



**Anekant Education Society's**  
**Tuljaram Chaturchand College**  
**of Arts, Science and Commerce, Baramati**  
**(Empowered Autonomous)**

**Four Year B.Sc. AEDP Degree Program in Blockchain Technology -**  
**(Faculty of Science & Technology)**  
**CBCS Syllabus**

**F.Y.B.Sc. (Blockchain Technology) Semester - I**  
**For Department of Blockchain Technology**

**Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati**

**Choice Based Credit System Syllabus**  
**As Per NEP 2.0 (2024 Pattern)**

**To be implemented from Academic Year 2026 – 2027**



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**Preamble: -**

In the rapidly evolving digital landscape, Blockchain Technology stands at the forefront of innovation, transforming the foundations of trust, transparency, and decentralization across industries. From finance and supply chain management to healthcare and governance, blockchain presents unparalleled opportunities to redefine the way information is stored, shared, and secured.

This Blockchain Technology Program is designed to equip learners with a comprehensive understanding of the principles, architecture, and applications of blockchain systems. Through a blend of theoretical foundations and hands-on experience, participants will explore distributed ledger technologies, smart contracts, consensus mechanisms, and emerging trends in decentralized finance (DeFi), non-fungible tokens (NFTs), and beyond.

Guided by academic rigor and industry relevance, this program aims to develop the next generation of blockchain professionals, innovators, and leaders. It fosters critical thinking, ethical responsibility, and technical proficiency to help learners navigate and shape the future of decentralized technologies.

Anekant Education Society's  
**Tuljaram Chaturchand College**  
of Arts, Science and Commerce Baramati, Dist.-Pune, MS, India.  
*(Empowered Autonomous)*

**Board of Studies in Data Science**  
**(Academic Year 2025-26 to 2027-28)**

Sr. No.	Name of Members	Designation
1.	<b>Mrs. Salma T. Shaikh</b> HoD, Assistant Professor, Department of BBA(C.A.) T. C. College, Baramati	<b>Chairperson</b>
2.	<b>Dr. Niranjana Shah,</b> Assistant Professor & Dean, Faculty of Commerce & Management	<b>Member</b>
3.	<b>Mrs. Ashwini Bhosale</b> Assistant Professor, Dept. of BBA(C.A.)	<b>Member</b>
4.	<b>Ms. Trupti Bhosale</b> Assistant Professor, Dept. of BBA(C.A.)	<b>Member</b>
5.	<b>Mrs. Asmita Bhagat</b> Assistant Professor, Dept. of Computer Science	<b>Member</b>
6.	<b>Mr. Vishal Shaha</b> Head & Assistant Professor, Dept. of BCA	<b>Member</b>
7.	<b>Mrs. Malati Vaibhav Tribhuwan</b> Assistant Professor	<b>Industry Expert</b>
8.	<b>Mr. Sahil Shaikh</b> Assistant Professor	<b>Industry Expert</b>
9.	<b>Mr. Vikas Raskar</b> Founder & CEO, PRS CyberShield and Rahitech Solution, Pune	<b>Industry Expert</b>



Anekant Education Society's  
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of Arts, Science & Commerce, Baramati.

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati is an empowered autonomous & dynamic institute and has successfully implemented the National Education Policy 2.0 2024 pattern since the academic year 2024-25. We are updating our academic policies as per local needs keeping in view the global perspectives. Accordingly, we have updated our program outcomes as per the graduate attributes defined in New Education Policy. In general, program outcomes are categorized into two categories as disciplinary & interdisciplinary outcomes and generic outcomes.

**PO.1. Comprehensive Knowledge and Understanding:** Graduates will develop a comprehensive understanding of computers with a focus on blockchain technology, data visualization tools, programming languages, distributed systems, and emerging decentralized technologies.

**PO.2. Practical, Professional, and Procedural Knowledge:** Graduates will design real-world solutions such as web-based and blockchain applications that address specific organizational and societal needs while following industry standards and best practices.

**PO.3. Entrepreneurial Mindset and Knowledge:** Graduates will create innovative solutions for industry and entrepreneurial success by applying validation, design, implementation, and assessment techniques through research and exploration of emerging technologies.

**PO.4. Specialized Skills and Competencies:** Graduates will demonstrate proficiency in technical and analytical skills to analyze business and management problems and propose innovative solutions using blockchain and computing technologies.

**PO.5. Capacity for Application, Problem-Solving, and Analytical Reasoning:** Graduates will apply computing knowledge to analyze, design, and implement programs that solve real-world problems while ensuring program validation, performance optimization, and correctness.

**PO.6. Communication Skills and Collaboration:** Graduates will effectively communicate technical and non-technical information to diverse audiences and collaborate efficiently within multidisciplinary teams to achieve common goals.

**PO.7. Research-related Skills:** Graduates will investigate complex blockchain and distributed system problems using research-based knowledge, experimentation, and data analysis techniques.

**PO.8. Learning How to Learn Skills:** Graduates will engage in continuous professional development and lifelong learning to keep pace with evolving technologies and industry practices.

**PO.9. Digital and Technological Skills:** Graduates will demonstrate proficiency in the use of computers, programming tools, blockchain platforms, and data visualization technologies to design and implement effective solutions.

**PO.10. Multicultural Competence, Inclusive Spirit, and Empathy:** Graduates will work effectively in diverse teams, respecting different perspectives and contributing collaboratively to solve complex computing and organizational challenges.

**PO.11. Value Inculcation and Environmental Awareness:** Graduates will apply ethical practices in computing by following professional standards and considering the social and environmental impact of technology.

**PO.12. Autonomy, Responsibility, and Accountability:** Graduates will independently analyze, design, and evaluate computing solutions while taking responsibility for project execution, validation, and overall performance.

**PO.13. Community Engagement and Service:** Graduates will plan, manage, and deploy blockchain and computing projects considering real-world constraints, resources, timelines, scalability, and societal needs.

## Programme Specific Outcomes (PSOs)

### **PSO1: Blockchain Application Development**

Design, develop, and deploy blockchain-based applications and smart contracts using platform like Ethereum and Hyperledger.

### **PSO2: Blockchain Infrastructure & Integration**

Design blockchain infrastructure and integrate decentralized systems with cloud, web, and enterprise environments.

### **PSO3: Blockchain Security Implementation**

Apply auditing, cryptographic techniques, and penetration testing methodologies to enhance blockchain security.

### **SO4: Blockchain Performance & Scalability Engineering**

Design and optimize blockchain systems to improve scalability, interoperability, performance efficiency, and sustainability.

### **SO5: Blockchain Project Implementation & Industry Deployment**

Execute end-to-end blockchain projects in collaboration with industry, applying professional standards and deployment strategies.

### **PSO6: Research, Innovation & Advanced Technology Exploration**

Engage in research to explore new applications of blockchain technology and contribute to its advancement.

### **PSO7: Ethical and Legal Awareness**

Understand and apply ethical principles and legal regulations related to blockchain technology.

**Credit Distribution Structure for Three/Four Year Honours/Honours with Research Degree Programme With Multiple Entry and Exit options  
as per National Education Policy (2024 Pattern as per NEP-2020)**

Level/ Difficulty	Sem	Subject DSC-1				Subject DSC-2	Subject DSC-3	GE/OE	SEC	IKS	AEC	VEC	CC	Total
4.5/100	I	2(T)+2(P)				2(T)+2(P)	2(T)+ 2(P)	2(T)	2 (T/P)	2(T) (Generic)	2(T)	2(T)	--	22
	II	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(P)	2 (T/P)	--	2(T)	2(T)	2(T)	22
<b>Exit option:</b> Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/Internship OR Continue with Major and Minor <b>Continue option:</b> Student will select one subject among the (subject 1, subject 2 and subject 3) as major and other as minor and third subject will be dropped.														
Level/ Difficulty	Sem	Credits Related to Major				Minor	--	GE/OE	SEC	IKS	AEC	VEC	CC	Total
		Major Core	Major Elective	VSC	FP/OJT/CE P/RP									
5.0/200	III	4(T)+2(P)	--	2 (T/P)	2(FP)	2(T)+2(P)	--	2(T)	--	2(T)	--	2(T)	22	
	IV	4(T)+2(P)	--	2 (T/P)	2(CEP)	2(T)+2(P)	--	2(P)	2 (T/P)	--	2(T)	--	2(T)	22
<b>Exit option:</b> Award of UG Diploma in Major and Minor with 88 credits and an additional 4credits core NSQF course/Internship OR Continue with Major and Minor														
5.5/300	V	8(T)+4(P)	2(T)+2(P)	2 (T/P)	2(FP/CEP)	2(T)	--	--	--	--	--	--	22	
	VI	8(T)+4(P)	2(T)+2(P)	2 (T/P)	4 (OJT)	--	--	--	--	--	--	--	22	
<b>Total 3Years</b>		<b>44</b>	<b>8</b>	<b>8</b>	<b>10</b>	<b>18</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>132</b>
<b>Exit option:</b> Award of UG Degree in Major with 132 credits OR Continue with Major and Minor														
6.0/400	VII	6(T)+4(P)	2(T)+2 (T/P)	--	4(RP)	4(RM)(T)	--	--	--	--	--	--	22	
	VIII	6(T)+4(P)	2(T)+2 (T/P)	--	8(RP)	--	--	--	--	--	--	--	22	
<b>Total 4Years</b>		<b>64</b>	<b>16</b>	<b>8</b>	<b>22</b>	<b>22</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>176</b>
Four Year UG Honours with Research Degree in Major and Minor with 176 credits														
6.0/400	VII	10(T)+4(P)	2(T)+2 (T/P)	--	--	4(RM) (T)	--	--	--	--	--	--	22	
	VIII	10(T)+4(P)	2(T)+2 (T/P)	--	4 (OJT)	--	--	--	--	--	--	--	22	
<b>Total 4Years</b>		<b>72</b>	<b>16</b>	<b>8</b>	<b>14</b>	<b>22</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>176</b>
Four Year UG Honours Degree in Major and Minor with 176 credits														
<b>T</b> = Theory <b>P</b> = Practical <b>DSC</b> = Discipline Specific Course <b>OE</b> = Open Elective <b>SEC</b> = Skill Enhancement Course <b>IKS</b> = Indian Knowledge System <b>AEC</b> = Ability Enhancement Course <b>VEC</b> = Value Education Course <b>CC</b> = Co-curricular Course <b>VSC</b> = Vocational Skill Course <b>OJT</b> = On Job Training <b>CEP</b> = Community Engagement Project <b>FP</b> = Field Project <b>RP</b> = Research Project														

**Course Structure for F.Y.B.Sc. (Blockchain Technology) (2024 Pattern as per NEP- 2.0)**

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
<b>I</b>	DSC-I (General)	BBT-101-GEN	Python Programming.	Theory	02
		BBT-102-GEN	Python Programming Laboratory	Practical	02
	DSC-II (General)	BBT-103-GEN	Web Development	Theory	02
		BBT-104-GEN	Web Development Laboratory	Practical	02
	DSC-III (General)	BBT -105-GEN	Fundamentals of Blockchain	Theory	02
		BBT -106-GEN	Basics of Solidity language Laboratory	Practical	02
	Other Elective (OE)	BBT -107-OE	Introduction to Data Science for Business	Theory	02
	Skill Enhancement Course (SEC)	DSC-108-SEC	Office Automation & Productivity Tools	Practical	02
	Ability Enhancement Course (AEC)	ENG-104-AEC	Functional English – I	Theory	02
	Value Education Course (VEC)	ENV-105-VEC	Environmental Studies & Sustainability	Theory	02
Generic Indian Knowledge System (GIKS)	GEN-106-IKS	Generic Indian Knowledge System	Theory	02	
<b>Total Credits Semester- I</b>					<b>22</b>
<b>II</b>	DSC-I (General)	BBT -151-GEN	Tokenomics in Blockchain	Theory	02
		BBT -152-GEN	Tokenomics in Blockchain Laboratory	Practical	02
	DSC-II (General)	BBT -153-GEN	Computer Networking in Blockchain	Theory	02
		BBT -154-GEN	Computer Networking in Blockchain Laboratory	Practical	02
	DSC-III (General)	BBT -155-GEN	Data Structure using Python	Theory	02
		BBT -156-GEN	Data Structure using Python Laboratory	Practical	02
	Open Elective (OE)	BBT -157-OE	Financial Markets & Digital Assets in Blockchain	Practical	02
	Skill Enhancement Course (SEC)	BBT -158-SEC	Linux & Command Line Skills	Practical	02
	Ability Enhancement Course (AEC)	ENG-154-AEC	Functional English – II	Theory	02
	Value Education Course (VEC)	COS-155-VEC	Digital and Technological Solutions	Theory	02
Co-curricular Course (CC)	YOG/PES/CUL/ NSS/NCC-156- CC	To be selected from CC Basket	Theory	02	
<b>Total Credits Semester- II</b>					<b>22</b>
<b>Cumulative Credits Semester I + Semester II</b>					<b>44</b>

**Course Structure for S.Y.B.Sc. (Blockchain Technology ) (2024 Pattern as per NEP- 2.0)**

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
III	Major Mandatory	DSC-201-MRM	Distributed Systems	T	02
	Major Mandatory	DSC-202-MRM	Blockchain Platform	T	02
	Major Mandatory	DSC-203-MRM	Practical Based on Distributed Systems	P	02
	Vocational Skill Course (VSC)	DSC-204-VSC	Practical Based on Blockchain Platform	P	02
	Field Project (FP)	DSC-205-FP	Project on Ethereum	P	02
	Minor	DSC-206-MN	R Programming	T	02
	Minor	DSC-207-MN	Practical Based on R Programming	P	02
	Open Elective (OE)	DSC-208-OE	Retail Management	T	02
	Subject Specific Indian Knowledge System (IKS)	DSC-209-IKS	Blockchain relevant IKS	T	02
	Ability Enhancement Course (AEC)	MAR-210-AEC	Marathi Savand	T (Any One)	02
HIN-210-AEC					
SAN-210-AEC					
Co-curricular Course (CC)	YOG/PES/CUL/ NSS/NCC-211- CC	To be continued from the Semester - II		02	
<b>Total Credits Semester-III</b>					<b>22</b>
IV	Major Mandatory	DSC-251-MRM	Hyperledger	T	02
	Major Mandatory	DSC-252-MRM	Corda Fundamentals	T	02
	Major Mandatory	DSC-253-MRM	Practical Based on Corda Fundamentals	P	02
	Vocational Skill Course (VSC)	DSC-254-VSC	Web3 Development	T	02
	Community Engagement Project (CEP)	DSC-255-CEP	Project	P	02
	Minor	DSC-256-MN	Cloud Computing	T	02
	Minor	DSC-257-MN	Practical Based on Cloud Computing	P	02
	Open Elective (OE)	DSC-258-OE	Digital Marketing	P	02
	Skill Enhancement Course (SEC)	DSC-259-SEC	Rust Programming	P	02

Ability Enhancement Course (AEC)	MAR-260-AEC	Marathi Sahitya	T (Any One)	02
	HIN-260-AEC			
	SAN-260-AEC			
Co-curricular Course (CC)	YOG/PES/CUL/ NSS/ NCC-261- CC	To be Continued from the Semester - III		02
<b>Total Credits Semester-IV</b>				<b>22</b>
<b>Total Credits Semester III + IV</b>				<b>44</b>

**Course Structure for T.Y.B.Sc. (Blockchain Technology) (2024 Pattern as per NEP- 2.0)**

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
V	Major Mandatory	DSC-301-MRM	Smart Contract Auditing	T	02
	Major Mandatory	DSC-302-MRM	Decentralized Finance (DeFi)	T	02
	Major Mandatory	DSC-303-MRM	Blockchain Interoperability	T	02
	Major Mandatory	DSC-304-MRM	Blockchain Security and Privacy	T	02
	Major Mandatory	DSC-305-MRM	Practical Based on Decentralized Finance (DeFi)	P	02
	Major Mandatory	DSC-306-MRM	Practical Based on Blockchain Interoperability	P	02
	Major Elective (MJE)	DSC-307-MJE(A)	BlockChain in FinTech	T (Any one)	02
		DSC-307-MJE(B)	Blockchain in Supply Chain Management		
	Major Elective (MJE)	DSC-308-MJE(A)	Practical based on BlockChain in FinTech	P (Any one)	02
		DSC-308-MJE(B)	Practical based on Blockchain in Supply Chain Management		
On Job Training (OJT)	DSC-309-OJT	On Job Training	P	04	
Minor	DSC-310-MN	Data Visualization using Tableau and Power BI	T	02	
<b>Total Credits Semester – V</b>					<b>22</b>
VI	Major Mandatory	DSC-351-MRM	Introduction To Solana	T	02
	Major Mandatory	DSC-352-MRM	Blockchain Governance and Regulation	T	02
	Major Mandatory	DSC-353-MRM	Quantum Computing and Future Blockchain Technologies	T	02
	Major Mandatory	DSC-354-MRM	Blockchain Scalability	T	02
	Major Mandatory	DSC-355-MRM	Practical based on Introduction to Solana	P	02
	Major Mandatory	DSC-356-MRM	Practical Based on Quantum Computing and Future blockchain Technologies	P	02
	Major Elective (MJE)	DSC-357-MJE (A)	Security Tools & Penetration Testing	T (Any one)	02
	Major Elective (MJE)	DSC-357-MJE (B)	Metaverse and Blockchain Integration		
	Major Elective (MJE)	DSC-358-MJE (A)	Practical Based on Security Tools & Penetration Testing	P (Any one)	02

	Major Elective (MJE)	DSC-358-MJE (B)	Practical Based on Metaverse and Blockchain Integration		
	Vocational Skill Course (VSC)	DSC-359-VSC	Artificial Intelligence	T	02
	Vocational Skill Course (VSC)	DSC-360-VSC	Practical Based on Artificial Intelligence	P	04
	Field Project/CEP	DSC-361-FP	Field Project	P	02
	<b>Total Credits Semester-VI</b>				<b>22</b>
	<b>Total Credits Semester V + VI</b>				<b>44</b>

### Course Structure for T.Y.B.Sc. (Blockchain Technology) (2024 Pattern as per NEP- 2.0)

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
VII	APR	BBT-401	Apprenticeship	P	22
	<b>Total Credits Semester – V</b>				<b>22</b>
VIII	APR	BBT-481	Apprenticeship	P	22
	<b>Total Credits Semester-VI</b>				<b>22</b>
	<b>Total Credits Semester V + VI</b>				<b>44</b>

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc.( Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc.( Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT (General) (Theory)
<b>Course Code</b>	: BBT- 101-GEN
<b>Course Title</b>	: Python Programming
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 30

**Course Objectives:**

1. To introduce students to fundamental programming concepts using Python.
2. To develop problem-solving skills using control structures, loops, and operators.
3. To familiarize students with Python built-in functions and data structures such as List, Tuple, Set, and Dictionary.
4. To enable students to design modular programs using functions and modules.
5. To develop skills in exception handling for writing robust programs.
6. To introduce GUI development using Tkinter for basic desktop applications.
7. To prepare students for industry-oriented programming roles and higher-level computing courses.

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

- CO1.** Understand and apply basic Python syntax, data types, operators, and built-in functions.
- CO2.** Implement decision-making statements and looping constructs to solve computational problems.
- CO3.** Use Python data structures (List, Tuple, Set, Dictionary) and string functions effectively in programs.
- CO4.** Develop modular programs using functions, modules, namespaces, and handle exceptions efficiently.
- CO5.** Design and develop basic GUI-based applications using Tkinter widgets and geometry managers.
- CO6.** Integrate programming concepts to develop mini-projects suitable for real-world and job-oriented applications.
- CO7.** Apply Python libraries and file handling techniques to store, process, and manage data effectively in applications.

**Topics and Learning Points****Topics/ Contents**

<b>Unit 1</b>	<b>Introduction to Python</b>	<b>(07 L)</b>
	1.1 Introduction to Programming and Python	
	1.2 Python Environment Setup	
	1.3 Basic Python Program	
	1.4 Python Syntax and Structure	
	1.5 Comments and Code Formatting	
	1.6 Input, Output and Built-in Functions	
	1.7 Operators and Data Types	
<b>Unit 2</b>	<b>Decision Making Statements and Loops</b>	<b>(03L)</b>
	2.1 Decision Making Statements	
	2.2 Looping Statements	
	2.3 Loop Control Statements, Iterators and Generators	
<b>Unit 3</b>	<b>Built In Functions and Python Data Structures</b>	<b>(10L)</b>
	3.1. Mathematical Functions	
	3.2. Number Functions	
	3.3. Random Number Functions	
	3.4. Trigonometric Functions	
	3.5. Introduction to Strings	
	3.6. String Manipulation Functions	
	3.7. String Testing and Searching Functions	
	3.8. String Formatting and Conversion Functions	
	3.9. Python Data Structures	
	3.10. List, Set, Tuple and Dictionary	
<b>Unit 4</b>	<b>Function, Modules and Exception Handling</b>	<b>(05L)</b>
	4.1. Functions in Python	
	4.2. Function Arguments and Anonymous Functions	
	4.3. Python Modules and Packages	
	4.4. Namespaces, Scope and Built-in Module Functions	
	4.5. Exception Handling and User-Defined Exceptions	

**Unit 5 GUI Programming (Tkinter)**

- 5.1. Introduction to GUI Programming with Tkinter (05L)
- 5.2. Tkinter Widgets
- 5.3. Tkinter Window Components and Properties
- 5.4. Tkinter Geometry Management Methods
- 5.5. Tkinter GUI Design and Layout

**References:**

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming – Eric Matthews
2. Automate the Boring Stuff With Python: Practical Programming for Total Beginners – Al Sweigart
3. Fluent Python: Clear, Concise, and Effective Programming – Luciano Ramalho
4. Introduction to Machine Learning With Python: A Guide for Data Scientists – Andreas C. Müller, Sarah Guido
5. Python Tutorials

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
<b>CO1</b>	3	2	1	3	2	2	1	1	1	2	2	1	1
<b>CO2</b>	3	3	2	3	3	2	1	1	1	3	2	2	2
<b>CO3</b>	3	3	3	3	3	2	1	1	1	3	2	2	2
<b>CO4</b>	3	3	3	3	3	3	1	1	1	3	2	3	3
<b>CO5</b>	3	3	2	3	3	3	2	2	2	3	2	2	3
<b>CO6</b>	3	3	2	3	3	3	2	2	2	3	3	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1, CO4, CO6 as Python fundamentals, modular programming, and integration of concepts provide foundational programming knowledge essential for blockchain and emerging technologies.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO2, CO3, CO4, CO5, CO6 as Students design structured programs using control statements, data structures, GUI applications, and modular coding practices.

**PO3: Entrepreneurial Mindset and Knowledge**

Moderately mapped with CO3, CO4, CO5 as Use of structured programming, exception handling, and modular development introduces validation and debugging practices.

**PO4: Specialized Skills and Competencies**

Strongly mapped with CO1–CO6 as Algorithm design, logical decision-making, and structured problem-solving enhance analytical capability.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with CO4, CO5, CO6 as Exception handling, structured design, and GUI-based implementation ensure correctness and validation of programs.

**PO6: Communication Skills and Collaboration**

Strongly mapped with CO2, CO4, CO6 as Students experiment with programming constructs and GUI-based systems, encouraging innovation.

**PO7: Research-related Skills:**

Weakly mapped with CO1–CO6 as Indirect mapping through code documentation and explanation of logic during viva.

**PO8: Learning How to Learn Skills**

Moderately mapped with CO4, CO5 as Exception handling and structured coding encourage responsible programming practices.

**PO9: Digital and Technological Skills:**

Weakly mapped with CO1–CO6 as Limited direct teamwork; mainly individual theoretical learning.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO2–CO6 as Program design, validation, and GUI applications reflect industry-level application development.

**PO11: Value Inculcation and Environmental Awareness**

Moderately mapped with CO1–CO6 as Python foundation supports continuous upskilling and advanced learning.

**PO12: Autonomy, Responsibility, and Accountability**

Moderately mapped with CO3, CO4 as Data structures and modular programming promote structured experimentation.

**PO13: Community Engagement and Service**

Moderately mapped with CO6 as Application development introduces project structuring and planning skills.

**CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Data Science (2024 Pattern)****Name of the Programme** : B.Sc.(Blockchain Technology)**Programme Code** : USBT**Class** : First Year B.Sc.(Blockchain Technology)**Semester** : I**Course Type** : BBT (General) (Practical)**Course Code** : BBT-102-GEN**Course Title** : Python Programming Laboratory**No. of Credits** : 02**No. of Teaching Hours** : 60**Course Objectives:**

1. To introduce students to fundamental programming concepts using Python.
2. To develop problem-solving skills using control structures, loops, and operators.
3. To familiarize students with Python built-in functions and data structures such as List, Tuple, Set, and Dictionary.
4. To enable students to design modular programs using functions and modules.
5. To develop skills in exception handling for writing robust programs.
6. To introduce GUI development using Tkinter for basic desktop applications.
7. To prepare students for industry-oriented programming roles and higher-level computing courses.

**Course Outcomes:****After successful completion of this course, students will be able to:****CO1:** Understand and apply basic Python syntax, data types, operators, and built-in functions.**CO2:** Implement decision-making statements and looping constructs to solve computational problems.**CO3:** Use Python data structures (List, Tuple, Set, Dictionary) and string functions effectively in programs.**CO4:** Develop modular programs using functions, modules, namespaces, and handle exceptions efficiently.**CO5:** Design and develop basic GUI-based applications using Tkinter widgets and geometry managers.**CO6:** Integrate programming concepts to develop mini-projects suitable for real-world and job-oriented applications.**Topics and Learning Points**

**Program List / Practical Exercises**

<b>Sr. No</b>	<b>Title of Program</b>
1	Write a Python program to solve simple mathematical and logical problems such as addition, subtraction, multiplication, division, checking even/odd, largest of three numbers, and calculating factorial.
2	Write a Python program demonstrating basic syntax, identifiers, comments, indentation, and use of built-in functions like print(), input(), and range().
3	Write a Python program to demonstrate different data types and type conversion (int, float, string, boolean).
4	Write a Python program to demonstrate various types of operators including arithmetic, comparison, logical, bitwise, assignment, membership, identity operators and operator precedence.
5	Write a Python program using decision-making statements (if, if-else, if-elif-else, nested if) to solve real-life problems (e.g., grading system).
6	Write a Python program to implement looping constructs (for, while, nested loops) with suitable examples such as pattern printing and number series.
7	Write a Python program to demonstrate loop control statements (break, continue, pass) and create a simple generator example.
8	Write a Python program to demonstrate the use of mathematical, number, and trigonometric functions from the math and random modules.
9	Write a Python program to perform string operations including slicing, concatenation, searching, replacing, case conversion, and validation methods.
10	Write a Python program to demonstrate Python data structures: List, Set, Tuple, and Dictionary (creation, indexing, updating, deleting, and iterating elements).
11	Write a Python program to define and call functions using different types of arguments (required, keyword, default, variable-length) and demonstrate lambda (anonymous) functions.
12	Write a Python program to create and use modules and packages using import, from...import, and demonstrate namespace functions like dir(), globals(), and locals().
13	Write a Python program to implement exception handling using try-except, multiple exceptions, try-finally, assertions, raising exceptions, and user-defined exceptions.
14	Write a Python program to create a GUI application using Tkinter widgets (Label, Button, Entry, Text, Radiobutton, Checkbutton, Listbox, etc.) and geometry managers (pack(), grid(), place()).
15	Write a Python program to develop a mini-project integrating strings, data structures, functions, modules, exception handling, and Tkinter GUI (e.g., Student Management System / Banking System / Calculator Application).

**References:**

1. Python Crash Course – Eric Matthes  
(Good for basics, syntax, loops, functions, and mini projects)
2. Automate the Boring Stuff with Python – Al Sweigart  
(Excellent for practical programs and job-oriented automation skills)
3. Fluent Python – Luciano Ramalho  
(Advanced understanding of data structures, functions, and Pythonic coding)
4. Introduction to Machine Learning with Python – Andreas C. Müller & Sarah Guido  
(Useful for understanding real-world applications of Python)
5. Python Software Foundation – Official Python Documentation  
Website: <https://docs.python.org/>

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
<b>CO1</b>	3	3	2	3	3	2	1	1	2	3	2	2	2
<b>CO2</b>	3	3	2	3	3	2	1	1	2	3	2	2	2
<b>CO3</b>	3	3	3	3	3	2	1	1	2	3	2	2	2
<b>CO4</b>	3	3	3	3	3	3	1	1	2	3	2	3	3
<b>CO5</b>	3	3	2	3	3	3	1	2	2	3	2	3	3
<b>CO6</b>	3	3	2	3	3	3	2	2	3	3	2	3	3
<b>CO7</b>	3	3	3	3	3	3	2	2	3	3	3	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and understanding**

Strongly mapped with CO1, CO4, CO7 as Practical coding strengthens foundational programming knowledge and real-world application skills.

**PO2: Practical, Professional, and Procedural Knowledge.**

Strongly mapped with CO2, CO3, CO4, CO6, CO7 as Students develop structured programs and mini-projects addressing real-life problems.

**PO3: Entrepreneurial Mindset and Knowledge**

Strongly mapped with CO3, CO4, CO5, CO7 as Debugging, exception handling, and structured programming emphasize validation and optimization.

**PO4: Specialized Skills and Competencies**

Strongly mapped with CO1–CO7 as Every practical requires logical thinking, debugging, and structured design.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with CO4, CO5, CO7 as Exception handling, modular coding, and mini-project validation ensure correctness.

**PO6: Communication Skills and Collaboration.**

Strongly mapped with CO6, CO7 as GUI applications and integrated mini-projects encourage creative and innovative solutions.

**PO7: Research-related Skills**

Moderately mapped with CO7 as Mini-project presentations and viva enhance technical communication.

**PO8: Learning How to Learn Skills.**

Moderately mapped with CO5, CO7 as Responsible handling of inputs, errors, and structured programming builds ethical awareness.

**PO9: Digital and Technological Skills**

Moderately mapped with CO7 as Mini-project development may involve collaboration.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO2–CO7 as Lab exercises simulate real-world software development workflows.

**PO11: Value Inculcation and Environmental Awareness**

Moderately mapped with CO1–CO7 as Hands-on coding strengthens employability and continuous learning skills.

**PO12: Autonomy, Responsibility, and Accountability**

Strongly mapped with CO4, CO7 as Mini-project and debugging tasks involve systematic investigation and experimentation.

**PO13: Community Engagement and Service.**

Strongly mapped with CO7 as Mini-project requires planning, implementation, validation, and presentation similar to real-world project execution.

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc.( Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc.( Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT General (Theory)
<b>Course Code</b>	: BBT-103-GEN
<b>Course Title</b>	: Web Development
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 30

**Course Objectives:**

1. To introduce fundamental concepts of web technologies and Internet architecture.
2. To develop skills in designing static and dynamic web pages using HTML, CSS, and JavaScript.
3. To enable students to implement client-side scripting and interactive web features.
4. To provide knowledge of server-side scripting using PHP and data persistence mechanisms.
5. To develop the ability to design user-centric and goal-oriented web interfaces.
6. To understand HTTP protocol, DNS, and web application workflow.

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

**CO1:** Select appropriate protocols and technologies for web applications.

**CO2:** Apply JavaScript to add dynamic functionality to web pages.

**CO3:** Develop interactive and responsive web pages using HTML and CSS.

**CO4:** Explain the working of web browsers, HTTP/HTTPS, and DNS.

**CO5:** Implement user-centric design techniques for effective web interfaces.

**CO6:** Develop server-side applications using PHP and implement data persistence.

**Topics and Learning Points****Topics/ Contents**

<b>Unit 1</b>	<b>Basics in Web Design</b>	<b>(05L)</b>
	1.1 History and Evolution of the Internet	
	1.2 World Wide Web, URL and Domain	
	1.3 Web Page and Website	
	1.4 Internet Browsers and HTML/CSS Editors	
	1.5 Working of Web Browsers, HTTP, HTTPS and DNS	
<b>Unit 2</b>	<b>Introduction to HTML</b>	<b>(03 L)</b>
	2.1 HTML Structure, Basic Tags, and Tag Types	
	2.2 HTML Formatting, Lists, Tables, and Frames	
	2.3 Hyperlinks, Images, Multimedia, Forms, and Marquee Elements	
<b>Unit 3</b>	<b>Introduction to CSS</b>	<b>(05 L)</b>
	3.1 Introduction to CSS and CSS Properties	
	3.2 Background and Text Styling	
	3.3 CSS ID and Class	
	3.4 CSS Box Model and Navigation Bar	
	3.5 Layout and Website Design	
<b>Unit 4</b>	<b>JavaScript</b>	<b>(05 L)</b>
	4.1 Introduction to JavaScript, Variables and Data Types	
	4.2 Control Structures in JavaScript	
	4.3 JavaScript Objects (Document and Window)	
	4.4 Events and DOM Manipulation	
	4.5 Regular Expressions in JavaScript	
<b>Unit 5</b>	<b>Basics of PHP</b>	<b>(05 L)</b>
	5.1 Introduction and Features of PHP	
	5.2 Object-Oriented Programming in PHP	
	5.3 Variables and Operators in PHP	
	5.4 Flow Control Statements, Loops and Arrays	
	5.5 Embedding PHP in HTML	

**Unit 6 Data and File Handling****(07 L)**

- 6.1 Introduction to PHP Forms
- 6.2 GET and POST Methods in PHP
- 6.3 Form Validation in PHP
- 6.4 Cookies and Sessions in PHP
- 6.5 File Handling in PHP
- 6.6 File Upload and Download in PHP
- 6.7 Directory Handling in PHP

**References:**

1. HTML & CSS: The Complete Reference – Thomas A. Powell
2. Programming PHP – Rasmus Lerdorf & Kevin Tatroe
3. Beginning PHP 5
4. Programming the World Wide Web – Robert W. Sebesta
5. HTML 5 Black Book
6. Bootstrap: Responsive Web Development – Jake Spurlock

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	2	3	2	1	1	1	1	2	2	1	1
CO2	3	3	2	3	3	1	1	1	2	3	2	3	3
CO3	3	3	3	3	3	1	1	1	2	3	2	3	3
CO4	3	2	1	3	2	1	1	1	1	2	2	1	1
CO5	3	3	2	3	3	1	1	2	2	3	2	3	3
CO6	3	3	3	3	3	2	1	2	2	3	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1–CO6 as Students gain foundational knowledge of web technologies and server-side scripting.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO2, CO3, CO6 as Students design interactive and data-driven web applications.

**PO3: Entrepreneurial Mindset and Knowledge**

Strongly mapped with CO2, CO3, CO6 as JavaScript and PHP implementation builds development competency.

**PO4: Specialized Skills and Competencies**

Strongly mapped with CO1–CO6 as Students understand how protocols and scripting integrate within web systems.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with CO2–CO6 as Validation techniques and file handling improve debugging and verification skills.

**PO6: Communication Skills and Collaboration**

Moderately mapped with CO2 and CO6 as Dynamic web applications and server-side scripting support innovation.

**PO8: Learning How to Learn Skills**

Moderately mapped with CO6 as Sessions, cookies, and form validation introduce secure coding awareness.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO2–CO6 as Web development is a core employability skill in IT and blockchain ecosystems.

**PO13: Community Engagement and Service**

Strongly mapped with CO3 and CO6 as Server-side scripting and data persistence simulate real-world deployment.

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc.( Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc.( Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT General (Practical)
<b>Course Code</b>	: BBT-104-GEN
<b>Course Title</b>	: Web Development Laboratory
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 60

**Course Objectives:**

1. To understand the fundamentals of web development technologies including HTML, CSS, and JavaScript.
2. To build dynamic and responsive web applications.
3. To implement client-side and server-side scripting techniques.
4. To integrate web frameworks and REST APIs in applications.
5. To deploy and host web applications on live servers.

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

**CO1:** Develop static and dynamic web pages using HTML, CSS, and JavaScript.

**CO2:** Implement form validation and DOM manipulation techniques.

**CO3:** Create server-side applications using Node.js or PHP.

**CO4:** Use REST APIs for frontend-backend data exchange.

**CO5:** Deploy and host websites on web servers and cloud platforms.

## Topics and Learning Points

### Program List / Practical Exercises

Sr. No.	Title of Assignment
1	Create a simple HTML webpage using basic tags such as headings, paragraphs, lists, images and hyperlinks.
2	Design a personal profile webpage using HTML including information like name, education, hobbies and contact details.
3	Create a webpage demonstrating HTML lists, tables and images.
4	Design a webpage using HTML forms with different input controls such as textbox, radio button, checkbox, dropdown and submit button.
5	Create a personal portfolio website using HTML5 and CSS3 including sections: Home, About, Skills and Contact.
6	Design a static website for a Blockchain Startup Company including company introduction, services, team section and contact form using CSS styling.
7	Create a multi-page website (minimum 3 pages) with navigation bar and footer and apply basic responsive design using media queries.
8	Create a landing page for a Web3 product using Bootstrap framework.
9	Develop a registration form with JavaScript validation (name required, valid email, password minimum 8 characters, confirm password match).
10	Create a dynamic webpage using JavaScript DOM manipulation that changes content when a button is clicked.
11	Design a login page with client-side validation and display a success message after correct validation.
12	Create a webpage that fetches data from a public REST API and displays the data dynamically.
13	Develop a simple Node.js and Express.js application that displays a homepage and handles routing for About and Contact pages.
14	Create a PHP backend (using XAMPP) to handle form submission and store data.
15	Mini Project: Develop a complete full-stack Blockchain Event Registration System with frontend (HTML, CSS, JavaScript) and backend (Node.js or PHP) including form submission, data storage and deployment.

**References:**

1. HTML & CSS: The Complete Reference – Thomas A. Powell
2. Programming PHP – Rasmus Lerdorf & Kevin Tatroe
3. Beginning PHP 5
4. Programming the World Wide Web – Robert W. Sebesta
5. HTML 5 Black Book
6. Bootstrap: Responsive Web Development – Jake Spurloc

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	3	2	3	3	1	1	1	1	3	2	3	3
CO2	3	3	2	3	3	1	1	1	2	3	2	3	3
CO3	3	3	3	3	3	2	1	1	2	3	2	3	3
CO4	3	3	3	3	3	2	1	1	2	3	2	3	3
CO5	3	2	2	3	3	2	1	2	2	3	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1–CO5 as Students gain practical knowledge of frontend, backend, and deployment technologies.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO1–CO4 as Designing dynamic websites and backend logic enhances analytical and problem-solving skills.

**PO3: Entrepreneurial Mindset and Knowledge**

Strongly mapped with CO3 and CO4 as CRUD applications and full-stack projects build real-world development competency.

**PO4: Specialized Skills and Competencies**

Strongly mapped with CO1–CO5 as Students analyze UI logic, backend integration, and API responses.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with CO3–CO5 as Testing validation, API integration, and deployment ensures correctness.

**PO6: Communication Skills and Collaboration**

Moderately mapped with CO3 and CO4 as Integration of APIs and full-stack projects encourages innovation.

**PO8: Learning How to Learn Skills**

Moderately mapped with CO5 as Deployment and hosting practices introduce secure web development concepts.

**PO9: Digital and Technological Skills**

Moderately mapped with CO4 and CO5 as Mini projects enhance collaboration and documentation skills.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO1–CO5 as Web development skills are highly demanded in industry and startup ecosystems.

**PO13: Community Engagement and Service**

Strongly mapped with CO3–CO5. As Hosting and full-stack integration simulate real-world deployment scenarios.

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc.( Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc.( Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT General (Theory)
<b>Course Code</b>	: BBT-105-GEN
<b>Course Title</b>	: Fundamentals of Blockchain
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 30

**Course Objectives:**

1. To introduce students to the fundamental concepts of Blockchain technology.
2. To explain the working principles of decentralized and distributed systems
3. To develop understanding of cryptographic foundations used in blockchain
4. To familiarize students with blockchain transaction lifecycle and ecosystem.
5. To understand the concept of smart contracts and their role in Blockchain applications.
6. To explore various blockchain types and their industrial applications.
7. To compare blockchain systems with traditional database systems.

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

**CO1:** Define blockchain technology and explain its key features and principles.

**CO2:** Differentiate between various types of blockchain networks and their use cases

**CO3:** Understand and explain the fundamental concepts of cryptography used in blockchain.

**CO4:** Analyse the structure and lifecycle of blockchain transactions.

**CO5:** Evaluate the benefits and challenges of implementing blockchain in various industries.

**CO6:** Compare blockchain technology with traditional database systems.

**CO7:** Understand the role of nodes, consensus mechanisms, and distributed networks in blockchain systems.

## Topics and Learning Points

Topic/Content	Teaching Hours
<b>Unit 1: Introduction to Blockchain</b> <ul style="list-style-type: none"> <li>1.1 Definition of Blockchain Ecosystem Structure and Functions</li> <li>1.2 History and Evolution of Blockchain</li> <li>1.3 Key Features: Decentralization, Immutability, Transparency</li> <li>1.4 Distributed Ledger Technology (DLT)</li> <li>1.5 Blockchain vs. Traditional Databases</li> </ul>	<b>(05 L)</b>
<b>Unit 2: Basics of Blockchain Network</b> <ul style="list-style-type: none"> <li>2.1. Peer-to-Peer (P2P) Network</li> <li>2.2. Centralized vs Decentralized vs Distributed Network</li> <li>2.3. Nodes (Peers) and Types of Nodes</li> <li>2.4. Role of Nodes in Blockchain</li> <li>2.5. Introduction to Consensus Mechanisms</li> </ul>	<b>(05 L)</b>
<b>Unit 3: Types of Blockchain</b> <ul style="list-style-type: none"> <li>3.1. Benefits of Using Blockchain Technology, Causes and Effects of Pollution</li> <li>3.2. Evolution of Blockchain after Bitcoin</li> <li>3.3. Types of Blockchains: Public, Private, Consortium, Hybrid</li> <li>3.4. Use Cases of Public Blockchain</li> <li>3.5. Use Cases of Private, Consortium, and Hybrid Blockchain</li> </ul>	<b>(05 L)</b>
<b>Unit 4: Transaction Ecosystem in Blockchain</b> <ul style="list-style-type: none"> <li>4.1. Wallet and Types of Wallets (Hot &amp; Cold Wallets)</li> <li>4.2. Public Key and Private Key</li> <li>4.3. Digital Signatures in Blockchain</li> <li>4.4. Hash Functions and Their Role</li> <li>4.5. Basic Cryptography Concepts in Blockchain</li> </ul>	<b>(05 L)</b>
<b>Unit 5: Blockchain Transactions</b> <ul style="list-style-type: none"> <li>5.1. Nonce and Its Role</li> <li>5.2. Merkle Tree and Merkle Root</li> <li>5.3. UTXO (Unspent Transaction Output) Model and Account-Based Model</li> <li>5.4. Transaction Structure and Lifecycle</li> <li>5.5. Previous Hash Concept and Block Linking</li> </ul>	<b>(05 L)</b>

**Unit 6: Blockchain Use Cases and Applications****(05 L)**

- 6.1. Differences in Use Cases Across Platforms, Objectives and Importance of EIA
- 6.2. Blockchain in Finance (Cryptocurrencies, Cross-Border Payments)
- 6.3. Supply Chain Management and Healthcare Applications
- 6.4. Government and Voting Systems
- 6.5. Blockchain Adoption Challenges and Opportunities and Case Studies of Real-World Implementations

**References:**

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps – Daniel Drescher
2. Mastering Bitcoin: Programming the Open Blockchain – Andreas M. Antonopoulos
3. Blockchain: Blueprint for a New Economy – Melanie Swan
4. The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology – William Mougayar
5. Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World – Don Tapscott and Alex Tapscott
6. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions – Joseph J. Bambara and Paul R. Allen
7. Crypto assets: The Innovative Investor's Guide to Bitcoin and Beyond – Chris Bernasek and Jack Tatar

**Programme Outcomes and Course Outcomes Mapping:**

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	3	2	2	1	1	1	2	2	1	1
CO2	3	2	1	3	2	2	1	1	1	2	2	1	1
CO3	3	2	3	3	3	2	1	1	1	3	2	3	2
CO4	3	2	3	3	3	2	1	1	1	3	2	3	2
CO5	3	3	2	3	3	3	1	2	1	3	2	2	3
CO6	3	2	2	3	3	2	1	1	1	3	2	2	2
CO7	3	3	3	3	3	2	1	1	1	3	2	3	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1–CO10 as the course builds foundational knowledge of blockchain architecture, distributed systems, cryptographic principles, transaction lifecycle, and real-world applications, forming the core theoretical base for advanced blockchain subjects.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO2, CO4, CO5, CO7, CO10 as Understanding blockchain types, transaction models, nodes, and industry applications enables students to conceptualize real-world blockchain-based solutions.

**PO3: Entrepreneurial Mindset and Knowledge**

Strongly mapped with CO3, CO4, CO7, CO8, CO9 as Cryptography, transaction validation, Merkle trees, and distributed verification mechanisms introduce validation, integrity checking, and performance awareness concepts.

**PO4: Specialized Skills and Competencies**

Strongly mapped with CO1–CO10 as Students analyse decentralized systems, compare blockchain with traditional databases, and evaluate industry use cases, strengthening analytical and decision-making abilities.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with CO3, CO4, CO5, CO7, CO8, CO9, CO10 as Concepts like hashing, digital signatures, Merkle root verification, and transaction lifecycle emphasize correctness, security validation, and solution evaluation.

**PO6: Communication Skills and Collaboration**

Strongly mapped with CO5, CO10 as Exploration of blockchain adoption challenges, opportunities, and cross-industry applications encourages innovation and entrepreneurial thinking.

**PO7: Research-related Skills**

Moderately mapped with CO10 as Case study discussions and critical assessment of blockchain implementations enhance technical articulation and explanation skills.

**PO8: Learning How to Learn Skills:**

Moderately mapped with CO5, CO8, CO10 as Topics like wallet security, key management, regulatory implications, and blockchain governance promote ethical and responsible technology use.

**PO9: Digital and Technological Skills**

Weakly mapped with CO10 as Although primarily theoretical, discussions and collaborative analysis of case studies promote basic collaborative learning.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO2–CO10 as the course covers transaction structure, cryptographic validation, blockchain types, and real-world deployments, directly supporting industry-level understanding.

**PO11: Value Inculcation and Environmental Awareness**

Moderately mapped with CO1–CO10 as Foundational blockchain knowledge prepares students for advanced subjects like DeFi, Smart Contracts, Hyperledger, and Security in higher semesters.

**PO12: Autonomy, Responsibility, and Accountability**

Strongly mapped with CO3, CO4, CO7, CO8, CO9, CO10 as Investigation of consensus, cryptographic integrity, transaction validation, and distributed ledger mechanisms builds research-oriented thinking.

**PO13: Community Engagement and Service:**

Strongly mapped with CO5, CO10 as Understanding adoption challenges, industry case studies, and blockchain ecosystem structure introduces planning and deployment perspectives.

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc. (Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc. (Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT General (Practical)
<b>Course Code</b>	: BBT-106-GEN
<b>Course Title</b>	: Basics of Solidity language Laboratory
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 60

**Course Objectives:**

1. To introduce Ethereum blockchain and smart contract concepts.
2. To understand Solidity programming syntax and structure.
3. To implement functions, modifiers, inheritance, and events.
4. To deploy and test smart contracts using Remix IDE and testnets.
5. To develop decentralized applications (basic level).
6. To understand the security aspects and best practices in smart contract development.
7. To explore real-world applications of Ethereum and decentralized applications (DApps)

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

- CO1.** Develop simple smart contracts using Solidity.
- CO2.** Apply programming constructs, storage types, arrays, and mappings.
- CO3.** Implement modifiers, inheritance, visibility controls, and events.
- CO4.** Handle payable functions, Ether transactions, and error handling.
- CO5.** Deploy and test smart contracts using Remix IDE, MetaMask, and testnets.
- CO6.** Design and implement basic decentralized applications (Voting, To-Do List).
- CO7.** Analyze smart contract security practices and optimize contract performance for efficient blockchain applications.

### Topics and Learning Points

Sr. No.	Title of Practical
<b>Practical-1</b>	Write a program to create and deploy a “Hello Blockchain” smart contract that stores and returns a welcome message.
<b>Practical-2</b>	Write a smart contract using Solidity that demonstrates the use of variables (state/local), functions (pure/view), and data types (uint, string, bool).
<b>Practical-3</b>	Write a smart contract that implements conditionals (if, else) and loops (for, while) to perform basic logic (e.g., calculate sum or filter even numbers).
<b>Practical-4</b>	Write a program to store and retrieve values using dynamic arrays and mappings in Solidity.
<b>Practical-5</b>	Write a smart contract using visibility modifiers (public, private, internal, external) and function modifiers to restrict access or validate conditions.
<b>Practical-6</b>	Write a program to create a base contract and an inherited contract in Solidity that extends its functionality.
<b>Practical-7</b>	Write a smart contract that emits an event whenever a blockchain state is changed (e.g., when data is stored or updated).
<b>Practical-8</b>	Write a smart contract with a payable function to accept Ether and a function to check or withdraw the balance.
<b>Practical-9</b>	Write a smart contract that uses require, assert, and revert for validating inputs and handling errors.
<b>Practical-10</b>	Write a program to deploy a simple Solidity smart contract to a testnet (e.g., Goerli) using MetaMask and Remix or Hardhat.
<b>Practical-11</b>	Write a Solidity program to create a basic voting smart contract where users can vote and view results.
<b>Practical-12</b>	Write and deploy a decentralized to-do list smart contract where users can: <ul style="list-style-type: none"> <li>• Add tasks</li> <li>• Mark tasks as complete</li> <li>• View the list of tasks</li> </ul>
<b>Practical-13</b>	Write a smart contract in Solidity to demonstrate the use of structures (struct) for storing complex data such as student details and retrieve the stored information.
<b>Practical-14</b>	Write a smart contract that creates and interacts with multiple contracts, where one contract calls the function of another contract to exchange data.
<b>Practical-15</b>	Write a Solidity program to implement a simple token system, where users can transfer tokens between accounts and check their token balance.

**References:**

1. Introducing Ethereum and Solidity – Chris Dannen
2. Ethereum Smart Contract Development in Solidity – Mayukh Mukhopadhyay
3. Solidity Programming Essentials – Ritesh Modi
4. Building Ethereum DApps – Roberto Infante
5. Learn Ethereum – Xun (Brian) Wu, Zhihong Zou
6. Hands-On Smart Contract Development with Solidity and Ethereum – Kevin Solorio, Randall Kanna, David H. Hoover

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	2	2	3	2	1	1	1	2	1	2	1
CO2	3	3	3	3	3	2	1	1	1	3	2	3	2
CO3	3	3	3	3	3	2	1	1	1	3	2	3	2
CO4	3	3	3	3	3	3	1	1	1	3	2	3	2
CO5	3	3	3	3	3	3	1	1	1	3	3	3	1
CO6	3	3	3	3	3	3	2	2	2	3	3	3	3

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1, CO2, CO3, CO4, CO5, CO6 (3 level) as All course outcomes contribute significantly to blockchain knowledge, Solidity programming, and decentralized application development.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO2, CO3, CO4, CO5, CO6 (3 level) and moderately mapped with CO1 (2 level) as Logical constructs, conditionals, validation, and DApp design enhance analytical and problem-solving skills.

**PO3: Entrepreneurial Mindset and Knowledge**

Strongly mapped with CO2, CO3, CO4, CO5, CO6 (3 level) and moderately mapped with CO1 (2 level). As Students develop smart contracts and mini-projects demonstrating structured solution development.

**PO4: Specialized Skills and Competencies**

Strongly mapped with CO2–CO6 (3 level) and moderately mapped with CO1 (2 level) as testing, debugging, and validation in Remix strengthens investigative capability.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with all COs (3 level) as students use Remix, MetaMask, and testnets for contract deployment and interaction.

**PO6: Communication Skills and Collaboration**

Strongly mapped with CO4, CO5, CO6 (3 level) and moderately mapped with CO1–CO3 (2 level) as error handling, validation, and Ether transaction management promote secure coding practices.

**PO7: Research-related Skills**

Low mapping with CO1–CO5 (1 level), Moderately mapped with CO6 (2 level) as introduction to blockchain networks builds basic ecosystem awareness.

**PO8: Learning How to Learn Skills**

Low mapping with CO1–CO5 (1 level), Moderately mapped with CO6 (2 level) as Mini-project development promotes collaboration and independent execution.

**PO9: Digital and Technological Skills**

Low mapping with CO1–CO5 (1 level), Moderately mapped with CO6 (2 level) as students explain smart contract logic during evaluation and documentation.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO2–CO6 (3 level), Moderately mapped with CO1 (2 level) as structured smart contract development and deployment reflect project execution stages.

**PO11: Value Inculcation and Environmental Awareness**

Strongly mapped with CO5, CO6 (3 level), Moderately mapped with CO2, CO3, CO4 (2 level), Low mapping with CO1 (1 level) as deployment and DApp development ensure practical technological proficiency.

**PO12: Autonomy, Responsibility, and Accountability**

Moderately mapped with CO1 (2 level), Strongly mapped with CO2 to CO7 (level3) as deployment and DApp development ensure practical technological proficiency.

**PO13: Community Engagement and Service**

Low mapping with CO1 and CO5 (1 level), Moderately mapped with CO2, CO3, CO4 (2 level), Strongly mapped with CO6 (3 level) as Mini-project DApps (Voting, To-Do) encourage innovative thinking and blockchain startup mindset.

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc.( Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc.( Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT General (Theory)
<b>Course Code</b>	: BBT-107-GEN
<b>Course Title</b>	: Introduction to Data Science for Business
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 30

**Course Objectives:**

1. To introduce the concepts, lifecycle, and workflow of data science projects.
2. To develop skills in data collection, cleaning, and preprocessing using modern tools.
3. To apply statistical methods for data analysis and interpretation.
4. To develop data visualization skills for effective communication of insights.
5. To introduce basic machine learning techniques for prediction and classification.
6. To promote collaborative problem-solving using data-driven decision-making approaches.

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

- CO1:** Understand the process and workflow of a data science project.
- CO2:** Collect, clean, and prepare data for analysis.
- CO3:** Apply descriptive and inferential statistics to datasets.
- CO4:** Visualize data effectively to find patterns and trends.
- CO5:** Use basic machine learning models for prediction and classification.
- CO6:** Work in teams to solve problems using data-driven decision making.

## Topics and Learning Points

Topic/Content	Teaching Hours
<b>Unit 1: Introduction to Data Science</b>	<b>(07 L)</b>
1.1 Definition and Evolution of Data Science	
1.2 Components of Data Science Lifecycle	
1.3 Roles and Responsibilities of a Data Scientist	
1.4 Applications of Data Science	
1.5 Introduction to Data Science Tools	
<b>Unit 2: Data Collection and Cleaning</b>	<b>(03 L)</b>
2.1 Types of Data Sources	
2.2 Structured vs Unstructured Data	
2.3 Data Cleaning Techniques	
2.4 Data Wrangling using Python	
<b>Unit 3: Exploratory Data Analysis and Visualization</b>	<b>(06 L)</b>
3.1 Descriptive Statistics	
3.2 Understanding Data Distribution	
3.3 Data Relationships and Correlation	
3.4 Data Visualization Techniques	
3.5 Visualization Tools	
3.6 Introduction to Dashboards and Data Storytelling	
<b>Unit 4: Statistical Techniques in Data Science</b>	<b>(05 L)</b>
4.1 Probability and Probability Distributions	
4.2 Hypothesis Testing	
4.3 Confidence Intervals and Margin of Error	
4.4 Correlation Analysis	
4.5 Simple Linear Regression	
4.6 Applications using Python	
<b>Unit 5: Introduction to Machine Learning</b>	<b>(05 L)</b>
5.1 Introduction to Machine Learning	
5.2 Linear Regression Algorithm	
5.3 Logistic Regression Algorithm	
5.4 K-Means Clustering	
5.5 Model Training and Testing	
5.6 Model Evaluation Metrics	

5.7 Implementation using Scikit-Learn

**Unit 6: Case Studies and Mini Project**

**(04 L)**

6.1 Case Study in Healthcare

6.2 Case Study in Finance

6.3 Case Study in Marketing

6.4 Case Study in Blockchain

6.5 Mini Project

6.6 Team Collaboration and Data-Driven Decision Making

**References:**

1. Python for Data Analysis – Wes McKinney
2. Data Science from Scratch – Joel Grus
3. Hands-On Machine Learning with Scikit-Learn and TensorFlow – Aurélien Géron
4. Doing Data Science – Cathy O'Neil & Rachel Schutt

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	3	2	1	1	1	1	2	2	1	1
CO2	3	3	2	3	3	2	1	1	2	3	2	3	2
CO3	3	3	3	3	3	2	1	1	2	3	2	3	2
CO4	3	3	2	3	3	2	1	1	2	3	2	3	2
CO5	3	3	3	3	3	2	1	1	2	3	2	3	3
CO6	3	2	2	3	2	1	1	2	3	3	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1–CO6 as Students gain foundational knowledge of data science, statistics, and machine learning concepts.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO2, CO3, CO4, CO5 as Data cleaning, analysis, and modeling enhance structured problem-solving skills.

**PO3: Entrepreneurial Mindset and Knowledge**

Strongly mapped with CO3 and CO5 as Implementation of machine learning algorithms strengthens application-oriented learning.

**PO4: Specialized Skills and Competencies**

Strongly mapped with all COs as Statistical analysis and model evaluation promote critical and analytical thinking.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strongly mapped with CO3–CO5 as Model accuracy and hypothesis testing build validation capability.

**PO6: Communication Skills and Collaboration**

Moderately mapped with CO5 as Introduction to machine learning fosters innovation mindset.

**PO8: Learning How to Learn Skills**

Moderately mapped with CO6 as team projects and data-driven decisions promote responsible data usage.

**PO9: Digital and Technological Skills**

Strongly mapped with CO6 as Mini project and presentations enhance collaboration and communication skills.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strongly mapped with CO2–CO6 as Data science skills are highly demanded in analytics, fintech, and blockchain sectors.

**PO13: Community Engagement and Service**

Moderately mapped with CO5 and CO6 as understanding real-world datasets and decision-making prepares students for industry scenarios.

**CBCS Syllabus as per NEP 2020 for First Year B.Sc. (Blockchain Technology) (2024 Pattern)**

<b>Name of the Programme</b>	: B.Sc.( Blockchain Technology)
<b>Programme Code</b>	: USBT
<b>Class</b>	: First Year B.Sc.( Blockchain Technology)
<b>Semester</b>	: I
<b>Course Type</b>	: BBT General (Practical)
<b>Course Code</b>	: BBT -108-SEC
<b>Course Title</b>	: Office Automation & Productivity Tools
<b>No. of Credits</b>	: 02
<b>No. of Teaching Hours</b>	: 60

**Course Objectives:**

1. To introduce students to modern office automation tools.
2. To develop professional documentation and presentation skills.
3. To enable students to analyze data using spreadsheet tools.
4. To improve communication and collaboration skills.
5. To prepare students for corporate and startup work environments.
6. To enhance digital productivity and workplace efficiency.

**Course Outcomes:**

**After successful completion of this course, students will be able to:**

- CO1:** Create professional documents using word processing tools.
- CO2:** Perform data analysis using spreadsheet functions and formulas.
- CO3:** Design effective presentations using presentation software.
- CO4:** Use collaborative tools for teamwork and communication.
- CO5:** Apply productivity tools for academic and business tasks.
- CO6:** Demonstrate digital professionalism in workplace documentation.

## Topics and Learning Points

### Topic/Content

### Teaching Hours

#### Unit 1: Introduction to Office Automation

(06 L)

- 1.1. Concept of Office Automation
- 1.2. Importance of Digital Productivity
- 1.3. Types of Office Tools
- 1.4. Overview of: Microsoft Office, Google Workspace and LibreOffice
- 1.5. File Management Basics
- 1.6. Cloud Storage Concepts
- 1.7. Introduction to Artificial Intelligence in Productivity
- 1.8. Introduction to AI Assistants: ChatGPT, Microsoft Copilot & Google Gemini\
- 1.9. Ethical Use of AI in Academic & Corporate Work

#### Unit 2: Word Processing Tools

(07 L)

- 2.1. Creating and Formatting Documents
- 2.2. Text Formatting (Font, Paragraph, Alignment)
- 2.3. Page Layout and Margins
- 2.4. Headers, Footers, Page Numbers
- 2.5. Tables and Images
- 2.6. Mail Merge
- 2.7. Creating Professional Reports & Resume
- 2.8. Tools: Microsoft Word and Google Docs
- 2.9. AI-based Content Generation & Summarization

#### Unit 3: Spreadsheet Tools

(07 L)

- 3.1. Introduction to Spreadsheets
- 3.2. Rows, Columns, Cells
- 3.3. Basic Formulas and Functions (SUM, AVERAGE, COUNT, IF)
- 3.4. Sorting and Filtering Data
- 3.5. Charts and Graphs
- 3.6. Data Validation & Basic Financial Calculations Tools: Microsoft Excel and Google Sheets
- 3.7. Automated Data Insights
- 3.8. Financial Calculations & Budget Planning

**Unit 4: Presentation Tools****(05 L)**

- 4.1. Creating Slides
- 4.2. Slide Layout and Design
- 4.3. Themes and Templates
- 4.4. Adding Images, Charts, Animations
- 4.5. Creating Academic & Business Presentations Tools: Microsoft PowerPoint and Google Slides
- 4.6. Professional Email Writing using AI
- 4.7. AI-based Meeting Summaries

**Unit 5: Collaboration & Productivity Tools****(05 L)**

- 5.1. Email Communication Basics
- 5.2. Professional Email Writing
- 5.3. Cloud Collaboration
- 5.4. File Sharing and Permissions
- 5.5. Online Meeting Tools: Zoom and Microsoft Teams
- 5.6. Introduction to Digital Note-taking Tools
- 5.7. Data Security & Digital Etiquette
- 5.8. Workflow Automation Basics
- 5.9. Prompt Writing Basics (Introduction to Prompt Engineering)
- 5.10. AI Bias, Privacy & Data Security
- 5.11. AI in Corporate Productivity & Future Trends

**References:**

1. Microsoft Official Training Materials
2. Google Workspace Learning Center
3. LibreOffice Documentation
4. Business Communication – Meenakshi Raman

**Programme Outcomes and Course Outcomes Mapping:**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	3	2	2	3	2	2	2	2	1	1
CO2	3	3	2	3	3	2	2	2	2	3	2	2	2
CO3	3	3	2	3	3	3	3	2	2	3	2	2	2
CO4	3	3	3	3	3	3	3	3	3	3	2	3	2
CO5	3	3	2	3	3	3	3	3	2	3	2	3	2
CO6	3	3	2	3	3	3	3	3	3	3	3	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

**Justification of CO-PO Mapping:****PO1: Comprehensive Knowledge and Understanding**

Strongly mapped with CO1–CO6 as students gain digital productivity and AI integration skills.

**PO2: Practical, Professional, and Procedural Knowledge**

Strongly mapped with CO2–CO6 as Use of AI tools for solving academic and business problems.

**PO3: Entrepreneurial Mindset and Knowledge**

Strong mapping with CO2–CO5 as data validation, automation, and structured documentation.

**PO4: Specialized Skills and Competencies**

Strong mapping with CO1–CO6 as AI-assisted data analysis and decision-making.

**PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning**

Strong mapping with CO2–CO5 as evaluating AI outputs, validating spreadsheets and reports.

**PO6: Communication Skills and Collaboration**

Strong mapping with CO3–CO6 as for Application of AI tools like: ChatGPT, Microsoft Copilot and Google Gemini

**PO7: Research-related Skills**

Strong mapping with CO1, CO3, CO4 as Professional documentation and AI-assisted communication.

**PO8: Learning How to Learn Skills**

Strong mapping with CO5 as responsible and ethical use of AI tools.

**PO9: Digital and Technological Skills**

Moderate mapping with CO4, CO6 as Cloud collaboration and shared documents.

**PO10: Multicultural Competence, Inclusive Spirit, and Empathy**

Strong mapping with CO2–CO6 as Corporate digital workflow readiness.

**PO11: Value Inculcation and Environmental Awareness**

Strong mapping with CO6 as Career readiness in AI-driven workplace.

**PO12: Autonomy, Responsibility, and Accountability**

Moderate mapping with CO4, CO5 as AI-assisted research and data exploration.

**PO13: Community Engagement and Service**

Strong mapping with CO6 as Documentation, presentations, and workflow automation.