



**Maharashtra Education Society's
Abasaheb Garware College
(Autonomous)**

(Affiliated to Savitribai Phule Pune University)

**Three Year B.Sc. Degree Program in Data Science
(Faculty of Science and Technology)**

F.Y.B.Sc. Data Science

**Choice Based Credit System Syllabus
To be implemented from Academic Year 2025-2028
(As per NEP 2020)**

Structure of the major for Course: B.Sc. Data Science

Year	Semester	Course Type	Course Code	Course Title	Remark	Credit	No.of Hours
I	I	Major	DS-111-TH	Principles of Programming Languages		2	30
			DS-112-PR	Python Programming - Practical		2	60
		Minor	CYS-113-T H	Introduction to Cybersecurity		2	30
			CYS-114-P R	Cybersecurity tools and Techniques		2	60
			STD-111-T H	Probability and Descriptive Statistics		2	30
			STD-112-P R	Probability and Descriptive Statistics – Practical in Excel/Python		2	60
		SEC	SEC-101-D S	Introduction to Data Science and Analytics		2	30
		GE/OE		General Elective/ Open Elective		2	30
		IKS		Indian Knowledge System		2	30
		AEC		Fundamentals of Business Communication (english)		2	30
II	II	Major	DS-161-TH	Linear Algebra and Basics of Calculus		2	30
			DS-162-PR	Data Analysis with R Programming		2	30
		Minor	CYS-163-T H	Ethical Hacking and Penetration Testing		2	30
II	II	Minor	CYS-164-P R	Ethical Hacking - Practicals		2	60
			STD-161-T H	Inferential Statistics using Python		2	30
			STD-162-P R	Inferential Statistics using Python - Practical		2	60
		SEC	SEC-151-D S	Fundamentals of Analytics using EXCEL		2	30

		GE/OE		General Elective/ Open Elective		2	30
		AEC		Personal Branding and Networking		2	30
		VEC		Generative AI and Prompt Engineering		2	30
		CC		Mental Well Being/ISR/NSS/NCC		2	30
III	III	Major		Data Mining and Warehousing		2	30
				Database Management Systems		2	30
				Database Management Systems – Practical in SQL		2	60
		Minor		Time Series and Predictive Analytics		2	30
				Time Series and Predictive Analytics – Practical in R/Python		2	60
		VSC		Web and Social Media Analytics - Practical		2	60
		FP/OJT /CEP		Field Project / On Job Training		2	30
		GE/OE		General Elective/ Open Elective		2	30
		IKS		Indian Knowledge System		2	30
		AEC		Critical Thinking and Soft Skills		2	30
		CC		Yoga Practices/ISR/NSS/NCC		2	30
IV	IV	Major		Advanced SQL - Practical		2	60
				Machine Learning		2	30
				Machine Learning – Practical		2	60
		Minor		Design of Experiments		2	30
				Non Parametric Tests		2	30
		VSC		Big Data Architecture and Ecosystem - HADOOP		2	30
		FP/OJT /CEP		Field Project / On Job Training		2	30
		AEC		Career Development: Interview Preparation		2	30

		SEC		Design Thinking and Entrepreneurial Mindset		2	30
		GE/OE		General Elective/ Open Elective		2	30
		CC		Cultural Studies/ISR/NSS/NCC		2	30
V	V	Major		Advanced ML		2	30
				Natural Language Processing		2	30
				Natural Language Processing - Practical		2	60
				Data Visualisation using PowerBI		2	30
				Cloud Computing		2	30
				Cloud Computing – Practical in AWS/AZURE		2	60
				Block Chain Technology		2	30
				Internet of Things		2	30
V	V	Minor		Multivariate Analysis		2	30
		VSC		Next Generation Databases - MongoDB		2	30
		FP/CEP		Field Project / Community Engagement Project		2	30
VI	VI	Major		Artificial Intelligence		2	30
				Introduction to Deep Neural Networks		2	30
				Introduction to Deep Neural Networks - Practical		2	60
				Data Governance and Ethics in Technology		2	30
				Full Stack Web Development		2	30
				Full Stack Web Development - Practical		2	60
				Financial Analytics/ Marketing Analytics		2	30
				Health Analytics/ Public Policy Analytics		2	30
		VSC		Advanced Analytics using EXCEL		2	30
		OJT		Internship		4	60

Principles of Programming Languages

Lectures: 40 (Credit 2)

Course Objective:

The course offers a comprehensive overview of the theory and practice of various programming languages. It covers syntax, semantics, and paradigms, equipping students with the skills to evaluate and use different languages effectively. Students will gain insights into language design, implementation, and the trade-offs involved in selecting languages for specific tasks.

Learning Outcomes: On completion of this course, students will be able to:

1. Develop a deep understanding of the core concepts of programming languages, including syntax, semantics, and various programming paradigms.
2. Evaluate and compare different programming languages based on their features, strengths, and weaknesses.
3. Apply knowledge of programming language principles to solve complex computational problems efficiently.

Unit 1: Preliminary Concepts and Language Design

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- 1.1 Reasons for Studying Concepts of Programming Languages
- 1.2 Programming Domains
- 1.3 Language Evaluation Criteria
- 1.4 Influences on Language Design
- 1.5 Language Categories
- 1.6 Imperative Programming
- 1.7 Functional Programming Languages
- 1.8 Compilation, Interpretation
- 1.9 Overview of Different Programming Environments

Unit 2: Syntax, Semantics, and Data Types

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- 2.1 General Problems of Describing Syntax and Semantics
- 2.2 Backus-Naur Form (BNF)& Extended Backus-Naur Form (EBNF) for Common Programming Language Features
- 2.3 Ambiguous Grammar
- 2.4 Introduction to Primitive Data Types, User- Defined Data Types and Array Types, Record, Union, Pointer, and Reference Types, Names, Variables, and the Concept of Binding
- 2.5 Type Checking and Type Compatibility
- 2.6 Strong Typing, Named Constants, and Variable Initialization

Unit 3: Expressions, Statements, Control Structures, and Subprograms

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- 3.1 Arithmetic, Relational, and Boolean Expressions
- 3.2 Short-Circuit Evaluation
- 3.3 Assignment Statements and Mixed-Mode Assignment
- 3.4 Referential Transparency and Functional Programming
- 3.5 Statement Level Control Structures
- 3.6 Compound Statements, Selection Statements, Iterative Statements

- 3.7 Unconditional Branching, Guarded Commands
- 3.8 Subprograms and Blocks

Unit 4: Abstract Data Types, Exception Handling, and Advanced Programming Paradigms

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- 4.1 Abstraction and Encapsulation, Introduction to Data Abstraction and Design Issues
- 4.2 Language Examples
- 4.3 Parameterized Abstract Data Types in C++
- 4.4 Object-Oriented Programming
- 4.5 Exception Handling
- 4.6 Logic Programming
- 4.7 Functional Programming
- 4.8 Languages and Scripting Languages

Python Programming – Practical

(Credit 2)

1. Exploring Programming Paradigms and Language Design
Imperative Programming Exercise
Functional Programming Exercise Analysis and Comparison.
2. Understanding Language Evaluation Criteria and Influences on Language Design
Language Evaluation
Language Design Influences
Practical Implementation
3. Compilation and Interpretation in Different Programming Environments
Compilation Process
Interpretation Process Programming Environments
4. Describing Syntax and Semantics with BNF and EBNF
Describing Syntax with BNF
Describing Syntax with EBNF Ambiguous Grammar
5. Exploring Primitive and User-Defined Data Types
Primitive Data Types
User-Defined Data Types
Array Types and Structures
6. Variables, Binding, and Type Checking
Variable Binding and Initialization
Type Checking and Compatibility
Strong Typing and Named Constants & Pointer and Reference Types
7. Expressions and Control Structures
Arithmetic, Relational, and Boolean Expressions
Short-Circuit Evaluation
Assignment Statements and Mixed-Mode Assignment
8. Control Structures and Statements Selection
Iterative Statements
Compound Statements and Unconditional Branching
9. Subprograms and Blocks
Defining and Using Functions
Referential Transparency and Functional Programming
Subprograms and Blocks

10. Abstract Data Types and Object-Oriented Programming Abstraction and Encapsulation
Parameterized Abstract Data Types
Object-Oriented Programming
11. Exception Handling and Logic Programming
Exception Handling
Logic Programming
Functional Programming
12. Advanced Programming Paradigms and Scripting Languages
Introduction to Data Abstraction and Design Issues
Scripting Languages
Advanced Exception Handling

Probability and Descriptive Statistics

Lecture:40 (Credits: 2)

Course Objective:

This course focuses on introducing this subject to make students familiar with the concepts of central tendency like mean, median, mode, dispersion like variance, standard deviation and skew-ness and its application in real life world.

Learning Outcomes: On completion of this course, students will be able to:

1. Use the characteristics of central tendencies in day- to-day life problems.
2. Use the basic statistical concepts.
3. Identify statistical patterns in daily life practices.

Unit 1:

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- 1.1 Statistical Methods: Introduction to statistical Method and Collection, Classification, and tabulation of data.
- 1.2 Data Collection, Primary and Secondary Data, Pilot Survey & Questionnaires Summarize data using tabular and graphical methods, One way and Two-way frequency Distribution
- 1.3 Measure of Central Tendency: Describing and calculating measures of central tendency (Individual, Discrete & Continuous Series of Data), Weighted Mean Describing and calculating measures of dispersion and moment
- 1.4 Probability: Understanding elementary Probability Rules, Basic Terms of Probability, Definition of Probability of an event,
- 1.5 Empirical Definition & Limitation of Probability of an event - Definition & example on Permutation, Combination, conditional probability and independence
- 1.6 Theorem on Probability: -Additional, Multiplication, Bayes theorem along with Applications

Unit 2:

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- 2.1 Random Variable: Definition of Random Variable: - discrete and continuous variables. Learning how to find and use probability and distribution functions to find expectation, variance and higher order moments of univariate random variables.
- 2.2 Univariate: Univariate- Mathematical Expectation of Discrete and Continuous random Variable & its properties
- 2.3 Bivariate: Bivariate, Marginal & Conditional Probability Distribution, Mathematical Expectation of Discrete and Continuous Two random Variable& its properties.
- 2.4 Theorem on Expectation: - Additive & Multiplicative

Unit 3:

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- 3.1 Discrete distribution: Studying Discrete distributions & standard discrete distributions, using them to find probabilities, basic calculations to find moments, median and mode of these distributions and understanding their applications.
- 3.2 Continuous distributions: Studying continuous distributions & standard continuous distributions, using them to find probabilities, basic calculations to find moments, median and mode of these distributions and understanding their applications.

Unit 4:**10**

- 4.1 Linear regression: Linear regression, Data Types, Independent and Dependent variables, Pearson Correlation,
- 4.2 Types of Linear Regression, Metrics to evaluate the Linear Regression, Assumption of Linear Regression, Differentiate between Outlier and Influential,
- 4.3 Ordinary least squares [OLS], Maximum likelihood estimation (MLE)
- 4.4 Correlation: Correlation, Correlation Coefficient Formula: Definition, Pearson Correlation, Covariance, Spearman's Correlation, Monotonic Function, Spearman's rank correlation.

Reading List (Books)

- 1. Edexcel AS and A Level Modular Mathematics – Core Mathematics 1, 2, 3 & 4
- 2. Carla Morris and Robert Stark. Fundamentals of Calculus
- 3. S.K. Chung. Understanding basic Calculus.

Probability and Descriptive Statistics – Practical in Excel/Python

(Credit 2)

1. Data Collection and Summarization
 - Data Collection Methods
 - Summarizing Data
 - Measures of Central Tendency and Dispersion
2. Introduction to Probability
 - Basic Terms and Definitions
 - Permutation and Combination
 - Conditional Probability and Independence
3. Theorems and Applications in Probability
 - Theorems in Probability
 - Probability Applications
 - Hands-on Probability Simulation
4. Understanding Random Variables and Probability Distributions
 - Introduction to Random Variables
 - Probability and Distribution Functions
 - Expectation, Variance, and Higher Order Moments
5. Univariate and Bivariate Probability Distributions
 - Mathematical Expectation of Univariate Random Variables
 - Bivariate Probability Distributions
 - Theorems on Expectation
6. Practical Applications of Probability Distributions
 - Real-life Applications of Probability Distributions
 - Simulation of Random Variables
 - Advanced Probability Problems
7. Discrete Distributions
 - Introduction to Discrete Distributions
 - Calculating Probabilities and Moments
 - Applications of Discrete Distributions
8. Continuous Distributions
 - Overview of Continuous Distributions
 - Calculating Probabilities and Moments
 - Applications of Continuous Distributions
9. Advanced Applications and Comparisons
 - Comparative Analysis of Distributions
 - Advanced Calculations and Interpretations
 - Practical Modeling and Forecasting

10. Linear Regression Analysis
 - Introduction to Linear Regression
 - Metrics for Evaluating Linear Regression
 - Assumptions and Diagnostics in Linear Regression
11. Correlation Analysis
 - Types of Correlation Coefficients
 - Interpreting Correlation Results
 - Correlation vs. Causation
12. Advanced Topics in Linear Regression
 - Outlier and Influential Points Parameter
 - Estimation Techniques
 - Practical Application and Model Interpretation

Introduction to Cybersecurity

Lecture 50: (Credits- 2)

Course Objective:

The course provides a foundational understanding of the key concepts and principles of cybersecurity. It covers the nature of cyber threats, vulnerabilities, and risk management strategies to protect information systems. Students will learn about various security protocols, legal and ethical issues, and the tools and techniques used to defend against cyber attacks.

Learning Outcomes: On completion of this course, students will be able to:

1. Gain a thorough understanding of cybersecurity concepts, including threats, vulnerabilities, and risk management.
2. Learn to identify and explain various security protocols and their applications in safeguarding information systems.
3. Acquire practical skills in using cybersecurity tools and techniques to detect, prevent, and respond to cyber threats.

Unit 1: Foundations of Cybersecurity

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- 1.1 Introduction to Cybersecurity: Scope, objectives, and importance; Basics of Computers, Electronic Devices, and Operating Systems.
- 1.2 Understanding Cyber Safety and the CIA Triad (Confidentiality, Integrity, Availability).
- 1.3 Fundamentals of Digital Hygiene and Types of Cyber Threats.; Architecture of Cyberspace and Internet Infrastructure.
- 1.4 Communication and Web Technology: Evolution and current standards.; Governance of Internet Data Transfer and Internet Society.;
- 1.5 Regulation of Cyberspace: Overview of Cyber Security Mechanisms. Importance, Modes, and Need of Cryptography in Cybersecurity.; Encryption, Firewalls, Passwords, Privacy, and Digital Signatures
- 1.6 Issues and Challenges IPv4 vs IPv6: Transition and implications.;
- 1.7 Internet of Things (IoT), Machine Learning (ML), Artificial Intelligence (AI), and Blockchain Technology.
- 1.8 Cloud Computing, Web 3.0, and Dark Web, Security implications and considerations.

Unit 2: Electronic Governance and Cyber Laws

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- 2.1 Distinction between E-Government, Internet Governance, and E-Governance.;
- 2.2 Net Neutrality: Definition, necessity, and implications.; Ethical considerations in the digital realm and responsible digital citizenship.
- 2.3 Importance of Data Integrity, Privacy, Security, and Intellectual Property Rights.; Online inclusivity, diversity, digital etiquette, and consequences of unethical practices.;
- 2.4 Overview of the Information Technology Act 2000 (India).; Legal terms, investigative framework, and the role of Cert-In in Cyber- crime incidence.;
- 2.5 Legal recognition of Electronic Records, Electronic Signatures, and liabilities of IT Intermediaries.

Unit 3: Cyber Crimes and Digital Forensics

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- 3.1 Definition and Types of Cyber Crimes: Hacking, Malware, Phishing, Cyber Terrorism, etc.
- 3.2 Cyber Stalking, Cyber Bullying, Cyber Pornography, Data Privacy Violations, Cyber Laundering.

- 3.3 Online betting, games, and the role of Cyber Crime Cells in Cyber Investigations.
- 3.4 Introduction to Cyber Forensic Life Cycle and Digital Evidence Retrieval;
- 3.5 Analysis of electronic evidence and its significance in legal proceedings, Data storage mechanisms, data dumps, and validating collected evidence

Unit 4: Social Media and Cyber Security

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- 4.1 Architecture and types of Social Media Platforms.; Trends, challenges, and ethical collaboration on Social Media.
- 4.2 Managing Social Media Privacy Settings, Cyber Bullying, and effective communication.; Hashtags, viral content, social media marketing, and privacy concerns.; Rules, regulations, and privacy issues in social network platforms.;
- 4.3 Social Engineering Awareness and techniques to prevent cybercrimes.; Risks, legal issues, and challenges associated with third-party applications.;
- 4.4 Identity Theft, Romance Scams, Cyber Stalking, and best practices for social media usage.;
- 4.5 Introduction to OSINT Framework (Open-Source Intelligence tools) for information gathering.

Unit 5: E-Commerce and Cyber Security

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- 5.1 Concepts, models, and security implications of E- Commerce.; Digital Banking and Financial Services: Secure practices and authentication methods.;
- 5.2 Components of digital payments and preventive measures against frauds.;
- 5.3 Importance of SSL, HTTP, HTTPS, and password encryption in E-Commerce security, Overview of E- Commerce Rules under Consumer Protection Act 2019 (India).; Ensuring secure transactions and protecting consumer rights in digital payments.

Cybersecurity tools and Techniques – Practical

(Credit 2)

1. Cybersecurity Fundamentals Workshop
 - Understanding the CIA Triad
 - Exploring Cryptography
 - Firewalls and Network Security
 - Digital Signatures and Authentication
 - Introduction to IoT Security
 - Discussion on Cloud Computing and Security
2. Cybersecurity Trends and Emerging Technologies
 - IPv4 vs IPv6 Transition
 - Introduction to AI and ML in Cybersecurity
 - Blockchain Technology and Security
 - Exploring the Dark Web
 - Web 3.0 and Security Considerations
 - Discussion on Privacy and Regulatory Compliance
3. Understanding Cyber Laws and Regulations
 - Introduction to IT Act 2000
 - Role of Cert-In in Cyber-crime Incidence
 - Legal Aspects of Data Privacy and Security
4. Net Neutrality and Ethical Considerations
 - Net Neutrality
 - Ethical Digital Citizenship
 - Digital Etiquette and Inclusivity
5. E-Government and E-Governance
 - Distinction Between E-Government and E-Governance
 - Online Engagement and Participation
 - Legal Compliance in Electronic Governance
6. Understanding Types of Cyber Crimes
 - Introduction to Cyber Crimes
 - Exploring Social Media and Cyber Security
 - Legal Aspects of Cyber Crimes
7. Cyber Crime Investigation and Forensics
 - Introduction to Cyber Forensic Life Cycle
 - Digital Evidence Retrieval
 - Analysis and Validation of Digital Evidence

8. Data Storage Mechanisms and Validation Techniques
 - Data Storage Mechanisms
 - Data Dumps and Retrieval Techniques
 - Validation of Collected Evidence
9. Social Media Privacy and Security
 - Architecture and Types of Social Media Platforms
 - Managing Social Media Privacy Settings
 - Preventing Cyber Bullying and Social Engineering
10. Legal and Ethical Issues in Social Media
 - Privacy Issues and Regulations
 - Third-Party Applications and Risks
 - Identity Theft and Cyber Stalking
11. OSINT Framework and Information Gathering
 - Introduction to OSINT Tools
 - Social Media Monitoring and Analysis
 - Ethical Considerations in OSINT
12. Securing E-Commerce Transactions
 - Overview of E-Commerce Concepts and Models
 - Digital Banking and Financial Services
 - Secure Digital Payments
13. E-Commerce Security Standards and Practices
 - Importance of SSL, HTTP, HTTPS, and Password Encryption
 - Overview of Consumer Protection Laws
 - Ensuring Secure Transactions
14. Cyber Security in Digital Payments
 - E-Commerce Rules and Regulatory Compliance
 - Risk Assessment and Mitigation Strategies
 - Security Testing and Incident Response

Introduction to Data Science and Analytics

Lectures 40: (Credits- 2)

Course Objective:

Introduction to Data Science and Analytics gives students a solid knowledge of the ideas, tools, and applications of data science across several domains. The course covers core concepts such data collection, preparation, analysis, visualization, and interpretation. Through hands-on activities and real- world case studies, students will obtain practical expertise with data analytics tools and programming languages typically used in data science. This course is designed to help students who want to advance their education or pursue professions in data science, machine learning, or artificial intelligence.

Learning Outcomes: On completion of this course, students will be able to:

1. Upon completion of Introduction to Data Science and Analytics, students will:
2. Understand the fundamental principles and techniques of data science and analytics.
3. Acquire proficiency in data acquisition, pre- processing, analysis, and visualization.
4. Apply statistical methods and hypothesis testing techniques to analyse data and derive insights.
5. Gain exposure to machine learning algorithms and their applications in solving real-world problems.
6. Explore career opportunities in data science, machine learning, and artificial intelligence across various industries.

Unit 1:

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- 1.1 Introduction to Data Science
- 1.2 Overview of data science and its applications
- 1.3 Role of data scientists and data analysts
- 1.4 Introduction to data lifecycle and data-driven decision-making

Unit 2:

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- 2.1 Data Acquisition and Preprocessing Techniques for data collection and storage
- 2.2 Data cleaning, transformation, and normalization
- 2.3 Introduction to data wrangling tools (e.g., Pandas, SQL)

Unit 3:

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- 3.1 Exploratory Data Analysis (EDA)
- 3.2 Descriptive statistics and data visualization techniques
- 3.3 Exploratory analysis using statistical plots and charts Hands-on exercises with data visualization libraries (e.g., Matplotlib, Seaborn)

Unit 4:

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- 4.1 Statistical Analysis and Hypothesis
- 4.2 Testing Basic principles of probability and inferential statistics
- 4.3 Hypothesis testing techniques and significance testing
- 4.4 Practical examples of hypothesis testing in real-world scenarios

Reading List (Books)

1. "Python for Data Analysis" book by Wes McKinney
2. "Data Science for Business" book by Foster Provost and Tom Fawcett
3. "Introduction to Statistical Learning" book by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
4. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" book by Aurélien Géron
5. "Data Science from Scratch" book by Joel Grus.

Indian Knowledge System

Lectures 40: (Credits- 2)

Course Objectives:

This course provides an exploration of the rich Indian knowledge system, with a specific focus on Indian Mathematics and Vedic Maths. Through a historical lens, students will delve into the ancient Indian contributions to mathematics and the unique techniques employed in problem-solving. By studying the Indian knowledge system, students will gain a deeper appreciation for the cultural and intellectual heritage of India, and its relevance in modern-day applications.

Learning Outcomes: On completion of this course, students will be able to:

1. Understand the foundations and principles of Indian Mathematics
2. Analyze the distinctive arithmetic calculations and notation systems of ancient India
3. Appreciate the connections between Indian Mathematics and practical applications

Unit-I: Introduction to Indian Knowledge System:

10

- 1.1 Overview of Indian Knowledge System and its significance in history
- 1.2 Understanding the interconnections between Indian Mathematics and Vedic Maths
- 1.3 Brief introduction to the contributions of ancient Indian mathematicians; Ancient Indian Number Systems
- 1.4 Decimal place value system in ancient India; Understanding the concept of zero and its role in Indian Mathematics
- 1.5 Notation systems: Brahmi numerals, Gupta numerals, and more; Indian methods of arithmetic calculations.

Unit-II: Indian Mathematical Concepts and Techniques:

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- 2.1 Vedic Mathematics: Principles and techniques
- 2.2 Methods for mental calculations, including addition, subtraction, multiplication, and division
- 2.3 Squaring and square root techniques from ancient Indian texts
- 2.4 Algorithms for solving equations and finding unknowns; Concept of "Sulba Sutras" and geometric principles in ancient India
- 2.5 Geometrical constructions using traditional Indian methods; Measurement of geometric shapes and solids
- 2.6 Trigonometry in ancient Indian mathematics.

Unit-III: Algebraic Concepts in Indian Mathematics:

10

- 3.1 Understanding the Indian concept of "Bija Ganita" (seed-based algebra)
- 3.2 Solving quadratic equations using Indian methods
- 3.3 Algebraic symbolism in ancient Indian texts
- 3.4 Applications of Indian Mathematics in fields like astronomy, architecture, and trade
- 3.5 Use of Indian Mathematics concepts in modern problem-solving
- 3.6 Relevance of Indian Mathematical techniques in the digital age.

Unit-IV: Vedic Maths: Mind-Based Mathematics:**10**

- 4.1 Introduction to Vedic Maths and its origins
- 4.2 Understanding the connection between Vedic Maths and ancient Indian knowledge systems
- 4.3 Techniques for mental calculations and quick problem-solving using Vedic Maths
- 4.4 Practical Exercises and Problem Solving
- 4.5 Hands-on practice sessions for applying Indian Mathematical techniques
- 4.6 Problem-solving exercises using Indian Mathematics and Vedic Maths principles
- 4.7 Group activities and discussions to reinforce learning.

Fundamentals of Business Communication

Lectures 40: (Credits- 2)

Course Objectives:

This course aims to provide students with a solid foundation in essential communication skills, enabling them to communicate effectively, ethically, and confidently in various business contexts.

Learning Outcomes: On completion of this course, students will be able to:

1. Verbal and Written Proficiency: Demonstrate clear and concise verbal communication skills in presentations and articulate ideas effectively through professional writing.
2. Cultural Adaptability: Recognize and navigate cross-cultural communication differences, fostering better understanding and collaboration in diverse work environments.
3. Ethical Communication: Apply ethical communication practices, maintaining honesty, integrity, and respect while exchanging information and ideas in professional settings.

Unit-I: Introduction to Business Communication :

10

- 1.1 Understanding the Importance of Effective Business Communication
- 1.2 Types and Channels of Business Communication - Communication Models and Processes
- 1.3 Barriers to Effective Communication and How to Overcome Them
- 1.4 In-class Activities: Group Discussions, Case Studies, Verbal Communication Skills
- 1.5 Effective Speaking Skills: Clarity, Tone, and Confidence
- 1.6 Active Listening Techniques and Strategies
- 1.7 Developing Presentation Skills: Structure, Visual Aids, and Delivery
- 1.8 Role Plays and Mock Presentations.

Unit-II: Written Communication Skills

10

- 2.1 Principles of Effective Business Writing
- 2.2 Email Etiquette and Professional Correspondence
- 2.3 Writing Memos, Reports, and Proposals
- 2.4 Peer Review and Editing Exercises Nonverbal Communication
- 2.5 Importance of Body Language and Facial Expressions
- 2.6 Gestures, Postures, and Eye Contact
- 2.7 Personal Appearance and Dress Codes
- 2.8 Guest Speaker Session on Nonverbal Communication.

Unit-III: Cross-Cultural Communication

10

- 3.1 Understanding Cultural Differences in Communication
- 3.2 Adapting Communication Styles for Diverse Audiences
- 3.3 Avoiding Cultural Misunderstandings
- 3.4 Case Studies and Intercultural Communication Exercises Communication in Professional Settings
- 3.5 Effective Communication in Meetings and Group Discussions
- 3.6 Conflict Resolution and Negotiation Skills
- 3.7 Handling Difficult Conversations
- 3.8 Simulated Work Scenarios and Role-Playing
- 3.9 Communication Technologies

- 3.10 Utilizing Digital Tools for Business Communication (Video Conferencing, Instant Messaging, etc.)
- 3.11 Social Media Etiquette for Professionals
- 3.12 Virtual Communication Best Practices
- 3.13 Guest Speaker Session on Remote Communication.

Unit-IV: Cross-Cultural Communication

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- 4.1 Business Communication Ethics
- 4.2 Ethical Considerations in Business Communication
- 4.3 Handling Sensitive and Confidential Information
- 4.4 Avoiding Plagiarism and Maintaining Integrity
- 4.5 Case Studies and Ethical Dilemma Discussions
- 4.6 Developing Interpersonal Skills
- 4.7 Building and Nurturing Professional Relationships
- 4.8 Networking and Relationship-Building Strategies
- 4.9 Emotional Intelligence in Communication
- 4.10 Group Activities and Networking Events Final Projects and Assessments
- 4.11 Students work on a comprehensive communication project (e.g., creating a business proposal, delivering a persuasive presentation, writing a formal report)
- 4.12 Peer Evaluation and Feedback
- 4.13 Final Presentations and Project Submission

Introduction to Emerging Technologies

Lectures 40: (Credits- 2)

Course Objectives:

This course aims to introduce students to the forefront of technological advancements, enabling them to understand, evaluate, and leverage emerging technologies that are reshaping the field of data science.

Learning Outcomes: On completion of this course, students will be able to:

1. Technology Evaluation and Application: Students will proficiently assess and apply various emerging technologies, such as artificial intelligence, blockchain, and IoT, to address complex data challenges, showcasing their ability to select and implement appropriate tools.
2. Ethical and Responsible Integration: Students will critically analyze the ethical considerations and potential societal impacts of integrating emerging technologies, ensuring responsible and transparent use within data science projects.
3. Innovation and Adaptability: Students will demonstrate innovative thinking and adaptability by designing and executing creative solutions that leverage emerging technologies, positioning them as future-ready data science professionals.

Unit-I: Introduction to Emerging Technologies:

[10]

- 1.1 Understanding the concept of emerging technologies
- 1.2 Importance of staying updated with technology trends
- 1.3 Historical examples of transformative technologies
- 1.4 Ethical considerations in adopting emerging technologies; Artificial Intelligence and Machine Learning
- 1.5 Overview of AI and ML: Definitions and applications
- 1.6 Deep learning and neural networks
- 1.7 Reinforcement learning and its real-world applications
- 1.8 Explainable AI (XAI) and responsible AI practices
- 1.9 Future prospects and challenges in AI and ML

Unit-II: Internet of Things (IoT) and Sensor Technologies:

[10]

- 2.1 Introduction to IoT and its components
- 2.2 IoT applications in data collection and analysis
- 2.3 Sensor technologies and data integration
- 2.4 IoT security and privacy considerations
- 2.5 Case studies of IoT implementation Blockchain and Cryptocurrencies
- 2.6 Fundamentals of blockchain technology
- 2.7 Cryptocurrencies and their impact on finance and beyond
- 2.8 Smart contracts and decentralized applications (DApps)
- 2.9 Use cases of blockchain technology in data science and beyond.

Unit-III: Big Data and Cloud Computing:

[10]

- 3.1 Exploring big data: Volume, velocity, variety, veracity
- 3.2 Introduction to cloud computing and its advantages
- 3.3 Cloud-based data storage and processing
- 3.4 Big data analytics tools and techniques

- 3.5 Scalability and resource management in the cloud
- 3.6 Augmented and Virtual Reality
- 3.7 Augmented Reality (AR) vs. Virtual Reality (VR)
- 3.8 Applications of AR and VR in data visualization
- 3.9 Immersive experiences and training using AR and VR
- 3.10 Challenges and potential of AR and VR in data science & Quantum Computing
- 3.11 Basics of quantum mechanics for non-experts
- 3.12 Quantum computing principles and qubits
- 3.13 Quantum algorithms and their potential impact on data science
- 3.14 Current state and future developments in quantum computing.

Unit-IV: Automation and Robotics

[10]

- 4.1 Robotic process automation (RPA) and its role in data handling
- 4.2 Robotic applications in data collection and analysis
- 4.3 Integration of AI and robotics in data-driven decision-making
- 4.4 Ethical and Social Implications of Emerging Technologies
- 4.5 Addressing bias and fairness in AI and machine learning
- 4.6 Privacy concerns and data protection in the age of IoT
- 4.7 Ethical considerations in blockchain and cryptocurrencies
- 4.8 Impacts of emerging technologies on the job market and society
- 4.9 Future Trends and Continuous Learning
- 4.10 Anticipating upcoming technologies and trends
- 4.11 Importance of continuous learning and adaptability -
- 4.12 Strategies for staying updated with emerging technologies - Building a career in the rapidly evolving landscape of technology.

Semester II

Linear Algebra and Basics of Calculus

Lecture 40: (Credits-2)

Course Objective:

This course focuses on introducing this subject is to make students familiar with the concepts of linear algebraic equations, limits, and calculus.

Learning Outcomes: On completion of this course, students will be able to:

1. Use the characteristics of linear algebra and calculus
2. Use the basic calculus concepts in other subjects as well.
3. Learn the basics of math required for advanced subjects like ML and Deep learning in future semesters.

Unit 1:**10**

- 1.1 Evaluate general algebraic expressions, while learning how to interpret parentheses and alongside performing the correct order of operations
- 1.2 Solve equations with inequalities and understand weak and strict inequality.
- 1.3 Understand the concept of absolute values:
- 1.4 Solve equations and inequalities involving modulus and graph modulus functions
- 1.5 Pre-Calculus and Graphs: Reviewing various mathematical functions and their graphical representation

Unit 2:**10**

- 2.1 Concept and application of limits and continuity as a mathematical process, the exceptions and nuances of using limits correctly, and how limits are used to create other mathematical tools in calculus.
- 2.2 Defining differentiation through the use of limits and how they relate to rates of changes.
- 2.3 Understanding and developing methods and formulas that facilitate the calculation of derivatives.
- 2.4 Application of derivatives: Using derivatives as a tool for examining properties of functions and applying these to develop techniques for optimization, approximation methods, curve sketching, and solving problems of related rates.

Unit 3:**10**

- 3.1 Understanding the relationship between integration and differentiation, and how definite and indefinite integrals are related.
- 3.2 Developing integration as a mathematical tool and how this relates to the curriculum to be covered in the course.

Unit 4:**10**

- 1.1 Apply vectors to solve a real-world problem.
- 1.2 Introduce the concept of eigen values, vectors and its application.

1.3 Use matrices to organize large sets of data and understand the matrix operations to solve real world problems.

Reading List (Books)

1. J H Wilkinson. The Algebraic Eigenvalue Problem
2. K E Atkinson. An Introduction to Numerical Analysis
3. G E Golub and C F Van Loan. Matrix Computations
4. Shishir Gupta and Shukhendu Dey. Numerical Methods
5. Garrett Golemund. Handbook of programming with R
6. Norman Matloff. The Art of R programming
7. by Trevor Hastie and Rob Tibshirani An Introduction To Statistical Learning With Applications in R
8. Mark P.J.van der Loo. Learning RStudio For R Statistical Computing

Data Analysis with R Programming - Practical

(Credit 2)

1. Introduction to R and Basic Operations
 - Getting Started with R
 - Understanding Data Types and Operators
 - String and Numeric Functions
2. Data Structures and Control Structures in R
 - Data Structures in R
 - Control Structures
 - Data Manipulation with R
3. Advanced Data Manipulation Techniques in R
 - Recoding Variables
 - Sorting and Computing New Variables
 - Using the dplyr Package for Data Manipulation
4. Data Management and Manipulation in R
 - Importing and Exporting Data
 - Modifying and Manipulating Data
 - Subset Creation, Sorting, and Aggregation
5. Data Visualization with ggplot2 in R
 - Introduction to ggplot2
 - Building Basic Charts
 - Advanced Visualization Techniques
6. Data Aggregation and Cross-Tabulation in R
 - Applying Functions with "apply" Family
 - Creating Frequency Tables
 - Building Cross-Tabulations
7. Exploring Frequency and Contingency Tables
 - Frequency Tables
 - Contingency Tables
 - Statistical Inference from Tables
8. Correlation and Probability Distributions
 - Correlation Analysis
 - Probability Distributions
 - Nonparametric Tests of Group Differences
9. Performing Univariate Analyses
 - One-Sample T Test
 - Binomial Test
 - Chi-Square Test for Goodness-of-Fit

10. Working with CSV and Excel Files in R
 - Importing Data from CSV
 - Exporting Data to CSV
 - Working with Excel Files
11. Introduction to S3 and S4 Classes in R
 - S3 Classes
 - S4 Classes
 - Class Reference and Documentation
12. Using R Objects and References
 - R Objects and Memory Management
 - Referencing Variables
 - Advanced Data Structures

Ethical Hacking and Penetration Testing

Lecture 50: (Credits-2)

Objective:

Ethical Hacking and Penetration Testing are critical disciplines within cybersecurity aimed at identifying and addressing vulnerabilities in computer systems, networks, and applications. Ethical hackers, also known as penetration testers, simulate real-world cyber-attacks to assess the security posture of an organization's IT infrastructure. Their goal is to proactively identify weaknesses that malicious hackers could exploit and recommend remediation measures to strengthen defence.

Learning Outcomes: On completion of this course, students will be able to:

1. Acquire hands-on experience in performing ethical hacking and penetration testing exercises.
2. Comprehend foundational concepts in cybersecurity, including threat modelling, vulnerability assessment, and risk mitigation.
3. Enhance problem-solving skills to analyse and address security vulnerabilities effectively.
4. Prepare for industry-recognized certifications such as Certified Ethical Hacker (CEH) or Offensive Security Certified Professional (OSCP).
5. Contribute to enhancing the security posture of organizations by identifying and addressing potential security weaknesses.

Unit 1: Fundamentals of Ethical Hacking

10

- 1.1 Understanding Ethical Hacking: Concepts and Definitions;
- 1.2 Terms and Concepts in Ethical Hacking; Importance and Scope of Ethical Hacking; Case Studies of Ethical Hacking Incidents;
- 1.3 Basic Principles and Commandments of Ethical Hacking; Types and Phases of Ethical Hacking;
- 1.4 Role and Responsibilities of an Ethical Hacker; Scope and Limitations of Ethical Hacking;
- 1.5 Overview of Cyber Threats and Categories; Common Attack Vectors and Exploitation Techniques; Introduction to Common Hacking Tools and Techniques;
- 1.6 Policies and Controls in Ethical Hacking.

Unit 2: Malware Analysis and Countermeasures

10

- 2.1 Understanding Malware: Types and Distribution Methods;
- 2.2 Components and Characteristics of Malware;
- 2.3 Introduction to Fake Antiviruses and Malware Analysis; Overview of Viruses, Worms, and Trojans;
- 2.4 Different Types and Capabilities of Viruses, Worms, and Trojans;
- 2.5 How Antivirus Software Works and its Limitations;
- 2.6 Procedures for Malware Detection and Analysis.

Unit 3: Footprinting, Enumeration, and Sniffing Techniques

10

- 3.1 Techniques for Footprinting Using Search Engines and Web Services;
- 3.2 Information Gathering and Domain Enumeration Techniques;
- 3.3 Methods for Identifying Company Domains and Personnel Information;
- 3.4 Concepts and Tools for Network Scanning; Methods and Techniques for Network Enumeration;
- 3.5 Introduction to Packet Sniffing and Wireshark Tool.

Unit 4: Exploitation Techniques and System Hacking**10**

- 4.1 Basics of SQL Injection and Cross-Site Scripting (XSS) Attacks; DoS/DDoS Attack Techniques and Case Studies;
- 4.2 Session Hijacking Concepts and Prevention Methods;
- 4.3 Concepts and Techniques of System Hacking; Password Cracking and Privilege Escalation Methods;
- 4.4 Techniques for Hiding Files and Covering Tracks.

Unit 5:**10**

- 5.1 Web Application Security and Attack Methodology
- 5.2 Introduction to Web Application Technology Stack;
- 5.3 OWASP Top 10 Application Security Risks;
- 5.4 Methods and Tools for Web Application Hacking;
- 5.5 Web Server Security and Countermeasures

Ethical Hacking - Practical

(Credit 2)

1. Case Study Analysis of Ethical Hacking Incidents
2. Introduction to Common Hacking Tools and Techniques
3. Policies and Controls in Ethical Hacking
4. Malware Classification and Characteristics
5. Introduction to Malware Analysis Tools
6. Antivirus Evasion Techniques
7. Footprinting Using Search Engines and Web Services
8. Network Enumeration Techniques
9. Packet Sniffing Using Wireshark
10. SQL Injection and Cross-Site Scripting (XSS) Attacks
11. DoS/DDoS Attack Techniques and Case Studies
12. System Hacking Techniques
13. Exploiting OWASP Top 10 Application Security Risks
14. Web Server Security Assessment and Hardening

Inferential Statistics using Python

Lecture 40: (Credits-2)

Course Objective:

1. This course focuses on introducing the concepts estimation and sampling theory. The students will also understand the use and need of regression and GLM modelling.
2. This course focuses on familiarizing with the concept of analysis of variance.

Learning Outcomes: On completion of this course, students will be able to:

1. Understand the various theories for estimation
2. Use CLT and hypothesis
3. Analyse various data sets and apply regression concepts to understand the interaction elements
4. Extend the concept of linear regression to more dynamic GLM
5. Practically apply the analysis of variance

Unit 1:

10

- 1.1 Central Limit theorem: Central Limit Theorem, Sampling Distribution, Point Estimation & Confidence Interval
- 1.2 Hypothesis Testing: Hypothesis Testing: - Hypothesis, Null & Alternative,
- 1.3 Level of Significance, Decision Rule, T- Test, F-Test, Z-Test, Chi-Square Test
- 1.4 Anova: Anova - One Way & Two Way Anova,
- 1.5 Multiple Comparison Test -- Tukey HSD Test / LSD Test / Bonferroni Test

Unit 2:

10

- 2.1 Python Function: Basic of Python function on Data Frame
- 2.2 Data Preparation: Data Preparation: - Identify Missing Value & Outlier, Treatment of Missing Value & Outlier
- 2.3 Data Visualization: Data Visualization: - Scatter plot, Box plot, Heat map, Bar Plot, histogram, Pie Chart & Line Charts & Many More.

Unit 3:

10

- 3.1 Pivot Analysis: Pivot Analysis, Contingency Table Analysis
- 3.2 Probability Distribution: Discrete Distribution: - Binomial distribution, hypergeometric Distribution, Poisson Distribution,
- 3.3 Negative Binomial Distribution & Geometric Distribution & Continuous Distribution: - Normal Distribution, Exponential Distribution.

Unit 4:

10

- 4.1 Data Analysis: Data Analysis & Data Visualization,
- 4.2 Assumption of Linear Regression, Correlation, Fit Simple Linear Regression,
- 4.3 Model Performance = R-Square & Adjusted R-Square & RMSE
- 4.4 Multiple Linear Regression: Multiple Linear Regression,
- 4.5 Collinearity & Multi-collinearity, VIF,
- 4.6 Model Performance = R-Square & Adjusted R-Square & RMSE, Model Assumption Checking

Reading List (Books)

Thomas Haslwanter. *An introduction to Statistics with Python With Applications in Life Sciences*. Springer International Publishing Switzerland 2016

Inferential Statistics using Python - Practical

(Credit 2)

1. Hypothesis Testing

One-Sample T-Test: Analyzing a sample mean compared to a known population mean using Python libraries.

Independent Samples T-Test: Comparing means of two independent groups with Python code.

Paired Samples T-Test: Analyzing differences within paired data using Python.

ANOVA: Performing Analysis of Variance to compare means of multiple groups using Python.

2. Confidence Intervals

Confidence Interval for a Population Mean: Estimating a population mean using Python.

Confidence Interval for Proportions: Estimating a population proportion with Python.

3. Regression Analysis

Simple Linear Regression: Fitting a linear model to predict a dependent variable from an independent variable using Python.

Multiple Linear Regression: Extending linear regression to include multiple independent variables in Python.

Polynomial Regression: Fitting a polynomial regression model to non-linear data using Python.

Residual Analysis: Assessing the assumptions of linear regression using Python.

4. Logistic Regression

Binary Logistic Regression: Predicting binary outcomes using logistic regression in Python.

Multinomial Logistic Regression: Predicting outcomes with more than two categories using Python.

5. Logistic Regression

Binary Logistic Regression: Predicting binary outcomes using logistic regression in Python.

Multinomial Logistic Regression: Predicting outcomes with more than two categories using Python.

6. Model Evaluation and Selection

R-squared and Adjusted R-squared: Evaluating model fit with Python.

Feature Selection: Selecting relevant features for the model using Python.

7. Interaction Effects and ANOVA

Interaction Effects in Regression: Testing interaction between variables using Python

ANOVA with Regression: Combining regression and ANOVA for more complex analyses using Python.

Fundamentals of Analytics using EXCEL

Lecture 40: (Credits-2)

Course Objective:

This course focuses on providing training of all the tools necessary to create and use basic spreadsheets. This course helps the participants in receiving an overview of the interface and learn the various methods for entering and editing data. Additionally, participants will learn the various ways to write simple formulas.

Learning Outcomes: On completion of this course, students will be able to:

1. Examine spreadsheet concepts and explore the Microsoft Office Excel environment.
2. Work with cell references.
3. Learn to use functions and formulas.
4. Create and edit charts and graphics.
5. Filter and sort table data.
6. Work with pivot tables and charts.
7. Import and export data.

Unit 1:

10

- 1.1 Examine the value of using Excel to make decisions.
- 1.2 Learn how to start Excel and become familiar with the Excel workbook and saving workbooks.
Understand how to navigate worksheets.
- 1.3 Examine the Excel Ribbon, right-click menu options and the Status Bar.
- 1.4 Become familiar with the features in the Excel Help window.

Unit 2:

10

- 2.1 Understand how to enter data, delete data and use the undo command in a worksheet.
- 2.2 Examine how to edit data in a worksheet and how Auto Fill is used when entering data.
- 2.3 Examine how to adjust, hide, insert and delete rows and columns in a worksheet.
- 2.4 Learn how to move data to different locations in a worksheet.

Unit 3:

10

- 3.1 Use formatting techniques as introduced in the Excel Spreadsheet Guidelines to enhance the appearance of a worksheet.
- 3.2 Examine how to enter multiple lines of text in a cell location. Understand how to add borders to a worksheet.
- 3.3 Examine how to use the AutoSum feature to calculate totals.
- 3.4 Use the Cut, Copy, and Paste commands to manipulate the data on a worksheet.
- 3.5 Understand how to move, rename, insert, and delete worksheet tabs.

Unit 4:

10

- 4.1 Use the Page Layout tab to prepare a worksheet for printing.
- 4.2 Add headers and footers to a printed worksheet and examine how to print worksheets and workbooks
- 4.3 Save files and understand the importance and use of protecting workbook, worksheet and cells.
Understand built-in and creating custom templates.
- 4.4 Understanding the use of Pivot Tables in excel along with pivot charts.

Reading List (Books)

1. John Walkenbach. Excel 2016 Bible
2. Greg Harvey. Excel 2016 for Dummies
3. K. Scott Proctor. Building Financial Models with Microsoft Excel

Personal Branding and Networking

Lecture 40: (Credits-2)

Course Objective: -

This course aims to equip students with the knowledge and skills necessary to strategically develop, manage, and leverage their personal brand in the context of the data science field, enhancing their professional visibility and career prospects.

Learning Outcomes: On completion of this course, students will be able to:

1. Strategic Personal Brand Development: Students will demonstrate the ability to strategically define and communicate their unique value proposition, leveraging their strengths and expertise to create a compelling personal brand in the data science domain.
2. Effective Communication and Networking: Students will master the art of impactful communication, both online and offline, establishing and nurturing meaningful professional relationships within the data science community through active networking.
3. Thought Leadership and Content Creation: Students will showcase thought leadership by creating high-quality, data-driven content, positioning themselves as authoritative figures in the field and contributing valuable insights to the data science discourse.

Unit I: Introduction to Personal Branding

10

- 1.1 Understanding the concept of personal branding
- 1.2 Importance of personal branding in the context of data science
- 1.3 Exploring successful examples of personal brands Self-Discovery and Identity
- 1.4 Self-assessment exercises: strengths, values, passions
- 1.5 Defining your unique value proposition
- 1.6 Crafting a personal brand statement.

Unit II: Online Presence and Digital Identity

10

- 2.1 Building a professional online presence: social media, LinkedIn
- 2.2 Creating and curating content that aligns with your brand
- 2.3 Managing your digital reputation and privacy
- 2.4 Communication and Networking
- 2.5 Effective verbal and nonverbal communication skills
- 2.6 Elevator pitch development and practice
- 2.7 Networking strategies for building and nurturing relationships.

Unit III: Visual Branding and Design

10

- 3.1 Basics of graphic design for personal branding
- 3.2 Creating a visually consistent brand identity
- 3.3 Designing a personal logo and visual assets
- 3.4 Storytelling and Content Creation
- 3.5 The art of storytelling: crafting compelling narratives
- 3.6 Creating content that showcases your expertise
- 3.7 Blogging, podcasting, and video creation for personal branding
- 3.8 Personal Branding in the Workplace
- 3.9 Aligning your personal brand with your organization's values
- 3.10 Strategies for demonstrating leadership and innovation

3.11 Navigating personal branding within a team or company context.

Unit IV: Building a Portfolio

10

- 4.1 Showcasing your skills and projects through a portfolio
- 4.2 Selecting and organizing portfolio content
- 4.3 Presenting your portfolio effectively in interviews Public Speaking and Presentation Skills
 - Techniques for confident and impactful public speaking
- 4.4 Designing presentations that reflect your personal brand
- 4.5 Overcoming stage fright and delivering engaging talks
- 4.6 Continuous Branding and Career Growth
- 4.7 Strategies for maintaining and evolving your personal brand
- 4.8 Adapting your brand to changing career goals
- 4.9 Embracing lifelong learning and professional development.

Project and Assessment

1. Personal branding project: Create a comprehensive personal branding strategy
2. Presentation of the personal brand strategy and its components

Activity Integration:

1. Throughout the course, incorporate the following activities to enhance student engagement and learning:
2. Personal Brand Audit: Students assess their current online presence and identify areas for improvement.
3. Personal Logo Design: Students design a personal logo and visual assets using simple graphic design tools.
4. Elevator Pitch Practice: Students practice delivering concise and impactful elevator pitches.
5. Content Creation Challenge: Students create blog posts, videos, or other content showcasing their expertise.
6. Networking Event Simulation: Organize a virtual networking event where students practice networking and engaging in meaningful conversations.
7. Storytelling Workshop: Invite a guest speaker to conduct a workshop on effective storytelling techniques.
8. Portfolio Development: Students curate and present their data science projects in a visually appealing portfolio.
9. Mock Interview and Presentation: Students present their personal brand strategy in a mock interview setting.

Note: This curriculum emphasizes active learning and practical application. Incorporate real-world examples, case studies, and guest speakers from the data science and business fields to provide diverse perspectives and insights. Encourage students to reflect on their progress and continuously refine their personal branding strategies throughout the module.

Generative AI and Prompt Engineering

Lecture 40: (Credits-2)

Course Objective

This course aims to empower students with the knowledge, skills, and mindset required to conceptualize, develop, and scale innovative digital business ventures across diverse domains, leveraging the potential of digital technologies and services.

Learning Outcomes: On completion of this course, students will be able to:

1. Innovative Business Conceptualization: Students will demonstrate the ability to identify market opportunities, ideate innovative digital business concepts, and design viable business models that integrate digital technologies.
2. Practical Digital Solution Development: Students will acquire hands-on experience in developing digital solutions, ranging from e-commerce platforms to mobile apps and specialized digital services, tailored to address specific business needs.
3. Effective Entrepreneurial Communication: Students will enhance their ability to communicate and present their digital business concepts effectively, both to potential stakeholders and investors, showcasing their vision, value proposition, and growth potential.

Unit I: Introduction to Digital Business Ventures

10

- 1.1 Understanding the Intersection of Digital Technologies and Business Innovation
- 1.2 Identifying Market Opportunities for Digital Business Ventures
- 1.3 Exploring Successful Digital Business Case Studies
- 1.4 In-class Activity: Ideation Workshop for Digital Business Concepts
- 1.5 Business Model Innovation
- 1.6 Exploring Different Business Models in the Digital Era (Subscription, Marketplace, Freemium, etc.)
- 1.7 Lean Start-up Principles and Minimum Viable Product (MVP) Concept
- 1.8 Design Thinking and Customer-Centric Approach to Business Model Innovation
- 1.9 Group Activity: Designing a Digital Business Model Canvas Market Research and Analysis
- 1.10 Conducting market research using digital tools and platforms
- 1.11 Analysing market trends and consumer behaviour
- 1.12 Identifying opportunities and challenges in different business domains.

Unit II: E-Commerce and Online Retail

10

- 2.1 Setting up an e-commerce business: platforms, payment gateways Developing an online storefront and optimizing user experience
- 2.2 Marketing and promoting products/services through digital channels
- 2.3 Digital Marketing and Social Media
- 2.4 Creating a digital marketing strategy: SEO, SEM, content marketing
- 2.5 Utilizing social media platforms for brand building and customer engagement
- 2.6 Measuring digital marketing effectiveness and analyzing data E-Commerce and Marketplaces
- 2.7 Building and Scaling E-Commerce Platforms
- 2.8 Digital Marketing Strategies for E-Commerce Success
- 2.9 User Experience (UX) Design for E-Commerce Websites
- 2.10 Hands-on: Setting Up an E-Commerce Store
- 2.11 Mobile App Entrepreneurship
- 2.12 Introduction to Mobile App Development and Monetization

- 2.13 User-Centered App Design and Usability Testing
- 2.14 App Store Optimization (ASO) and App Marketing Strategies
- 2.15 Mobile App Prototype Development -Subscription
- 2.16 Based Services and SaaS
- 2.17 Creating and Launching Subscription-Based Business Models
- 2.18 SaaS Development and Cloud Services Integration
- 2.19 Customer Acquisition and Retention Strategies for Subscription Services
- 2.20 Guest Speaker Session: Successful SaaS Entrepreneur.

Unit III: Fintech and Digital Payment Solutions

10

- 3.1 Exploring Fintech Innovations (Mobile Payments, Peer-to-Peer Lending, etc.)
- 3.2 Developing Secure and User-Friendly Digital Payment Solutions
- 3.3 Regulatory and Compliance Considerations in Fintech
- 3.4 Workshop: Designing a Fintech Prototype
- 3.5 HealthTech and Telemedicine
- 3.6 Leveraging Digital Technologies for Healthcare Solutions
- 3.7 Building Telemedicine Platforms and Remote Health Services
- 3.8 Data Privacy and Security in HealthTech
- 3.9 Case Study: HealthTech Startup Journey EdTech and Online Education
- 3.10 Creating and delivering online educational content
- 3.11 Learning management systems, virtual classrooms, and interactive tools
- 3.12 Challenges and opportunities in the EdTech industry
- 3.13 GreenTech and Environmental Solutions
- 3.14 Role of digital technologies in addressing environmental issues
- 3.15 Renewable energy, waste management, and carbon footprint reduction
- 3.16 Creating and promoting environmentally friendly business models.

Unit IV: AgriTech and Sustainable Solutions

10

- 4.1 Applying Digital Technologies to Agriculture and Sustainability
- 4.2 Developing AgriTech Platforms and Farm Management Systems
- 4.3 Environmental and Social Impact Considerations in AgriTech
- 4.4 Project: AgriTech Prototype Development TravelTech and Tourism Innovation
- 4.5 Innovating in the Travel and Tourism Industry through Digital Solutions
- 4.6 Designing TravelTech Apps and Booking Platforms
- 4.7 Geolocation Services and Travel Experience Enhancement
- 4.8 Group Activity: Creating a TravelTech Concept Pitch -Pitching and Scaling Digital Ventures
- 4.9 Crafting a Compelling Business Pitch for Digital Ventures
- 4.10 Fundraising Strategies and Pitching to Investors
- 4.11 Scaling Strategies and Growth Hacking Techniques - Final Venture Pitches and Reflection.

Project and Assessment

- 1. Business simulation project: Students create a digital business plan for a chosen domain
- 2. Presentation of the digital business plan and its components
- 3. Digital Business Venture Proposal (30%)
- 4. Group Activities and Participation (20%)
- 5. Prototype Development and Presentation (40%)
- 6. Final Venture Pitch and Reflection (10%)

Activity Integration: Integrate the following activities to enhance student engagement and practical learning:

1. Market Research Challenge: Students conduct online market research to identify business opportunities in specific domains.
2. E-Commerce Store Setup: Students create a basic e-commerce store using platforms like Shopify or WooCommerce.
3. Digital Marketing Campaign: Students design and run a digital marketing campaign for a fictional business.
4. Financial App Prototype: Students develop a prototype for a fintech app focusing on financial management.
5. Telemedicine Platform Design: Students brainstorm and design a telemedicine platform interface.
6. Online Course Creation: Students create a mini online course on a chosen topic using an EdTech platform.
7. Eco-Friendly Product Pitch: Students pitch an eco-friendly product or service using digital tools.
8. AgriTech Data Analysis: Students analyze agricultural data to make informed decisions for a virtual farm.

Note:

The curriculum emphasizes hands-on activities, real-world projects, guest speaker sessions, and interactive workshops, allowing students to immerse themselves in diverse digital business domains. Adapt the content and activities based on student feedback and emerging business trends. This curriculum will equip students with the skills and mindset to create innovative and impactful digital businesses across various sectors.

Encourage students to collaborate, innovate, and think critically throughout the module. Guest speakers from various industries can provide insights into real-world challenges and opportunities. Incorporate current case studies and trends in each domain to ensure the curriculum remains relevant and up-to-date.

Mental Well Being

Lecture 40: (Credits-2)

Course Objective: -

This course aims to empower students with the knowledge and skills to integrate yoga practices and fitness routines into their lives, promoting physical well-being, mental clarity, and overall holistic health amidst the demands of academic and professional endeavours.

Learning Outcomes: On completion of this course, students will be able to:

1. Mind-Body Connection: Students will develop a deep understanding of the mind-body connection through yoga practices, cultivating mindfulness, and enhancing their ability to manage stress, improve focus, and maintain emotional balance.
2. Physical Fitness and Well-Being: Students will acquire proficiency in a variety of yoga postures, sequences, and mindfulness techniques, allowing them to build strength, flexibility, and vitality, while also enhancing their overall physical health.
3. Lifestyle Integration: Students will learn to integrate yoga practices and fitness routines seamlessly into their daily lives, enabling them to sustain healthy habits, manage energy levels, and foster a sustainable approach to well-being in the context of data science and beyond.

Unit I: Introduction to Yoga and Physical Well-Being

10

- 1.1 Understanding the Importance of Physical Health for Academic and Personal Success
- 1.2 Overview of Yoga and Its Benefits for Mental and Physical Well-Being
- 1.3 Exploration of Different Yoga Styles and Their Relevance - In-class Activity
- 1.4 Guided Deep Breathing and Relaxation Yoga Asanas and Alignment
- 1.5 Introduction to Common Yoga Poses (Asanas)
- 1.6 Correct Alignment and Posture in Yoga
- 1.7 Building Flexibility, Strength, and Balance - Yoga Asana Workshop
- 1.8 Practicing Key Poses.

Unit II: Mindfulness and Meditation

10

- 2.1 Exploring Mindfulness and Its Role in Stress Reduction
- 2.2 Introduction to Meditation Techniques (Breath Awareness, Body Scan)
- 2.3 Mindful Eating and Thought Observation
- 2.4 Guided Meditation Session
- 2.5 Mindfulness and Relaxation
- 2.6 Yoga for Stress Relief
- 2.7 Yoga Sequences for Stress Reduction and Relaxation
- 2.8 Breathing Exercises for Stress Management
- 2.9 Practicing Restorative Yoga for Rejuvenation
- 2.10 Workshop: Constructing a Stress-Busting Yoga Routine
- 2.11 Yoga for Posture and Back Health
- 2.12 Yoga Practices to Improve Posture and Alleviate Back Pain
- 2.13 Strengthening Core Muscles and Spinal Alignment
- 2.14 Desk Yoga and Ergonomic Awareness
- 2.15 Group Activity: Ergonomics and Posture Check.

Unit III: Yoga for Energy and Productivity

10

- 3.1 Dynamic Yoga Sequences to Boost Energy and Focus
- 3.2 Yoga Nidra for Mental Clarity and Recharge
- 3.3 Incorporating Yoga into Daily Routine for Enhanced Productivity
- 3.4 Energizing Yoga Session: Increasing Alertness
- 3.5 Yoga for Flexibility and Mobility
- 3.6 Developing Flexibility and Joint Mobility through Yoga
- 3.7 Effective Stretching Techniques and Yoga Flows
- 3.8 Yoga for Sedentary Lifestyles and Computer-Related Strain
- 3.9 Flexibility Challenge: Tracking Progress Yoga for Mind-Body Connection
- 3.10 Understanding the Mind-Body Connection in Yoga Philosophy
- 3.11 Yoga Practices for Body Awareness and Emotional Balance
- 3.12 Chakra Meditation and Visualization
- 3.13 Mind-Body Workshop: Yoga and Emotional Well-Being.

Unit IV: Yoga and Holistic Well-Being

10

- 4.1 Ayurveda Principles and Yoga for Holistic Health
- 4.2 Practicing Yoga for Digestive Health and Immunity
- 4.3 Integrating Yoga with Nutrition and Wellness
- 4.4 Ayurvedic Cooking Workshop: Preparing a Balanced Meal
- 4.5 Yoga Lifestyle and Reflection
- 4.6 Exploring Yogic Principles for Sustainable Well-Being
- 4.7 Reflecting on the Journey and Benefits of Yoga Practices
- 4.8 Sharing Personal Insights and Experiences
- 4.9 Final Project: Creating a Personalized Yoga and Fitness Plan
- 4.10 Holistic Nutrition and Hydration
- 4.11 Understanding the role of nutrition and hydration in fitness
- 4.12 Balanced diet principles: macronutrients, micronutrients, and hydration
- 4.13 Creating a mindful approach to eating and fueling the body
- 4.14 Sustainable Fitness and Self-Care
- 4.15 Promoting a sustainable fitness routine for long-term well-being
- 4.16 Self-care practices: rest, relaxation, and mental well-being
- 4.17 Reflecting on personal growth and well-being journey.

Assessment Methods:

Assign a final project where students design a comprehensive fitness and wellness plan that incorporates yoga practices, cardiovascular exercises, strength training, and holistic self-care strategies. Students can present their plans and share their personal experiences with the class.

- 1. Yoga Practice Journal (20%)
- 2. In-class Activities and Participation (30%)
- 3. Group Workshops and Presentations (30%)
- 4. Personalized Yoga and Fitness Plan (20%)

The curriculum engages students in active learning through yoga practices, guided meditations, workshops, and discussions. Adapt the content and activities based on student preferences and feedback. This curriculum will help students cultivate physical well-being, enhance mindfulness, and develop a sustainable yoga and fitness routine for a healthy lifestyle.

Activity Integration: To enhance student engagement and experiential learning, incorporate the following activities throughout the module:

1. Daily Yoga Practice: Encourage students to practice yoga asanas and mindfulness exercises daily.
2. Mindful Eating Challenge: Students keep a food journal and reflect on mindful eating habits.
3. Yoga Sequence Design: Students create a customized yoga sequence targeting specific goals (e.g., flexibility, relaxation).
4. Fitness Buddy System: Pair students for accountability and motivation in their fitness routines.
5. Wellness Workshop: Students lead workshops on nutrition, mindfulness, or specific yoga practices.
6. Fitness Challenge: Organize a fitness challenge where students track progress in strength, flexibility, or cardiovascular fitness.

Note: Prioritize safety and Inclusivity throughout the module. Encourage students to listen to their bodies and modify exercises as needed. Invite certified yoga instructors and fitness professionals for guest sessions to provide expert guidance

Evaluation Pattern

The internal and external evaluation will be 50-50%

All the courses, both theory as well as practical, of major and minor are of two credits each. So, total marks will be 50. Out of 25 marks will be allotted for internal evaluation and 25 marks for external evaluation.

Theory Courses:

- Internal evaluation will be of 25 marks for which 2 continuous evaluation exams will be conducted
- External evaluation will be of 25 marks

Practical Courses:

Internal evaluation will be of 25 marks out of which 10 marks will be for assignment submissions done throughout the semester and a test/viva will be conducted for 15 marks

External evaluation will be of 25 marks

For Skill Enhancement and Vocational skills, 2 credit course is divided as 1 credit for theory and 1 credit of practical. In that case also internal and external will be of 50-50%. Distribution of 25 internal and 25 external (For total 2 credits) can be decided subject- wise

Methods of assessment for internal evaluation:

Seminar, objective test, open book test, Quiz, viva, projects, assignments, group discussion, research paper review, case study, industrial visit

Passing percentage

The student must secure at least 40% marks of that course to earn the full credit.

Examination	Credits	Marks Out of	Passing marks (40%)
Internal	2	25	10
External	2	25	10

Note: There is separate passing for internal and external examinations.