KAVAYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERSITY, JALGAON

Semester- wise Code Structure

B. Sc. (Honors/ Research) Programme

Data Science

As per NEP-2020 for Affiliated Colleges

With effect from June-2024

BoS COMPUTER SCIENCE

Year (Level)	Sem.	Faculty	Subject-I (M-1)	Subject-II (M-2)	Subject-III (M-3)	Open Elective (OE)	VC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT, RP	Min. Credits for the Year (Sem)	Degree.
1 (4.5)	Sem-I	Science	DSC-1 (2T) DSC-2 (2P)	DSC-1 (2T) DSC-2 (2P)	DSC-1 (2T) DSC-2 (2P)	OE-1(2T)	----	AEC-1 (2) (Eng) VEC-1 (2) (EA) IKS (2)	CC-1 (2)	44 (22+22)	UG Certificate In Faculty
	Sem-II	Science	DSC-3 (2T) DSC-4 (2P)	DSC-3 (2T) DSC-4 (2P)	DSC-3 (2T) DSC-4 (2P)	OE-2(4T)	----	AEC-2 (2) (Eng) VEC-2 (2) {CI}	CC-2 (2)		
	Credit: 1st Year		08	08	08	06	---	10	4	44	

Note:
- T: Theory Course, P: Practical course, **Number in bracket indicate credit allotted.**
- **The courses which do not have practical, 'P' will be treated as 'T'**
- If student select subject other than faculty in the subjects M-1, M-2, & M-3, then that subject will be treated as Minor subject, and can not be selected as Major at Second year.

Abbreviations:	
• **T:** Theory Course • **P:** Practical course • **DSC:** Discipline Specific Core Course • **DSE:** Discipline Specific Elective Course • **MIN:** Minor subject • **VSEC:** Vocational skill and Skill Enhancement courses • **VC:** Vocational Skill Courses • **SEC:** Skill Enhancement Courses • **GE/OE:** Generic/Open elective • **CEP:** Community engagement and service	• **CC - Co-curricular Course** • **VEC: Value Education Courses** • **IKS: Indian Knowledge System** • **AEC: Ability Enhancement Courses** • **Eng: English** • **MIL: Modern Indian language** • **CI: Constitution of India** • **EA: Environment Awareness** • **OJT: On Job Training: Internship/ Apprenticeship** • **RP: Research Project** • **RM: Research methodology**

Note:
1. Syllabi of AEC, AEC, VEC, IKS, CC, will be displayed separately by KBCNMU.
2. Science student will Choose OE offered by Faculty of Commerce and Management orHumanities.

Subject Short Name:		
Sr	**Name of Subject**	**Short Name**
1	Biochemistry	BC
2	Biotechnology	BT
3	Botany	BO
4	Chemistry	CS
5	Computer Science	CS
6	Data Science	DS
7	Electronics	EL
8	Environmental Science	EV
9	Geography	GG
10	Geology	GE
11	Mathematics	MT
12	Microbiology	MB
13	Physics	PH
14	Statistics	ST
15	Zoology	ZO

Semester-wise Code structure for B. Sc (Honors/Research) Data Science Programme as perNEP2020, for Affiliated Colleges w.e.f. – June 2024.

B. Sc (Honors/Research) – First Year, SEMESTER – I, Level – 4.5

Subject	Course	Course Type	Course Code	Course Title	Credits	Teaching Hours / Week			Marks			
						T	P	Total	Internal (CA)		External (UA)	
									T	P	T	P
(M-1)	DSC-1	DSC	DS-111	Core Python for Beginners	2	2			20	---	30	---
	DSC-2	DSC	DS-112	Lab on Python Programming-I	2	-	4	4	---	20	---	30
OE	OE-1	OE	DS-113	Word Processing with Google Docs (Hands on)	2	2	--	2	20	--	30	--
VEC	VEC-1	VEC	ES-118	Environmental Awareness	2	2	--	2	20	--	30	--
IKS	IKS	IKS	IK-119	Ayurvedic Medicine in Ancient India	2	2	--	2	20	--	30	--
CC	CC-1	CC	CC-120	Sports and Yoga	2	2	--	2	20	--	30	--
AEC	AEC-1	AEC	EG-101	English -1	2	2	--	2	20	--	30	--

Semester-wise Code structure for B. Sc (Honors/Research) Data Science Programme as perNEP2020, for Affiliated Colleges w.e.f. – June 2024.

B. Sc (Honors/Research) – First Year, SEMESTER – II, Level – 4.5

Subject	Course	Course Type	Course Code	Course Title	Credits	Teaching Hours / Week			Marks			
						T	P	Total	Internal (CA)		External (UA)	
									T	P	T	P
(M-1)	DSC-3	DSC	DS-121	Database Management Systems (DBMS)	2	2	--	2	20	--	30	--
	DSC-4	DSC	DS-122	Lab on DBMS	2	--	4	4	--	20	--	30
OE	OE-2	OE	DS-123	Google Apps (Hands on)	4	4	--	4	40	--	60	--
VEC	VEC-2	VEC	CI-129	Constitution of India	2	2	--	2	20	--	30	--
CC	CC-2	CC	CC-130	Cyber Security	2	2	--	2	20	--	30	--
AEC	AEC-2	AEC	EG-102	English -2	2	2	--	2	20	--	30	--

<table>
<tr><td colspan="2" align="center">**Course Code: DS-111**
Course Title: Core Python for Beginners</td></tr>
<tr><td>**Course Code: DS-111**</td><td>**Course Category: Core Course (DSC)**</td></tr>
<tr><td>**Course Title: Core Python for Beginners**</td><td>**Type: Theory**</td></tr>
<tr><td>**Total Contact Hours: 30 (2/week)**</td><td>**Course Credits: 02**</td></tr>
<tr><td>**College Assessment (CA) Marks: 20 Marks**</td><td>**University Assessment (UA): 30 Marks**</td></tr>
</table>

Course Objectives:
- Understand the fundamentals of Python programming language.
- Learn how to set up the Python development environment and execute Python programs.
- Gain proficiency in working with variables, data types, and operators in Python.
- Develop skills in handling input and output operations in Python programs.

Course Outcomes:

After completion of this course, student will be able to:

- Understand and apply conditional statements for decision making in Python.
- Acquire knowledge of essential data structures like lists, tuples, and dictionaries in Python.
- Develop problem-solving skills using Python programming techniques.

Unit 1.   **Introduction to Python and Setting Up the Environment**   (Hr. 4 ,8M)

- Introduction to Data Science
- Applications of Data Science
- Introduction to Python and its features
- Installing Python and setting up the development environment (IDLE, Jupyter Notebook,Ancoonda Cloud etc.)
- Running and executing Python programs

Unit 2.   **Variables, Data Types, and Operators**   (Hr 4,8M)

- Variables: naming conventions, assignment, and reassignment
- Numeric data types: integers, floats, and complex numbers
- String data type: string manipulation, indexing, and slicing
- Operators: arithmetic, comparison, logical, and assignment operators

Unit 3.   **Input and Output Operations**   (Hr 3,4M)

- Input: using the input() function for user input
- Output: printing to the console with the print() function
- Formatting output: string formatting techniques

Unit 4   **Control Flow and Decision Making**   (Hr 6,6M)

- Conditional statements: if, else, and elif
- Comparison operators and logical operators
- Nested conditionals and multiple conditions
- Short-circuiting and boolean expressions

Unit 5   **Loops and Iterations**   (Hr 8,8M)

- While loop: syntax, condition, and control flow
- For loop: iterating over sequences and ranges
- Loop control statements: break and continue
- Nested loops and loop applications

Unit 6   Lists, Tuples, and Dictionaries   (Hr 5,11M)

- Lists: creating, accessing, and modifying elements
- List operations: concatenation, slicing, and list methods
- Tuples: creating, accessing, and modifying elements
- Dictionaries: creating, accessing, and modifying key-value pairs

Reference Books:

1) Eric Matthes,"Python Crash Course" , No Starch Press publication ISBN: 978-1593276034

2) Zed Shaw,"Learn Python the Hard Way", Addison-Wesley Professional Publication,ISBN: 978-0134692883

3) Jason R. Briggs,"Python for Kids: A Playful Introduction to Programming" ,No Starch Press publication ISBN: 978-1593274078

4) Michael Dawson,"Python Programming for the Absolute Beginner",Cengage Learning publication,ISBN: 978-1435455009

Course Content:

Course Code: DS-112
Course Title: Lab on Python Programming-I

Course Code: DS-112	**Course Category: Core Course (DSC)**
Course Title: Lab on Python Programming-I	**Type: Practical**
Total Contact Hours: 60 (4/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- To understand the practical approach of Python programming language.
- To learn how to set up the environment and execute Python programs.
- To gain proficiency in using variables, data types, and operators in Python.
- To develop skills to handle input and output operations in Python programs.

Course Outcomes:

After completion of this course, student will be able to:

- To solve simple real world problem using python fundamental
- To effectively use data structures like lists, tuples, and dictionaries in Python.

Practical List:

1) Write a Python program to input and output different data.

2) Write a Python program to create a calculator to perform different arithmetic operations.

3) Write a Python program to calculate factorial of a number.

4) Write a Python program to find maximum of n numbers.

5) Write a python program to demonstrate different types of loop statement.

6) Write a python program to demonstrate access modifiers in python.

7) Write a python program to demonstrate list operations.

8) Write a python program to demonstrate tuple operations.

9) Write python program to count no of even numbers in a list.

10) Write python program to demonstrate dictionary.

Reference Books:

1) Eric Matthes,"Python Crash Course" , No Starch Press publication ISBN: 978-1593276034

2) Zed Shaw,"Learn Python the Hard Way", Addison-Wesley Professional Publication,ISBN: 978-0134692883

3) Jason R. Briggs,"Python for Kids: A Playful Introduction to Programming" ,No Starch Press publication ISBN: 978-1593274078

4) Michael Dawson,"Python Programming for the Absolute Beginner",Cengage Learning publication,ISBN: 978-1435455009

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<tr><td colspan="2" align="center">**Course Code: DS-113**
Course Title: **Word Processing with Google Docs (Hands on)**</td></tr>
<tr><td>**Course Code: DS-113**</td><td>**Course Category: Open Elective Course (OE)**</td></tr>
<tr><td>**Course Title: Word Processing with Google Docs (Hands On)**</td><td>**Type: Theory**</td></tr>
<tr><td>**Total Contact Hours: 30 (2/week)**</td><td>**Course Credits: 02**</td></tr>
<tr><td>**College Assessment (CA) Marks: 20 Marks**</td><td>**University Assessment (UA): 30 Marks**</td></tr>
</table>

Course Objectives:

- To familiarize students with Google Docs
- To develop students' proficiency in document formatting
- To facilitate collaborative document editing
- To explore advanced features and customization options.

Course Outcomes:

- Proficiency in using Google Docs
- Effective document formatting skills
- Enhanced collaboration skills
- Understanding of advanced features.

Course Content:

Unit 1: Chapter 1: Introduction to Google Docs   **(08 L, 12 M)**
   1.1 Overview of word processing and its significance.
   1.2 Introduction to Google Docs: history, features, advantages.
   1.3 Creating a Google account and accessing Google Docs.
   1.4 Exploring the Google Docs interface
   1.5 Use of toolbar, menus, and settings.

Unit 2: Basic Document Formatting   **(08 L, 12 M)**
   2.1 Creating and saving documents: naming conventions, choosing templates
   2.2 Basic text formatting: font styles, sizes, colors, and alignments.
   2.3 Paragraph formatting: indentation, spacing, line spacing.
   2.4 Using special characters, symbols, and emojis in documents.
   2.5 Working with headers, footers, and page numbers.
   2.6 Inserting and formatting images, shapes, and drawings in documents.

Unit 3: Advanced Document Editing and Collaboration   **(08 L, 12 M)**
   3.1 Advanced text editing features: find and replace, spelling and grammar check.
   3.2 Collaboration tools: sharing documents, commenting, suggesting edits.
   3.3 Version history: tracking changes, reverting to previous versions.
   3.4 Working offline with Google Docs: enabling offline access, syncing changes.
   3.5 Utilizing Google Drive integration for seamless document storage and organization.
   3.6 Exporting and importing documents in various formats: Word, PDF, plain text, etc.
   3.7 Managing and organizing documents with folders and labels in Google Drive.
   3.8 Utilizing advanced search operators in Google Drive for efficient document retrieval.

Unit 4: Enhancing Productivity with Google Docs   **(06 L, 09 M)**
   4.1 Creating and formatting tables: adding rows, columns, merging cells.
   4.2 Using Google Docs for research and citations: citing sources, adding footnotes.
   4.3 Integrating with other Google Workspace apps: Google Drive, Google Sheets, Google Slides.

4.4 Automating tasks with Google Docs: using templates, creating custom add-ons.

4.5 Inserting and formatting images, shapes, and drawings in documents.

4.6 Using advanced table features: sorting, filtering, pivot tables, and conditional formatting.

4.7 Collaborative document automation with Google Apps Script.

4.8 Creating and using document templates for efficiency and consistency.

4.9 Utilizing third-party add-ons for extended functionality and customization.

Reference Books:

1. "Google Drive and Docs in 30 Minutes", by Ian Lamont

2. "Google Docs: The Unofficial Guide" by Lisa A. Bucki

3. "Google Workspace for Dummies" by Steve Schwartz

Course Code: DS-121	
Course Title: **Database Management Systems (DBMS)**	
Course Code: DS-121	**Course Category: Core Course (DSC)**
Course Title: Database Management Systems (DBMS)	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:

- Understand the fundamental concepts and principles of Database Management Systems (DBMS).
- Gain knowledge of different data models and understand the relational database model.
- Develop proficiency in using Structured Query Language (SQL) for querying and manipulating data.
- Gain knowledge of indexing and query optimization techniques for efficient data retrieval.

Course Outcomes:

After completion of this course, student will be able to:

- To use fundamental concepts of DBMS.
- To extract information from datasets.
- To execute queries to get required data.

Course Content:

Unit 1.	**Introduction to DBMS**	**(Hr6,10M)**

Overview of DBMS and its importance
Understanding data and its organization
Role of DBMS in managing data effectively
Terminology of Database Management System

Unit 2.	**Data Models and Relational Databases**	**(Hr4,5M)**

Conceptual, logical, and physical data models
Relational database model and its components
Primary keys, foreign keys, and relationships

Unit 3.	**SQL Fundamentals**	**(Hr8,10M)**

Introduction to Structured Query Language (SQL)
Basic SQL queries: SELECT, INSERT, UPDATE, DELETE
Filtering, sorting, and joining data

Unit 4	**Advanced SQL**	**(Hr6,10M)**

Aggregation functions: SUM, AVG, COUNT, etc.
Grouping and grouping functions
Subqueries and nested queries

Unit 5	**Advantages and Disadvantages of DBMS**	**(Hr6,10M)**

Advantages of using DBMS: data consistency, data sharing, data security Disadvantages of DBMS: cost, complexity, performance considerations

Reference Books:

1. Database System Concepts- Abraham Silberschatz, Henry F. Korth& S. Sudarshan,McGraw- Hill, 4th Edition / 5th Edition. ISBN 0-07-295886-3

2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007. ISBN-10 : 0321369572

3. Database System Concepts – Alexis Leon & Mathews leon, Vikas Publication House Ltd, New Delhi. ISBN-10 : 8182092221

Course Code: DS-122 Course Title: Lab on DBMS	
Course Code: DS-122	**Course Category: Core Course (DSC)**
Course Title: Lab on DBMS	**Type: Practical**
Total Contact Hours: 60 (4/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- To develop proficiency in using Structured Query Language (SQL) for querying and manipulating data.
- To gain knowledge of writing SQL queries to perform various operations on data.
- To develop SQL queries for generating reports.

Course Outcomes:

After completion of this course, student will be able to:

- Design the database schema.
- Write SQL queries to perform various operations on data.
- Write advanced SQL queries involving subqueries, grouping, and aggregation functions.
- Write SQL queries to generate reports.

Practical List:

1	Identify a domain of your choice (e.g., bookstore, university, e-commerce) and determine the entities and relationships involved. Design the database schema by defining tables, primary keys, and foreign keys. Write SQL statements to create the necessary tables in the database. Populate the tables with sample data to demonstrate the functionality of the database.

2	Write SQL queries to perform the following operations:
	
	  • Retrieve specific data from one or more tables using SELECT statements.
	
	  • Filter and sort the data using WHERE and ORDER BY clauses.
	
	  • Perform joins between tables to combine related data.
	
	  • Insert new records into the tables.
	
	  • Update existing records to modify data.
	
	  • Delete records from the tables.

3	Write more advanced SQL queries involving subqueries, grouping, and aggregation functions. Apply constraints (e.g., primary key, foreign key, unique) to ensure data integrity.

4	Database Design:
	
	  Identify the entities and attributes relevant to the employee management system.
	
	  Design the database schema.
	
	  Define the tables, primary keys, and foreign keys.

5	Table Creation and Data Population:

	Write SQL statements to create the necessary tables in the database. Populate the tables with sample data to demonstrate the functionality of the database.
6	SQL Queries: Write SQL queries to perform the following operations: Retrieve the list of all employees in the database. Retrieve the employees who belong to a specific department. Insert a new employee record into the database. Update the salary of an employee based on their employee ID. Delete an employee record from the database.
7	Reporting: Write SQL queries to generate reports, such as the total number of employees in each department or the average salary by job position.

Reference Books:

1. Database System Concepts- Abraham Silberschatz, Henry F. Korth& S. Sudarshan, McGraw-Hill, 4th Edition / 5th Edition. ISBN 0-07-295886-3

2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007. ISBN-10 ：0321369572

3. Database System Concepts – Alexis Leon & Mathews leon, Vikas Publication House Ltd, New Delhi. ISBN-10 : 8182092221

Course Code: DS-123

Course Title: Google Apps (Hands on)

Course Code: DS-123	**Course Category: Open Elective Course (OE)**
Course Title: Google Apps (Hands on)	**Type: Theory**
Total Contact Hours: 60 (4/week)	**Course Credits: 04**
College Assessment (CA) Marks: 40 Marks	**University Assessment (UA): 60 Marks**

Course Objectives:
- Understand the overall structure and components of Google Workspace.
- Learn to create, organize, and share folders and files in Google Drive.
- Develop spreadsheets, input data, and perform basic calculations.
- Create professional presentations using Google Slides.
- Design and distribute surveys and quizzes using Google Forms also
- Analyze responses and integrate data with Google Sheets.

Course Outcomes:

- Students will demonstrate proficiency in using Google Workspace apps, including Google Sheets, Google Slides, Google Forms, and Google Drive.
- Students will effectively collaborate with others using Google Workspace tools, utilizing features like real-time editing, commenting, and sharing permissions to manage and contribute to group projects.
- Students will create, format, and manage professional documents, spreadsheets, and presentations using Google Docs, Sheets, and Slides, incorporating advanced features such as templates, add-ons, and custom formatting.
- Students will analyze data using Google Sheets, performing functions such as sorting, filtering, creating pivot tables, and using complex formulas and functions.
- Students will organize and manage files and folders in Google Drive, understanding how to use storage efficiently, set permissions, and synchronize files across devices.
- Students will design, distribute, and analyze surveys using Google Forms, interpreting the data through the integrated response summary and exporting data for further analysis.

Course Content:

Unit 1: Introduction to Google Workspace   **(10 L, 15 M)**

1.1 Overview of Google Workspace
1.2 What is Google Workspace?
1.3 Overview of core apps (Gmail, Google Drive, Google Docs, Google Sheets, Google Slides, Google Calendar)
1.4 Setting up a Google Account
1.5 Creating a Google account
1.6 Navigating the Google Workspace interface

Unit 2: Google Drive   **(10 L, 15 M)**

2.1 Introduction to Google Drive
2.2 Uploading and organizing files
2.3 Sharing and collaboration features
2.4 File management and storage tips

Unit 3: Google Sheets   **(10 L, 15 M)**

3.1 Introduction to Google Sheets
3.2 Creating and formatting spread sheets

3.3 Basic formulas and functions

3.4 Data visualization (charts and graphs)

3.5 Collaboration and data sharing

Unit 4: Google Slides (10 L, 15 M)

4.1 Introduction to Google Slides

4.2 Creating and designing presentations

4.3 Using themes and templates

4.4 Adding multimedia (images, videos, animations)

4.5 Collaboration and presenting tips

Unit 5: Google Forms (10 L, 15 M)

5.1 Introduction to Google Forms

5.2 Creating surveys and quizzes

5.3 Customizing form settings and appearance

5.4 Analyzing responses

5.5 Integrating with Google Sheets

Unit 6: Google Mobile Apps (10 L, 15 M)

6.1 Introduction to Google Mobile Apps

6.2 Overview of the Google ecosystem and its integration across mobile platforms

6.3 Benefits of using Google Mobile Apps

6.4 Downloading and Installing Apps, Account Management

6.5 Key Productivity Apps: Gmail Mobile App, Google Calendar Mobile App

6.6 Media and Entertainment: Google Photos Mobile App, YouTube and YouTube Music Mobile Apps

Reference Books:

1   Nancy Conner, "Google Apps: The Missing Manual", O'Reilly Media; 1st edition (July 1, 2008), ISBN-10: 0596515790, ISBN-13: 978-0596515799.

2   Scott La Counte, "The Ridiculously Simple Guide to Google Apps (G Suite): A Practical Guide to Google Drive Google Docs, Google Sheets, Google Slides, and Google Forms", SL Editions (August 20, 2019), ISBN-10: 1621077020, ISBN-13: 978-1621077022.

3   James Ferreira, "Google Apps Script, 2nd Edition", O'Reilly Media, Inc., ISBN: 9781491946183

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