Nirmala Memorial Foundation College of Commerce and Science

(Autonomous)

Re-accredited by NAAC with B++, ISO 9001-2015 Certified, Recognised under section 2(f) & 12(B) of the UGC Act 1956

Permanently Affiliated to the University of Mumbai,

Syllabus

Bachelor of Science in Data Science

(B.Sc. Data Science)

(Programme Code: UGDS03)

As Per New Education Policy (NEP) 2020

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

INTRODUCTION OF THE PROGRAMME

1. Introduction

Introduction: A Data Science degree program is a dynamic educational pathway that equips students with a multidisciplinary skill set essential for navigating the intricacies of the data-driven world. Foundational courses in mathematics and statistics lay the groundwork, while programming skills in languages like Python and Rare honed for data manipulation and analysis. The curriculum delves into machine learning techniques, covering both supervised and unsupervised learning, and explores big data technologies such as Hadoop and Spark. Students gain practical experience in applying these skills to real-world problems through capstone projects, ensuring they are well-prepared to address the challenges of data science in diverse industries.

Furthermore, Data Science degree programs emphasize the ethical considerations surrounding data use and privacy. Students engage in discussions about responsible conduct in data science, addressing the societal implications of their work. The program typically culminates in the development of strong communication skills, with a focus on data visualization and effective presentation of findings to non-technical stakeholders. Through a combination of theoretical knowledge, practical experience, and ethical considerations, graduates of Data Science degree programs are well- positioned to make meaningful contributions in a data-driven world.

2. Aims and Objectives

A) Aims:

- To cultivate a strong foundation in mathematical and computational skills essential for data analysis.
- To enable students to understand and apply machine learning algorithms for predictive modeling and pattern recognition.
- Familiarize students with technologies and frameworks for handling and processing large datasets efficiently.
- To instill a sense of ethical responsibility and awareness of privacy considerations in data science work.
- To prepare students to apply data science techniques to specific industry domains.
- To develop effective communication skills for conveying data-driven insights to diverse audiences.
- To ensure students can apply theoretical knowledge to solve real-world problems.
- To prepare students for a field that is constantly evolving.

B) Objectives:

- To provide courses in mathematics, statistics, and programming languages, enabling students to manipulate, process, and analyze large datasets.
- To cover supervised and unsupervised learning techniques, ensuring students can select and deploy appropriate models for various data-driven tasks.
- To provide hands-on experience with tools like Hadoop and Spark, allowing students to work with big data in real-world scenarios.
- To incorporate discussions on ethical considerations in data collection, analysis, and dissemination, and to emphasize the responsible use of data.
- To offer courses or projects that focus on the application of data science in areas such as healthcare, finance, marketing, or other relevant sectors.

- To provide training in data visualization techniques and enhance report writing and presentation skills to facilitate clear communication of findings.
- To incorporate hands-on projects, possibly in the form of a capstone project or industry internship, allowing students to gain practical experience and build a portfolio of work.
- To encourage a mindset of continuous learning, adaptability, and staying abreast of emerging technologies and methodologies in data science.

PROGRAM OUTCOME

The B. Sc. (Data Science) Programme shall prepare and enable the graduates to:

- ✓ Proficiency in Data Analysis
- ✓ Mastery of Machine Learning Techniques
- ✓ Competence in Big Data Technologies
- ✓ Application of Data Science in Specific Domains
- ✓ Ethical Considerations and Privacy Awareness
- ✓ Effective Communication of Insights
- ✓ Critical Thinking and Problem-Solving
- ✓ Continuous Learning and Adaptability
- ✓ Team Collaboration and Interdisciplinary Skills
- ✓ Quantitative and Qualitative Research Skills
- ✓ Leadership and Decision-Making Skills

SEMESTER I

COURSE STRUCTURE

VERTICAL		COURSE CODE	SUBJECT	CREDIT
Vertical 1	Major	NUDS101	Python Programming	**2**
	Major	NUDS102	Descriptive Statistics	**2**
	Major	NUDS103	Practical 1(Python + DS)	**2**
Vertical 2	Minor	***		
Vertical 3	OE1	NUDS104	Indian Financial System - I	**2**
	OE2	NUDS105	Social Media and Communication	**2**
Vertical 4	VSC	NUDS106	Excel for Business	**2**
	SEC	NUDS107	Web Technology	**2**
Vertical 5	AEC	NUEN101	Communication Skills in English I	**2**
	VEC	NUES101	Environmental Systems and Management -I	**2**
	IKS	NUIK101	Indian Knowledge System	**2**
Vertical 6	CC	NUCC103	Fitness and Sports-I	**2**
			Total Credits	**22**

SEMESTER II

COURSE STRUCTURE

VERTICAL		COURSE CODE	SUBJECT	CREDIT
Vertical 1	Major	NUDS201	Advanced Python Programming	2
	Major	NUDS202	Database Management Systems	2
	Major	NUDS203	Practical 2(APP + DB)	2
Vertical 2	Minor	NUDS204	Problem Solving using 'C'	2
Vertical 3	OE1	NUDS205	Basics of Stock Market	2
	OE2	NUDS206	Research Principles and Practices	2
Vertical 4	VSC	NUDS207	R Programming for Statistics	2
	SEC	NUDS208	Statistical Methods	2
Vertical 5	AEC	NUEN201	Communication Skills in English II	2
	VEC	NUES201	Environmental Systems and Management -II	2
Vertical 6	CC	NUCC203	Fitness and Sports-II	2
			Total Credits	**22**

Vertical – I

Semester – I

Mandatory Courses

Name of the Course: Python Programming – NUDS101

Sr. No.	Heading	Particulars
1	**Description the course:**	• **Introduction:** Python has emerged as a fundamental language in the tech industry, valued for its simplicity, versatility, and readability. Its wide range of applications—from web development and data analysis to artificial intelligence and automation—has made it highly relevant and increasingly in demand across various domains. This introduction highlights Python's practical utility and its growing significance in today's technology-driven landscape. • **Relevance and Usefulness:** Python's adaptability has made it a key player across various sectors—including web development, data science, and automation—cementing its role in today's rapidly evolving tech environment. Its user-friendly syntax, combined with a vast collection of libraries, empowers developers to solve problems efficiently and streamline development processes with ease. • **Applications:** Python is widely applied in web development using frameworks like Django, in data science through powerful libraries such as NumPy and Pandas, and in cutting-edge fields like IoT and blockchain, making it a versatile tool across traditional and emerging technologies. • **Interest and Connection with Other Courses:** Python's beginner-friendly nature and wide-ranging interdisciplinary applications have made it one of the most sought-after programming languages, easily integrating into diverse academic courses and professional fields alike. • **Demand in the Industry:** With industries increasingly relying on Python for web development, data analysis, machine learning, and automation, there is a rising demand for professionals skilled in Python programming to meet these evolving technological needs. • **Job Prospects:** Professionals proficient in Python programming have strong career prospects, with opportunities spanning roles such as web developers, data analysts, and data scientists—highlighting the language's versatility and sustained demand across the tech industry.
2	**Vertical:**	Major
3	**Type:**	Theory
4	**Credits:**	2 credits (1 credit = 15 Hours for Theory in a semester)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks

7	**Course Objectives:** 1. To Learn Programming fundamentals using Python. 2. To understand the concept of data types and other basic elements in python. 3. To learn control statements and operators in python. 4. To learn to write different functions and strings in python. 5. To understand the concept of dictionaries in python.
8	**Course Outcomes:** CO 1. Ability to use variables with different data types and input output functions. CO 2. Ability to use control statements and operators in programming. CO 3. Proficiency in using function and strings. CO 4. Acquire knowledge of dictionaries.
9	**Modules** **Module 1: Fundamentals of Python Programming (15 Hours)** 1. **Introduction to Python Language**: Overview and key features of Python, Execution process of Python programs, Internal architecture of Python, Concept of frozen binaries, Understanding the Python interpreter, Comparison of Python with C and Java, Installing Python and setting up the environment, Writing and executing Python code, Introduction to IDLE (Integrated Development and Learning Environment) 2. **Data Types, Variables, and Basic Elements**: Comments and docstrings, Data types: Numeric, compound, Boolean, dictionary, sets, and mappings, Fundamental elements of Python programming, Variable declaration and usage 3. **Input and Output Operations; Control Statements**: Using input functions and output statements, Handling command-line arguments, Control flow statements: loops (for, while), else clause in loops, Key control keywords: break, continue, pass, assert, and return 4. **Functions**: Defining and invoking functions, Returning single and multiple values, Utilizing built-in functions, Parameters and arguments handling, Recursive functions, Anonymous (lambda) functions **Module 2: Operators, Arrays, Strings, and Dictionaries (15 Hours)** 1. **Operators in Python**: Arithmetic, assignment, and unary minus operators, Relational and logical operators, Bitwise, membership, and identity operators, Operator precedence and associativity 2. **Arrays:** Creating and initializing arrays, Indexing, slicing, and basic array operations, Array processing and mathematical operations, Understanding aliasing in arrays, Advanced slicing and indexing in NumPy arrays, Array dimensions and key attributes 3. **Strings:** Creating and manipulating strings, String functions and methods, Indexing, slicing, concatenation, and repetition, Checking membership and comparison, Trimming spaces, finding and counting substrings, String immutability and transformations (splitting, joining, case changes), Checking start/end patterns, sorting, searching, and formatting 4. **Dictionaries:** Creating and managing dictionaries, Dictionary operators and methods, Using loops with dictionaries, Dictionary operations and ordered dictionaries

<table>
<tr><td>10</td><td colspan="2">Text Books
1. Programming through Python M. T. Savaliya, R.K Maurya, G.M Magar, Staredu Solutions, 1st edition (2018)
2. Python DataScience Handbook, Jake VanderPlas, O'Reilly Media, 1stedition (2016)
3. Let Us Python, Yashwant Kanetkar, BPB publication , 1st edition (2019)</td></tr>
<tr><td>11</td><td colspan="2">Reference Books
1. Programming in Python3, Mark Summerfield, Pearson Education, 2nd edition (2018)
2. Learning Python, LutzM, O’Reilly- Shroff, 5th edition, 2013.
3. Beginning Python, Magnus LieHetland, Apress, 2nd edition, 2009.
4. Star Python, Star Certification, Star Certification,1st, 2018.</td></tr>
<tr><td>12</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination: 60%</td></tr>
<tr><td>13</td><td>Continuous Evaluation through:
Class test of 15 marks

Quizzes/ Presentations/ Assignments: 5 marks
Total: 20 marks</td><td>Format of Question Paper: External Examination (30 Marks)– 1 hr duration</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)
<table>
<tr><th>Questions</th><th>Based On</th><th>Options</th><th>Marks</th></tr>
<tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr>
<tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr>
<tr><td>Q.3</td><td>Module 1 & 2</td><td>Any 2 out of 4</td><td>10</td></tr>
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Name of the Course: Descriptive Statistics – NUDS102

Sr. No.	Heading	Particulars
1	**Description the course:**	• **Introduction:** Descriptive Statistics simplifies complex data, revealing patterns through measures like central tendency and data visualization, forming the foundation for data understanding. • **Relevance and Usefulness:** Descriptive Statistics is essential in today's data-driven world, turning raw data into clear insights. Used across fields like business and healthcare, it helps professionals make informed decisions through measures like mean, median, and visualizations. • **Applications:** Widely applicable, Descriptive Statistics is employed in finance, healthcare, sociology, and beyond, making it an essential skill for professionals in data analysis. • **Interest and Connection with Other Courses:** Descriptive Statistics unravels complex data visually, appealing to both analytical and creative minds. It lays the groundwork for advanced studies like inferential statistics and machine learning. • **Demand in the Industry:** With industries becoming more data-driven, the demand for professionals skilled in Descriptive Statistics is rising—particularly in roles such as data analysts, business analysts, and statistical consultants. • **Job Prospects:** Professionals proficient Descriptive Statistics are highly sought after, contributing significantly to organizational success through data-driven decision-making.
2	**Vertical:**	Major
3	**Type:**	Theory
4	**Credits:**	2 credits (1 credit = 15 Hours for Theory)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** **1:** To understand different types of Data, and to analyze and present the data. **2:** To compute various Measures of Central Tendencies. **3:** To compute various Measures of Dispersion. **4:** To understand the concept of Skewness and Kurtosis. **5**: To compute the Correlation Coefficient for bivariate data and further apply the regression analysis.	
8	**Course Outcomes :** **CO 1.** Able to organize, manage and present the data. **CO 2.** To understand the use Measures of Central Tendencies and Dispersion. **CO 3.** Able to understand and compute the consistent and inconsistent data **CO 4.** Able to identify the association between variables **CO 5.** Able to understand forecasting techniques and to find cause and effect relationship between variables through regression analysis.	

9	**Modules:-** **Module 1: (15 Hours)**
	1.Introduction of Statistics: Meaning of Statistics, Importance of Statistics, Different types of Scales: Nominal, Ordinal, Interval and ratio. Univariate frequency distribution of discrete and continuous variables and Cumulative frequency distribution. Data Presentation: Frequency Distribution, Frequency Curve, Frequency Polygon Histogram and Ogives Curves. **2. Measures of Central Tendencies**: Concept of Central Tendency: Mean, Median, Mode, characteristics of good measures of Central Tendency, Partition values: Quartiles, Deciles and Percentiles -examples of ungrouped and grouped data **3.Measures of Dispersion:** Concept of Dispersion, measures of Dispersion: Range, Quartile Deviation, Mean Absolute Deviation, Standard Deviation, Combined Standard Deviation-examples of ungrouped and grouped data, Variance. **4.Moments:** Raw and Central Moments, relation between Raw and Central moments, concept of Coefficient of Skewness and Kurtosis.
	Module 2: (15 Hours)
	1.Correlation: Concept of Correlation, its properties, Scatter Diagram, Karl Pearson's Coefficient of Correlation and Spearman's Rank Correlation, and Spearman' s Rank Correlation (with and without ties) **2.Concept of multiple correlation:** example for three variables **3.Regression:** Linear regression: Coefficients of regression, Concept of Linear Regression, Principle of Least Square, Fitting a straight line by method of least square. Non-linear regression: Fitting a quadratic polynomial, exponential function and multiple regression by method of least square. **4. Relation between Correlation and Regression**
10	**Text Books** **1.**Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentce Hall of India, NewDelhi. **2.**Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, NewDelhi. **3.**Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, NewDelhi. **4.**Schaum‟s Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum‟s Outline Series Mcgraw-Hill **5.**Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi
11	**Reference Books** **1.**Goon AM, Gupta MK, Das Gupta B: Fundamentals of Statistics, Vol-I, the World Press Pt. Ltd, Kolkata **2.** Shah R.J: Descriptive Statistics: Seth Publication, Eight Edition **3.**Spiegel M.R: Theory and Problems of Statistics, Schaum's Publishing Series, Tata McGraw-Hill, First Edition **4.** Basic Statistics: Agarwal B.L: New Age International Ltd

12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**
13	**Continuous Evaluation through:** Class test of 15 marks Quizzes/ Presentations/ Assignments: 5 marks Total: 20 marks	**Format of Question Paper: External Examination (30 Marks)– 1 hr duration**
14	**Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)**	

Questions	Based On	Options	Marks
Q.1	Module 1	Any 2 out of 4	10
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1 & 2	Any 2 out of 4	10

Name of the Course : Major Practical 1 – NUDS103

Sr. No.	Heading	Particulars
1	**Description the course:**	The Basic Python Programming practical modules equip learners with the skills to implement Python code for a variety of applications. These modules focus on handling different data types, using control structures and loops, manipulating strings and arrays, and applying functions effectively in real-world scenarios.
2	**Vertical:**	Major
3	**Type:**	Practical
4	**Credits:**	2 credits (1 credit = 30 Hours of Practical work in a semester)
5	**Hours Allotted:**	60 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** 1. To implement various data types. 2. To implement different functions. 3. To implement arrays and strings. 4. To plot graphs and charts 5. To develop the ability to analyze statistical data.	
8	**Course Outcomes:** CO 1. Ability to use all data types in different ways. CO 2. Acquire knowledge to implement user defined, built in and lambda functions. CO 3. Make a use of arrays and strings in python programming. CO 4. Enables to understand data analysis through programming. CO 5. Study the relationship between variables using techniques of correlation & regression.	
9	**Modules:-** **Module 1: (30 Hours)**	
	Practical No. 1: Data Types and Input/Output a) Write a Python program to define variables of various data types (int, float, string, boolean, complex) and display their types using the type() function. b) Accept a message from the user using the input() function and display it using print(). **Practical No. 2: Loops and Number Operations** a) Write a Python program to check whether the entered number is an Armstrong number using a while loop. b) Write a Python program to demonstrate the use of break and continue statements within a loop. **Practical No. 3: Conditional Statements and Functions** a) Write a Python program to check whether a number is even or odd using if-else statements. b) Write a Python program demonstrating a function with default and keyword arguments.	

Practical No. 4: Mathematical Conversions

a) Write a Python program to convert temperature from Celsius to Fahrenheit.
b) Write a Python program to solve a quadratic equation using the quadratic formula.

Practical No. 5: Number Systems and Utilities

a) Write a Python program to convert a decimal number to binary, octal, and hexadecimal formats.
b) Write a Python program to check whether a given year is a leap year.

Practical No. 6: Arithmetic and Lambda Functions

a) Write a Python program to calculate the area of a triangle using user input.
b) Write a Python program to demonstrate the use of lambda functions to square elements in a list.

Practical No. 7: Arrays and Lists

a) Write a Python program to create an array (list) of integers and demonstrate indexing and slicing.
b) Write a program to add an element to a list and remove a specific element from it.

Practical No. 8: String Handling

a) Write a Python program to demonstrate string immutability and display a multi-line string.
b) Write a Python program to compare two strings for equality.

Practical No. 9: String Processing

a) Write a Python program to check whether a given string is a palindrome.
b) Write a Python program to count the number of vowels in a given string.

Practical No. 10: Swapping and Matrix Operations

a) Write a Python program to swap values of two variables.
b) Write a Python program to add two matrices using nested lists.

Mini Assignment / Mini Project

a) Supermarket GST Calculator: Accept the bill amount from the user, calculate GST, and display the total amount.
b) Reverse Number Function: Define a function that takes a number as input and returns its reverse.

Preferred Software for practicals : Visual Studio Code (VS Code) or Jupyter Notebook or Python IDLE

	Module 2: (30 Hours)
	Practical No. 1-Introduction to Excel a) Understanding Data Tools. b) Understanding Formula Tools, insert functional library using insert function. c) Add-Ins Analysis tool packs d) Formula writing, Functions, using Cell reference, Sort, Filter & Advance Filter **Practical No. 2- Data Entry and Manipulation** a) Tools for data entry & accuracy: Quick Access toolbar customization, Form tool b) Data Transposition to fit Excel (as an Array) c) Data Conversion with the Logical If, VLOOKUP, Pivot table, Pivot chart. d) Data conversion to Text from Non-Excel Sources. Using text to Column **Practical No. 3- Data Validation** a) Specifying a valid range of values for a cell. b) Specifying a list of valid values for a cell c) Specifying custom validation based on formula for a cell. **Practical No. 4- Diagrams and Graphs** a) Write a Python/ Excel program to plot Histogram. b) Write a Python/ Excel program to plot Bar Graphs. c) Write a Python/ Excel program to plot Pie chart. d) Boxplot and multiple Boxplots **Practical No 5- Measures of Central Tendency** a) Write a Python/ Excel program to find Mean. b) Write a Python/ Excel program to find Median. c) Write a Python/ Excel program to find Mode **Practical No. 6- Measures of Dispersion** a) Write a Python/ Excel program to find Range, Interquartile Range b) Write a Python/ Excel program to find Variance. c) Write a Python/ Excel program to find Standard Deviation. d) Write a Python/ Excel program to find Skewness and Kurtosis. **Practical No. 7-Correlation** a) Write a Python/ Excel program to find Positive Correlation. b) Write a Python/ Excel program to find Negative Correlation. c) Write a Python/ Excel program to find Zero Correlation. **Practical No. 8-Regression-1** a) Write a Python/ Excel program to perform linear regression for prediction. **Practical No. 9-Regression – 2** a) Write a Python/ Excel program to perform polynomial regression for prediction **Practical No. 10** a) Write a Python/ Excel program to perform multiple linear regression for

	prediction. **Mini Assignment /Mini Project:** **1.** Design a survey form, get primary data and analyze it. **Preferred Software for practicals** : Microsoft Excel(2016/2019/2021, Jupyter Notebook or Python IDLE	
10	**Text Books** **1.** Programming through Python M. T. Savaliya, R.K Maurya, G.M Magar, Staredu Solutions, 1st edition (2018) **2.** Python DataScience Handbook, Jake VanderPlas, O'Reilly Media, 1st edition (2016) **3.** Let Us Python, Yashwant Kanetkar, BPB publication , 1st edition (2019)	
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12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**
13	**Continuous Evaluation through:** Practical journal submission, viva, assignments • Journal Submission : 10 Marks • Assignments: 10 Marks • Total: 20 marks	**Semester end practical examination of 2 hours duration for 30 marks as the paper pattern given below.** *Its compulsory to carry certified journal at the time of practical exam*
14	**Format of Question Paper: (Semester End Practical Examination: 30 Marks. Duration:2 hours)** Q1: Module 1 (10 marks) Q2: Module 2 (10 marks) Q.3 Viva (10 Marks)	

Letter Grades and Grade Points:

Semester GPA/ Program CGPA Semester/ Program	% of Marks	Alpha-Sign / Letter Grade Result		Grade Points
9.00-10.00	90.0-100	O	(Outstanding)	10
8.00-<9.00	80.0-<90.0	A+	(Excellent)	9
7.00-<8.00	70.0-<80.0	A	(Very Good)	8
6.00-<7.00	60.0-<70.0	B+	(Good)	7
5.50-<6.00	55.0-<60.0	B	(Above Average)	6
5.00-<5.50	50.0-<55.0	C	(Average)	5
4.00-<5.00	40.0-<50.0	P	(Pass)	4
Below 4.00	Below 40	F	(Fail)	0
Ab (Absent)	-	AB	(Absent)	0

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Vertical – III

Open Electives(OE)

Semester I

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Social Media and Communication – NUDS105

Sr. No.	Heading	Particulars
1	**Description of the course :**	This course offers a comprehensive overview of the evolution, structure, and impact of social media from its early platforms to the modern digital ecosystem. Students will explore the historical development of social media, the rise of mobile-based platforms, and the societal transformations driven by these technologies. The course also examines contemporary trends, including algorithmic curation, data privacy, ethical concerns, and the growing role of AI and machine learning in shaping digital interactions. Emphasis is placed on the application of social media in academic, professional, and interpersonal communication, equipping students with both theoretical understanding and practical insight.
2	**Vertical :**	**Open Electives**
3	**Type :**	**Theory**
4	**Credit**:	**2 credits**
5	**Hours Allotted :**	**30 Hours**
6	**Marks Allotted**:	**50 Marks**
7	**Course Objectives**: 1. **To introduce** students to the evolution and historical development of social media platforms and digital communication tools. 2. **To familiarize** students with modern social media platforms, their key features, and their influence on communication, culture, and society. 3. **To explore** the role of algorithms, artificial intelligence, and machine learning in shaping user experiences on social media. 4. **To sensitize** students to issues of digital ethics, data privacy, and the responsible use of social media. 5. **To enable** students to critically assess the use of social media in academic, interpersonal, and professional settings.	
8	**Course Outcomes:** By the end of this course, **students will be able to**: CO1. Describe the historical evolution and foundational concepts of social media platforms and their societal impact. CO2. Analyze the features and influence of major modern social media platforms, including their role in shaping digital interactions. CO3. Evaluate the ethical, privacy, and algorithmic challenges associated with social media usage in contemporary digital society. CO4. Apply knowledge of social media tools and technologies in academic, interpersonal, and professional contexts.	

9	**Modules**:-
	Module 1: Social Media – Past and Present 1. Concept and Scope of Social Media 2. Brief History and Evolution of Social Media 3. Early Platforms: Orkut, Friendster, MySpace 4. Evolution of Digital Communication Tools 5. Societal and Cultural Impact of Early Social Media
	Module 2: Modern Social Media Landscape and Applications 1. Overview of Major Platforms: Instagram, Twitter, TikTok, Snapchat 2. Recommendation Systems and Algorithmic Influence 3. Data Privacy, Ethics, and Digital Footprint 4. Social Media in Interpersonal and Academic Communication 5. Influencer Economy and Monetization Models 6. Academic and Research Applications of Social Media 7. Copyright Acts
10	**References:** 1. Boyd, D, and Ellison, N., 2007, Social network sites: Definition, history, and scholarship. Journal of computer-mediated communication, 13(1), 210-230 2. Burton, G. (2010). Media and Society: Critical Perspectives. New York; Mc Graw-Hill Publication. 3. Lipschultz, J.H. (2020). Social Media Communication Concepts, Practices, Data, Law and Ethics. Routledge. 4. Kaplan, A.M. and Haenlein, M. (2010) Users of the World, Unite! The Challenges and Opportunities of Social Media. Business Horizons, 53, 59-68. 5. Williams, R, and Gulati, G. J, 2017, Social Media Communication: Concepts, Practices Data, Law and Ethics. https://slejournal.springeropen.com/articles/10.1186/s40561-020-00118-7
12	**Internal Continuous Assessment: 40%** | **Semester End Examination : 60%**
	Internal Evaluation: 20 Marks 1. Classroom Presentations/ Assignments 10 Marks 2. Essay Submission/ Book review/ Field Visit Report /Educational Activity Report 10 Marks
	External Evaluation : 30 Marks **Format of Question Paper:** for the final examination Time: 1hour Marks: 30 **Q.1 Answer the following: (ATTEMPT ANY 2 OUT OF 4) (10 Marks)** **Q.2 Answer the following: (ATTEMPT ANY 2 OUT OF 4) (10 Marks)** **Q.3 Answer the following: (ATTEMPT ANY 2 OUT OF 4) (10 Marks)**

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Vertical – III

Open Electives(OE)

Semester I

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Indian Financial System – NUDS104

Sr. No.	Heading	Particulars
1	**Description the course:**	This course provides a comprehensive introduction to the Indian financial system, offering foundational knowledge of its structure, components, and functioning. It delves into the role of banks and other financial institutions in economic development and explores various banking services available to individuals and businesses. The course also introduces students to the basics of insurance and personal financial planning, enabling them to make informed financial decisions and develop sound saving and investment strategies. Through real-world examples, case studies, and practical insights, students will gain a deeper understanding of how financial instruments, services, and institutions interact to support the financial stability of individuals and the economy.
2	**Vertical:**	**Open Electives**
3	**Type:**	**Theory**
4	**Credits:**	**2 credits**
5	**Hours Allotted:**	**30 Hours**
6	**Marks Allotted:**	**50 Marks**
7	**Course Objectives:** 1. Understand the basic structure and role of the Indian financial system in the economy. 2. Identify the key functions of banks and the services they offer to individuals. 3. Recognize the importance of the Reserve Bank of India (RBI) as a regulatory authority. 4. Explain the concept of insurance and its relevance in personal financial planning. **5.** Develop basic awareness of saving, budgeting, and investment as essential financial habits.	
8	**Course Outcomes:** **After completing this course, students will have the knowledge and skills to** **CO1:** Describe the structure and components of the Indian financial system. **CO2**: Explain the roles and functions of various banking institutions and the regulatory framework. **CO3:** Understand the concept and significance of insurance in financial planning. **CO4:** Gain awareness of essential financial habits such as saving, budgeting, and basic investment concepts. **CO5:** Build a foundational understanding of financial services relevant to individuals in everyday life.	

<table>
<tr><td>•</td><td>Modules:- Module 1 (10 hours):

• Overview of Indian Financial System

o What is a financial system?
o Importance of financial systems in the economy
o Basic components: Institutions, markets, instruments, and services (in simple language)</td></tr>
<tr><td></td><td>Module 2 (10 hours):

• Banks and Banking Services
o Types of banks: Public, private, cooperative
o Basic services: Savings account, fixed deposits, loans, credit cards
o Role of RBI in regulating banks</td></tr>
<tr><td></td><td>Module 3 (10 hours):

• Insurance and Financial Planning Basics
o What is insurance? Types: Life and general insurance
o Importance of insurance in financial planning
o Basic idea of budgeting, saving, and investment</td></tr>
<tr><td>10</td><td>Text Books

✓ Halan, Monika. Let's Talk Money, Harper Business
✓ Pathak, Bharati V. The Indian Financial System (selected basic chapters)
✓ RBI's "Financial Literacy" booklets and SEBI's student guides</td></tr>
<tr><td>11</td><td>Reference Books

1. William Stallings (2010), Computer Organization and Architecture designing for performance, 8th edition, Prentice Hall, New Jersy.
2. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, PearsonEducation Inc,
3. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill
4. Ramesh Gaonkar (2013), Microprocessor Architecture, Programming and Application with 8085, 6th edition, Penram.</td></tr>
<tr><td>12</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination : 60%</td></tr>
<tr><td>13</td><td>Continuous Evaluation through:

<table><tr><th>Sr. No</th><th>Particular</th><th>Marks</th></tr><tr><td>1.</td><td>Class Test</td><td>15</td></tr><tr><td>2.</td><td>Class participation</td><td>05</td></tr><tr><td></td><td>Total</td><td>20</td></tr></table></td><td>Semester End Examination (30 Marks)</td></tr>
</table>

14	**Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)**

Questions	Type & Module	Marks
Q1.	Objective Question A) Multiple choice questions B) True or False	 08 Marks 07 Marks
Q2.	Theory Question	15 Marks
	OR	
Q2.	Theory Question	15 Marks
	Total	**30**

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Syllabus

Bachelor of Science in Data Science

(B.Sc. Data Science)

(Programme Code: UGSS03)

As Per New Education Policy (NEP) 2020

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Vertical – IV

Semester – I

Vocational Skill Course (VSC)

Name of the Course: Excel for Business – NUDS106

Sr. No.	Heading	Particulars
1	**Description the course:**	● **Introduction:** Excel for Business and Financial Modelling is a focused course aimed at equipping professionals with practical skills to leverage Microsoft Excel for financial analysis, data handling, and informed business decision-making ● **Relevance and Usefulness:** In the modern data-centric business landscape, Excel proficiency is essential for professionals in finance, accounting, business analysis, and related domains. ● **Applications:** This course emphasizes the hands-on use of Excel for financial modelling, budgeting, forecasting, and decision support. Participants gain the skills to build dynamic models that support strategic planning, risk assessment, and performance analysis. ● **Interest and Connection with Other Courses:** Excel for Business and Financial Modelling serves as a valuable complement to finance, accounting, and business analytics courses, offering a practical approach to applying theoretical concepts and bridging the gap between classroom learning and real-world financial decision-making. ● **Demand in the Industry:** Excel proficiency is a highly valued skill in the business and finance sectors. Employers seek professionals who can leverage Excel for financial modelling to deliver precise analyses and support data-driven decision-making. ● **Job Prospects:** Expertise in Excel for Business and Financial Modelling opens up career opportunities in roles such as financial analyst, business analyst, financial consultant, and management accountant.
2	**Vertical:**	Vocational Skill Course(VSC)
3	**Type :**	Practical
4	**Credits :**	2 credits (1 credit = 15 Hours of Practical work in a semester)
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** 1. Develop a strong foundation in spreadsheet fundamentals and the principles of financial modeling. 2. Understand various types of financial models, their components, and appropriate tools for different business applications. 3. Learn to design structured, accurate, and efficient financial models using Excel, including layout techniques and error prevention. 4. Apply advanced Excel functions and techniques to build, manage, and present dynamic financial models.	

8	**Course Outcomes:** **CO 1:** Demonstrate a foundational understanding of spreadsheet structures, financial model components, and project planning principles. **CO 2:** Identify and select appropriate financial models and software tools based on specific business scenarios. **CO 3:** Design and develop well-structured, visually clear, and error-free financial models using flowcharting and layout best practices. **CO 4:** Apply essential and advanced Excel functions—such as lookup, aggregation, regression, and financial evaluation—for effective modelling. **CO5:** Utilize Excel tools like named ranges, form controls, PivotTables, and formatting techniques to enhance model functionality and presentation.
9	**Modules: - Module 1: (15 Hours)**
	Practical No. 1: Introduction to Financial Models and Spreadsheet Design a) Identify types of financial models (3-statement, DCF, LBO, etc.). b) Design a simple project planning template with model layout and flowchart. c) Create a basic Excel workbook with sections for inputs, calculations, and outputs. **Practical No. 2: Using Basic Excel Features for Financial Modelling** a) Use formulas: `SUM`, `AVERAGE`, `IF`, `AND`, `OR`, `NOT`. b) Practice shortcuts like Ctrl+C, Ctrl+Shift+Arrow keys. c) Work with cell referencing: relative, absolute, and mixed. d) Define and use named ranges. **Practical No. 3: Logical and Lookup Functions in Financial Models** a) Apply `VLOOKUP`, `HLOOKUP`, `INDEX`, `MATCH`, `CHOOSE`, `OFFSET`. b) Nest logical and lookup functions to simulate decision-making. c) Create a mini model to compare product costs from multiple suppliers. **Practical No. 4: Financial Functions and Loan Modelling** a) Use `PMT`, `FV`, `PV`, `NPER`, `RATE`. b) Calculate EMI for a loan. c) Build a loan amortization schedule. **Practical No. 5: Model Display and Formatting Tools** a) Apply conditional formatting to highlight variances. b) Use data bars, icon sets, and sparklines. c) Insert form controls (dropdowns, sliders). **Mini Project:** • Create a structured table for a loan model. • Create a structure for Inventory Management System for Small Business.
	Module 2: (15 Hours)
	Practical No. 6: PivotTables and Dashboard Components a) Create PivotTables and Pivot Charts from financial data. b) Use slicers to filter reports. c) Build a mini-dashboard to present revenue and expenses summary.

	Practical No. 7: Scenario and Sensitivity Analysis a) Create a one-variable and two-variable data table. b) Build a scenario manager tool for best, worst, and expected cases. c) Perform a sensitivity analysis on key financial inputs like sales growth or interest rate. **Practical No. 8: Break-Even Analysis and WACC** a) Model break-even analysis with charts. b) Calculate Weighted Average Cost of Capital (WACC). c) Simulate changes in cost or revenue to see effects on break-even points. **Practical No. 9: Presenting Financial Model Results** a) Create charts: line, bar, bubble, and waterfall. b) Use dynamic named ranges for real-time updates. c) Create a report sheet summarising key results with graphs and commentary. **Practical No. 10: Stress Testing and Model Validation** a) Apply stress tests by manually altering critical assumptions. b) Use conditional formatting to flag unusual or extreme values. c) Document assumptions and validate formulas used in the model. **Mini Project:** • Create a structured table for a financial model. Create a structure to manage and categorize expenses for personal or business use.	
10	**Online References:** **1.** https://www.w3schools.com/EXCEL/index.php Microsoft Excel Help Centre :https://trumpexcel.com/learn-excel/	
11	**Reference Books** **1.** Using Excel for Business and Financial Modelling: A Practical Guide, by Danielle Stein Fairhurst, Wiley, 3rd Edition, 2019 **2.** Microsoft Excel Professional 2021 Guide: Complete Excel Reference, by CA Manmeet Singh Mehta, Paperback, 1st Edition, 2022 **3.** Financial Modeling, by Simon Benninga, MIT Press, 4th Edition, 2014 Principles of Financial Modelling: Model Design and Best Practices Using Excel and VBA, by Michael Rees, Wiley, 1st Edition, 2018	
12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**
13	**Continuous Evaluation through:** Practical journal submission, viva, assignments ● Journal Submission : 10 Marks ● Assignments: 10 Marks ● Total: 20 marks	**A semester end practical examination of 2 hours duration for 30 marks as the paper pattern given below.** *Its compulsory to carry certified journal at the time of practical exam*
14	**Format of Question Paper: (Semester End Practical Examination : 30 Marks. Duration:2 hours)** Q1: Module 1 (10 marks) Q2: Module 2 (10 marks) Q.3 Viva (10 Marks)	

Nam Skill Enhancement Courses (SEC)

Name of the Course: Web Technology – NUDS107

Sr. No.	Heading	Particulars
1	**Description the course : Including but Not limited to:**	This course introduces students to the fundamentals of web development using HTML5, CSS, JavaScript, jQuery, and JSON. It covers the structure and design of interactive and responsive web pages, client-side scripting for dynamic content, and data handling using JSON. Through hands-on practicals and mini-projects, students will gain essential skills for building modern web applications.
2	**Vertical:**	Minor
3	**Type:**	Practical
4	**Credits:**	2 credits (1 credit = 15 Hours for Practical)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** 1. **To introduce students to the structure and elements of web technologies**, including HTML5 and CSS, for designing responsive and accessible web pages. 2. **To equip students with the ability to implement interactivity on web pages** using JavaScript events and DOM manipulation techniques. 3. **To provide practical knowledge of modern client-side scripting technologies** like jQuery for simplifying and enhancing JavaScript programming. 4. **To develop skills in working with structured data formats** such as JSON for data exchange between client and server in web applications. 5. **To enable students to create dynamic and functional web interfaces**, incorporating form controls, multimedia elements, animations, and event handling through hands-on practicals and mini-assignments.	
8	**Course Outcomes:** **CO 1:** Students will be able to design well-structured web pages using HTML5 elements including text, media, tables, forms, and semantic tags. **CO 2:** Students will apply CSS styling techniques to enhance the visual presentation and layout of web content across different devices. **CO 3:** Students will implement dynamic behavior on web pages through JavaScript by handling events, validating forms, and manipulating HTML elements. **CO 4:** Students will utilize jQuery to simplify DOM operations, apply animations, and handle user interactions efficiently. **CO 5:** Students will construct and manage structured data using JSON for client-server communication, and differentiate it from alternative data formats.	
9	**Modules:-** **Module 1 (15 Hours):**	
	odule I: **Concepts**: Internet and the World Wide Web: What is Internet? Applications of Internet, internet related concepts. HTML 5: Getting started with HTML, Doctypes, Headings, Paragraphs, Text Formatting, Anchors and Hyperlinks, Lists, Tables, Comments, Classes	

and IDs, Linking Resources, Images, Image Maps. HTML OTHER ELEMENTS: Input Control Elements, Forms, Div Element, Sectioning Elements, Navigation Bars, Label Element, Output Element, Void Elements, Media Elements, Progress Element, Selection Menu Controls, Embed, IFrames, SVG, Canvas, Tabindex.

CSS: Implementing Styles using CSS – Stylesheets, Formatting Text and Links using CSS, CSS Selectors, Changing Background, Adding Border, Margin and Padding, Setting Dimensions, Using Inline Container to mark up a part of a text.

Programs to be completed during lab sessions :

Practical No. 1. Create a Personal Web Page

Design a personal webpage with your name, photograph, short bio, and links to your social media profiles. Use appropriate headings, paragraphs, text formatting, hyperlinks, and images.

Practical No. 2. Design a Student Registration Form

Create a form using various input controls (text, email, password, radio buttons, checkboxes, dropdown, etc.). Organize the form using <fieldset>, <legend>, , and <section>. Include labels and use the required attribute.

Practical No. 3. Build a Responsive Navigation Bar with Embedded Media

Design a webpage with a horizontal navigation bar using <nav>. Embed a YouTube video using <iframe>, include an audio clip using <audio>, and add a Google Map using <embed>.

Practical No. 4. Apply CSS Styling to a Multi-Section Webpage

Create a webpage with at least three sections and apply an external CSS file to:

- Change fonts and text color
- Set background images/colors
- Add padding, margins, and borders
- Style links and headings

Practical No. 5. Create a Canvas and SVG Drawing

Use the <canvas> element and JavaScript to draw a rectangle, circle, and line. Additionally, use an inline <svg> to draw a star or a basic geometric shape.

Mini-Assignment:

Title: *"Designing a Multi-page Portfolio Website using HTML5 and CSS"*

Assignment Description:

Design a personal portfolio website with **minimum 3 interlinked pages** using HTML5 and CSS. The Home Page pages should include:

- **Home Page** – with your photo, introduction, and navigation bar
- **Projects Page** – showcasing 2–3 projects using tables and images
- **Contact Page** – a form for visitors to contact you (with input fields, radio buttons, dropdown, etc.)

Requirements:

- Use of <header>, <footer>, <section>, <article>, <nav>, , and <aside>
- Apply external CSS to style text, layout, background, margins, and borders
- Include at least one embedded video or audio file

Use responsive images and hyperlinks

Module 2: 15 Hours

Concepts: Java Script Events and Event Handlers: HTML Events, DOM Events, DOM Event Listener, onAbort, onBlur, onChange, onClick, onDblClick, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onReset, onResize, onSelect, onSubmit, onUnload, Form Validation Example. jQuery: Introduction, Syntax, Selectors, Events, Effects, Hide/Show, Fade, Slide, Animate, stop(), Callback, Chaining, HTML, Get, Set, Add, Remove, CSS Classes, css( ), Dimensions. JSON: Introduction, JSON Grammar, JSON Values, JSON Tokens, Syntax, JSON vs XML, Data Types, Objects, Arrays, Creating JSON, JSON Object, Parsing JSON, Persisting JSON, Data Interchange, JSONHTM, JSONP.

Programs to be completed during lab sessions :

Practical No. 1. Validate a Form Using JavaScript Events

Create a form with fields like name, email, and age. Write JavaScript code to:

- Ensure no field is left blank
- Display an alert if validation fails
- Use onBlur, onFocus, and onSubmit events

Practical No. 2. Handle Mouse and Keyboard Events on a Webpage

Create a webpage where:

- Clicking a button changes a paragraph's text (onClick)
- Hovering over an image changes it (onMouseOver, onMouseOut)
- Pressing a key updates a display box (onKeyDown, onKeyUp)

Practical No. 3. Create a jQuery-based Image Gallery

Build a webpage that shows images with buttons to:

- Hide/show them using hide() and show()
- Fade images in/out using fadeIn() and fadeOut()
- Slide images up/down using slideUp() and slideDown()
- Use chaining for combined effects

Practical No. 4. Create and Manipulate HTML Elements using jQuery

Create a dynamic to-do list where users can:

- Add new tasks
- Mark tasks as completed
- Remove tasks

Use jQuery methods like append(), remove(), addClass(), css()

Practical No. 5. Load and Display Data from a JSON File

Create a webpage that loads student data (name, course, contact) from a JSON file and displays it in a table. Use JavaScript or jQuery to parse the JSON and dynamically

<table>
<tr><td></td><td colspan="2">populate the table.

<u>Mini-Assignment</u>:

Title: "Create a Dynamic Quiz Application using JavaScript, jQuery, and JSON"

Assignment Description:
Develop a simple MCQ quiz application that:
• Loads a set of questions and options from a JSON file
• Allows users to select answers one by one
• Displays score at the end with basic feedback (e.g., “Well done!”, “Try again!”)
• Uses jQuery to dynamically show/hide questions and apply basic animations (fade/slide)</td></tr>
<tr><td>10</td><td colspan="2">Online References
• https://www.w3schools.com/
• https://developer.mozilla.org/
• https://javascript.info/
• https://www.freecodecamp.org/
• https://codepen.io/</td></tr>
<tr><td>11</td><td colspan="2">Reference Books:
1. Web Design with HTML, CSS, JavaScript and JQuery, by Jon Duckett, Paperback, 1st Edition, 2014
2. HTML 5 Black Book, by DT Editorial Services, Paperback, 2nd Edition, 2016
3. Beginning JSON, by Ben Smith, Apress, 1st Edition, 2015
Web Design: The Complete Reference, by Thomas Powell, TMH, 2009</td></tr>
<tr><td>12</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination: 60%</td></tr>
<tr><td>13</td><td>Continuous Evaluation through:
Practical journal submission, viva, assignments
• Journal Submission : 10 Marks
• Assignments: 10 Marks
Total: 20 marks</td><td>A semester end practical examination of 2 hours duration for 30 marks as the paper pattern given below.
Its compulsory to carry certified journal at the time of practical exam</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper:Total Marks: 30 Duration: 2 Hours

<table>
<tr><th>Question</th><th>Practical Question Based On</th><th>Marks</th></tr>
<tr><td>Q.1</td><td>Module 1</td><td>12</td></tr>
<tr><td>Q.2</td><td>Module 2</td><td>12</td></tr>
<tr><td>Q.3</td><td>Viva</td><td>06</td></tr>
</table>
</td></tr>
</table>

Letter Grades and Grade Points:

Semester GPA/ Program CGPA Semester/ Program	% of Marks	Alpha-Sign / Letter Grade Result		Grade Points
9.00-10.00	90.0-100	O	(Outstanding)	10
8.00-<9.00	80.0-<90.0	A+	(Excellent)	9
7.00-<8.00	70.0-<80.0	A	(Very Good)	8
6.00-<7.00	60.0-<70.0	B+	(Good)	7
5.50-<6.00	55.0-<60.0	B	(Above Average)	6
5.00-<5.50	50.0-<55.0	C	(Average)	5
4.00-<5.00	40.0-<50.0	P	(Pass)	4
Below 4.00	Below 40	F	(Fail)	0
Ab (Absent)	-	AB	(Absent)	0

Signature of BOS Chairman	***Signature of Faculty Member***	***Signature of I/C Principal***
Dr. Bhakti Chaudhari	***Mr. Vinay Dukale***	***Dr. Swiddle D'Cunha***
BOS (Computer Science)	*(Data Science)*	

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Vertical – V

Ability Enhancement Courses(AEC)

Semester I

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Communication Skills in English I – NUEN101

Sr. No.	Heading	Particulars
1	**Description of the course :**	This course aims to develop foundational communication skills in English through both theoretical and practical approaches. It begins with an introduction to the nature of communication, including verbal and non-verbal forms, effective writing and speech, and listening techniques. Learners will enhance their reading and listening skills through guided practice using varied texts and listening materials. The second part of the course focuses on speaking and formal writing. It includes training in public speaking, conversational English for different contexts, and practical writing tasks such as job applications, RTI requests, and formal letters. The course is designed to build confidence and competence in real-world communication scenarios.`
2	**Vertical :**	**Ability Enhancement Courses(AEC)**
3	**Type :**	**Theory**
4	**Credit**:	**2 credits**
5	**Hours Allotted :**	**30 Hours**
6	**Marks Allotted**:	**50 Marks**
7	**Course Objectives**: • To enhance the English language proficiency of students by familiarizing them with • Listening, Speaking, Reading, and Writing (LSRW) skills • To introduce learners to different perspectives of looking at a text or passage • To equip learners in the functional aspects of English so that they use the • acquired language skills correctly and confidently • To guide learners in the effective use of the digital medium of communication	
8	**Course Outcomes:** After completion of the course, learners would be able to: CO1) Understand and interpret any text they are reading from different perspectives CO2) Arouse the interest of learners in listening to and watching good-quality audio and visual media CO3) Acquire proficiency in the skills of listening, speaking, reading, and writing that will help them meet the challenges of the world CO4) Develop good oral and written skills of communication in the English language	
9	**Modules**:-	

	Module 1: 1. Introduction to Communication Skills • English as an international language and varieties of English • Verbal and Non-Verbal Communication • Features of Effective Writing Skills • Characteristics of an Effective Speech • Effective Listening Skills This section provides a theoretical base for the following units that are practical in nature. 2. Reading Skills: • Scanning a text for information • Skimming a passage to look for main ideas, understanding text type Passages of around 200- 250 words from fables, folk stories, short stories, non-fiction, history, business or environment could be chosen in this section. 3. Listening Skills • Listening for main ideas/Gist • Listening for details • Listening for text organization features • Listening for tone, accent, style and register Listening skills in English should be developed through various activities, along with the practice done while teaching in the class.
	Module 2 : 1. Speaking Skills in English i) Public Speaking in English • Introduction • Characteristics of an effective speech • Analysis of model speeches • Drafting and presenting a speech in formal and informal gatherings ii) Conversation skills • Opening a conversation • Introducing oneself in various contexts • Introducing others formally and informally 2. Formal Writing Skills: • Job applications with biodata (solicited and unsolicited) • RTI applications • Applications for duplicate documents (I-cards / mark sheet, etc.)
10	**References:** 1. Bellare, Nirmala. Reading & Study Strategies. Books. 1 and 2. Oxford University Press, 1997, 1998 2. Bellare, Nirmala. Easy Steps to Summary Writing and Note-Making. Amazon Kindle Edition, 2020 3. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, 1994.

<table>
<tr><td></td><td colspan="2">4. Das, Bikram K., et. al. An Introduction to Professional English and Soft Skills.Cambridge University Press India Pvt. Ltd., 2010
5. Das, Yadjnaseni& R. Saha (eds.) English for Careers. Pearson Education India, 2012.
6. Dimond-Bayir, Stephanie. Unlock Level 2 Listening and Speaking Skills Student's Book and Online Workbook: Listening and Speaking Skills Student's Book+ Online Workbook. Cambridge University Press, 2014.
7. Doff, Adrian and Christopher Jones. Language in Use (Intermediate and Upper Intermediate). CUP, 2004.</td></tr>
<tr><td>11</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination : 60%</td></tr>
<tr><td></td><td colspan="2">Internal Evaluation: 20 Marks
10 marks Role Play/ Skits
05 marks Resume Writing,
05 marks Class Participation and Attendance</td></tr>
<tr><td></td><td colspan="2">External Evaluation : 30 Marks

Semester End Examination

<u>Question Paper Pattern</u>

Each question carries 15 Marks

<table>
<tr><th>Question No.</th><th>Questions</th><th>Marks</th></tr>
<tr><td>Q 1</td><td>Writing Skills/ Comprehension</td><td>15 marks</td></tr>
<tr><td>Q 2</td><td>Practical/ Theory</td><td>15 marks</td></tr>
</table>
Note:
1. Equal Weightage is to be given to all the modules.
2. 15 marks question may subdivide into 7.5 marks each. Internal option shall be given, i.e. attempt any two out of three. For direct 15 Marks question option should be given. Attempt any one out of two.
3. Use of simple calculator is allowed in the examination.
4. Wherever possible more importance is to be given to the practical problems.</td></tr>
</table>

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Vertical – V

Value Education Course(VEC)

Semester I

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Environmental Systems and Management-I – NUES101

Sr. No.	Heading	Particulars
1	**Description of the course :**	Environmental awareness transcends academic boundaries. This course transcends academic boundaries, equipping you with a foundational understanding of ecosystems, biodiversity, and the human impact on natural resources and climate. Students will learn about critical issues like pollution and explore solutions for a sustainable future. The knowledge you gain here connects with diverse fields such as biology, economics, and even engineering. It is a foundation for further exploration in environmental science, conservation biology, and environmental policy. This course ignites your interest in environmental issues and opens doors to exciting careers in environmental management, conservation, and sustainable development – fields with growing demand across industries. Prepare for an interactive learning experience through engaging lectures, stimulating group discussions, and insightful case studies examining real-world environmental challenges and solutions.
2	**Vertical :**	**Value Education Course(VEC)**
3	**Type :**	**Theory**
4	**Credit**:	**2 credits**
5	**Hours Allotted :**	**30 Hours**
6	**Marks Allotted**:	**50 Marks**
7	**Course Objectives**: • To introduce students to fundamental environmental concepts including ecosystems, biodiversity, and the human-nature relationship. • To sensitize students to the causes and consequences of environmental degradation and pollution. • To develop awareness about global issues like climate change and the loss of biodiversity and their impact on commerce and society. • To encourage students to understand the importance of environmental education and conservation in promoting sustainability.	
8	**Course Outcomes:** After studying this course students will be in position to : CO1. Students will be able to explain the structure and function of ecosystems, and understand how energy flows through food chains and food webs. CO2. Students will identify various types of environmental pollution and their sources, and suggest prevention and control strategies. CO3. Students will analyze the factors contributing to biodiversity loss and describe the importance of conservation efforts. CO4. Students will demonstrate an understanding of human impact on the environment, emphasizing the need for sustainable resource use and the role of environmental education in promoting sustainability.	

9	**Modules**:-
	Unit I: Introduction to Environmental Concepts (15 Lectures) • Environment: Meaning and Components of Environment • Ecosystem and Ecology: The Structure and Function of Ecosystem. Food chains and food webs as illustrations of energy flow and ecological balance. Real-life case studies that illustrate the impact of imbalance in the food chain • Resources: Meaning, Classification (Renewable and Non-Renewable), Conservation of Natural Resources in a Sustainable Manner • Human-Nature Relationship and Environmental Awareness: The changing role of humans in nature-from coexistence to exploitation. Importance of environmental education and awareness programs in organizations and among youth **Unit II: Threats to the Environment (15 Lectures)** • Loss of Biodiversity: Understanding biodiversity and its importance. Factors leading to Extinction of Species, Loss of Habitat, and Biodiversity Loss. Conservation efforts at global and local levels • Degradation of Environment: Meaning, Causes and Effects • Pollution: Meaning and Types of Pollution (Air, Water, Noise, Land, and Radio-active). Causes and Preventive Techniques • Climate Change and Global Warming: Causes and its Impacts on ecosystems, agriculture, health, and global weather patterns
10	**Text Books :** 1. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006. 2. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders. 3. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi. 4. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson. 5. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher (ELBS) 6. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications https://sdgs.un.org/goals 7. Down to Earth, Centre of Science and Environment ®. 8. Hawkins R. E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay ®. 9. Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues 6th Edition. Routledge. 10. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press. 11. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
10	**Reference Books :** 1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt. 2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press. 3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge. 4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.

<table>
<tr><td></td><td colspan="2">5. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
6. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
7. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
8. Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
9. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press</td></tr>
<tr><td>11</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination: 60%</td></tr>
<tr><td>12</td><td>Continuous Evaluation through:
Project Work – 15 Marks
Attendance and Participation in Seminar, Workshop, and Activity, etc. – 05 Marks
Total – 20 Marks</td><td>Report Submission based on Suggested Practical Activities by Faculty Members for 30 Marks</td></tr>
<tr><td>13</td><td colspan="2">Suggested Practical Activities:
• A guest lecture by a disaster management official or NGO working in disaster relief.
• Project work involving conducting a waste audit in their own homes or college vicinity for a week and proposing ways to reduce waste.
• Project to develop a business plan for a fictional "eco-friendly" product or service, incorporating principles of green marketing and sustainable packaging.
• Mangroves Conservation Activity
• Environment Conservation Activity</td></tr>
</table>

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Syllabus

Vertical – V

Indian Knowledge System(IKS)

Semester I

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on **5th July 2025**

Name of the Course : Indian Knowledge System – UGIKS01

Sr. No.	Heading	Particulars
1	**Description the course :**	This course offers a comprehensive introduction to the Indian Knowledge System (IKS), exploring its core principles, historical context, and contemporary relevance. It examines the impact of colonial education policies and emphasizes the need to revisit ancient Indian traditions. The course highlights traditional Indian entrepreneurship through handloom, khadi, tribal handicrafts, herbal products, and culturally rooted food ventures. It also showcases sustainable practices like the use of clay bottles, banana leaf plates, and the repair-and-reuse culture. Students will further explore key domains of IKS such as Ayurveda, ancient sports, astronomy, yoga, traditional banking, trade, commerce, and governance models from texts like the Arthashastra.
2	**Vertical :**	IKS
3	**Type :**	Theory
4	**Credit**:	2 credits
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives**: The student should be able to : 1. To sensitize the students about context in which they are embedded i.e. Indian culture and civilization including its Knowledge System and Tradition. 2. To help student to understand the knowledge, art and creative practices, skills and values in ancient Indian system. 3. To help to study the enriched scientific Indian heritage. 4. To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.	
8	**Course Outcomes**: CO1. Learner will understand and appreciate the rich Indian Knowledge Tradition CO2. Learner will understand the contribution of Indians in various fields CO3. Learner will experience increase subject-awareness and self-esteem CO4. Learner will develop a comprehensive understanding of how all knowledge is ultimately intertwined	
9	**Module :** Module 1: (15 Hours) 1. Introduction to IKS: What is knowledge System, Characteristic Features of Indian Knowledge System 2. Why IKS? Macaulay's Education Policy and its impact, Need of revisiting Ancient Indian Traditions 3. IKS and Entrepreneurship: Handloom, Khadi, Tribal Handicrafts and Herbal Products, Food-based start-ups rooted in tradition	

4. Sustainable Indian Practices: Clay bottles, Banana leaf plates, Cloth Bags- Repair culture (Reuse, Patchwork, Jugaad)

Module 2: Indian Knowledge System – II (15 Hours)

1. Medicine (Ayurveda)
2. Ancient Sports
3. Astronomy
4. Yoga and Wellbeing
5. Banking
6. Trade and Commerce
7. Art of Governance (Arthashastra)

10 Reference Books:

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banrasidas, Delhi1958.
3. History of Chemistry in Ancient India & Medieval India, P.Ray- Indian Chemicals
4. Society, Calcutta 1956
5. Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of India, New Delhi 1965.
6. MacDonnell A.A- History of Sanskrit literature
7. Winternitz M- History of Indian Literature Vol. I, II & III
8. Dasgupta S.N & De S.K- History of Sanskrit literature Vol. I.
9. Ramkrishna Mission- cultural heritage of India Vol. I, II & III.
10. Majumdar R. C & Pushalkar A.D- History & culture of the Indian people, Vol. I, II & III.
11. Keith A.B- History of Sanskrit literature.
12. Varadachari V- History of Sanskrit literature Chaitanya Krishna- A new History of Sanskrit

11 Internal Continuous Assessment: 40%

Continuous Internal Assessment: 20 Marks

- Field Visit Report: **10 Marks,**
- Class Test / MCQ Test :**10 Marks,**

12 External Assessment: 60% : (30 Marks)

Format of Question Paper: For the External examination

Q1	(A)	Objectives (MCQs)	5
	(B)	Concept/One Sentence	5
Q2		A **OR** B	10
Q3		A **OR** B	10

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Vertical – VI

Co-Curricular Courses (CC)

Semester I

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on **5th July 2025**

Title of Paper: Fitness and Sports I - UG.1CCS

Sr. No.	Heading	Particulars
1	**Description the course :** **Including but Not limited to :**	India is growing rapidly as a global super-power. To face the challenges of the century and to keep up with the pace of the world, maintaining health is of prime importance. Giving thrust to healthy society, Physical Education, Sports, Health & fitness and Yoga are of great significance in today's world. The Government of India insists on Physical Fitness, Mental Health and Overall Development of Personality for every citizen. However, creating efficient and skilled human resource in the field of Physical Education, Sports and Yoga is identified as the need of the hour. Thus, the Governments of India and Government of Maharashtra have included Physical Education, Sports and Yoga as a key area under the NEP 2020.
2	**Vertical :**	Co-Curricular
3	**Type :**	Activity Based
4	**Credit**:	2 credits
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives**: The student should be able to : • **To understand the core components of physical fitness** and learn basic techniques for assessing and improving personal health and endurance. • **To gain knowledge of various sports classifications, rules, and techniques** for both individual and team-based indoor and outdoor games. • **To develop life skills such as discipline, teamwork, and leadership** through active	
8	**Course Outcomes**: • **Understanding of physical fitness components** and apply appropriate assessment techniques like BMI, flexibility, and endurance tests. • **Identify and explain the rules, techniques, and classifications** of major indoor and outdoor sports, including both individual and team games. • **Exhibit improved teamwork, discipline, and personal growth** through participation in physical activities and application of sportsmanship values.	

9	**Module :** This module introduces the fundamentals of physical fitness, including strength, endurance, flexibility, body composition, and cardiovascular health. It emphasizes the importance of fitness for students and explains basic assessment methods like BMI and endurance tests. It also covers the classification of sports into indoor/outdoor and individual/team. Basic rules and techniques of popular games like cricket, football, volleyball, and athletics are explained. The module highlights how sports encourage discipline, teamwork, and contribute to personality development.
10	**Reference Books:** 1. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication. 2. Muller, J.P. (2000). Health, Exercise and Fitness. Delhi: Sports. 3. Russell, R.P. (1994). Health and Fitness Through Physical Education. USA: Human Kinetics. 4. Kamlesh, M.L. (2007). Physical Education and Sports. New Delhi: Metropolita Book Singh Hardayal (1991), Science of Sports Training, DVS Publication, New Delhi
11	**Internal Continuous Assessment: 40%(20 Marks)** ❖ Assignment/Report Writing
12	**External Assessment: 60% (30 Marks)** **Certificate Submission Guidelines** *Each student must submit at least* **three certificates** *from the following approved categories:* 1. Attending **Zumba or Aerobics** sessions conducted by a certified fitness trainer. 2. Participation in **Team Sports** such as Cricket, Volleyball, Football, Kabaddi, Basketball, or Kho-Kho. 3. Participation in **Indoor Sports** like Carrom, Chess, or Badminton. 4. Participation in **Marathons or Walkathons**. 5. Serving as a **Volunteer** in roles such as Event Coordinator, Scorekeeper, Timekeeper, or Referee. *Note: Students participating in sports competitions conducted by University at State or National Level, students who have represented Mumbai University or College at Intercollegiate / Inter Zonal / West Zone Inter University / All India Inter University/ International tournament are exempt from submission of report.*

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Bachelor of Science in Data Science

(B.Sc. Data Science)

(Programme Code: UGDS03)

As Per New Education Policy (NEP) 2020

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Vertical – I

Semester – II

Mandatory Courses

Name of the Course: Advanced Python Programming – NUDS201

Sr. No.	Heading	Particulars
1	**Description the course :**	• **Introduction:** The Advanced Python Programming course serves as a crucial milestone for developers seeking to enhance their Python proficiency. This introduction highlights the course's relevance, practical applications, and growing industry demand—underscoring its significance in advancing career opportunities. • **Relevance and Usefulness:** In today's technology-driven world, advanced Python skills distinguish developers in a competitive field. This course meets the increasing demand for professionals who can master complex Python concepts, making it ideal for those aiming to elevate their programming expertise. • **Applications:** The advanced Python skills gained through this course are directly applicable across diverse fields such as software development, data analysis, and automation. Participants will be prepared to build scalable, efficient, and maintainable solutions in real-world environments. • **Interest and Connection with Other Courses:** Designed for learners seeking deeper Python knowledge, this course complements other programming courses and offers a well-rounded pathway toward comprehensive expertise in software development. • **Demand in the Industry:** With Python playing a vital role in complex, industry-wide applications, the demand for professionals with advanced Python skills is rapidly growing. Employers are actively seeking individuals who can fully leverage Python's capabilities, driving the need for expertise in advanced concepts. • **Job Prospects:** Completing the Advanced Python Programming course greatly boosts career prospects. Professionals with advanced Python expertise are well-suited for roles such as software architects and technical leads, opening doors to high-paying opportunities in fields where advanced programming skills are essential.
2	**Vertical :**	Major
3	**Type :**	Theory
4	**Credits :**	2 credits (30 Hours in a semester)
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** 1. To learn the concept of Lists and tuples in python programming, 2. To understand the use of Regular Expression in python. 3. To learn the use of date and time in python. 4. To understand the concept of Numpy in python. 5. To learn manipulation and visualization of data in python.	
8	**Course Outcomes:** **CO 1**: Ability to use lists and tuples in python programming. **CO 2:** Ability to implement different regular expressions. **CO 3:** Ability to use date time in python programming. **CO 4:** Acquire knowledge of Numpy.	

	CO 5: Proficiency in handling, manipulating and visualizing data.
9	**Modules:**
	Module 1(15 Hrs)
	1. **Lists and Tuples**: Lists, List Functions and Methods, List Operations, Tuples, 2. **Regular Expressions**: What is a Regular Expression? Sequence Characters in Regular Expressions, Quantifiers in Regular Expressions, Special Characters in Regular Expressions, Using Regular Expression on Files, Retrieving Information from an HTML File 3. **Date and Time in Python:** Date and Time, Date and Time Now, Combining Date and Time, Formatting Dates and Times, Finding Durations using "timedelta", Comparing Two Dates, Sorting Dates, Stopping Execution Temporarily, Knowing the Time taken by a Program, Working with Calendar Module. 4. **IPython:** Beyond Normal Python, Help and Documentation in IPython, Keyboard Shortcuts in the IPython Shell, IPython Magic Commands, Input and Output History, IPython and Shell Commands, Errors and Debugging, Profiling and Timing Code
	Module 2: 15 hours
	1 **Introduction to NumPy:** Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything In Between, Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays. 2 **Data Manipulation with Pandas**: Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append. 3 **Combining Datasets:** Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series. High-Performance Pandas: eval() and query() 4 **Visualization with Matplotlib**: Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Color bars, Multiple Subplots, Text and Annotation, Customizing Tick s, Customizing Matplotlib: Configurations and Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn
10	Online References • https://www.geeksforgeeks.org/fundamentals-of-algorithms/ • https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/ • https://mitpress.mit.edu/books/introduction-algorithms-third-edition • https://visualgo.net/en
11	**Reference Books:** 1. Data Structure and Algorithm Using Python, Rance D. Necaise, Wiley India Edition, 2016. 2. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications, 2016. 3. Introduction to Algorithms, Thomas H. Cormen, 3rd Edition, PHI. 4. Introduction to the Design and Analysis of Algorithms, Anany Levitin, Pearson, 3rd Edition, 2011. 5. Design and Analysis of Algorithms, S. Sridhar, Oxford University Press, 2014.
12	**Internal Continuous Assessment: 40%** | **Semester End Examination: 60%**

<table>
<tr><td>13</td><td>Continuous Evaluation through:
Class test of 15 marks

Quizzes/ Presentations/
Assignments: 5 marks
Total: 20 marks</td><td>Format of Question Paper: External Examination (30 Marks)– 1 hr duration</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)
<table>
<tr><th>Questions</th><th>Based On</th><th>Options</th><th>Marks</th></tr>
<tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr>
<tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr>
<tr><td>Q.3</td><td>Module 1 & 2</td><td>Any 2 out of 4</td><td>10</td></tr>
</table></td></tr>
</table>

Name of the Course: Programming with C++ - NUDS202

Sr. No.	Heading	Particulars
1	**Description the course :**	The Introduction to Object-Oriented Programming (OOP) using C++ course provides a comprehensive foundation in the essential principles of object-oriented programming through hands-on experience with the C++ language. Designed as an entry point for students, this course enables learners to grasp and implement fundamental concepts that underpin modern software design and development, such as classes, objects, encapsulation, inheritance, and polymorphism. By mastering these core ideas, students are equipped to build robust, maintainable, and reusable software solutions in C++.
2	**Vertical :**	Major
3	**Type :**	Theory
4	**Credits :**	2 credits (1 credit = 15 Hours for Theory)
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** • Enable learners to comprehend the fundamental principles of object-oriented programming (OOP). • Equip learners with the ability to design object-oriented solutions using Unified Modelling Language (UML) diagrams. • Develop proficiency in the syntax and features of the C++ programming language. • Foster analytical skills to evaluate and implement key OOP concepts in software development. • Empower learners to design and develop programs that effectively apply object-oriented programming concepts.	
8	**Course Outcomes:** **At the end of the course:** • **Students will be able to** comprehend, recall, demonstrate, and clearly articulate the fundamental concepts of object-oriented programming. • **Students will be capable** of designing and constructing UML diagrams to represent object-oriented systems. • **Students will be able** to effectively illustrate and utilize various control statements in C++. • **Students will develop** the ability to critically analyze and implement core object-oriented programming concepts in practical scenarios. • **Students will be** proficient in writing and developing C++ programs that apply and integrate object-oriented programming principles.	
9	**Modules:**	
	Module 1: 15 Hours	
	Introduction to Programming Concepts: Basic concepts of Object Oriented Programming, benefits of object oriented programming, object oriented languages, applications of object oriented programming. **Tokens:** Keywords, identifiers, and simple C++ program without class, compiling and running C++ program. Basic data types, variables, rules for naming variables, the type cast operator, implicit and explicit type casting.	

Decision Making, Loops, Arrays and Strings: Conditional statements - if, if...else, switch loops- while, do...while, for, types of arrays and string.

Classes, Abstraction & Encapsulation: Classes and Objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function.

Constructors and Polymorphism : Default constructor, parameterized constructor, copy constructor, destructors. Binding-static binding & overloading, constructor overloading function overloading, operator overloading.

Module 2: 15 Hours

Inheritance: Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical, multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes.

Run time Polymorphism - Dynamic Binding, Function overriding, virtual function, pure virtual function, virtual base class, abstract class.

Pointers: Introduction to pointers, * and & operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects & this pointer.

File Handling: File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling.

10 **Online References**

- https://www.w3schools.com/cpp/
- https://www.programiz.com/cpp-programming
- https://www.tpointtech.com/cpp-tutorial

11 **Reference Books:**

1. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India.
2. UML & C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition2015
3. Mastering C++ by Venugopal, Publisher: McGraw-Hill Education, 2017
4. Let Us C++ by KanetkarYashwant, Publisher: BPB Publications, 2020
5. Object Oriented Analysis and Design by Timothy Budd TMH, 2001

12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**
13	**Continuous Evaluation through:** Class test of 15 marks Quizzes/ Presentations/ Assignments: 5 marks Total: 20 marks	**Format of Question Paper: External Examination (30 Marks)– 1 hr duration**

14 **Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)**

Questions	Based On	Options	Marks
Q.1	Module 1	Any 2 out of 4	10
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1 & 2	Any 2 out of 4	10

Name of the Course: Computer Science Practical 2
(Design and Analysis of Algorithms and Object-Oriented Programming (OOP) using C++.) – NUDS203

Sr. No.	Heading	Particulars
1	**Description the course :**	The Computer Science Practical Course offers an integrated exploration of **Design and Analysis of Algorithms** and **Object-Oriented Programming (OOP) using C++**. Designed to build a strong foundation in core computer science principles, the course combines theoretical understanding of algorithmic strategies with hands-on programming experience. Through the C++ language, students will develop practical skills in designing efficient algorithms and implementing robust, object-oriented software solutions.
2	**Vertical :**	Major
3	**Type :**	Practical
4	**Credits :**	2 credits (1 credit = 30 Hours of Practical work in a semester)
5	**Hours Allotted :**	60 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** • Enable learners to comprehend the fundamental principles of object-oriented programming (OOP). • Equip learners with the ability to design object-oriented solutions using Unified Modelling Language (UML) diagrams. • Develop proficiency in the syntax and features of the C++ programming language. • Foster analytical skills to evaluate and implement key OOP concepts in software development. • Empower learners to design and develop programs that effectively apply object-oriented programming concepts.	
8	**Course Outcomes :** **At the end of the course:** • Design and implement algorithms across diverse problem domains effectively. • Evaluate and compare algorithms based on their time and space complexity. • Apply divide and conquer strategies to develop efficient computational solutions. • Implement and analyze algorithms using greedy strategies for problem-solving. • Utilize advanced C++ features such as friend functions, inline functions, and the **this** pointer. • Understand and manage the effects of scope specifiers on class members for proper encapsulation.	
9	**Modules:**	
	Module 1: 30 Hours (Design and Analysis of Algorithms)	
	1. Array Operations a) Write a program in python to store 5 numbers in an array. Print 3rd element of an array. Update 3rd element of an array, Hence print array. Also calculate the sum of elements in array. b) Write a program in python to store two matrices as an 2- D array. Hence find matrix addition of matrices. **2. List-Based Stack Operations** a) Write a program in python to take positive integers as input from user until he enter negative integer. b) Write a program in python to display last element of stack and check whether	

the stack is empty or not.

3. **Linear and Binary Search**
   a) Write a program in python to find position of particular number in the given array, by using linear search.
   b) Write a program in python to find position of particular number in the given array, by using binary search.
4. **Sorting Algorithms**
   a) Write a program in python to find smallest element of given array by using bubble sort algorithm. (Take : A={9, 8, 7, 6, 5 })
   b) Write a program in python to find smallest element of given array by using selection sort algorithm. (Take: A={7,9,6,8,4})
   c) Write a program in python to find smallest element of given array by using insertion sort algorithm. (Take : A={7,9,6,8,4})
5. **Nth Max/Min Element**
   a) Write a program in python to find 4th maximum value of the given data. {5,3,13,7,2,4,8,12}
   b) Write a program in python to find 4th minimum value of the given data. {5,3,13,7,2,4,8,12}
6. **String Pattern Matching**
   a) Find a substring within a string using naive matching.
7. **Recursion**
   a) Write a program in python to find factorial of 6 by using recursion.
   b) Implement the Fibonacci series recursively.
8. **Greedy Algorithm**
   a) Write a program in python to find minimum number coins needed for changes of 59.
9. **Divide and Conquer**
   a) Write a program in python to sort the array by using divide and conquer sort algorithm. (Take : A={6, 5, 12, 10, 9, 1})
10. **Dynamic Programming**
   a) Write a program in python to find factorial of 6 by using dynamic programming principles.
   b) Write a program in python to find length of Longest Common Subsequence (LCS) using dynamic programming.

Mini-Assignment:

Title: *"Create a mini project on Sorting of contact numbers"*

Module 2 : 30 Hours (Object-Oriented Programming (OOP) using C++.)

C++ Programming Concepts: Basic concepts of Object Oriented Programming. Basic data types and declaration variables. Conditional statements and Branching statements. Classes and Objects, scope and visibility of variables in function. Constructors and Polymorphism**.**

Programs to be completed during lab sessions :

1. **Introduction to Classes**

Design an Employee class for reading and displaying the employee information, the getInfo() and dispInfo() are member functions will be used respectively.

2. **Branching and Looping with Classes**

a) Write and execute a C++ program using classes to find Factorial (For Loop)
b) Write and execute a C++ program using classes to check whether the number is Even number or Odd number.

	3. To demonstrate array Write a program in C++ using array to arrange number in Matrix form. **4. Scope Resolution Operator** Write a program in C++ to calculate the Area of Circle and Rectangle using Scope Resolution Operator. **5. Constructors and Destructors** Write a program in C++ to display the side of the Cube, using default constructors, parameterized constructors, copy constructors, and destructor **6. Demonstrate Access Specifier** Write a program to display details of Employee by displaying Age as Public specifier and Identification as Private specifier, and Contact as Protected specifier. **7. Implement classes to demonstrate single inheritance scenarios** Write a program in C++ to calculate Product of two numbers using Single Inheritance. **8. Implement classes to demonstrate multilevel inheritance scenarios** Write a program in C++ to calculate marks of students where class student gets the Student details, class Marks gets marks and class result to calculate total marks of Student. **9. Explore the use of pointers within classes** Write a program in C++ to except input to create an account and can access through function and calculate the Rate of Interest. Using this pointer. **10. Develop programs to demonstrate function overloading and overriding within classes.** Write a program in C++ a) To add two different data types using add function using function overloading. b) Calculate sum of two numbers using friend function. **Mini-Assignment**: **Title:** *"Create Student's 5 Records displaying the details and calculate the CPGA"* **Assignment Description:** Create a Student Details Class which has Student RollNo, Student Name, Subjects, Marks. The functions using scope resolution should include: • **Mark_Obtained – accept the marks of the students** • **Calculate CPGA** – Calculate average of marks accepted from class • **Object of a class** – all the functions are called **Requirements:** • Declaration of variables and functions • Operator to be used scope resolution (::)
10	Online References • https://www.w3schools.com/cpp/ • https://www.programiz.com/cpp-programming • https://www.tpointtech.com/cpp-tutorial
11	**Reference Books:**

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<tr><td></td><td colspan="2">1. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India.
2. UML & C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition2015
3. Mastering C++ by Venugopal, Publisher: McGraw-Hill Education, 2017
4. Let Us C++ by Kanetkar Yashwant, Publisher: BPB Publications, 2020
5. Object Oriented Analysis and Design by Timothy Budd TMH, 2001</td></tr>
<tr><td>12</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination: 60%</td></tr>
<tr><td>13</td><td>Continuous Evaluation through:
Practical journal submission, viva, assignments
● Journal Submission : 10 Marks
● Assignments: 10 Marks
Total: 20 marks</td><td>A semester end practical examination of 2 hours duration for 30 marks as the paper pattern given below.
Its compulsory to carry certified journal at the time of practical exam</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper:

Total Marks: 30 Duration: 2 Hours
<table>
<tr><th>Question</th><th>Practical Question Based On</th><th>Marks</th></tr>
<tr><td>Q.1</td><td>Module 1</td><td>12</td></tr>
<tr><td>Q.2</td><td>Module 2</td><td>12</td></tr>
<tr><td>Q.3</td><td>Viva</td><td>06</td></tr>
</table></td></tr>
</table>

Letter Grades and Grade Points:

Semester GPA/ Program CGPA Semester/ Program	% of Marks	Alpha-Sign / Letter Grade Result		Grade Points
9.00-10.00	90.0-100	O	(Outstanding)	10
8.00-<9.00	80.0-<90.0	A+	(Excellent)	9
7.00-<8.00	70.0-<80.0	A	(Very Good)	8
6.00-<7.00	60.0-<70.0	B+	(Good)	7
5.50-<6.00	55.0-<60.0	B	(Above Average)	6
5.00-<5.50	50.0-<55.0	C	(Average)	5
4.00-<5.00	40.0-<50.0	P	(Pass)	4
Below 4.00	Below 40	F	(Fail)	0
Ab (Absent)	-	AB	(Absent)	0

Signature of BOS Chairman	***Signature of Faculty Member***	***Signature of I/C Principal***
Dr. Bhakti Chaudhari	***Mr. Vinay Dukale***	***Dr. Swiddle D'Cunha***
BOS (Computer Science)	*(Data Science)*	

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Vertical – II
Minor

Semester II

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: IT_Problem Solving Using 'C'

Sr. No.	Heading	Particulars
1	**Description the course:**	This course, *Problem Solving Using C*, is designed to equip students with computational and algorithmic thinking to solve real-life problems using the C programming language. It emphasizes writing structured, modular code while introducing core programming concepts such as data types, control structures, arrays, strings, and functions. Students will develop logical reasoning through hands-on programming and gain skills in debugging, testing, and evaluating code for accuracy and efficiency.
2	**Vertical:**	Minor
3	**Type:**	Practical
4	**Credits:**	2 credits (1 credit = 15 Hours for Practical)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** ● **To introduce** the syntax, structure, and core concepts of C programming through hands-on practice. ● **To develop** logical thinking and structured problem-solving abilities using algorithms and control structures. ● **To enhance** the ability to work with arrays, strings, and user-defined functions for real-world applications. ● **To encourage** modular programming practices through the use of functions and code reuse. **To provide** practical experience in implementing basic algorithms like searching, sorting, and recursion.	
8	**Course Outcomes:** **CO 1:** The student will learn to demonstrate the ability to write and execute simple C programs using basic syntax, data types, and operators. **CO 2:** The student will learn to demonstrate the use of conditional and looping control structures for solving decision-based problems. **CO 3:** The student will learn to demonstrate the ability to manipulate arrays and strings for handling data in structured formats. **CO 4:** The student will learn to demonstrate the creation and use of user-defined functions to implement modular and reusable code. **CO 5:** The student will learn to demonstrate the implementation of basic problem-solving algorithms such as linear search, bubble sort, and recursion.	
9	**Modules:**	
	Module 1: 15 hours	
	Module I: Basics of C Programming and Control Structures ● Structure of a C Program – #include, main(), comments ● Data Types and Variables – int, float, char, etc. ● Operator– Arithmetic, Relational, Logical, Assignment, etc. Input/Outputs Functions – scanf(), printf()	

	Control Structures: ○ Conditional Statements: if, if-else, nested if, switch ○ Looping Constructs: for, while, do-while ***Programs to be completed during lab sessions*** 1. Program to calculate area and perimeter of geometric shapes. 2. Program to check if a number is even or odd, positive or negative. 3. Create a simple calculator using switch-case. 4. Generate number patterns (triangle, pyramid, etc.) 5. Find factorial, sum of digits, reverse of a number using loops. **Mini-Assignments**: ● Grade calculator using conditional statements ● Simple interest and compound interest calculator
	Module 2: 15 hours
	Module II: Arrays, Strings, and Functions ● Arrays: One-dimensional array operations (sum, average, max, min) ● Two-dimensional arrays (matrix addition, multiplication) ● Strings: Reading, writing, string operations (strlen, strcpy, strcmp, etc.) ● Functions: User-defined functions (with/without parameters and return types) Function calling, scope of variables ● Basic Problem-Solving Algorithms: Linear Search, Bubble Sort (1D arrays) Recursive programs (factorial, Fibonacci) ***Programs to be completed during lab sessions*** 1. Program to read and process marks of students using arrays. 2. Program to sort numbers in ascending order. 3. Create a modular grade calculator using functions. 4. Program to compare and copy strings. **5.** Recursive function to find factorial. **Mini-Assignments:** ● Menu-driven calculator using functions ● Student marks analysis using arrays
10	**Text and References:** 1. Kanetkar, Y. (n.d.). *Let Us C*. BPB Publications. 2. Balagurusamy, E. (n.d.). *Programming in ANSI C*. McGraw-Hill Education. 3. King, K. N. (2008). *C Programming: A Modern Approach* (2nd ed.). W. W. Norton & Company.

11	**Internal Continuous Assessment: 40%**	**External Assessment : 60%**
12	**Continuous Evaluation through:** Practical journal submission, viva, assignments ● Journal Submission : 10 Marks ● Assignments: 10 Marks Total: 20 marks	**A semester end practical examination of 2 hours duration for 30 marks as the paper pattern given below.** *Its compulsory to carry certified journal at the time of practical exam*

13	**Format of Question Paper:** **Total Marks: 30** **Duration: 2 Hours**

Questions	Type & Module	Marks
Q1.	Module 1	12
Q2.	Module 2	12
Q2.	Viva	06

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Open Electives(OE)

As Per New Education Policy (NEP) 2020

Vertical – III - Semester II

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Research and Principles – NUDS206

Sr. No.	Heading	Particulars
1	**Description the course :**	This course provides a comprehensive introduction to the principles and practices of research, with a focus on its application in academic and professional settings. Students will explore both **qualitative and quantitative research methods**, learn how to **formulate research problems**, and understand the **process of developing a research proposal**. Key aspects include **literature review**, **data collection strategies**, **research design**, and **hypothesis formulation**. By the end of the course, students will be equipped with the essential skills to **initiate, plan, and present a research study**, preparing them for future academic projects, internships, or industry-driven research.
2	**Vertical :**	**Open Elective**
3	**Type :**	**Theory**
4	**Credits :**	**2 credits**
5	**Hours Allotted :**	**30 Hours**
6	**Marks Allotted:**	**50 Marks**
7	**Course Objectives:** • To introduce students to the fundamental concepts, types, and purposes of research. • To develop an understanding of qualitative and quantitative research methodologies. • To guide students through the research process—from identifying a topic to formulating objectives and hypotheses. • To familiarize students with research design strategies, ethical considerations, and techniques for writing research proposals.	
8	**Course Outcomes:** By the end of the course, students will: **CO1.** Gain a clear understanding of what research is and why it is important in academic and professional fields. **CO2.** Learn the difference between qualitative and quantitative research methods and when to apply them. **CO3.** Be able to identify research topics, review related literature, and frame effective research questions and hypotheses. **CO4.** Understand various research designs and how to choose appropriate methods for different types of studies. **CO5.** Acquire the skills to prepare a structured and ethical research proposal, ready for academic or practical use.	
9	**Modules:**	
	Module 1: Foundations of Research (15 Hrs) 1. Definition and Purpose of Research 2. Types of Research (Qualitative vs Quantitative; Basic vs Applied) 3. The Research Process (From idea to publication) 4. Sources of Research Problems 5. Research Ethics and Integrity	

	Module 2: Research Design (15 Hrs) 1. Types of Research Designs (Experimental, Exploratory, Descriptive) 2. Formulation of Hypothesis 3. Sampling Methods and Techniques 4. Preparing a Research Proposal (Topic, Objectives, Research Questions) 5. Data Collection Techniques and Tools	
10	**References** • Booth, W. C. Colomb, G. G. and Williams, J. M. (2016). *The Craft of Research.* • 4th edition, University of Chicago Press. • Bryman, Alan. (2018). *Social Research Methods*, London: OUP. • Creswell, J.W.(2014). *Research Methods: A Practical Guide*. 9th Edition, Pearson • Creswell, J.W.(2014). *Research Methods: A Practical Guide*. 9th Edition, Pearson. • Creswell, J.W. and Creswell, D. J. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* , 5th edition, SAGE Publications. • Creswell, J.W. and Creswell, D. J. (2017). *Research Design*, New Delhi: SAGE Publications. • Ghosh, B.N. (1984). *Scientific Method and Social Research*, New Delhi: Sterling. • Goode, W. J. and Hatt, P. K. (1952). *Methods in Social Research*, New York: Mc Graw-Hill Book Co.	
11	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**
12	**Continuous Evaluation through:** **Internal Evaluation:** 20 Marks • Classroom Presentations/ Assignments :10 Marks • Essay Submission/ Book review/ • Field Visit Report /Educational Activity Report 10Marks	**Semester End Examination : 30 Marks**
14	**Format of Question Paper:** for the final examination Time: 1hour Marks: 30 **Q.1 Answer the following: (ATTEMPT ANY 2 OUT OF 4) (10 Marks)** **Q.2 Answer the following: (ATTEMPT ANY 2 OUT OF 4) (10 Marks)** **Q.3 Answer the following: (ATTEMPT ANY 2 OUT OF 4) (10 Marks)**	

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Vertical – III
Open Electives(OE)

Semester II

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Basics of Stock Market – NUDS205

Sr. No.	Heading	Particulars
1	**Description the course:**	This course provides a comprehensive introduction to the Indian financial system, offering foundational knowledge of its structure, components, and functioning. It delves into the role of banks and other financial institutions in economic development and explores various banking services available to individuals and businesses. The course also introduces students to the basics of insurance and personal financial planning, enabling them to make informed financial decisions and develop sound saving and investment strategies. Through real-world examples, case studies, and practical insights, students will gain a deeper understanding of how financial instruments, services, and institutions interact to support the financial stability of individuals and the economy.
2	**Vertical:**	**Open Electives**
3	**Type:**	**Theory**
4	**Credits:**	**2 credits**
5	**Hours Allotted:**	**30 Hours**
6	**Marks Allotted:**	**50 Marks**
7	**Course Objectives:** 1. Understand the concept and function of stock markets. 2. Identify the key participants and their roles in the stock market. 3. Familiarize with Indian stock exchanges (NSE & BSE). 4. Recognize common stock market terms such as shares, IPO, and dividends. 5. Compare features of stocks, bonds, mutual funds, ETFs, and SIPs. 6. Understand the concept of risk vs return. 7. Learn the importance of diversification in portfolio building.	
8	**Course Outcomes (CO):** **After completing this course, students will have the knowledge and skills to** CO1. Explain the basic structure of stock markets, key participants, and commonly used investment terms. CO2. Differentiate between various investment options and evaluate them based on risk and return, with basic understanding of portfolio diversification.	
•	**Modules:-** **Module 1 (15 hours): Introduction to Stock Markets** • What is a stock market?	

- Types of markets: Primary vs Secondary
- Key participants: Investors, Brokers, SEBI
- Indian stock exchanges: NSE, BSE
- Basic terms: stock, share, equity, IPO, index, dividend

Module 2 (15 hours): Investment Instruments

1. Types of investment options: Stocks, Bonds, Mutual Funds, ETFs, SIPs
2. Risk vs Return: Low-risk vs High-risk options
3. Diversification and Portfolio basics

10 Text Books

1. Halan, Monika. *Let's Talk Money*, Harper Business
2. Pathak, Bharati V. *The Indian Financial System* (selected basic chapters)
3. RBI's "Financial Literacy" booklets and SEBI's student guides

11 Reference Books

1. Investment Analysis and Portfolio Management – Prasanna Chandra
2. Security Analysis and Portfolio Management – Punithavathy Pandian
3. Financial Markets and Institutions – L.M. Bhole & Jitendra Mahakud
4. Investment Management – V.K. Bhalla

12 Internal Continuous Assessment: 40% | **External Assessment : 60%**

13 Continuous Evaluation through:

Sr. No	Particular	Marks
1.	Class Test	15
2.	Class participation	05
	Total	**20**

Semester End Examination (30 Marks)

14 Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)

Questions	Type & Module	Marks
Q1.	Objective Question A) Multiple choice questions B) True or False	 08 Marks 07 Marks
Q2.	Theory Question	15 Marks
	OR	
Q2.	Theory Question	15 Marks
	Total	**30**

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Bachelor of Science in Data Science

(B.Sc. Data Science)

(Programme Code: UGdS03)

As Per New Education Policy (NEP) 2020

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Vertical – IV

Semester – II

Vocational Skill Course (VSC)

Name of the Course: R Programming for Statistics – NUDS207

Sr. No.	Heading	Particulars
1	**Description the course:**	**Introduction:** This course offers a comprehensive introduction to statistical computing and data analysis using R, a powerful open-source programming language widely adopted by professionals for its robust capabilities in statistics and data visualization. **Relevance:** In today's data-driven world, R programming holds significant relevance, offering powerful tools for statistical modeling, data visualization, and machine learning. Its widespread use makes it an essential skill for professionals working in data-intensive fields. **Usefulness:** This course empowers learners to handle data manipulation, conduct statistical analysis, and develop insightful visualizations. With its versatility, R serves as a valuable tool for both newcomers to data science and experienced professionals seeking to expand their analytical capabilities. **Application:** R programming is utilized across a wide range of fields such as finance, healthcare, marketing, and academia. Through this course, participants learn to apply R for solving real-world problems, uncovering data-driven insights, and supporting informed decision-making. **Interest:** The R programming course captures interest with its practical, hands-on approach. Participants actively work with real datasets, build visualizations, and develop statistical models—promoting a strong, experiential grasp of data analytics. **Connection with Other Courses:** This course seamlessly integrates with other data-focused disciplines, complementing studies in statistics, machine learning, and data science. It lays a strong foundation for pursuing advanced analytics and deeper exploration in related fields. **Demand in the Industry:** Professionals skilled in R programming are highly sought after across industries such as finance, healthcare, and more. Their ability to harness R for data analysis and informed decision-making supports the growing shift toward evidence-based

		practices. **Job Prospects:** Graduates of an R programming course unlock a wide range of career opportunities, including roles such as data analyst, statistician, business intelligence analyst, and data scientist. Their expertise in extracting actionable insights from data makes them valuable assets across industries.
2	**Vertical:**	SEC
3	**Type:**	Practical
4	**Credits:**	2 credits (1 credit = 15 Hours of Practical work in a semester)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:** 1. Understand R basics, set up R Studio, and customize the environment. 2. Master R expressions, assignments, loops, and decision-making. 3. Develop proficiency in using R data structures: vectors, matrices, lists & data frames 4. Demonstrate expertise in character strings manipulation in R. 5. Apply built-in statistical functions, regression analysis, and distribution functions fluently.	
8	**Course Outcomes :** **CO 1.** Confidently navigate Studio, R GUI, and manage data in R. **CO 2.** Fluent implementation of expressions, assignments, and loops in R. **CO 3.** Use R data structures for effective data management. **CO 4.** Efficiently manipulate and operate on character strings in R. **CO 5.** Apply statistical functions, regression analysis & distribution functions with confidence.	
9	**Modules:-** **Module 1 (15 hours):**	
	Practical No 1: Setting Up R Environment • Installing R and RStudio • Installing R Commander **Practical No 2: Customizing RStudio and Data Management** • Customizing RStudio Layout • Loading and Managing Data **Practical No 3: Implementing Expressions and Control Structures** • Basic Expressions and Assignment • Decision Making and Loops	

	Practical No 4: Essential Data Structures in R • Working with Vectors and Matrices • Working with Arrays, Lists, and Data Frames **Practical No 5: Implementing Strings in R** • Working with Character Strings • Basic String Manipulations **Mini Project/Mini Assignment:** Analyze and visualize academic performance of the student.
	Module 2 (15 hours):
	Practical No 6: Built-in Statistical Functions in R • Calculating Mean, Median, and Standard Deviation • Other Built-in Statistical Functions **Practical No 7: Regression Analysis** • Performing Linear Regression • Performing Multiple Regression **Practical No 8: Working with Distributions** • Normal Distribution Functions • Binomial Distribution Functions **Practical No 9: Time Series Analysis and Data Visualization** • Time Series Analysis • Creating and Analyzing Contingency Tables **Practical No 10: Graphical Models and Data Visualization** • Creating Basic Plots • Creating Special Plots and Saving Graphics **Mini Project/Mini Assignment:** • Analyze movie ratings from a dataset like IMDb or Kaggle. **Preferred Software for practicals** : **RStudio**
10	**Text Books** 1. Statistical Programming in R, K.G. Srinivasa G.M. Siddesh,Chetan Shetty , Oxford University Press, 2017 Learning R: A Language for Data Analytics and Visualization, Sybgen Learning, R. K. Maurya, 2021

<table>
<tr><td>11</td><td colspan="2">Reference Books
1. Programming in Python 3, Mark Summerfield, Pearson Education, 2nd edition (2018)
2. Learning Python, Mark Lutz, O'Reilly–Shroff, 5th edition (2013)
3. Automate the Boring Stuff with Python, Al Sweigart, No Starch Press, 1st edition (2015)
Python Cookbook, David Beazley and Brian K. Jones, O'Reilly Media, 3rd edition (2013)</td></tr>
<tr><td>12</td><td>Internal Continuous Assessment: 40%</td><td>Semester End Examination: 60%</td></tr>
<tr><td>13</td><td>Continuous Evaluation through:
Practical journal submission, viva, assignments
● Journal Submission : 10 Marks
● Assignments: 10 Marks
Total: 20 marks</td><td>A semester end practical examination of 2 hours duration for 30 marks as the paper pattern given below.

Its compulsory to carry certified journal at the time of practical exam</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper: (Semester End Practical Examination: 30 Marks. Duration:2 hours)
<table>
<tr><td>Question</td><td>Module</td><td>Marks</td></tr>
<tr><td>Q1</td><td>Module 1</td><td>10</td></tr>
<tr><td>Q2</td><td>Module 1</td><td>10</td></tr>
<tr><td>Q3</td><td>Viva</td><td>10</td></tr>
</table></td></tr>
</table>

Name of the Course: Statistical Methods – NUDS208

Sr. No.	Heading	Particulars
1	**Description the course:**	**1. Introduction:** This course introduces concepts of probability, statistical distributions, hypothesis testing, ANOVA, and non-parametric tests. It forms the base for data-driven decision-making. **2. Relevance and Usefulness:** Essential for analyzing uncertainty, interpreting data, and applying statistical methods in real-world problems across domains. **3. Applications:** Used in clinical trials, quality control, A/B testing, market research, and risk analysis. **4. Connections with Other Courses:** Links with Data Science, Machine Learning, Programming (Python/R), Economics, and Operations Research. **5. Demand in Industry:** Valued in IT, healthcare, finance, government, and consulting for roles requiring data analysis and statistical insight. **6. Job Prospects:** Relevant for roles such as Data Analyst, Statistician, Business Analyst, Risk Analyst, and Research Associate.
2	**Vertical:**	VEC
3	**Type:**	Theory
4	**Credits:**	2 credits (1 credit = 15 Hours for Theory)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives:**	**1.** To introduce the fundamental concepts of discrete and continuous random variables along with their probability distributions. **2.** To develop the ability to compute and interpret mathematical expectation, variance, and standard deviation. **3.** To explore standard probability distributions such as Binomial and Normal and apply them to real-world problems. **4.** To impart knowledge of hypothesis testing techniques, confidence intervals, and analysis of variance (ANOVA). **5.** To familiarize students with non-parametric statistical tests and their applications in scenarios with minimal assumptions.
8	**Course Outcomes :**	**C**O 1: Identify and differentiate between discrete and continuous random variables, and apply probability functions appropriately. **CO 2:** Calculate expectation, variance, and standard deviation of random variables and interpret their significance. **CO 3:** Apply binomial and normal distributions to solve real-life problems involving uncertainty and risk. **CO 4:** Perform hypothesis testing using t, normal, and F distributions, and construct

	confidence intervals for decision-making. **CO 5:** Analyze data using ANOVA and non-parametric tests like the Chi-square, Wilcoxon, and Kruskal-Wallis tests.	
9	**Modules:-** **Module 1 (15 hours):**	
	Random Variables: Concept and definition of discrete and continuous random variables, Probability Mass Function (PMF), Probability Density Function (PDF), Cumulative Distribution Function (CDF), Properties of the CDF **Mathematical Expectation and Variance**: Expectation of a function, Variance and Standard Deviation of a random variable, Properties of Expectation and Variance **Standard Probability Distributions:** Introduction and properties of: Binomial Distribution, Normal Distribution, Examples and applications of these distributions	
	Module 2: (15 Hrs)	
	Hypothesis Testing: One-sided and Two-sided hypothesis, Critical region and p-value, Tests based on: t-distribution, Normal distribution, F-distribution, Confidence Intervals **Analysis of Variance (ANOVA)**: One-way ANOVA, Two-way ANOVA **Non-Parametric Tests:** Importance and need for non-parametric methods, Sign Test, Wilcoxon Signed-Rank Test, Run Test, Kruskal-Wallis Test, Chi-Square Test	
10	**Text Books** 1. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi 2. Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.	
11	**Reference Books** 1. Mood, A. M. and Graybill, F. A. and Boes D.C. (1974). Introduction to the Theory of Statistics,Ed. 3, McGraw Hill Book Company. 2. Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, New York. 3. Hogg, R.V. and Craig R.G. (1989). Introduction to Mathematical Statistics, Ed. MacMillan Publishing Co., New York. 4. Walpole R. E., Myers R. H. and Myers S. L. (1985), Probability and Statistics for Engineers and Scientists 5. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.	
12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**

<table>
<tr><td>13</td><td>Continuous Evaluation through:
Class test of 15 marks

Quizzes/ Presentations/
Assignments: 5 marks

Total: 20 marks</td><td>Format of Question Paper: External Examination (30 Marks)– 1 hr duration</td></tr>
<tr><td>14</td><td colspan="2">Format of Question Paper: (Semester End Examination: 30 Marks. Duration:1 hour)

<table>
<tr><th>Questions</th><th>Based On</th><th>Options</th><th>Marks</th></tr>
<tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr>
<tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr>
<tr><td>Q.3</td><td>Module 1 & 2</td><td>Any 2 out of 4</td><td>10</td></tr>
</table>
</td></tr>
</table>

Letter Grades and Grade Points:

Semester GPA/ Program CGPA Semester/ Program	% of Marks	Alpha-Sign / Letter Grade Result		Grade Points
9.00-10.00	90.0-100	O	(Outstanding)	10
8.00-<9.00	80.0-<90.0	A+	(Excellent)	9
7.00-<8.00	70.0-<80.0	A	(Very Good)	8
6.00-<7.00	60.0-<70.0	B+	(Good)	7
5.50-<6.00	55.0-<60.0	B	(Above Average)	6
5.00-<5.50	50.0-<55.0	C	(Average)	5
4.00-<5.00	40.0-<50.0	P	(Pass)	4
Below 4.00	Below 40	F	(Fail)	0
Ab (Absent)	-	AB	(Absent)	0

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Vertical – V

Ability Enhancement Courses (AEC)

Semester II

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Communication Skills in English II – NUEN201

Sr. No.	Heading	Particulars
1	**Description of the course :**	This course develops essential communication skills for professional and digital environments. It covers vocabulary, business writing, effective communication techniques, public speaking, and presentation skills. Learners also gain digital communication abilities, including virtual meeting etiquette, content creation for blogs and social media, SEO writing, and cross-cultural awareness for global interactions.
2	**Vertical :**	**V**
3	**Type :**	**Theory**
4	**Credit**:	**2 credits**
5	**Hours Allotted :**	**30 Hours**
6	**Marks Allotted**:	**50 Marks**
7	**Course Objectives**: 1. To equip the learners with confidence and proficiency in spoken and written English in and professional and social context 2. To enhance confidence in public speaking, interpersonal exchanges and professional interactions 3. To enable the learners to adapt to diverse audiences, cultural frameworks and workplace setups 4. To equip them with deftness in use of different digital platforms to communicate efficiently in every situation	
8	**Course Outcomes:** **After completion of the course, learners would be able to:** CO1. Acquire proficiency in English for media-specific platforms and forums CO2. Speak and write effectively for diverse media platforms CO3. Enhance critical abilities to present effective social media content CO4. Understand the roles and functions of English in global media framework CO5. To attain proficiency in understanding media trends at a global level	
9	**Modules**:-	
	Module 1: **1.1 Professional English Language Development** • Vocabulary Building • Punctuation and Style • Close Reading of Content for Different Genre • Phrasal Verbs and Idioms • Business English for Letters, Emails, Reports • Paraphrasing **1.2 : Essentials for Effective Communication** • The Seven C's of Effective Communication • The 4 C's of 21st Century Skills • 'You' Attitude and Professional Etiquette • Conflict Management **1.3 Public Speaking and Presentation Skills** • Organizing a speech • Presentation skills with visual aids like PowerPoint	

<table>
<tr><td></td><td>

Overcoming stage fright
Use of visual aids and storytelling

</td></tr>
<tr><td></td><td>
Module 2 :
1.1 : Digital Communication Skills

Communicating in online platforms
Managing digital identity
Virtual meetings etiquette (Zoom, Teams)
Understanding Video scripts and Podcast Scripts
Social Media Marketing

1.2 : Digital Writing and Content Creation

Writing Blogs, Articles, and Online Features
SEO Writing and Keyword Optimization
Writing for Social Media
Writing Captions, White Paperand Headlines

1.3 Cross-cultural Communication

Cultural Quotient and Cultural Intelligence
Cultural differences in communication styles
Global communication etiquette
Dining Etiquette in Professional and Social Setup

</td></tr>
<tr><td>10</td><td>
References:

Effective Communication Skills” – by M.S. Rao
Mass Communication in India (4th Edition): Keval J. Kumar
Taylor, Grant. English Conversation Practice. 1967. Tata McGraw-Hill, 2013
Labade, Sachin, Katre Deepaetal. Communication Skills in English. Orient Black swan, Pvt Ltd, 2021
Sethi, J. Standard English and Indian usage: Vocabulary and grammar. PHI Learning Pvt. Ltd., 2011
The Secret of Viral Content Creation- Priyanka Agarwal
Mohan, R C Sharma Krishna. Business Correspondence and Report Writing. Third edition. Tata McGraw-Hill Education, 2002
Writing Skills For Technical Purposes: Raj Mohan Josh
Cross-Cultural Communication: Concepts, Cases and Challenges: Francisca O. Norales
Fundamentals of Writing: How to Write Articles, Media Releases, Case Studies, Blog Posts and Social Media Content: Paul Lima
Excuse Me: The Survival Guide to Modern Business Etiquette: Rosanne Thomas
Business Etiquette: A Guide For The Indian Professional: Shital Kakkar Mehra

</td></tr>
<tr><td>11</td><td>
Internal Evaluation: 20 Marks
10 marks Assignment,
05 marks Viva,
05 marks Class Participation and Attendance
</td></tr>
<tr><td>12</td><td>
External Evaluation : 30 Marks
Semester End Examination
<u>Question Paper Pattern</u>
<table>
<tr><th>Question No.</th><th>Questions</th><th>Marks</th></tr>
<tr><td>Q 1</td><td>Writing Skills/ Comprehension</td><td>15 marks</td></tr>
<tr><td>Q 2</td><td>Practical/ Theory</td><td>15 marks</td></tr>
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Syllabus

Vertical - V

Ability Enhancement Courses (AEC)

Semester II

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on ***5th July 2025***

Name of the Course: Environmental Systems and Management-II – NUES201

Sr. No.	Heading	Particulars
1	**Description of the course :**	This course introduces students to the vital link between the environment and the world of commerce. It offers an essential understanding of how ecological systems interact with economic activities, preparing future professionals to make informed, responsible decisions in business and society. **What They Will Learn**: • Ecosystems and Biodiversity: Understand the balance of natural systems and the economic value of biodiversity in sectors like agriculture, tourism, and healthcare. • Human Impact on the Environment: Analyze how industries, trade, and consumer behavior contribute to environmental challenges such as resource depletion, pollution, and climate change. • Sustainability and Commerce: Explore sustainable business practices and how commerce can play a role in achieving long- term environmental and economic goals. **Why It Matters for First Year Undergraduate Students:** In any specialization, environmental awareness is essential in today's global business environment. This course empowers students to: • Become socially responsible citizens: Make ethical decisions that consider environmental impact and sustainability. • Understand environmental challenges in business contexts: Gain insight into how issues like climate change, waste management, and pollution affect business operations, supply chains, and policy. • Explore emerging green career paths: Discover opportunities in environmental consulting, sustainable business strategy, and green entrepreneurship.
2	**Vertical :**	**VEC**
3	**Type :**	**Theory**
4	**Credit**:	**2 credits**
5	**Hours Allotted :**	**30 Hours**
6	**Marks Allotted**:	**50 Marks**
7	**Course Objectives**: • To provide knowledge on types of disasters and their impact on human life and the economy. • To equip students with the principles of disaster management and waste management strategies. • To promote understanding of sustainable development models and eco-friendly innovations. • To introduce key environmental movements, ethics, and legal frameworks relevant to environmental conservation.	

8	**Course Outcomes:** After studying this course students will be in position to : • To describe different types of disasters and outline the phases of disaster management. • To apply concepts of waste reduction, reuse, and recycling in real-life scenarios. • To evaluate sustainable development initiatives and propose eco-friendly business strategies. • To critically assess environmental movements, laws, and policies, and their role in conservation and management.
9	**Modules**:-
	Unit I: Dealing with Environmental Concerns • Concept and Classification of Disaster (Natural, Man-made and Hybrid Disaster). General effects of Disaster on Human Life- Physical, Psychological, Economic and Social • Disaster Management: Meaning and Phases of Disaster Management (Prevention, Mitigation, Preparedness, Response, and Recovery) • Waste Management: Meaning and Types of Waste (biodegradable, non-biodegradable, hazardous, e-waste, etc). • Waste Management- Reduce, Reuse, and Recycle Strategies in Daily Life
	Unit II: Sustainable Development and Environmental Conservation • Introduction to Sustainable Development: Meaning and Importance. Sustainable Development Goals (SDGs). Case Studies • Environmental Movements and Ethics: Chipko, Silent Valley, Bishnoi of Rajasthan. Role of Religion and Culture in Environmental Conservation. • Innovative Models: Eco Tourism, Green Marketing, Organic Farming, and Eco-Friendly Packaging • • Environmental Legislation and Policies: Major environmental laws and policies at national and international levels, and their effectiveness in environmental conservation
10	**References:** • 1. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and Resources Institute (TERI). • 2. Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards/ • 3. Masters, G. M., & Ela, W. P. (2008). Introduction to environmental engineering and science (No. 60457). Englewood Cliffs, NJ: Prentice Hall. • 4. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press. • 5. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge. • 6. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press. • 7. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press. • 8. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5 • 9. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp content/uploads/2020/02/convention-V-16-CURVE-web.pdf • 10. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp content/uploads/2020/02/convention-V-16-CURVE-web.pdf 11. India Code – Digital repository of all Central and State Acts: https://www.indiacode.nic.in/ 12. University Grants Commission, D.O.No.F. 14-5/2015(CPP-II) dated 2nd August1 2019.

11	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**
12	Project Work 15 Marks Attendance and Participation in Seminar, Workshop, and Activity, etc. 05 Marks	Report Submission based on Suggested Practical Activities by Faculty Members for 30 Marks.
13	Suggested Practical Activities: • A field visit to observe and identify different environmental components (e.g., land, water bodies, air, flora, fauna) in a local park or urban green space. • Develop a mini-awareness campaign (e.g., posters, short video, etc.) on a chosen environmental issue for their college or local community. • Report on an endangered species in India and the conservation efforts being undertaken. • Hands-on experiment involving simple water quality testing (e.g., pH, turbidity) of different water samples (e.g., tap water, pond water). • A debate or discussion on the role of individual actions vs. governmental policies in combating climate change. • Beach Cleaning Activity • Tree Plantation (One Student – One Plant) • Environment Conservation Activity	

Course Outcomes (CO)	PO 1	PO 2	PO 3	PO 4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1: Acquire proficiency in English for media-specific platforms and forums	2	3	0	2	2	2	2	2	1	2
CO2: Speak and write effectively for diverse media platforms	2	3	0	2	2	2	3	2	2	2
CO3: Enhance critical abilities to present effective social media content	2	2	0	3	3	3	3	3	3	3
CO4: Understand the roles and functions of English in global media framework	3	2	0	3	2	2	2	0	2	3
CO5: To attain proficiency in understanding media trends at a global level	3	2	0	3	3	2	3	0	3	3

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Co-Curricular Courses

Vertical – V

Semester II

(To be implemented from the Academic Year 2025-2026)

Approved in the Academic Council Meeting held on **5th July 202**

Name of the Course: Fitness and Sports II – NUCC203

Sr. No.	Heading	Particulars
1	**Description the course :**	India is growing rapidly as a global super-power. To face the challenges of the century and to keep up with the pace of the world, maintaining health is of prime importance. Giving thrust to healthy society, Physical Education, Sports, Health & fitness and Yoga are of great significance in today's world. The Government of India insists on Physical Fitness, Mental Health and Overall Development of Personality for every citizen. However, creating efficient and skilled human resource in the field of Physical Education, Sports and Yoga is identified as the need of the hour. Thus, the Governments of India and Government of Maharashtra have included Physical Education, Sports and Yoga as a key area under the NEP 2020.
2	**Vertical :**	Co-Curricular
3	**Type :**	Activity Based
4	**Credit**:	2 credits
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives**: The student should be able to: • **To develop foundational knowledge of physical fitness techniques** including strength, cardiovascular, and flexibility training, along with understanding basic nutrition for sports performance. • **To enhance students' mental preparedness and focus** by introducing key concepts of sports psychology such as goal setting, motivation, confidence, and stress management. • **To promote a holistic approach to health and performance**, integrating physical	
8	**Course Outcomes**: • **Apply appropriate physical training methods** including strength, cardiovascular, and flexibility routines to enhance overall fitness and performance. • **Demonstrate understanding of basic sports nutrition** and its role in supporting physical activity and athletic goals. • **Utilize principles of sports psychology** such as goal setting, stress management, and motivation to improve mental focus and performance in sports.	

9	**Module :** This module covers key aspects of physical training, including strength training through bodyweight and resistance methods, and cardiovascular workouts like HIIT and circuit training. It introduces flexibility and mobility routines essential for injury prevention and performance. Basic nutrition for fitness and sports is also discussed. The module then explores sports psychology, focusing on mental preparation and goal setting. It addresses techniques to manage performance anxiety and stress. Finally, it highlights the role of concentration, confidence, and motivation in achieving success in sports.
10	**Reference Books:** 1. Singh, Hardayal. (1991). Science of Sports Training. New Delhi: DVS Publications. 2. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication. 3. Iyengar, B.K.S. (2001). Light on Yoga. London: Thorsons. 4. Tiwari, O.P. (1996). Asana: Why and How? Lonavla: Kaivalyadhama Yoga Institute. 5. Nagendra, H. R. & Nagarathna, R. (2002). Samagra Yoga Chikitse. Bengaluru: Swami
11	**Internal Continuous Assessment: 40% (20 Marks)** • Assignment/Report Writing
12	**External Assessment: 60% : (30 Marks)** • Submission of **minimum 3 certificates** from approved fitness/sports activities (yoga, aerobics, team sports, etc.). • Attendance and involvement in fitness sessions, group games, or workshops. *Note: Students participating in sports competitions conducted by University at State or National Level, students who have represented Mumbai University or College at Intercollegiate / Inter Zonal / West Zone Inter University / All India Inter University/ International tournament are exempt from submission of report.*