

Common course structure for V semester UG Courses

Department of BCA

Discipline Specific Core Course: BCA

Semester	Theory/ Practical	Course Title	Teaching/ Practical Instruction hour/week	Total Hour/Sem	Duration of Exam in hours	Assessment Marks			Credits
						Summative	Formative	Total	
V	Theory	Statistical techniques using Pythons	4	60	3	80	20	100	4
	Practical	Statistical techniques using Pythons Lab	4	60	3	40	10	50	2
	Theory	Web Programming Using PHP	4	60	3	80	20	100	4
	Practical	Web Programming Using PHP Lab	4	60	3	40	10	50	2
	Theory	1.Data Science	4	60	3	80	20	100	4
		2. Cloud Computing							
	Theory	Research Methodology	3	60	3	80	20	100	3
Elective	Computer Concepts and Office Automation	3	60	3	80	20	100	3	

BCA5th semester Syllabus w.e.f. 2026-27 onwards

Paper 1	Statistical techniques using Python	Credits: 4	Contact Hours: 52	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03 hrs

Course Outcomes(COs): At the end of the course, students will be able to:

- Understand Basic Statistical Concepts: Grasp fundamental statistical concepts relevant to computing and IT.
- Analyze Data: Use basic statistical techniques to analyze data for insights in computing contexts.
- Visualize Data: Create charts and graphs to represent data visually for better understanding.
- Demonstrate proficiency in Python Programming including variables, datatypes, functions, and control structures.
- Manipulate and visualize data effectively using NumPy, Pandas and Matplotlib.

Unit 1**10 Hours**

Basic concepts of Statistics, qualitative and quantitative data, classification of data, construction of frequency distribution, diagrammatic representation of data.

Unit 2**10 Hours**

Measures of Central Tendency: Arithmetic mean, median and mode—their properties Measures of Dispersion: Range, mean deviation, quartile deviation, variance and standard deviation..

Unit 3**12 Hours**

Correlation: Definition, scatter diagram, types of correlation, measures—Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient. Regression: Linear regression-fitting by least square method and interpretation.

Unit 4**10 Hours**

Python Fundamentals- Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Syntax, variables, data types. Control Structures, loops, functions. Input/output, file handling, importing CSV/Excel data.

Unit 5**10 Hours**

Libraries for Data: NumPy basics (arrays, operations), Pandas basics (Series, DataFrame). Frequency Distribution: using Pandas to construct frequency tables. Visualization: Matplotlib/Seaborn for bar charts, histograms, pie charts. Writing Python functions to compute statistical measures. **Visualization of Statistics:** boxplots, scatter plots, and distribution plots. **Case Studies:** applying Python to small datasets (student marks, survey data).

Text Book:

1. Manish Sharma, Amit Gupta, The Practice of Business Statistics, Khanna Book Publishing Company, 2010
2. Ross Sheldon M., Introduction to Probability and Statistics for Engineers and Scientists, 6th

- Edition, Elsevier, 2021.
3. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, GreenTeaPress.
 4. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015

References:

1. Miller Irwin and Miller Marylees, Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2005
2. Statistical Methods: By Dr. S.P. Gupta, covering various statistical methods including business forecasting, correlation, and regression analysis.
3. Elementary Statistical Methods: Also by Dr. S.P. Gupta, providing an introduction to basic statistical methods.

Paper-1	LAB: Statistical Techniques Lab. Using Python	Credits: 2	Contact Hours: 52	Practical 04 Hrs/week
Internal assessment: 10 marks		Term end exam: 40 marks		Exam duration: 02 hrs

Assignments based on the subject Paper-1: Statistical Techniques using Python shall be implemented in the lab.

PART-A

1. Check if an number belongs to the Fibonacci Sequence
2. Write a python program to find factorial of a given number using functions.
3. Write a python program to explore string functions.
4. Write a python program to accept marks of students, store them in a list, and compute the average.
5. Read a dataset from a CSV file and display the contents using Pandas.
6. Write a python program to create arrays using NumPy and perform operations on arrays.
7. Write a python program to create DataFrame from Excel sheet using Pandas and perform operations on DataFrames

PART-B

8. Plot bar chart, pie chart, and histogram using Matplotlib/Seaborn for a dataset.
9. Write Python functions to calculate mean, median, and mode for a dataset.
10. Program to compute range, mean deviation, variance, and standard deviation using NumPy.
11. Generate a boxplot to visualize quartiles, median, and dispersion of data.
12. Program to calculate Karl Pearson's correlation coefficient using NumPy/Pandas for a dataset.
13. Fit a simple linear regression line using NumPy/SciPy, plot the regression line on a scatter diagram, and interpret slope & intercept.
14. Apply all statistical measures (central tendency + dispersion) on a dataset of student marks, and visualize results with graphs.

Paper 2	Web Programming Using PHP	Credits: 4	Contact Hours: 52	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03 hrs

Course Outcomes(COs):At the end of the course, students will be able to:

- Design dynamic and interactive web pages and websites.
- Run PHP scripts on the server and retrieve results.
- Handle databases like MySQL using PHP in websites.

Unit-I

10 Hours

Introduction to PHP: Introduction to PHP, History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages, Understanding PHP, HTML and White Space, Writing Comments in PHP, Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP, Expressions in PHP, Operators in PHP.

Unit-II

10 Hours

Programming with PHP: Conditional statements: if, if-else, switch, The? Operator, Looping statements: while Loop, do-while Loop, for Loop.

Arrays in PHP: Introduction- What is Array?, Creating Arrays, Accessing 2 Array elements, Types of Arrays: Indexed v/s Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying array, Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.

Unit-III

10 Hours

Using Functions, Class Objects, Forms in PHP: Functions in PHP, Function definition, Creating and invoking user-defined functions, Formal parameters versus actual parameters, Function and variable scope, Recursion, Library functions, Date and Time Functions.

Strings in PHP: What is String?, Creating and Declaring String, String Functions

Unit-IV

10 Hours

Class & Objects in PHP: What is Class & Object, Creating and accessing a Class &Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor.

Form Handling: Creating HTML Form, Handling HTML Form data in PHP Database Handling Using PHP with MySQL: Introduction to MySQL: Database terms, Data Types.

Unit -V

12 Hours

Accessing MySQL -Using MySQL Client and Using php MyAdmin, MySQL Commands, Using PHP with MySQL: PHP MySQL Functions, Connecting to MySQL and Selecting the Database, Executing Simple Queries, Retrieving Query Results, Counting Returned Records, Updating Records with PHP

References:

1. PHP & MySQL for Dynamic Web Sites- Fourth Edition By Larry Ullman. 2. Learning PHP, MySQL and JavaScript By Robin Nixon-O'REILLY Publications

2. Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre
3. SAMS Teach Yourself PHP in 24 hours, Author: Matt Zandstra, Sams Publishing

Paper 2	Web Programming Using PHP Lab	Credits: 2	Contact Hours: 52	Practical 04 Hrs/week
Internal assessment: 10 marks		Term end exam: 40 marks		Exam duration: 02 hrs

Assignments based on the subject Paper-2: Web Programming Using PHP shall be implemented in the lab.

Part-A

1. Write a PHP script to print "hello world".
2. Write a PHP script to find odd or even number from given number.
3. Write a PHP script to find maximum of three numbers.
4. Write a PHP script to swap two numbers.
5. Write a PHP script to find the factorial of a number.
6. Write a PHP script to check whether given number is palindrome or not.
7. Write a PHP script to reverse a given number and calculate its sum
8. Write a PHP script to generate a Fibonacci series using Recursive function
9. Write a PHP script to implement atleast seven string functions.
10. Write a PHP program to insert new item in array on any position in PHP.

Part-B

1. Write a PHP script to implement constructor and destructor
2. Write a PHP script to implement form handling using get method
3. Write a PHP script to implement form handling using post method.
4. Write a PHP script that receive form input by the method post to check the number is prime or not.
5. Write a PHP script that receive string as a form input
6. Write a PHP script to compute addition of two matrices as a form input.
7. Write a PHP script to show the functionality of date and time function.
8. Write a PHP program to upload a file
9. Write a PHP script to implement database creation
10. Write a PHP script to create table
11. Develop a PHP program to design a college admission form using MYSQL database.

Paper 3	1. Data Science	Credits: 4	Contact Hours: 52	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03 hrs

Course Outcomes: On successful completion of the course, the students shall be able to

1. Define the data science lifecycle and identify key roles, tools, and techniques in data science.
1. Perform data cleaning, transformation, and exploratory data analysis using libraries such as Pandas and NumPy.
2. Apply descriptive and inferential statistics to analyze data distributions and relationships.
3. Implement supervised and unsupervised machine learning models for classification and clustering problems.
4. Visualize data insights using tools like Matplotlib, Seaborn, or Tableau to support decisionmaking.
5. Evaluate model performance using appropriate metrics and improve models through feature selection and hyperparameter tuning.
6. Demonstrate the ability to complete a data science project involving problem definition, data handling, modeling, and result communication.

Unit-I

12 Hrs.

Introduction to Data Science: Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation.

Unit-II

10 Hrs.

Introduction to Data Science: Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation.

Unit-III

14 Hrs.

Data Visualization: Introduction to data visualization – Data visualization options – Filters – MapReduce – Dashboard development tools – Creating an interactive dashboard with dc.js/summary

Unit-IV

16 Hrs.

Ethics and Recent Trends: Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text books:

1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016.
2. An Introduction to Statistical Learning: with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 1st edition, 2013.

References:

1. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 1st edition, 2016.
2. Ethics and Data Science, D J Patil, Hilary Mason, Mike Loukides, O' Reilly, 1st edition, 2018.

Paper 3	2. Cloud Computing	Credits: 4	Contact Hours: 52	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03 hrs

Course Outcomes (COs): At the end of the course, students will be able to:

- Understand Cloud Computing Basics: Grasp fundamental concepts of cloud computing relevant to IT and computing.
- Identify Cloud Service and Deployment Models: Understand IaaS, PaaS, SaaS and public, private, hybrid clouds.
- Apply Cloud in Computing: Use cloud computing for applications in IT and computing fields.
- Consider Cloud Security: Understand basic security considerations in cloud computing.
- Evaluate Cloud for IT Needs: Assess cloud options for computing and IT requirements.

Unit 1**10 Hours**

What is Cloud Computing: Definition, characteristics, and overview of cloud computing paradigms.
Importance in IT: Role of cloud computing in modern IT infrastructure, scalability, and cost-effectiveness.

Unit 2**12 Hours**

Cloud Service Models IaaS (Infrastructure as a Service): Providing virtualized computing resources over the internet.

PaaS (Platform as a Service): Offering a platform for developing, running, and managing applications.

SaaS (Software as a Service): Delivering software applications over the internet.

Use Cases: Examples of using these service models in computing and IT projects.

Unit 3**10 Hours**

Cloud Deployment Models Public Clouds: Cloud services offered over the public internet.

Private Clouds: Cloud infrastructure for a single organization.

Hybrid Clouds: Combination of public and private clouds.

Choosing a Model: Factors to consider when selecting a cloud deployment model for IT needs.

Unit 4**10 Hours**

Cloud Computing Applications: Applications of cloud computing in IT, computing fields, and business.

Benefits and Challenges: Overview of advantages (scalability, cost savings) and challenges (security, management) in cloud adoption.

Unit 5**10 Hours**

Cloud Security Basics: Introduction to security considerations and risks in cloud computing.

Data Protection: Basics of protecting data in cloud environments - encryption, access controls.

Text Books:

1. Mastering Cloud Computing: By Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, and Shivananda Poojara (2nd Edition, 2024)
2. Cloud Computing: By Ashish Bhatnagar and Shailza Sharma (published by S.K. Kataria & Sons, 2019)

References:

1. Cloud Computing: By Pankaj Sharma (published by S.K. Kataria, 2013)
2. Cloud Computing: A Practical Approach for Learning and Implementation: By Srinivasan
3. Mastering Cloud Computing: By Dr. Vimal Mishra, Dr. A. K. Dubey, Aditya Bhushan, and SK Singh
4. Cloud Computing: By Dr. Jayanti Goyal, Deepa Chauhan, and Virendra Tank (2023)

Paper 4	Research Methodology	Credits: 3	Contact Hours: 45	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03 hrs

Course Outcomes (COs): At the end of the course, students will be able to::

- Understand fundamental concepts
- Identify research problems
- Design a research study
- Data collection and analysis
- Apply statistical tools
- Write a research proposal
- Evaluate ethical issues
- Present and communicate findings

UNIT I**10 Hrs**

Introduction : Meaning, objectives and motivations in research, Characteristics and limitations of research – Components of research work - Criteria of good research, Research process – Types of Research, Fundamental, Pure or Theoretical Research –Applied Research –Descriptive Research – Evaluation Research –Experimental Research – Survey Research – Qualitative Research – Quantitative Research – Historical Research.

UNIT II**10 Hrs**

Research Design: Research Design – definition – essentials and types of research design – errors and types of errors in research design. Research problem: Selecting and analyzing the research problem – problem statement formulation – formulation of hypothesis. Literature review: purpose, sources, and importance - literature review procedure. Objectives: Learning Objectives; Definitions; Formulation of the research objectives.

UNIT III**10 Hrs**

Measurement. Scaling and Sampling: Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument. Data Collection methods –

primary and secondary data – Construction of questionnaire and instrument – validation of instruments.
Sample size determination - Sample design and sampling techniques

UNIT IV**08 Hrs**

Data Analysis and Tools: Processing of Data: Editing of Data – Coding of Data – Classification of Data – Statistical Series. Qualitative vs Quantitative data analyses – Univariate, Bivariate and Multivariate statistical techniques Measures of Central Tendency, Dispersion, correlation and Regression, Chi-square test: Applications, Steps, characteristics, limitations, Analysis of Variance and Covariance, Application of statistical software for data analysis.

UNIT V**07 Hrs**

Research Report Writing: Research report – Different types – Contents of report –executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension – tone – final proof – report format – title of the report – Ethical issues in research: Code of Ethics in Research – Ethics and Research Process – Importance of Ethics in Research.

Text Book:

1. Kothari, C.R., 2004. Research methodology: Methods and techniques. New Age International.

References:

1. Cooper, D.R., Schindler, P.S. and Sun, J., 2006. Business research methods (Vol. 9). New York: McGraw-Hill Irwin.
2. Creswell, J.W. and Creswell, J.D., 2017. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.
3. Krishnaswamy, K.N., 2006. Management Research Methodology: Integration of Principles, Methods and Techniques. Pearson Education India.
4. Sekaran, U. and Bougie, R., 2016. Research methods for business: A skill building approach. John Wiley & Sons.

Paper 5	Elective: Computer Concepts and office Automation	Credits: 3	Contact Hours: 45	Theory 04 Hrs/week
Internal assessment: 20 marks		Term end exam: 80 marks		Exam duration: 03 hrs

Course Outcomes (COs): At the end of the course, students will be able to:

- Understand the basics of computer systems and its components
- Possess the the knowledge of operating systems
- Understand and apply the basic concepts of a word processing package
- Understand and apply the basic concepts of electronic spreadsheet software
- Understand and create a presentation using PowerPoint tool.

Unit 1**10 Hours**

Introduction to Computers, history of computers, types of computers, Characteristics of computers, block diagram, a brief introduction of CPU, Main Memory.

Basic Anatomy of a computer, Applications of computer - Input and Output devices - inputting text: keyboards, OCR, Bar codes and speech recognition - Inputting graphics- scanners – pointing devices - Output devices – types of screens- CRT- flat panel displays, Printers - Laser Printers, Ink-jet printers -

other printers – color printers. Memory and Types: Memory types – Secondary storage - Diskettes - Hard Disks - Optical Disks - Magnetic Tapes – External Hard Disks, USB Flash Drive.

Unit 2**10 Hours**

Windows ,Control Panel, Taskbar, Desktop, Icons, Windows Accessories, Note pad, Paintbrush, Introduction to Operating system (Windows XP), Windows concepts, Features. Windows Structure, Desktop, Task bar, Start Menu, My Computer, Recycle Bin, Windows Accessories, calculator, Notepad, Paint, Word pad, Character Map Windows Explorer, Entertainment, Installation of Hardware and Software Using scanner, system tools, communication, sharing information between computers Conclusion of unit

Unit 3**10 Hours**

Word processing -Introduction to Word Processing Working with Files – Working with Text – Formatting, Moving, copying and pasting text Styles–Lists–Bullets and numbered lists, Nested lists, Formatting lists. Table Manipulations. Graphics- Adding clip Art, add an image from a file, editing graphics, Spelling and Grammar, AutoCorrect - Page formatting - Header and footers, page numbers, Protect the Document, Mail Merge, Macros - Creating and Saving web pages, Hyperlinks and conclusion of unit

Unit 4**10 Hours**

Spreadsheets- Introduction to Excel Spreadsheet, Modifying a Worksheet – Moving through cells, adding worksheets, rows and columns Resizing rows and columns, selecting cells, Moving and copying cells, freezing panes - Macros – recording and running. Formatting cells – Formatting toolbar, Dates and times, Auto formatting. Formula and Functions. Linking worksheets - Sorting and Filling, Alternating text and numbers with Auto fill, Auto filling functions. Graphics – Adding clip art, add an image from a file, Creating Charts – Using chart Wizard, Copy a chart to Microsoft Word, Sharing & Importing Data, Printing, and Conclusion of unit.

Unit 5**05 Hours**

MS-Power Point -Introduction to PowerPoint Presentations Getting started in Power Point, Creating a presentation, Creating & editing slides, Previewing a slide show, Adding picture & graph, Adding sound and video, Adding auto shape, Animating objects, Conclusion of unit

References:

1. Sanjay Saxena, A First Course in Computers (Based on Windows 8 And MS Office 2013) Vikas Publishing 2015.
2. P. K. Sinha and Priti Sinha, Computer Fundamentals, Sixth Edition, BPB publications. (Main)
3. S. K. Basandra, Computers Today ,Galgotia Publications.
4. Rajaraman V., Introduction to Information Technology, 2nd Edition, PHI
5. Xavier, C, Introduction to Computers and Basic Programming New age International,
6. Rajaraman, V., Adabala, Neeharika, Fundamentals of Computers, PHI
7. Jennifer fulton, Sherri Kinkoph, and Joe Kraynak, The Big Basics Book of Microsoft Office 1997, PHI, 1998.
8. Laura Acklen et al, Microsoft Office 97 Professional Essentials, EEE Que E&T, PHI(1998).
9. Andy Channelle, Beginning OpenOffice 3, APress 2009
10. Online Resources, https://www.tutorialspoint.com/computer_fundamentals/index.htm,
https://onlinecourses.swayam2.ac.in/cec19_cs06/preview

Evaluation Scheme for Lab. Term end Examination

Assessment Criteria		Marks
Program– 1	Writing the Program	05
	Execution and Formatting	05
Program– 2	Writing the Program	05
	Execution and Formatting	05
Viva Voice		05
Practical Record book		05
Total		40