/Tel101 /San 101	**Second language**	4 Hrs	4	20	80	100
CSC105	**Fundamentals of Information Technology**	2 Hrs	2	20	80	100
CSC106	**Programming with C**	3 Hrs	3	20	80	100
Mat105	**Calculus and Differential Equations**	4 Hrs	4	20	80	100
Sta105	**Statistics and Probability Models**	3 Hrs	3	20	80	100
Practical						
CSC135	**Fundamentals of Information Technology**	2 Hrs	1	20	30	50
CSC136	**Programming with C**	2 Hrs	1	20	30	50
Sta136	**Statistics and Probability Models**	2 Hrs	1	20	30	50

Semester-II

Code	Course Title	HPW	Credits	Internal	External	Total
AECC II	**Communication skills**	2	2	10	40	50
Eng 151	**English**	4	4	20	80	100
Hin151/Tel151 /San 151	**Second language**	4	4	20	80	100
CSC 155	**Computer Organization**	4 Hrs	4	20	80	100
CSC 156	**Problem Solving and Python Programming**	3 Hrs	3	20	80	100
Mat 155	**Algebra**	4 Hrs	4	20	80	100
Sta155	**Statistical Inference**	3 Hrs	3	20	80	100
Practical						
CSC185	**Problem Solving and Python Programming**	2 Hrs	1	20	30	50
Sta185	**Statistical Inference**	2 Hrs	1	20	30	50

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DEPARTMENT OF COMPUTER SCIENCE

SEMESTER-I

SYLLABI, MODEL PAPERS
2025-2026

B.Sc.-Honors (Computer Science)
Semester -I
Fundamentals of Information Technology

Subject Code	CSC 105
Instruction	2 Hrs/ Week
Duration of the semester Examination	3 Hrs
Duration of the Session Examination	1 Hrs
Semester Examination	80 Marks
Session Examination	20 Marks
No of Credits	2 Credits

Course Objectives:

- To deal with the basic concepts of computers.
- To discuss about the computer hardware, its components and basic computer architecture.
- To understand the basic computer software including the operating system and its concepts.
- To introduce the Telecommunications process

Course Outcome:

At the end or the course, students should be able to:

- Identify the components of a computer and their functions.
- Understand the concept of networking, LAN, Internet, and working of www.
- Understand the notion of problem solving using computer by programming
- Understand the notion Security Issues

Unit -I

Digital Age: Digital basis of Computers, Data/Information, Hardware Input, Output, Memory, Communication Hardware, Software, Application Software, System Software, Communications, Five kinds of Computers, Development in communication Technology, Connectivity and . Interactivity, Five Generations of Programming Languages, Programming languages used today, Object Oriented & Visual Programming.

Operating Systems: Booting, Managing Storage, Resources, Files tasks, Common operating systems

Unit -II

Processors: The CPU and Main Memory, Data Representation, Micro Computer System Unit, Input & Output devices, Keyboard, Pointing devices, Diskettes, Hard-disks, Optical disks, Flash memory, Magnetic tape, Compression and Decompression.

Files & Databases: Data storage hierarchy, File management, Files Management Systems, Database Management Systems,

Unit -III

Telecommunications: DATA, Video, Audio communication, the Internet, the World Wide Web, new Internet technologies, Communication channels, Networks, conduits of communication, Communication networks, Local networks, factors affecting communication among devices.

Application Software: Common features of software, Word processing, Spread sheet, software for Cyber space, Internet programming, HTML, XML, & Active X.

Unit- IV

Information Systems: Organization:- Departments, Tasks, Management Information systems, Six phases of system analysis and design. Software Development: Programming as a five step procedures.

Security Issues: Threats to computers & Communication systems, Safeguarding computers, and communications.

Suggested Reading:

1. Williams B.K. Sawyer et.al., *"Using. information Technology"*, Sixth Edition, Tata McGraw Hill, 2006.

References:

1. Aksoy & DeNardis " *Introduction to information Technology* ", Cengage Learning, 2006.
2. Dennis P. Curtin & Kim Folley, Kunalsen Cathymorin Irwin /McGraw-Hill 1997," Tata Graw Hill, 1998.
3. ITL Edn Solutions Ltd. *"Introduction to Information Technology"*, Pearson Education,2005.

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B.Sc.-Honors (Computer Science)
Semester -I
Fundamentals of Information Technology Lab

Subject Code	**CSC135**
Instruction	**2 Hrs/Week**
Duration of the semester Examination	**2 Hrs**
Marks for semester Examination	**50 Marks**
No of Credits	**1 Credit**

Course Objective:
The main objective of this laboratory is to familiarize the students with the basic hardware and software in computers.

Course Outcomes:
At the end or the course, students should be able to:

CO1 : Understand basic concepts and terminology of information technology.
CO2 : Have a basic understanding of personal computers and their operations.
CO3 : Be able to identify issues related to information security.

1. Identify and describe the relationships and role of the components of the "Logical' diagram of the computer. (e.g. processor, RAM, ROM, BIOS, input, output, storage.)

2. Relate the "logical" diagram of a computer system to the "physical" system by identifying physical components of a computer and describing their purpose. (e.g. the processor, memory chips, motherboard, disk drives, and controller cards such as AGP board, network cards, sound card, as well as parallel and serial ports etc)I

3. Assemble the computer which they will use and load the OS with partitions for Windows andLinux, configure for network connection.

4. Troubleshoot her PC from time to time.

5. Install/Un installs SW/HW on his/her PC from time to time.

6. Identify and distinguish between various types of application software. by describing and using them. (e.g. word processor, spreadsheet, database, browser, mailers etc.)

7. MS Word: Create documents with standard formatting commands, single/multi column, insert pictures/objects, drawings, hyperlinks, header/footer, and tables. No macros.

8. MS Power Point: Create presentations with preset animations, using different layouts, backgrounds, slide master, insert pictures/objects, drawings, hyperlinks, header/footer, tables

9. MS Excel: Creating worksheets with various kinds of data, making charts, conditional formatting, awareness of the various functions- statistical, date/time, math/trig etc, ability to explore (help) and use these functions if need be, demonstration through some common functions like sum, average, standard deviation, logical and information.

10. HTML: Should be able to create their web-page (title, text, frames, hyperlinks to some sites, pictures, lists, tables, fo

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B.Sc.-Honors (Computer Science)
Semester -I
Programming with C

Subject Code	**CSC 106**
Instruction	**3 Hrs/ Week**
Duration of the semester Examination	**3 Hrs**
Duration of the Session Examination	**1 Hrs**
Semester Examination	**80 Marks**
Session Examination	**20 Marks**
No of Credits	**3 Credits**

Course Objectives

- To provide students with a comprehensive understanding of the C programming language.
- To enable students to develop logical thinking skills for designing and implementing programs and applications in C.
- To equip students with fundamental programming concepts, allowing them to easily transition to other programming languages in the future..

Course Outcome:

After the completion of the Course ,the students will be able to

CO1: Design simple algorithms for arithmetic and logical problems.
CO2: Apply the algorithms to programs in C language
CO3: Understand conditional branching, iteration and recursion
CO4: Apply programming to problems involving arrays, structures and unions

Unit – I

Basics of C: Overview of C, Developing Programs in C, Parts of Simple C Program, Structure of a C Program, compilation and linking processes, Comments, Program Statements, C Tokens, Keywords, Identifiers, Data Types, Variables, Constants, Operators and Expressions, Expression Evaluation–precedence and associativity, Type Conversions. **Input-Output: Non-formatted and Formatted Input** and Output Functions, Escape Sequences,

Unit – II

Control Statements: Selection Statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch; Iterative Statements–while, for, do-while; Special Control Statement–goto, break, continue, return, exit.

Arrays and Strings: One-dimensional Arrays, Character Arrays, Functions from ctype.h, string.h, Multidimensional Arrays.

Unit – III

Functions: Concept of Function, Using Functions, Call-by-Value Vs Call-by-reference, Passing Arrays to Functions, Score of Variables, Storage Classes, Inline Functions, and Recursion.

Pointers: Introduction, Address of Operator (&), Pointer, Uses of Pointers, Arrays and Pointers, Pointers and Strings, Pointers to Pointers, Array of Pointers, Pointer to Array, Dynamic Memory Allocation.

Unit – IV

User-defined Data Types: Declaring a Structure (Union) and its members, Initialization Structure(Union), Accessing members of a Structure (Union), Array of Structures (Union), Structures verses Unions, Enumeration Types.

Files: Introduction, Using Files in C, Working with Text Files, Working with Binary Files, Files of Records, Random Access to Files of Records, Other File Management Functions.

Textbook:

Pradip Dey, Manas Ghosh, *Computer Fundamentals and Programming in C (2e)*, Oxford University Press

References:

- Herbert Schildt, *C: The Complete Reference*, Fourth Edition, McGraw Hill, 2003
- Bjarne Stroustrup, *The C Programming Language*, 4th Edition, Addison-Wesley, 2013
- Paul Deitel, Harvey Deitel, *C How to Program*, 8th Edition, Prentice Hall, 2011
- John R. Hubbard, *Programming with C*, Schaum's Series, 2nd Edition, 2000
- Walter Savitch, *Problem Solving with C*, Pearson Education, 2007

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B.Sc.-Honors (Computer Science)
Semester -I
Programming with C Lab

Subject Code	**CSC136**
Instruction	**2 Hrs/Week**
Duration of the semester Examination	**2 Hrs**
Marks for semester Examination	**50 Marks**
No of Credits	**1 Credit**

Course Objectives:

- To introduce students to the basic knowledge of programming fundamentals of C language.
- To impart writing skill of C programming to the students and solving problems.

Course Outcome:

After the completion of the Course ,the students will be able to

CO 1: Know concepts in problem solving ·
CO 2: Develop programming in C language ·
CO 3: Write diversified solutions using C language

1 Write a program to find the largest two (three) numbers using if and conditional operator.
2 Write a program to print the reverse of a given number.
3 Write a program to print the prime number from 2 to n where n is given by user.
4 Write a program to find the roots of a quadratic equation using switch statement.
5 Write a program to print a triangle of stars as follows (take number of lines from user):

```
*
* * *
*****
*******
*********
```

6 Write a program to find largest and smallest elements in a given list of numbers.
7 Write a program to find the product of two matrices..
8 Write a program to find the GCD of two numbers using iteration and recursion.
9 Write a program to illustrate use of storage classes.
10 Write a program to demonstrate the call by value and the call by reference concepts.
11 Write a program that prints a table indicating the number of occurrences of each alphabet inthe text entered as command line arguments.
12 Write a program to illustrate use of data type enum.
13 Write a program to demonstrate use of string functions string.h headerfile.
14 Write a program that opens a file and counts the number of characters in a file.
15 Write a program to create a structure Student containing fields for Roll No., Name, Class, Yearand Total Marks. Create 10 students and store them in a file.
16 Write a program that opens an existing text file and copies it to a new text file with alllowercase letters changed to capital letters and all other characters unchanged.

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SYLLABUS FOR B.SC HONORS(STATISTICS)
Semester I(Theory)
Statistics and Probability Models

Subject Code	**Sta105**
Instruction	**3 Hrs/Week**
Duration of Semester Examination	**3 Hrs**
Duration of Sessional Examination	**1 Hr**
Semester Examination	**80 Marks**
Sessional Examination	**20 Marks**
No of Credits	**3 Credit**

Course Objectives:

1. Introduce the fundamental concepts of descriptive statistics, including measures of central tendency, dispersion, moments, skewness, and kurtosis.
2. Provide a solid foundation in probability theory through classical, statistical, and axiomatic definitions, along with probability theorems and applications.
3. Develop understanding of random variables (discrete and continuous), distribution functions, and properties of bivariate distributions.
4. Familiarize students with the concept of mathematical expectation, generating functions, and inequalities with statistical applications.
5. Study standard discrete and continuous probability distributions, their properties, generating functions, and real-world applications.

Course Outcome:

CO1: Apply descriptive statistical measures (central tendency, dispersion, moments, skewness, kurtosis) to analyze and interpret data.
CO2: Demonstrate understanding of probability concepts, definitions, and solve problems using addition, multiplication, and Bayes' theorems.
CO3: Differentiate between discrete and continuous random variables, derive their probability mass/density functions, and analyze joint, marginal, and conditional distributions.
CO4: Compute expectations, moments, and apply generating functions (MGF, CGF, PGF, Ch.F) and inequalities (Chebyshev's, Cauchy–Schwartz) in solving probability problems.
CO5: Evaluate the properties and applications of standard discrete distributions (Binomial, Poisson, Negative Binomial, Geometric) in real-life contexts.
CO6: Analyze continuous distributions (Rectangular, Normal, Exponential, Gamma, Beta, Cauchy), derive their statistical measures, and apply them to practical scenarios.

Unit-I

Statistics: Measures of Central Tendency, Measures of Dispersions, Central and Non-central Moments, their inter-relationships, Measures of Skewness and Kurtosis.

Probability: Basic concepts of Probability with examples, Mathematical, Statistical and Axiomatic definitions of Probability and their merits and demerits. Joint, Marginal and Conditional probabilities; Addition, Multiplication and Bayes' theorems, Problems on Probability.

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Unit-II

Random Variables: Discrete and continuous random variables, functions of random variables, probability mass and density functions with illustrations. Distribution function and its properties, bivariate distribution, statements of its properties, Joint, marginal and conditional distributions, Independence of random variables.

Mathematical Expectation: Mathematical expectation of a function of a random variable with examples, Addition and Multiplication theorems of expectation. Definitions of moment generating function, characteristic function, cumulant generating function, probability generating function and statements of their properties with applications, Chebyshev's and Cauchy-Schwartz's inequalities and their applications.

Unit-III

Discrete Distributions: Definitions, mean, median, mode, variance, moment generating function, characteristic function, cumulant generating function, probability generating function and special properties (if any) for the discrete distributions: Binomial, Poisson, Negative binomial, Geometric distributions.

Unit-IV

Continuous distributions: Definitions, mean, median, mode, variance, moment generating function, characteristic function, cumulant generating function, and special properties (if any) for the continuous distributions: Rectangular, Normal, Exponential, Gamma, Beta and Cauchy distributions.

Reference Books:

1. V. K. Kapoor and S. C.Gupta:Fundamentals of Mathematical Statistics, S. Chand & Sons.
2. Hogg, Tanis, Rao: Probability and Statistical Inference, (7th edition), Pearson.
3. M. Jagan Mohan Rao and Papa Rao: A Text book of Statistics (Paper-I).
4. Sanjay Arora and Bansilal: New Mathematical Statistics, Satya Prakashan, New Delhi.

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SYLLABUS FOR B.SC HONORS(STATISTICS)

Semester I

Statistics and Probability Models

List of Practical

Subject Code	**Sta135**
Instruction	**2 Hrs/Week**
Duration of the semester Examination	**3 Hrs**
Marks for semester Examination	**50 Marks**
No of Credits	**1 Credit**

(Using MS-Excel)

(Basics of Excel- data entry, editing and saving, establishing and copying formulae, built in Functions in excel, copy and paste and exporting to MS word document).

1. Diagrammatic presentation of data (Bar and Pie).
2. Graphical presentation of data (Histogram, Frequency polygon, Ogives).
3. Computation of Measures of Central Tendencies, Dispersions and Coefficients of Dispersions
4. Computation of Moments, Coefficients of Skewness, Kurtosis.
5. Fitting of Binomial distribution - Direct & Recurrence relation methods.
6. Fitting of Poisson distribution - Direct & Recurrence relation methods.
7. Fitting of Negative Binomial distribution - Direct & recurrence relation methods
8. Fitting of Normal distribution - Areas & Ordinates methods.
9. Fitting of Exponential distribution.
10. Fitting of Cauchy distribution.
11. Generation of random samples from Uniform (0,1), Uniform (a,b)
12. Generation of random samples from Binomial, Poisson, Normal and Exponential distributions

Note :1. Training shall be on establishing formulae in Excel cells and deriving the results. The Excel output shall be exported to MSWord for writing inferences.

2.As per the norms for UG 20 students batch for practicals.

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B.Sc.-Honors (Mathematics)
Semester -I
Calculus and Differential Equations

Subject Code	**Mat 105**
Instruction	**4 Hrs/ Week**
Duration of the semester Examination	**3 hrs**
Duration of the Session Examination	**½ hrs**
Semester Examination	**80 Marks**
Session Examination	**20 Marks**
No of Credits	**4 Credits**

Unit – I

Successive Differentiation - Higher order derivatives - Calculation of nth derivative - Some standard results - Determination of nth derivative of rational functions - the nth derivatives of the products of the powers of sines and cosines - Leibnitz's theorem - the nth derivative of the product of two functions.

Unit – II

Linear Differential Equations - Differential Equations Reducible to Linear form - Exact differential equations - Integrating Factors.

Unit – III

Differential Equations of first order but not of first degree: Equations solvable for p - Equations solvable for y - Equations solvable for x - Equations that do not contain x (or y) - Equations Homogeneous in x and y - Equations of first degree in x and y - Clairaut's equation - Applications of first order Differential Equations - Growth and Decay - Radioactivity and carbon dating.

Unit – IV

Higher order Linear Differential Equations - Solution of homogeneous linear differential equations - Constant coefficients - Solution of non-homogeneous differential equations P(D)y=Q(x) with constant coefficients by means of polynomial operators when Q(x) = be^{ax},bsinax, bcosax, bx^k, Ve^{ax} - Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy Euler Equation.

Suggested Reading:

1. Differentail Calculus by Shanti Narayana and P.K.Mittal, S.Chand Publishers, New Delhi
2. Differential Equations and their Applications by Zafar Ahsan, PHI Pvt. Ltd, New Delhi

References:

1. Frank Ayres Jr: Theory and Problems of Differential Equations

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B.Sc.-Honors (Computer Science)
Semester -I

Syllabus: Environmental Informatics

Subject Code:	
Instruction	**2 Hrs/ Week**
Duration of the semester Examination	**2 hrs**
Duration of the Session Examination	**½ hrs**
Semester Examination	**40 Marks**
Session Examination	**10 Marks**
No of Credits	**2 Credits**

Unit I

Chapter 1: Introduction to Environmental Informatics and Environmental Studies
Introduction to the concept of environment, scope and importance of environmental studies, and basics of informatics. Brief introduction to remote sensing and GIS as tools to observe, map, and analyze environmental changes. Examples include air quality apps, weather forecasting, and satellite-based forest monitoring.

Chapter 2: Ecosystems and Informatics
Basic structure of ecosystems with abiotic and biotic components. Producers, consumers, decomposers, food chains, food webs, and ecological pyramids. Use of GIS and computer models to visualize ecosystem interactions and predict changes.

Chapter 3: Energy Flow in Ecosystems
Energy flow through ecosystems, solar energy capture by plants, and transfer to animals. Importance of ecological balance and conservation. Application of modeling and simulation tools to study energy flow.

Chapter 4: Biodiversity and Informatics Tools
Concept of biodiversity at genetic, species, and ecosystem levels. Hotspots, threats, and methods of conservation. Use of biodiversity databases, GPS, remote sensing, and citizen science apps for monitoring species and habitats.

Chapter 5: Natural Resources and Environmental Data Systems
Types of natural resources, renewable and non-renewable. Need for sustainable management. Use of remote sensing and GIS for mapping forests, minerals, and energy resources.

Unit II

Chapter 6: Water Resources and Informatics
Water as a critical resource and conservation methods including rainwater harvesting and watershed management. Role of satellites, GIS, and mobile apps in water monitoring and planning.

Chapter 7: Environmental Pollution and Informatics Solutions
Causes and impacts of air, water, and soil pollution. Solid waste management. Informatics-based solutions like sensors, GIS mapping, IoT, and smart bins.

Chapter 8: Global Environmental Issues and Informatics
Global challenges including climate change, global warming, ozone depletion, and fireworks pollution. Use of remote sensing, climate models, and global databases in monitoring and mitigation.

Chapter 9: Disaster Management and Informatics Applications
Types of disasters: floods, cyclones, earthquakes. Use of remote sensing and GIS for early warning, hazard mapping, and disaster preparedness. Example of Indian Ocean tsunami warning system.

Chapter 10: Environmental Legislation, Human Rights, and IT in Health
Overview of major environmental acts in India. Human rights and environmental concerns, including women and children. IT applications in legal monitoring, health, and environment (disease tracking, GIS for health risks).

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DEPARTMENT OF COMPUTER SCIENCE

SEMESTER-II

SYLLABI, MODEL PAPERS
2025-2026

B.Sc.-Honors (Computer Science)
Semester -II
Computer Organization

Subject Code	**CSC 155**
Instruction	**4 Hrs/ Week**
Duration of the semester Examination	**3 Hrs**
Duration of the Session Examination	**1 Hrs**
Semester Examination	**80 Marks**
Session Examination	**20 Marks**
No of Credits	**4 Credits**

Course Objectives:

- The course objectives of Computer Organization are to discuss and make student familiar with the Principles and the Implementation of Computer Arithmetic.
- Operations of CPU including RTL, ALU, Instruction Cycle and Busses.
- Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design.
- Memory System and I/O Organization.

Unit -I

Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip Flops, Sequential Circuits.
Digital Components: Integrated Circuits, Decoder, Multiplexers, 'Registers, Shift Registers, Binary counter, Memory unit.
Data Representation: Data types, Complements, Fixed and Floating Point Representation, Other binary codes and error Detection codes.

Unit -II

Register Transfer and Micro operations: Register Transfer language, Register transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations and Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycles, Memory Reference Instructions, Input, Output and Interrupts, Design of Accumulator logic.
Memory Organization: Memory Hierarchy, Main Memory, Cache Memory.

Unit -III

Programming the Basic Computer: Introduction, Machine Language, Assembly Language, The Assembler, Programming Arithmetic and Logic Operations, Subroutines, and I/O, Programming.
Micro programmed Control: Control Memory, Address Sequencing, Micro program Example,Design of Control Unit.
Input -Output organization: Peripheral Devices, I/O Output interlace, Asynchronous data transfer, Modes 0ftransfer, Priority Interrupt, OMA, Input output Processor, Serial Communication.

Unit –IV

Central Processing Unit: Introduction, General Register Organization, Stack Organization,Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC.
Parallel Processing: Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline. Computer Arithmetic: Addition and Subtraction, Multiplication algorithms, Division Algorithms, Floating point arithmetic operations, decimal arithmetic unit, and decimal arithmetic operations.

Suggested Reading:

1. M. Morris Mano, "Computer System Architecture", Pearson Education Asia, Third Edition, 1993.

References:

1. Miles Murdocca, Vincent Heuring, "Computer Architecture and Organization", John Wiley & Sons 2007.
2. Sivarama P Dandamudi —Fundamentals of Computer Organization and Designl, Wiley Dream Tech publishers, 2003.
3. William stallings, —Computer Organization & Architecturel, Pearson Education, Sixth Edition 2003.

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B.Sc.-Honors (Computer Science)

Semester -II

Problem Solving and Python Programming

Subject Code	**CSC 156**
Instruction	**3 Hrs/ Week**
Duration of the semester Examination	**3 Hhrs**
Duration of the Session Examination	**1 Hrs**
Semester Examination	**80 Marks**
Session Examination	**20 Marks**
No of Credits	**3 Credits**

Course Objectives

- To convert an algorithm into a Python program
- To construct Python programs with control structures.
- To do input/output with files in Python.
- To construct Python programs as a set of objects.

Course Outcome:

After the completion of the Course ,the students will be able to

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Develop and execute simple Python programs.

CO3: Structure a Python program into functions.

CO4: Read and write data from/to files in Python Programs.

Unit-I

Introduction to Computing and Problem Solving: Fundamentals of Computing – ComputingDevices – Identification of Computational Problems – Pseudo Code and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms.

Introduction to Python Programming: Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: The if, The if...else, The if...elif...else Decision Control Statements, Nested if Statement, The while Loop, The for Loop, The continue and break Statements.

Unit-II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Unit-III

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram. Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

Unit-IV

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance The Polymorphism.

Functional Programming: Lambda. Iterators, Generators, List Comprehensions.

Suggested Reading:

1. Learning To Program With Python. Richard L. Halterman. Copyright © 2011
2. Python for Everybody, Exploring Data Using Python 3. Dr. Charles R. Severance. 2016

References:

1. Introduction to Python Programming. Gowrishankar S., Veena A. CRC Press, Taylor & Francis Group, 2019
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python
3. Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

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B.Sc.-Honors (Computer Science)
Semester -II
Problem Solving and Python Programming LAB

Subject Code	**CSC186**
Instruction	**2 Hrs/Week**
Duration of the semester Examination	**2 Hrs**
Marks for semester Examination	**50 Marks**
No of Credits	**1 Credit**

Course Objectives:

The main objective of this laboratory is to put into practice computational thinking. The students will be expected to write, compile, run and debug .
Python programs to demonstrate the usage of

- variables, conditionals and control structures.
- functions (both recursive and iterative).
- Basic data types as well as compound data structures such as strings, lists, sets, tuples, dictionaries.
- object-oriented programming.

Installing Python and Setting up the Environment

Python interpreter can be downloaded for Windows/Linux platform using the link below: https://www.python.org/downloads/windows/

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Exercises

I. Programs to demonstrate the usage of operators and conditional statements

1. Write a program that takes two integers as command line arguments and prints the sum of twointegers.
2. Program to display the information:
Your name, Full Address, Mobile Number, College Name, Course Subjects
3. Program to find the largest number among _n' given numbers.
4. Program that reads the URL of a website as input and displays contents of a webpage.

II. Programs to demonstrate usage of control structures

4. Program to find the sum of all prime numbers between 1 and 1000.
5. Program that reads set of integers and displays first and second largest numbers.
6. Program to print the sum of first _n' natural numbers.
7. Program to find the product of two matrices.
8. Program to find the roots of a quadratic equation

III. Programs to demonstrate the usage of Functions and Recursion

9. Write both recursive and non-recursive functions for the following: a. To find GCD of two integers
b. To find the factorial of positive integer
c. To print Fibonacci Sequence up to given number _n'
d. To convert decimal number to Binary equivalent
10. Program with a function that accepts two arguments: a list and a number _n'. It should display all
the numbers in the list that are greater than the given number _n'.
11. Program with a function to find how many numbers are divisible by 4,5,6,7 between 1 to1000

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IV. Programs to demonstrate the usage of String functions

12. Program that accept a string as an argument and return the number of vowels and consonants thestring contains.
13. Program that accepts two strings S1, S2, and finds whether they are equal are not.
14. Program to count the number of occurrences of characters in a given string.
15. Program to find whether a given string is palindrome or not

V. Programs to demonstrate the usage of lists, sets, dictionaries, tuples and files.

16. Program with a function that takes two lists L1 and L2 containing integer numbers as parameters. The return value is a single list containing the pair wise sums of the numbers in L1 and L2.
17. Program to read the lists of numbers as L1, print the lists in reverse order without using reversefunction.
18. Write a program that combine lists L1 and L2 into a dictionary.
19. Program to find mean, median, mode for the given set of numbers in a list.
20. Program to find all duplicates in the list.
21. Program to o find all the unique elements of a list.
22. Program to find max and min of a given tuple of integers.
23. Program to find union, intersection, difference, symmetric difference of given two sets.
24. Program to display a list of all unique words in a text file
25. Program to read the content of a text file and display it on the screen line wise with a line numberfollowed by a colon
26. Program to analyze the two text files using set operations
27. Write a program to print each line of a file in reverse order.

VI. Programs to demonstrate the usage of Object Oriented Programming

28. Program to implement the inheritance
29. Program to implement the polymorphism

VII. Programs to search and sort the numbers

30. Programs to implement Linear search and Binary search
31. Programs to implement Selection sort, Insertion

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SYLLABUS FOR B.SC HONORS(STATISTICS)
Semester II (Theory)
Statistical Inference

Subject Code	**Sta155**
Instruction	**3 Hrs/Week**
Duration of Semester Examination	**3 Hrs**
Duration of Sessional Examination	**1 Hr**
Semester Examination	**80 Marks**
Sessional Examination	**20 Marks**
No of Credits	**3 Credit**

Course Objectives:

1.Introduce the concepts of population, sample, sampling distributions, and standard error, and to study the exact sampling distributions of χ^2, t, and F.
2.Provide knowledge of point and interval estimation, properties of good estimators, and methods of estimation such as method of moments and maximum likelihood estimation.
3.Familiarize students with the theory and applications of hypothesis testing for large and small samples using χ^2, t, and F tests.
4.Enable students to apply non-parametric tests and understand their advantages, disadvantages, and relation to parametric tests.

Course Outcome:

CO1: Explain and apply the concepts of population, sample, sampling distribution, and standard error in data analysis.
CO2: Derive and use exact sampling distributions (χ^2, t, F) and apply them in inferential procedures.
CO3: Evaluate point estimators for properties such as unbiasedness, consistency, efficiency, and sufficiency; apply methods of estimation (method of moments, MLE) and construct interval estimates.
CO4: Formulate and test statistical hypotheses for large and small samples using appropriate test statistics (χ^2, t, F) and interpret results.
CO5: Perform non-parametric tests (runs test, sign test, Wilcoxon signed-rank test, Mann–Whitney U test, median test, Wald–Wolfowitz test) and compare them with parametric approaches.

Unit-I

Sampling Distributions: Concepts of Population, Parameter, Random sample, Statistic, Sampling distribution and Standard error. Standard error of sample mean(s) and sample proportion(s). Exact sampling distributions: Statement and properties of $\chi 2$, t and F distributions. Point estimation: Estimation, criteria of a good estimator- consistency, unbiasedness, efficiency and sufficiency with examples. Deriving sufficient statistics for Binomial, Poisson, Normal and Exponential (one parameter only) distributions. Estimation

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by the method of moments, Maximum likelihood estimation (MLE), Concept of interval estimation

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Unit-II

Testing of Hypothesis: Concepts of statistical hypotheses, Statement of Neyman-Pearson's lemma, Examples in case of Binomial, Poisson, Exponential and Normal distributions and their power of the test functions. Large sample tests: single sample mean, difference of means, single sample proportion, difference of proportions and difference of standard deviations.

Unit-III

Small sample tests: Tests of significance based on $\chi 2$: for specified variance, goodness of fit and test for independence of attributes. Tests of significance based on student's-t: test for single sample specified mean, difference of means for independent and related samples. F - test for equality of population variances.

Unit-IV

Non-parametric tests: Their advantages and disadvantages, comparison with parametric tests. Measurement scale - nominal, ordinal, interval and ratio. Use of Central Limit Theorem in testing. One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runs test. Use of central limit theorem in testing.

Reference Books:

1. V.K. Kapoor and S.C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi 2. Sanjay Arora and Bansi Lal: New Mathematical Statistics Satya Prakashan , New Delhi 3. Siegal, S., and Sidney: Non-parametric statistics for Behavioral Science. McGraw Hill. 4. Gibbons J.D and Subhabrata Chakraborti: Nonparametric Statistical Inference. Marcel Dekker. 5. Conover: Practical Nonparametric Statistics. Wiley series. 6. Hogg, Tanis, Rao. Probability and Statistical Inference.7th edition. Pearson Publication.

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SYLLABUS FOR B.SC HONORS(STATISTICS)
Semester II (Practical)
Paper-II: Statistical Inference

List of Practical

Subject Code	**Sta185**
Instruction	**2 Hrs/Week**
Marks for semester Examination	**50 Marks**
No of Credits	**1 Credit**

(Using R)

1. Data Visualization using: Bar diagram, Pie diagram, Histogram, Frequency polygon, Ogives.
2. Computation of Measures of Central Tendencies, Dispersions and Coefficients of Dispersions
3. Computation of Moments, Coefficients of Skewness, Kurtosis.
4. Generation of random samples from Uniform (0,1), Uniform (a, b)
5. Generation of random samples from Binomial, Poisson, Normal and Exponential distributions
6. Small/large sample tests for: single sample mean, two / paired sample means, Small / large sample test for single and difference of variances.
7. $\chi 2$-test for goodness of fit and independence of attributes.
8. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.

Note : 1.As per the norms for UG 20 students batch for practicals.

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B.Sc.-Honors (Mathematics)
Semester -II
Algebra Theory

Subject Code	**Mat 155**
Instruction	**4 Hrs/ Week**
Duration of the semester Examination	**3 hrs**
Duration of the Session Examination	**½ hrs**
Semester Examination	**80 Marks**
Session Examination	**20 Marks**
No of Credits	**4 Credits**

Unit-I

Group Theory: Definition of a Group - Some Examples of a Groups - Some Preliminary Lemmas - Subgroups - A Counting Principle.

Unit-II

Normal Subgroups and Quotient Groups – Homomorphisms.

Unit-III

Ring Theory: Definition and Examples of Rings - Some Special Classes of Rings - Homomorphisms

Unit-IV

Ideals and Quotient Rings - More Ideals and Quotient Rings - Euclidean Rings.

Suggested Reading:
1. Topics in Algebra by I.N.Herstein 2nd Edition, John Wiley & Sons

References:
1. Contemporary Abstract Algebra by Joseph A Gallion (9th edition)
2 . Fraleigh J.B, A First Course in Abstract Algebra

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