Programme: Bachelor of Science
Specialization: Information Technology

Sr no.	Programme Outcome
PO1.	**Scientific knowledge:** Apply the knowledge of mathematics, science, and computing to the solution of complex scientific problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and applied sciences.
PO3	**Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tools usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.
PO6	**The software engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional practice.
PO7	**Environment and sustainability:** Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex activities with the scientific community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management:** Demonstrate knowledge understanding of the scientific and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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Program Specific Outcomes

Programme	Programme Specific Outcomes
B.Sc. Information Technology	A graduate with a B.Sc. in Information Technology will have the ability to **PSO1.** Demonstrate mastery of Information Technology in the following core knowledge areas: • Data Structures and Programming Languages • Databases, Software Engineering and Development, Software Quality Assurance. • Blockchain Technology, Artificial Intelligence, Computer Security • Computer Hardware and Architecture, Networking, Linux Administration **PSO2.** Apply problem-solving skills and the knowledge of information technology and computing fundamentals to solve real world problems. **PSO3.** Develop technical project reports and present them orally

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Programme: B.Sc. (Information Technology)

Under Choice Based Credit System

Programme Structure

(To be implemented from Academic Year- 2019-2020)

F.Y.B.Sc. (Information Technology)

Semester - I				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	19UBIT101	Introduction to Information Technology	Core Course	3
2	19UBIT102	Digital Electronics	Core Course	3
3	19UBIT103	Introduction to Programming	Skill Enhancement Course	3
4	19UBIT104	Discrete Mathematics	Allied Course	3
5	19UBIT105	Communication Skills	Language	3
6	19UBIT106	Introduction to Information Technology Practical	Core Course Practical	2
7	19UBIT107	Digital Electronics Practical	Core Course Practical	2
8	19UBIT108	Introduction to Programming Practical	Skill Enhancement Course Practical	2
9	19UBIT109	Discrete Mathematics Practical	Allied Course Practical	2
10	19UBIT110	Foundation Course	Ability Enhancement Compulsory Course	2
Total				25

Semester - II				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	19UBIT201	Object oriented Programming	Core Course	3
2	19UBIT202	Database management Systems	Core Course	3
3	19UBIT203	Web Programming	Skill Enhancement Course	3
4	19UBIT204	Computer Networks	Skill Enhancement Course	3
5	19UBIT205	Numerical and Statistical Methods	Allied Course	3
6	19UBIT206	Object Oriented Programming Practical	Core Course Practical	2
7	19UBIT207	Database management Systems Practical	Core Course Practical	2
8	19UBIT208	Web Programming Practical	Skill Enhancement Course Practical	2
9	19UBIT209	Computer Networks Practical	Skill Enhancement Course Practical	2
10	19UBIT210	Environmental Studies	Ability Enhancement Course	2
Total				25

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Programme Structure

(To be implemented from Academic Year- 2020-2021)

S.Y.B.Sc. (Information Technology)

Semester – 3				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20UBIT301	Blockchain Technology	General Elective	2
2	20UBIT302	Microprocessor Architecture	Core Course	2
3	20UBIT303	Python Programming	Core Course	2
4	20UBIT304	Core Java	Discipline Specific Elective 1	2
	20UBIT305	C#	Discipline Specific Elective 1	
5	20UBIT306	Data Structure	Core Course	2
6	20UBIT307	Blockchain Technology Practical	General Elective Practical	2
7	20UBIT308	Microprocessor Architecture Practical	Core Course Practical	2
8	20UBIT309	Python Programming Practical	Core Course Practical	2
9	20UBIT310	Core Java Practical	Discipline Specific Elective 1 Practical	2
	20UBIT311	C# Practical	Discipline Specific Elective 1 Practical	
10	20UBIT312	Data Structure Practical	Core Course Practical	2
Total				**20**

Semester – 4				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20UBIT401	Artificial Intelligence	Core Course	2
2	20UBIT402	Operating System	Core Course	2
3	20UBIT403	Embedded Systems	Core Course	2
4	20UBIT404	Enterprise Java	Discipline Specific Elective 2	2
	20UBIT405	.Net Technology	Discipline Specific Elective 2	
5	20UBIT406	Operation Research	General Elective Course	2
6	20UBIT407	Artificial Intelligence Practical	Core Course Practical	2
7	20UBIT408	Operating System Practical	Core Course Practical	2
8	20UBIT409	Embedded Systems Practical	Core Course Practical	2
9	20UBIT410	Enterprise Java Practical	Discipline Specific Elective 2 Practical	2
	20UBIT411	.Net Technologies	Discipline Specific Elective 2 Practical	
10	20UBIT412	Operation Research Practical	General Elective Practical	2
Total				**20**

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Programme Structure

(To be implemented from Academic Year- 2021-2022)

T.Y.B.Sc. (Information Technology)

Semester – 5				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBIT501	Software Engineering & Project Management	General Elective	2
2	21UBIT502	Cryptography & Network Security	Core Course	2
3	21UBIT503	Internet of Things	Core Course	2
4	21UBIT504	Spring	Discipline Specific Elective 1	2
	21UBIT505	ASP.Net Core	Discipline Specific Elective 1	
5	21UBIT506	Project	Core Course	4
6	21UBIT507	SEPM Practical	General Elective Practical	2
7	21UBIT508	Cryptography & Network Security Practical	Core Course Practical	2
8	21UBIT509	Internet of Things Practical	Core Course Practical	2
9	21UBIT510	Spring Practical	Discipline Specific Elective 1 Practical	2
	21UBIT511	ASP.Net Core Practical	Discipline Specific Elective 1 Practical	
Total				**20**

Semester – 6				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBIT601	Geographic Information System	Core Course	2
2	21UBIT602	Software Testing	Core Course	2
3	21UBIT603	User Experience & User Design	Discipline Specific Elective 1	2
	21UBIT604	Steganography and Digital Watermarking	Discipline Specific Elective 1	
4	21UBIT605	Linux	Discipline Specific Elective 2	2
	21UBIT606	Android	Discipline Specific Elective 2	
5	21UBIT607	Project	Core Course	4
6	21UBIT608	Geographic Information System Practical	Core Course Practical	2
7	21UBIT609	Software Testing Practical	Core Course Practical	2
8	21UBIT610	User Experience & User Design Practical	Discipline Specific Elective 1 Practical	2
9	21UBIT611	Steganography and Digital Watermarking Practical	Discipline Specific Elective 1 Practical	
	21UBIT612	Linux Practical	Discipline Specific Elective 2 Practical	2

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10	21UBIT613	Android Practical	Discipline Specific Elective 2 Practical	
Total				**20**

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SEMESTER I

B. Sc (Information Technology)		Semester – I	
Course Name: Introduction to Information Technology		Course Code: 19UBIT101	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – I	
Course Name: Introduction to Information Technology Practical		Course Code: 19UBIT106	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

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Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Recall the fundamentals of information technology, including the Internet, the Web, Software and Hardware & to identify security and privacy threats in digital environment	Remembering & Understanding	1,2
2	Demonstrate that they can use digital technology in research, analysis, and critical inquiry	Applying	3
3	Apply a variety of information technologies to their own work, demonstrating their competence in researching, creating, and presenting projects using a variety of digital information tools	Analyzing	4

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B. Sc (Information Technology)		Semester – I	
Course Name: Digital Electronics		Course Code: 19UBIT102	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – I	
Course Name: Digital Electronics Practical		Course Code: 19UBIT107	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the structure of various number systems and its application in digital design	Remembering & Understanding	1,2
2	Apply digital logic it to solve real life problems.	Applying	3
3	Analyse, design and implement digital electronic circuits, combinational logic circuits, sequential circuits, multiplexers and demultiplexers & Construct digital circuits using various types of gates	Analyzing	4

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Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – I	
Course Name: Discrete Mathematics Practical		Course Code: 19UBIT109	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Remember and Utilize the algebraic techniques effectively to analyse basic discrete structures and algorithms & Interpret whether the given arguments are valid or invalid logically and mathematically	Remembering & Understanding	1, 2

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B. Sc (Information Technology)		Semester – I	
Course Name: Professional Communication Skills		Course Code: 19UBIT105	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks

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B. Sc (Information Technology)		Semester – I	
Course Name: Introduction to Programming Practical		Course Code: 19UBIT108	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

B. Sc (Information Technology)		Semester – I	
Course Name: Introduction to Programming		Course Code: 19UBIT103	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Recall and Understand the concept of algorithms based on which they can draw flowcharts for solving Mathematical and Engineering problems.	Remembering & Understanding	1, 2
2	Apply an algorithm for solving Mathematical and Engineering problems.	Applying	3
3	Analyze and solve the issues in file organization and the usage of file systems	Analyzing	4
4	Develop C applications using C programming language	Creating	3, 5

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B. Sc (Information Technology)	Semester – I
Course Name: Discrete Mathematics	Course Code: 19UBIT104

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	Theory Examination	**2 Hrs.**	**60**
	Internal	**------**	**40**

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Remember and understand how to make their communication more effective	Remembering & Understanding	1, 2, 10
2	Write an impactful resume and job application letter and handle basic business correspondence confidently	Applying	3, 5
3	Analyse the ways to make their communication more effective	Analyzing	4, 10

B. Sc (Information Technology)		**Semester – I**	
Course Name: Foundation Course		**Course Code: 19UBIT110**	
Lectures per week (1 Period is 50 minutes)		**5**	
Credits		**3**	
Evaluation System		**Hours**	**Marks**
	Theory Examination	**2 Hrs.**	**60**
	Internal	**------**	**40**

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Recall and understand the diverse but united culture of India	Remembering & Understanding	1
2	Develop the empathy towards various social problems of the country	Applying	8
3	Value their fundamental rights and duties s a citizen of the country	Analyzing	12

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SEMESTER II

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B. Sc (Information Technology)		Semester – II	
Course Name: Object Oriented Programming with C++		Course Code: 19UBIT201	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)	Semester – II
Course Name: Object Oriented Programming with C++ Practical	Course Code: 19UBIT206
Lectures per week (1 Period is 50 minutes)	3
Credits	2

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		Hours	Marks
Evaluation System	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the principles of Object-oriented programming approach to design software	Remembering & Understanding	1
2	To choose the appropriate concept object – oriented programming for designing applications	Applying	5
3	To develop the applications using Object-oriented programming	Analyzing	3

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B. Sc (Information Technology)		Semester – II	
Course Name: Database Management System		Course Code: 19UBIT202	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – II	
Course Name: Database Management System Practical		Course Code: 19UBIT207	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

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Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand database concepts and database management system software	Remembering & Understanding	1, 2
2	Model an application's data requirements using conceptual modelling tools like ER diagrams and design database schemas based on the conceptual model	Applying	5
3	Evaluate business information and find the requirements of a problem in terms of data	Evaluation	4, 6

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B. Sc (Information Technology)		Semester – II	
Course Name: Web Programming		Course Code: 19UBIT203	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – II	
Course Name: Web Programming Practical		Course Code: 19UBIT208	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			

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1	Explain aesthetics and formal concepts of layout and organization to design websites that effectively communicate using visual elements	Understanding & Evaluating	1, 2, 3
2	Select and apply markup languages for processing, identifying, and presenting of information in web pages	Applying	5
3	Create websites using appropriate security principles, focusing specifically on the vulnerabilities inherent in common web implementations	Creating	3, 11

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B. Sc (Information Technology)		Semester – II	
Course Name: Computer Networks		Course Code: 19UBIT204	
Lectures per week (1 Period is 60 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – II	
Course Name: Computer Networks Practical		Course Code: 19UBIT209	
Lectures per week (1 Period is 60 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and apply the terminology and concepts of the OSI reference model and the TCP-IP reference model	Remembering Understanding & Applying	1,2
2	Experience with wireless networking concepts	Applying	5

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3	Analyse contemporary issues in networking technologies	Analyzing	3

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B. Sc (Information Technology)		Semester – II	
Course Name: Numerical and Statistical Method		Course Code: 19UBIT205	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Compare and calculate errors in approximation by numerical method	Remembering & Understanding	1, 2
2	Apply Numerical analysis in the field of Science and Engineering and iterational methods to solve problems of nonlinear equations	Applying	4, 5
3	Analyze and interpret the hypothetical results using different statistical test in research	Understanding & Analysing	3, 4

B. Sc (Information Technology)		Semester – II	
Course Name: Environmental Studies		Course Code: 19UBIT210	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO

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Program Outcomes

Sr no.	Programme Outcome
PO1.	**Scientific knowledge:** Apply the knowledge of mathematics, science, and computing to the solution of complex scientific problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and applied sciences.
PO3	**Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tools usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.
PO6	**The software engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional practice.
PO7	**Environment and sustainability:** Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex activities with the scientific community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management:** Demonstrate knowledge understanding of the scientific and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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Program Specific Outcomes

Programme	Programme Specific Outcomes
B.Sc. Information Technology	A graduate with a B.Sc. in Information Technology will have the ability to **PSO1.** Demonstrate mastery of Information Technology in the following core knowledge areas: • Data Structures and Programming Languages • Databases, Software Engineering and Development, Software Quality Assurance. • Blockchain Technology, Artificial Intelligence, Computer Security • Computer Hardware and Architecture, Networking, Linux Administration **PSO2.** Apply problem-solving skills and the knowledge of information technology and computing fundamentals to solve real world problems. **PSO3.** Develop technical project reports and present them orally

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SEMESTER 3

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B. Sc (Information Technology)		Semester – III	
Course Name: Blockchain Technology		Course Code: 20UBIT301	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

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B. Sc (Information Technology)	Semester – III

Course Name: Blockchain Practical		Course Code: 20UBIT307	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Clear understanding of State-of-the-art, open research challenges, and future directions & to Understand emerging abstract models for Blockchain Technology	Remembering & Understanding	1, 2
2	Understand and Apply Cryptographic concept, Blockchain Technique and Distributed system	Understanding & Applying	2, 3, 4, 5
3	Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain. And Design, build, and deploy applications based on Blockchain Technology	Analysing, Evaluate & Applying	4, 5, 6

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B.Sc (Information Technology)		Semester – III	
Course Name: Microprocessor Architecture		Course Code: 20UBIT302	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – III	
Course Name: Microprocessor Architecture Practical		Course Code: 20UBIT308	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50

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Course Outcome:

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B. Sc (Information Technology)		Semester – III	
Course Name: Python Programming		Course Code: 20UBIT303	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming	Remembering & Understanding	1, 2
2	Develop basic Assembly program to use of register and memory location & operations	Applying	3, 5
3	Analyze the general architecture of a microcomputer system and architecture & organization of 8085 Microprocessor and understand the difference between 8085 and advanced microprocessor	Understanding & Analysing	2, 4

B. Sc (Information Technology)		Semester – III	
Course Name: Python Programming Practical		Course Code: 20UBIT309	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			

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1	Explain basic principles of Python programming language	Remembering & Understanding	1
2	Apply object-oriented concepts	Applying	2, 5
3	Design and implement a project to solve a real-world problem using the language idioms, data structures, and standard library of Python	Analysing & Creating	3, 5

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B. Sc (Information Technology)		Semester – III	
Course Name: Core Java		Course Code: 20UBIT304	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – III	
Course Name: Core Java Practical		Course Code: 20UBIT310	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO

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By the end of this course, learner will be able to:			
1	Define Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.	Remembering & Understanding	1
2	Demonstrates and explain how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.	Understanding & Evaluating	2, 5
3	Develop Java based Application and use of different exception handling mechanisms and concept of multithreading, applets, exception handling for robust faster and efficient application development.	Applying & Creating	3, 5

B. Sc (Information Technology)		Semester – I	
Course Name: Programming with C#		Course Code: 20UBIT305	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – III	
Course Name: Programming with C# Practical		Course Code: 20UBIT311	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2 Hrs.	50
	Internal	------	

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Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.	Remembering & Understanding	1
2	Demonstrates and explain how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.	Understanding & Evaluating	2, 5

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3	Develop C# based Application and use of different exception handling mechanisms and concept of multithreading, applets, exception handling for robust faster and efficient application development.	Applying & Creating	3, 5

B. Sc (Information Technology)		Semester – III	
Course Name: Data Structure		Course Code: 20UBIT306	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Lectures			100

B. Sc (Information Technology)		Semester – III	
Course Name: Data Structure Practical		Course Code: 20UBIT312	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and implement various data structures along with their application	Remembering & Understanding	1, 3
2	Students will be able to develop and implement Linear and Non-Linear data structures	Applying	3, 5
3	Choose the appropriate data structure for modeling a given problem	Analyzing	3

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SEMESTER 4

B. Sc (Information Technology)		Semester – IV	
Course Name: Artificial Intelligence		Course Code: 20UBIT401	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – IV	
Course Name: Artificial Intelligence Practical		Course Code: 20UBIT407	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define & Understand knowledge of the building blocks of AI as presented in terms of intelligent agents	Remembering & Understanding	1
2	Study and apply various searching algorithms, Understand concept of propositional and first order logic.	Understand & Applying	2, 5
3	Analyze and formalize the problem based on different techniques to solve them	Analysing	2, 3

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B. Sc (Information Technology)		Semester – IV	
Course Name: Operating System		Course Code: 20UBIT402	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – IV	
Course Name: Operating System Practical		Course Code: 20UBIT408	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the concept of a process, thread, mutual exclusion, and deadlock	Remembering & Understanding	1
2	Apply and analyze the concepts of memory management techniques	Analysing & Applying	2, 5
3	Evaluate performance of process scheduling algorithms and IPC	Analysing	3, 4

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B. Sc (Information Technology)		Semester – IV	
Course Name: Embedded System		Course Code: 20UBIT403	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – IV	
Course Name: Embedded System Practical		Course Code: 20UBIT409	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand hardware and software design requirements of embedded systems	Remembering & Understanding	1, 3
2	Evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems	Evaluating & Applying	4, 5
3	Analyze the embedded systems' specification and develop software programs	Analysing	3, 4, 5

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B. Sc (Information Technology)	Semester – IV
Course Name: Enterprise Java	Course Code: 20UBIT404
Lectures per week (1 Period is 50 minutes)	5
Credits	3

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Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – IV	
Course Name: Enterprise Java Practical		Course Code: 20UBIT410	
Lectures per week (1 Period is 60 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB)	Remembering & Understanding	1, 2
2	Apply event handling on Swing components	Applying	3, 5
3	Understand the use Struts frameworks and apply the concept to reuse the codes for quick development	Understanding & Applying	2, 3, 5

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B. Sc (Information Technology)		Semester – IV	
Course Name: .NET Technology		Course Code: 20UBIT405	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – IV	
Course Name: .NET Technology Practical		Course Code: 20UBIT411	
Lectures per week (1 Period is 60 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate the features of Dot Net Framework along with the features of ASP. NET & C#	Remembering & Understanding	1, 2, 5
2	Use appropriate data sources and data bindings in ASP.NET web applications	Applying	3, 5
3	Create dynamic web applications, create and consume web services	Creating	2, 3, 5

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B. Sc (Information Technology)		Semester – IV	
Course Name: Operational Research		Course Code: 19UBIT406	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

B. Sc (Information Technology)		Semester – IV	
Course Name: Operational Research Practical		Course Code: 20UBIT412	
Lectures per week (1 Period is 60 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

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Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the usage of game theory and PERT and CPM in solving Business Problems	Remembering & Understanding	1, 2
2	Define and apply the best way of transporting goods and assigning the jobs to people	Understanding & Applying	2, 10, 11
3	Apply the concept of Linear Programming in solving the problems	Applying	2, 6

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SEMESTER 5

B. Sc (Information Technology)		Semester – V	
Course Name: Software Engineering & Project Management		Course Code: 21UBIT501	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – V	
Course Name: SEPM Practicals		Course Code: 21UBIT507	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define and Understand the concepts of Software Engineering and Project Management.	Remembering & Understanding	1, 2, 11
2	Make use of estimation logic for estimation of software size as well as cost of software & Demonstrate understanding of the requirements Analysis and Application of UML Models	Applying & Analysing	1, 2, 3, 4, 5, 6
3	Assess various factors influencing project management, quality assurance, change management and risk assessment & Develop process for successful quality project delivery	Analyzing	3, 4, 6, 8, 9, 10, 11, 12

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B. Sc (Information Technology)		Semester – V	
Course Name: Cryptography & Network Security		Course Code: 21UBIT502	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks

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	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – V	
Course Name: Cryptography & Network Security		Course Code: 21UBIT508	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define, Understand and Classify various cryptographic terms	Remembering & Understanding	1, 2, 8
2	Understand and Apply Various symmetric and asymmetric key cryptography and Mode of operations	Understanding & Applying	1, 2, 3
3	Understand and Evaluate various cryptographic algorithm & various TCP – IP threats and vulnerabilities	Understanding & Evaluating	2, 4, 6, 8

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B. Sc (Information Technology)		Semester – V	
Course Name: Internet of Things		Course Code: 21UBIT503	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

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B. Sc (Information Technology)		Semester – V	
Course Name: Internet of Things Practicals		Course Code: 21UNIT509	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Acquire good understanding of the Internet of Things concept and systems architecture	Remembering & Understanding	1, 3
2	Conceptualize the standard security and privacy preserving mechanisms, and understand different cloud integration methods	Understanding & Applying	2, 5
3	Operate with wireless technologies and networking protocols specific to IoT systems & Design, implement, test and create IoT system equipped with sensors and wireless transceivers to help the society	Applying and Evaluating Creating	2, 3, 5, 6, 7

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B. Sc (Information Technology)		Semester – V	
Course Name: Spring		Course Code: 21UBIT504	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)	Semester – V
Course Name: Spring Practicals	Course Code: 21UBIT510
Lectures per week (1 Period is 50 minutes)	5
Credits	2

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		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

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B. Sc (Information Technology)		Semester – V	
Course Name: ASP.NET CORE		Course Code: 21UBIT505	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and develop applications using Spring Framework, Lightweight Container and Dependency Injection with Spring	Remembering & Understanding & Applying	1, 3, 5
2	Apply JDBC Data Access with Spring and demonstrate data access operations with Jdbc Template and Spring	Applying	5
3	Create Spring Boot Web Application and Spring Boot RESTful WebServices and Develop applications using Aspect Oriented Programming with Spring	Applying and Creating	2, 3, 5

B. Sc (Information Technology)		Semester – V	
Course Name: ASP.NET CORE Practical		Course Code: 21UBIT511	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

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Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	To remember and understand the concepts of .NET core framework	Remembering & Understanding	1, 2, 3
2	Develop robust ASP .NET Core application	Creating	2, 3, 5, 8
3	Evaluating the performance of application with integrated tools and services	Evaluation	2, 4, 5

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B. Sc (Information Technology)		Semester – V	
Course Name: Project		Course Code: 21UBIT516	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Students will be able to communicate with Clients and define the requirements based on problems in the existing system.	Remembering, Understanding, Analysing & Evaluating	1, 2, 4, 5, 6, 7, 10
2	Students will be able to design, develop and deploy solution to meet all the user and system requirements.	Understanding, Applying, Analysing & Creating	2, 4, 5, 6, 8, 9, 10, 11

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3	Students will be able to design use cases and test cases to evaluate the performance of system & estimate the cost and efforts.	Applying, Analysing and Evaluating	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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B. Sc (Information Technology)		Semester – VI	
Course Name: Geographical Information System		Course Code: 21UBIT601	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – VI	
Course Name: Geographical Information System Practical		Course Code: 21UBIT608	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the concept of maps, coordinate system basics, cartography and principles of GIS.	Remembering & Understanding	1
2	Designing and developing Maps based Real world examples.	Applying	3, 5
3	Analyze spatial data, using GIS analysis tools.	Analyzing	2, 5

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B. Sc (Information Technology)		Semester – VI	
Course Name: Software Testing		Course Code: 21UBIT602	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – VI	
Course Name: Software Testing & Quality Assurance Practical		Course Code: 21UBIT609	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Study principles of Software testing and Quality Assurance	Remembering & Understanding	1, 2, 3, 4
2	Identify Levels of testing, classify types of testing and understand & apply techniques of testing & create and communicate the test report	Understanding, Applying, Analysing and Evaluating	1, 2, 3, 4, 5, 6, 8, 9, 10
3	Explore various software testing tools and implement the tool for testing software components and system throughout the software development process	Applying, Analysing, Evaluating and Creating	1, 2, 5, 6, 7, 8, 9, 10, 11

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B. Sc (Information Technology)		Semester – VI	
Course Name: User Experience & User Design		Course Code: 21UBIT603	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – VI	
Course Name: User Experience & User Design Practical		Course Code: 21UBIT610	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and create interest in User Experience Design (UXD)	Remembering & Understanding	1
2	Apply prototyping and problems solving techniques related to user experience design	Applying	2, 3, 5
3	Analyze the framework and methodological approach for user experience design	Analyzing	2, 3

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B. Sc (Information Technology)	Semester – VI
Course Name: Stegnography and Digital Watermarking	Course Code:21UBIT604
Lectures per week (1 Period is 50 minutes)	5
Credits	3

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		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – VI	
Course Name: Steganography and Digital Watermarking Practical		Course Code:21UBIT611	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Describe various finger printing techniques	Remembering & Understanding	1
2	Implement algorithms for steganography and watermarking operations	Applying	2, 3, 5
3	Evaluate steganography and watermarking algorithms for robustness	Analyzing	2, 3

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B. Sc (Information Technology)		Semester – VI	
Course Name: Linux		Course Code: 21UBIT605	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – VI	
Course Name: Linux Practical		Course Code: 21UBIT612	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and remember the concepts of Linux environment, its shell and shell programming	Remembering & Understanding	1
2	Install appropriate service on Linux server as per requirement and Develop Linux based systems and maintain	Applying	2, 3, 5
3	Analyse and compare the computer resources utilization in Linux Environment and windows environment	Analyzing	3

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B. Sc (Information Technology)		Semester – VI	
Course Name: Android		Course Code: 21UBIT606	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Information Technology)		Semester – VI	
Course Name: Android Practical		Course Code: 21UBIT613	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate Android activities life cycle	Remembering & Understanding	1
2	Apply proficiency in coding on a mobile programming platform	Applying	5
3	Design and develop innovative android applications	Analyzing	3

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B. Sc (Information Technology)	Semester – VI
Course Name: Project	Course Code: 21UBIT607
Lectures per week (1 Period is 50 minutes)	5
Credits	4

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		Hours	Marks
...uation System	IMPLEMENTATION & VIVA VOCE	2 Hrs.	60
	PROJECT REPORT	------	40

...se Outcome:

...O	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Students will be able to communicate with Clients and define the requirements based on problems in the existing system.	Remembering, Understanding, Analysing & Evaluating	1, 2, 4, 5, 6, 7, 10
2	Students will be able to design, develop and deploy solution to meet all the user and system requirements.	Understanding, Applying, Analysing & Creating	2, 4, 5, 6, 8, 9, 10, 11
3	Students will be able to design use cases and test cases to evaluate the performance of system & estimate the cost and efforts.	Applying, Analysing and Evaluating	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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CRITERIA – II
Teaching-learning and
Evaluation

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Programme: Bachelor of Science
Specialization: Data Science

Program Outcomes

Sr no.	Programme Outcome
PO1.	**Scientific knowledge:** Apply the knowledge of mathematics, science, and computing to the solution of codmplex scientific problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and applied sciences.
PO3	**Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tools usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.
PO6	**The software engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional practice.
PO7	**Environment and sustainability:** Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex activities with the scientific community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management:** Demonstrate knowledge understanding of the scientific and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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CRITERIA – II
Teaching-learning and Evaluation

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Program Specific Outcomes

Programme	Programme Specific Outcomes
B.Sc. Data Science	A graduate with a B.Sc. in Data Science will have the ability to **PSO1.** Demonstrate mastery of Data Science in the following core knowledge areas: • Statistics, Data Structures and Programming Languages • Databases, Big data, and cloud computing, Computer networking • Artificial Intelligence, Machine Learning, Deep Learning, Data Visualization **PSO2.** Apply problem-solving skills and the knowledge data Science and computing fundamentals to solve real world problems. **PSO3.** Develop technical project reports and present them orally

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Programme Structure

(To be implemented from Academic Year- 2020 - 2021)

F.Y.B.Sc. (Data Science)

Semester – I				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20UBDS101	Professional Communication Skill	Ability Enhancement Course	2
2	20UBDS102	Foundation Course	Ability Enhancement Course	2
3	20UBDS103	Database Management System	Core Course	2
4	20UBDS104	Descriptive Statistics	Core Course	2
5	20UBDS105	Digital Computer Fundamentals	Core Course	
6	20UBDS106	Introduction to programming with C++	Skill Enhancement Course	2
7	20UBDS107	Database Management System Practical	Core Course Practical	2
8	20UBDS108	Descriptive Statistics Practical	Core Course Practical	2
9	20UBDS109	Digital Computer Fundamentals Practical	Core Course Practical	2
10	20UBDS110	Introduction to programming with C++ Practical	Skill Enhancement Course Practical	2
		Total		20

Semester – II				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20UBDS201	Environmental Studies	Ability Enhancement Course	2
2	20UBDS202	Advance Database Management System	Core Course	2
3	20UBDS203	Introduction to Data Science and Analytics	Core Course	2
4	20UBDS204	Theory of Probability	Core Course	2
5	20UBDS205	Python Programming	Skill Enhancement Course	
6	20UBDS206	Web Programming	Skill Enhancement Course	2
7	20UBDS207	Advance Database Management System Practical	Core Course Practical	2
8	20UBDS208	Theory of Probability Practical	Core Course Practical	2
9	20UBDS209	Python Programming Practical	Skill Enhancement Course Practical	2
10	20UBDS210	Web programming Practical	Skill Enhancement Course Practical	2
		Total		20

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SEMESTER I

B. Sc (Data Science)		Semester – I	
Course Name: Professional Communication Skills		Course Code: 20UBDS101	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Remember and understand how to make their communication more effective	Remembering & Understanding	1, 2, 10
2	Write an impactful resume and job application letter and handle basic business correspondence confidently	Applying	3, 5
3	Analyse the ways to make their communication more effective	Analyzing	4, 10

B. Sc (Data Science)		Semester – I	
Course Name: Foundation Course		Course Code: 20UBDS102	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Recall and understand the diverse but united culture of India	Remembering & Understanding	1
2	Develop the empathy towards various social problems of the country	Applying	8
3	Value their fundamental rights and duties s a citizen of the country	Analyzing	12

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B. Sc (Data Science)		Semester – I	
Course Name: Database Management System		Course Code: 20UBDS103	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – I	
Course Name: Database Management System Practical		Course Code: 20UBDS107	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand database concepts and database management system software	Remembering & Understanding	1, 2
2	Model an application's data requirements using conceptual modelling tools like ER diagrams and design database schemas based on the conceptual model	Applying	5
3	Evaluate business information and find the requirements of a problem in terms of data	Evaluation	4, 6

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B. Sc (Data Science)		Semester – I	
Course Name: Descriptive Statistics		Course Code: 20UBDS104	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – I	
Course Name: Descriptive Statistics Practical		Course Code: 20UBDS108	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Study and understand the terminology and special notation of statistical analysis.	Remembering & Understanding	1, 2
2	Evaluate and interpret the various measures of central tendency, dispersion skewness, Kurtosis,	Understanding and Evaluating	1,2,3
3	Use R Studio for descriptive Statistics analysis	Applying and Analysing	2,3,5

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B. Sc (Data Science)		Semester – I	
Course Name: Digital Computer Fundamental		Course Code: 20UBDS105	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – I	
Course Name: Digital Computer Fundamental Practical		Course Code: 20UBDS109	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the structure of various number systems and its application in digital design	Remembering & Understanding	1,2
2	Apply digital logic it to solve real life problems.	Applying	3
3	Analyse, design and implement digital electronic circuits, combinational logic circuits, sequential circuits, multiplexers and demultiplexers & Construct digital circuits using various types of gates	Analyzing	4

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B. Sc (Data Science)		Semester – I	
Course Name: Introduction to Programming with C++		Course Code: 20UBDS106	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – I	
Course Name: Introduction to Programming with C++ Practical		Course Code: 20UBDS110	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Recall and Understand the concept of algorithms based on which they can draw flowcharts for solving Mathematical and Engineering problems.	Remembering & Understanding	1, 2
2	Apply an algorithm for solving Mathematical and Engineering problems.	Applying	3
3	Analyze and solve the issues in file organization and the usage of file systems	Analyzing	4
4	Develop C++ applications using C++ programming language	Creating	3, 5

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SEMESTER II

B. Sc (Data Science)		Semester – II	
Course Name: Environmental Studies		Course Code: 20UBDS201	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the various environmental problems of the world	Remembering & Understanding	7
2	Demonstrate their fundamental rights and duties as a citizen for conservation of natural and man-made resources	Applying	8
3	Examine their fundamental rights and duties as a citizen for conservation of natural and man-made resources	Analyzing	8, 12

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B. Sc (Data Science)		Semester – II	
Course Name: Advance Database Management System		Course Code: 20UBDS202	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – II	
Course Name: Advance Database Management System Practical		Course Code: 20UBDS207	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand advanced database concepts distributed, parallel and object-oriented databases.	Remembering & Understanding	1, 2, 5
2	Understand and apply the concept of data warehousing.	Understanding & Applying	1, 2, 5
3	Understand and apply the concept of data mining and differentiate between classification and clustering methods.	Understanding, Applying and Analyzing	1, 2, 5

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B. Sc (Data Science)		Semester – II	
Course Name: Introduction to Data Science and Analytics		Course Code: 20UBDS203	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.	Remembering & Understanding	1, 2, 3
2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NOSQL in big data analytics and Interpret business models, scientific computing paradigms, and apply software tools for big data analytics.	Applying and Analyzing	1, 2, 3, 4
3	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.	Understanding, Applying	2, 3, 5

B. Sc (Data Science)		Semester – II	
Course Name: Theory of Probability		Course Code: 20UBDS204	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – II	
Course Name: Theory of Probability Practical		Course Code: 20UBDS208	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

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CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Articulate the axioms (laws) of probability; Define event, outcome, trial, simple event, sample space and calculate the probability that an event will occur.	Remembering & Understanding	1, 2, 3
2	Apply probability distributions and recognize them in applications	Remember, Applying	1, 2, 3, 4
3	Learn and develop complex mathematical reasoning	Applying & Analyzing	2, 3,4

B. Sc (Data Science)		Semester – II	
Course Name: Python Programming		Course Code: 20UBDS205	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – II	
Course Name: Python Programming Practical		Course Code: 20UBDS209	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain basic principles of Python programming language	Remembering & Understanding	1
2	Apply object-oriented concepts	Applying	2, 5
3	Design and implement a project to solve a real-world problem using the language idioms, data structures, and standard library of Python	Analysing & Creating	3, 5

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B. Sc (Data Science)		Semester – II	
Course Name: Web Programming		Course Code: 20UBDS206	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – II	
Course Name: Web Programming Practical		Course Code: 20UBDS210	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain aesthetics and formal concepts of layout and organization to design websites that effectively communicate using visual elements	Understanding & Evaluating	1, 2, 3
2	Select and apply markup languages for processing, identifying, and presenting of information in web pages	Applying	5
3	Create websites using appropriate security principles, focusing specifically on the vulnerabilities inherent in common web implementations	Creating	3, 11

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Programme Structure

(To be implemented from Academic Year- 2021 - 2022)

S.Y.B.Sc. (Data Science)

Semester – III				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBDS301	Java	Ability Enhancement Course	2
2	21UBDS302	Data Structure	Ability Enhancement Course	2
3	21UBDS303	Inferential Statistics	Core Course	2
4	21UBDS304	Artificial Intelligence	Core Course	2
5	21UBDS305	Data Science with Python	Core Course	2
6	21UBDS306	Java Practical	Skill Enhancement Course	2
7	21UBDS307	Data Communication & Networking Practical	Core Course Practical	2
8	21UBDS308	Inferential Statistics Practical	Core Course Practical	2
9	21UBDS309	Artificial Intelligence Practical	Core Course Practical	2
10	21UBDS310	Data Science with Python Practical	Skill Enhancement Course Practical	2
Total				20

Semester – IV				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBDS401	Advanced Web Programming	Ability Enhancement Course	2
2	21UBDS402	Fundamentals of Data Science	Core Course	2
3	21UBDS403	Industrial Statistics	Core Course	2
4	21UBDS404	R Programming	Core Course	2
5	21UBDS405	Data Communication & Networking	Skill Enhancement Course	2
6	21UBDS406	Advanced Web Programming Practical	Skill Enhancement Course	2
7	21UBDS407	Fundamentals of Data Science Practical	Core Course Practical	2
8	21UBDS408	Industrial Statistics Practical	Core Course Practical	2
9	21UBDS409	R Programming Practical	Skill Enhancement Course Practical	2
10	21UBDS410	Data Structure Practical	Skill Enhancement Course Practical	2
Total				20

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Programme Structure

(To be implemented from Academic Year- 2021 - 2022)

S.Y.B.Sc. (Data Science)

Semester – III				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBDS301	Java	Ability Enhancement Course	2
2	21UBDS302	Data Structure	Ability Enhancement Course	2
3	21UBDS303	Inferential Statistics	Core Course	2
4	21UBDS304	Artificial Intelligence	Core Course	2
5	21UBDS305	Data Science with Python	Core Course	2
6	21UBDS306	Java Practical	Skill Enhancement Course	2
7	21UBDS307	Data Communication & Networking Practical	Core Course Practical	2
8	21UBDS308	Inferential Statistics Practical	Core Course Practical	2
9	21UBDS309	Artificial Intelligence Practical	Core Course Practical	2
10	21UBDS310	Data Science with Python Practical	Skill Enhancement Course Practical	2
Total				20

Semester – IV				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBDS401	Advanced Web Programming	Ability Enhancement Course	2
2	21UBDS402	Fundamentals of Data Science	Core Course	2
3	21UBDS403	Industrial Statistics	Core Course	2
4	21UBDS404	R Programming	Core Course	2
5	21UBDS405	Data Communication & Networking	Skill Enhancement Course	2
6	21UBDS406	Advanced Web Programming Practical	Skill Enhancement Course	2
7	21UBDS407	Fundamentals of Data Science Practical	Core Course Practical	2
8	21UBDS408	Industrial Statistics Practical	Core Course Practical	2
9	21UBDS409	R Programming Practical	Skill Enhancement Course Practical	2
10	21UBDS410	Data Structure Practical	Skill Enhancement Course Practical	2
Total				20

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SEMESTER III

B. Sc (Data Science)		Semester – III	
Course Name: Java		Course Code: 21UBDS301	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – III	
Course Name: Java Practical		Course Code: 21UBDS306	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.	Remembering & Understanding	1
2	Demonstrates and explain how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.	Understanding & Evaluating	2, 5
3	Develop Java based Application and use of different exception handling mechanisms and concept of multithreading, applets, exception handling for robust faster and efficient application development.	Applying & Creating	3, 5

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B. Sc (Data Science)		Semester – III	
Course Name: Data Structure		Course Code: 21UBDS302	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – IV	
Course Name: Data Structure Practical		Course Code: 21UBDS307	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and implement various data structures along with their application	Remembering & Understanding	1, 3
2	Students will be able to develop and implement Linear and Non-Linear data structures	Applying	3, 5
3	Choose the appropriate data structure for modeling a given problem	Analyzing	3

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B. Sc (Data Science)		Semester – III	
Course Name: Inferential Statistics		Course Code: 21UBDS303	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – III	
Course Name: Inferential Statistics Practical		Course Code: 21UBDS308	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Apply probabilistic and statistical reasoning to describe and analyze essential features of data sets and problems in real-life business situations.	Remembering, Understanding & Applying	1, 2, 3
2	Understand statistical techniques to estimate the population mean, proportion and variance, Use and extend knowledge of inferential statistics and their applications in real-life business situations.	Understanding & Applying	2, 3, 4
3	Acquire techniques to test hypothesis with an assumption on the population means, proportions and variances under different circumstances.	Analyzing and Evaluating	2, 3, 5

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B. Sc (Data Science)		Semester – III	
Course Name: Artificial Intelligence		Course Code: 21UBDS304	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – III	
Course Name: Artificial Intelligence Practical		Course Code: 21UBDS309	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand Artificial Intelligence, its components and influence on business.	Remembering & Understanding	1,2,3
2	Comprehend the impact of Artificial Intelligence in marketing, understand its implications, determine how to optimize AI in this field and apply the learnings to use cases.	Understand & Applying	2, 3,4
3	Develop an understanding of the role of analytics in Human Resources and Finance especially the forecasting techniques, predictive analytics and leveraging optimization techniques and apply the same.	Applying & Analysing	2, 3, 4, 6

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B. Sc (Data Science)		Semester – III	
Course Name: Data Science with Python		Course Code: 21UBDS305	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – III	
Course Name: Data Science with Python Practical		Course Code: 21UBDS310	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain basic principles of Python programming language	Remembering & Understanding	1
2	Apply object-oriented concepts and Use database and GUI Technique in Python application development.	Applying	2, 3, 5
3	Design and implement a project to solve a real-world problem using the language idioms, data structures, and standard library of Python	Analysing & Creating	3, 5

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SEMESTER IV

B. Sc (Data Science)	Semester – IV

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Course Name: Advance Web Programming		Course Code: 21UBDS401	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – III	
Course Name: Advance Web Programming Practical		Course Code: 21UBDS406	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and apply markup languages for processing, identifying, and presenting of information in web pages.	Remembering, Understanding & Applying	1
2	Explain aesthetics and formal concepts of layout and organization to design websites that effectively communicate using visual elements.	Applying	2, 5
3	Create websites using appropriate security principles, focusing specifically on the vulnerabilities inherent in common web implementations.	Analysing & Creating	3, 5

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B. Sc (Data Science)		Semester – IV	
Course Name: Fundamentals of Data Science		Course Code: 21UBDS402	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – IV	
Course Name: Fundamentals of Data Science Practical		Course Code: 21UBDS407	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand Big Data and its associated technologies and explore the applications of Big Data is solving business problems.	Remembering & Understanding	1
2	Apply the principles of virtualization and cloud computing to solve Big Data problems	Applying	2, 5
3	Use Map Reduce tools to handle big Data problems and Identify the Technologies for handling Big Data	Understanding & Applying	1, 3, 5

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B. Sc (Data Science)		Semester – IV	
Course Name: Industrial Statistics		Course Code: 21UBDS403	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – IV	
Course Name: Industrial Statistics Practical		Course Code: 21UBDS408	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define the different terminologies used Statistical quality control and PERT/CPM	Remembering & Understanding	1
2	Understand the basic tools of SPC and statistical basis of Shewhart control charts	Understanding & Applying.	2, 5
3	Construct and interpret different control charts and compute the critical path and the project completion time.	Applying & Analyzing	1, 3, 5

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B. Sc (Data Science)		Semester – IV	
Course Name: R		Course Code: 21UBDS404	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – IV	
Course Name: R Practical		Course Code: 21UBDS409	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate various probability distribution technique using R and mapping with purr	Remembering & Understanding	1
2	Implement regression technique in R	Applying	2, 5
3	Build own package in R	Create	1, 3, 5

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B. Sc (Data Science)		Semester – IV	
Course Name: Data Communication & Networking		Course Code: 21UBDS405	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

B. Sc (Data Science)		Semester – III	
Course Name: Data Communication & Networking Practical		Course Code: 21UBDS410	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	40

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and apply the terminology and concepts of the OSI reference model and the TCP-IP reference model	Remembering & Understanding Applying	1,2
2	Experience with wireless networking concepts	Applying	5
3	Analyse contemporary issues in networking technologies	Analyzing	3

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Programme: Master of Science
Specialization: Information Technology

Program Outcomes

Sr no.	Programme Outcome
PO1.	**Scientific knowledge:** Apply the knowledge of mathematics, science, and computing to the solution of complex scientific problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and applied sciences.
PO3	**Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tools usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.
PO6	**The software engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional practice.
PO7	**Environment and sustainability:** Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex activities with the scientific community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management:** Demonstrate knowledge understanding of the scientific and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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Program Specific Outcomes

Programme	Programme Specific Outcomes
M.Sc. Information Technology	A graduate with a M.Sc. in Information Technology will have the ability to **PSO1.** Communicate Information Technology concepts, research, designs, and solutions effectively and professionally **PSO2.** Apply knowledge of computing to produce effective designs and solutions for specific problems **PSO3.** Use software development tools, software systems, and modern

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Programme Structure

(To be implemented from Academic Year- 2020-2021)

M.Sc Part I (Information Technology)

Semester – I				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20PMIT101	Research Methodology	Skill Enhancement Course	4
2	20PMIT102	Internet of Things	Core Course	4
3	20PMIT103	Cloud Computing	Core Course	4
4	20PMIT104	Soft Computing Techniques	Core Course	4
5	20PMIT105	Research Methodology Practical	Skill Enhancement Practical	2
6	20PMIT106	Internet of Things Practical	Core Course Practical	2
7	20PMIT107	Cloud Computing Practical	Core Course Practical	2
8	20PMIT108	Soft Computing Techniques Practical	Core Course Practical	2
Total				24

Semester – II				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20PMIT201	Theory of Computation	Core Course	4
2	20PMIT202	Big Data Analytics	Core Course	4
3	20PMIT203	Wireless Sensor Network	Core Course	4
4	20PMIT204	Storage Area Network	Skill Enhancement Course	4
5	20PMIT205	Theory of Computation Practical	Core Course Practical	2
6	20PMIT206	Big Data Analytics Practical	Core Course Practical	2
7	20PMIT207	Wireless Sensor Network Practical	Core Course Practical	2
8	20PMIT208	Storage Area Network Practical	Skill Enhancement Practical	2
Total				24

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Programme Structure

(To be implemented from Academic Year- 2021-2022)

M.Sc Part II (Information Technology)

Semester – III				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21PMIT301	Machine Learning	Skill Enhancement Course	4
2	21PMIT302	Amazon Web Services	Core Course	4
3	21PMIT303	Network Security	Discipline Specific Elective 1	4
4	21PMIT304	Computer Forensics	Discipline Specific Elective 1	
5	21PMIT305	Game Programming	Discipline Specific Elective 2	4
6	21PMIT306	Augmentation & Virtual Reality	Discipline Specific Elective 2	
7	21PMIT307	Machine Learning Practical	Skill Enhancement Practical	2
8	21PMIT308	Amazon Web Services Practical	Core Course Practical	2
9	21PMIT309	Network Security Practical	Discipline Specific Elective 1 Practical	2
10	21PMIT310	Computer Forensics Practical	Discipline Specific Elective 1 Practical	
11	21PMIT311	Game Programming Practical	Discipline Specific Elective 2 Practical	2
12	21PMIT312	Augmentation & Virtual Reality Practical	Discipline Specific Elective 2 Practical	
Total				24

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Semester – IV				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21PMIT401	Blockchain Technology	Core Course	4
2	21PMIT402	Computer Vision	Discipline Specific Elective 1	4
3	21PMIT403	Quantum Computing	Discipline Specific Elective 1	
4	21PMIT404	Cryptography & Security Assessment and Testing	Discipline Specific Elective 2	4
5	21PMIT405	Ethical Hacking	Discipline Specific Elective 2	
6	21PMIT406	Project	Skill Enhancement Practical	6
7	21PMIT407	Blockchain Technology	Core Course Practical	2
8	21PMIT408	Computer Vision	Discipline Specific Elective 1 Practical	2
9	21PMIT409	Quantum Computing	Discipline Specific Elective 1 Practical	
10	21PMIT410	Cryptography & Security Assessment and Testing	Discipline Specific Elective 2 Practical	2
11	21PMIT411	Ethical Hacking	Discipline Specific Elective 2 Practical	
Total				24

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SEMESTER I

M. Sc (Information Technology)	Semester – I		
Course Name: Research Methodology	Course Code: 20PMIT101		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

B. Sc (Information Technology)		Semester – I	
Course Name: Research Methodology		Course Code: 20PMIT105	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define research and describe the research process and research methods, follow research ethics	Remembering & Understanding	1, 2, 3, 4, 6, 7, 8
2	Understand and apply basic research methods including research design, data analysis, and interpretation	Applying & Analyzing	1, 2, 3, 4, 5, 6, 7
3	Assess the basic function and working of analytical instruments used in research and propose the required numerical skills necessary to carry out research and prepare report/ dissertation/ thesis	Applying, Analyzing, Evaluating & Creating	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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M. Sc (Information Technology)	Semester – II		
Course Name: Internet of Things	Course Code: 20PMIT102		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

B. Sc (Information Technology)		Semester – I	
Course Name: Internet of Things Practical		Course Code: 20PMDIT106	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Acquire good understanding of the Internet of Things concept and systems architecture	Remembering & Understanding	1, 3
2	Conceptualize the standard security and privacy preserving mechanisms, and understand different cloud integration methods	Understanding & Applying	2, 5
3	Operate with wireless technologies and networking protocols specific to IoT systems & Design, implement, test and create IoT system equipped with sensors and wireless transceivers to help the society	Applying Evaluating and Creating	2, 3, 5, 6, 7

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M. Sc (Information Technology)	Semester – I		
Course Name: Cloud Computing	Course Code: 20PMIT103		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

B. Sc (Information Technology)		Semester – I	
Course Name: Cloud Computing Practical		Course Code: 20PMIT107	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand virtualization of clusters and Data centers along with various cloud computing and Service Models-PaaS, SaaS, IaaS.	Remembering & Understanding	1, 2, 3
2	Design of computer clusters for scalable parallel computing.	Applying	2, 3, 4
3	Apply and evaluating various aspects of security to cloud clusters	Applying & Evaluating	2, 3, 5

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M. Sc (Information Technology)	Semester – I		
Course Name: Soft Computing Techniques	Course Code: 20PMIT104		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

M. Sc (Information Technology)		Semester – I	
Course Name: Soft Computing Techniques Practical		Course Code: 20PMIT108	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand fuzzy logic, supervised machine learning and genetic algorithm	Remembering & Understanding	1, 2, 3
2	Apply and evaluate genetic Algorithm on applications	Applying & Evaluating	2, 3, 4
3	Apply, evaluate and analyse various aspects of security to cloud clusters	Applying, Analyzing & Evaluating	2, 3, 5

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SEMESTER II

M. Sc (Information Technology)	Semester – II		
Course Name: Theory of Computation	Course Code: 20PMIT201		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

M. Sc (Information Technology)		Semester – II	
Course Name: Theory of Computation Practical		Course Code: 20PMIT205	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Identify the central concepts in theory of computation and differentiate between deterministic and nondeterministic automata, also obtain equivalence of NFA and DFA.	Remembering & Understanding	1, 2, 3
2	Infer the equivalence of languages described by finite automata and regular expressions and design regular, context free grammars while recognizing the strings and tokens	Applying & Evaluating	2, 3, 4
3	Design pushdown automata to recognize the language and develop an understanding of computation through Turing Machine	Applying & Creating	2, 3, 5

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M. Sc (Information Technology)	Semester – II		
Course Name: Big Data Analytics	Course Code: 20PMIT202		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

B. Sc (Information Technology)		Semester – II	
Course Name: Big Data Analytics Practical		Course Code: 20PMIT206	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.	Remembering & Understanding	1, 2
2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and Big SQL in big data analytics.	Understanding, Analyzing & Evaluating	2, 3, 4
3	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.	Applying	1, 2, 3, 5

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M. Sc (Information Technology)	Semester – II		
Course Name: Wireless Sensor Network	Course Code: 20PMIT203		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

M. Sc (Information Technology)		Semester – II	
Course Name: Wireless Sensor Network Practical		Course Code: 20PMIT207	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	understand various applications of wireless sensor networks.	Remembering & Understanding	1, 2
2	describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks.	Understanding & Analyzing	2, 3, 4
3	Implement and evaluate new ideas for solving wireless sensor network design issues.	Applying & Evaluating	1, 2, 3, 5

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M. Sc (Information Technology)	Semester – II		
Course Name: Storage Area Network	Course Code: 20PMIT204		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

B. Sc (Information Technology)		Semester – II	
Course Name: Storage Area Network		Course Code: 20PMIT208	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand, interpret and examine various SAN technologies and describe and sketch the SAN architecture and its uses.	Remembering & Understanding	1, 2
2	Classify the applications as per their requirements and select relevant SAN solutions and design case studies on NAS, SAN and SAN/ NAS	Analyzing & Creating	2, 3, 4
3	Analyze the limitations of the client-server architecture and evaluate the need for data protection and storage centric architectures such as Intelligent storage system.	Analyzing & Evaluating	1, 2, 3, 5

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SEMESTER III

M. Sc (Information Technology)		Semester – 3	
Course Name: Machine Learning		Course Code: 21PMIT301	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 3	
Course Name: Machine Learning Practical		Course Code: 21PMIT307	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Develop learning algorithms based on logistic regression, Support Vector Machines to predict discrete-valued output given a training data comprising of features and corresponding class labels.	Remember, Understanding & Applying	1, 2, 3, 4
2	Design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms.	Analyzing, Evaluating & Creating	2, 3, 4, 5
3	Design and develop Linear Models for Regression using Bias-Variance Decomposition, Bayesian Linear Regression.	Applying & Creating	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 3	
Course Name: AMAZON WEB SERVICES		Course Code: 21PMIT302	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 3	
Course Name: AMAZON WEB SERVICES		Course Code: 21PMIT308	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand architecture of AWS	Remember, Understanding	1, 2, 3,
2	Analyze various Configuration file and manage Virtual private network	Applying & Analyzing	2, 3, 4, 5
3	Create Internet Gateway, Security Group, NAT Gateway	Creating	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 3	
Course Name: NETWORK SECURITY		Course Code: 21PMIT303	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 3	
Course Name: NETWORK SECURITY		Course Code: 21PMIT309	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Compute hash and digital signature for the given message to provide integrity and non-repudiation.	Remember, Understanding	1, 2, 3
2	Examine the strength of any cryptographic algorithm by crypt analysis using Open SSL.	Analyzing & Evaluating	2, 3, 4, 5
3	Explain and the working principle of security protocols and analyze threats and vulnerabilities of information systems	Applying & Analyzing	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 3	
Course Name: Computer Forensics		Course Code: 21PMIT304	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester –	
Course Name: Computer Forensics		Course Code: 21PMIT310	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Utilizing the knowledge for investigations in order to solve computer crime	Remember & Understanding	1, 2, 3,
2	Develop computer forensic awareness and Perform best practices for incidence response	Applying	2, 3, 4, 5
3	Apply computer forensic tools for investigation, evaluation and analysis	Applying, Analyzing & Evaluating	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 3	
Course Name: GAME DEVELOPEMENT		Course Code: 21PMIT305	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 3	
Course Name: GAME DEVELOPMENT		Course Code: 21PMIT311	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate Principles of Game Development Understanding	Remember & Understanding	1, 2, 3, 4
2	Develop multilayered and interactive games	Applying	2, 3, 5
3	Build applications using various components of Game development	Applying & Creating	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 3	
Course Name: AUGMENTATION & VIRTUAL REALITY		Course Code: 21PMIT306	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 3	
Course Name: AUGMENTATION & VIRTUAL REALITY		Course Code: 21PMIT312	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand trends and technology future VR experiences.	Remember & Understanding	1, 2, 3, 4
2	Apply the concepts of Virtual and Augmented Reality to various problems	Analyzing,	2, 3, 4, 5
3	Evaluate Virtual Reality Systems.	Evaluating	2, 3, 4

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SEMESTER IV

M. Sc (Information Technology)		Semester – 4	
Course Name: Blockchain Technology		Course Code: 20PMIT401	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

M. Sc (Information Technology)		Semester – 4	
Course Name: Blockchain Technology Practical		Course Code: 20PMIT407	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Clear understanding of State-of-the-art, open research challenges, and future directions & to Understand emerging abstract models for Blockchain Technology	Remembering & Understanding	1, 2
2	Understand and Apply Cryptographic concept, Blockchain Technique and Distributed system	Understanding & Applying	2, 3, 4, 5
3	Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain. And Design, build, and deploy applications based on Blockchain Technology	Analysing, Evaluate & Applying	4, 5, 6

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M. Sc (Information Technology)		Semester – 4	
Course Name: Computer Vision		Course Code: 21PMIT402	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 4	
Course Name: Computer Vision Practical		Course Code: 21PMIT408	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain low level processing of image and transformation techniques applied to images.	Remember, Understanding	1, 2, 3, 4
2	Apply ANN Model for diagnosing the computer vision problems, and identify the supervised and semi supervised techniques applicable to real word problems.	Applying & Analyzing	2, 3, 4
3	Apply vision techniques to real time applications and cognitive vision application to track the driver eye movement.	Applying & Evaluating	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 4	
Course Name: Quantum Computing		Course Code: 21PMIT403	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Information Technology)		Semester – 4	
Course Name: Quantum Computing Practical		Course Code: 21PMIT409	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand basic principles and components of Quantum Computing and identify classes of problems that can be solved using Quantum Computing	Remember & Understanding	1, 2, 3, 4
2	Apply and analyze Quantum Computing algorithms	Applying & Analyzing	2, 3, 4,
3	Design programs to perform basic Quantum Computing operations	Creating	1, 2, 3, 5

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M. Sc (Information Technology)		Semester – 4	
Course Name: Cryptography & Security Assessment and Testing		Course Code: 21PMIT404	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

M. Sc (Information Technology)		Semester – 4	
Course Name: Cryptography & Security Assessment and Testing Practicals		Course Code: 21PMIT410	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define, Understand and Classify various cryptographic terms	Remembering & Understanding	1, 2, 8
2	Understand and Apply Various symmetric and asymmetric key cryptography and Mode of operations	Understanding & Applying	1, 2, 3
3	Understand and Evaluate various cryptographic algorithm & various TCP – IP threats and vulnerabilities	Understanding & Evaluating	2, 4, 6, 8

M. Sc (Information Technology)		Semester – 4	
Course Name: Ethical Hacking		Course Code: 21PMIT405	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

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M. Sc (Information Technology)		Semester – 4	
Course Name: Ethical Hacking Practicals		Course Code: 21PMIT411	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Recall the networking, sql, and encryption algorithm concepts to further study ethical hacking techniques, threats, tools and prevention against attacks.	Remember, Understanding	1, 2, 3, 4
2	Understand ethical hacking concepts, cases, ethics and cyberlaws and apply available hacking tools to find a solution to a given hacking issue.	Understanding & Applying	2, 3, 4, 5
3	Analyze and classify the real-world hacking cases and situations	Analyzing	2, 3, 4, 5

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M. Sc (Information Technology)		Semester – 4	
Course Name: PROJECT		Course Code: 21PMIT406	
Lectures per week (1 Period is 50 minutes)		5	
Credits		6	
Evaluation System		Hours	Marks
	IMPLEMNTATION & VIVA VOCE	2 Hrs.	60
	PROJRCT REPORT	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Students will be able to communicate with Clients and define the requirements based on problems in the existing system.	Remembering, Understanding, Analysing & Evaluating	1, 2, 4, 5, 6, 7, 10
2	Students will be able to design, develop and deploy solution to meet all the user and system requirements.	Understanding, Applying, Analysing & Creating	2, 4, 5, 6, 8, 9, 10, 11
3	Students will be able to design use cases and test cases to evaluate the performance of system & estimate the cost and efforts.	Applying, Analysing and Evaluating	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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Programme: Master of Science
Specialization: Data Science

Outcomes

Sr no.	Programme Outcome
PO1.	**Scientific knowledge:** Apply the knowledge of mathematics, science, and computing to the solution of complex scientific problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and applied sciences.
PO3	**Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tools usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.
PO6	**The software engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional practice.
PO7	**Environment and sustainability:** Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex activities with the scientific community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management:** Demonstrate knowledge understanding of the scientific and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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Program Specific Outcomes

Programme	Programme Specific Outcomes
M.Sc. Data Science	A graduate with a M.Sc. in Data Science will have the ability to **PSO1.** Demonstrate mastery of Data Science in the following core knowledge areas: • Communicate data science concepts, research, designs, and solutions effectively and professionally • Statistics, Programming Languages • Databases, Big data, and cloud computing • Artificial Intelligence, Machine Learning, Deep Learning, Data Visualization **PSO2.** Apply knowledge of computing to produce effective designs and solutions for specific problems **PSO3.** Use software development tools, software systems, and modern computing platforms

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Programme Structure

(To be implemented from Academic Year- 2020-2021)

M.Sc Part I (Data Science)

Semester – I				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20PMDS101	Python Programming	Skill Enhancement Course	4
2	20PMDS102	Advance Database Management System	Core Course	4
3	20PMDS103	Statistics I	Core Course	4
4	20PMDS104	Research Methodology	Skill Enhancement Course	4
5	20PMDS105	Python Programming Practical	Skill Enhancement Course Practical	2
6	20PMDS106	Advance Database Management System Practical	Core Course Practical	2
7	20PMDS107	Statistics I Practical	Core Course Practical	2
8	20PMDS108	Research Methodology Practical	Skill Enhancement Course Practical	2
Total				24

Semester – II				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	20PMDS201	Data Science with Python	Core Course	4
2	20PMDS202	Big Data Analytics	Skill Enhancement Course	4
3	20PMDS203	Statistics II	Core Course	4
4	20PMDS204	Artificial Intelligence	Skill Enhancement Course	4
5	20PMDS205	Data Science with Python Practical	Core Course Practical	2
6	20PMDS206	Big Data Analytics Practical	Skill Enhancement Course Practical	2
7	20PMDS207	Statistics II Practical	Core Course Practical	2
8	20PMDS208	Artificial Intelligence Practical	Skill Enhancement Course Practical	2
Total				24

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Programme Structure

(To be implemented from Academic Year- 2021 - 2022)

M.Sc. (Data Science)

Semester – III				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21PMDS301	Machine Learning	Ability Enhancement Course	4
2	21UBDS302	Data Visualization	Ability Enhancement Course	4
3	21UBDS303	Cloud Computing	Core Course	4
4	21UBDS304	Information Retrieval	Core Course	4
5	21UBDS305	Machine Learning Practical	Skill Enhancement Course	2
6	21UBDS306	Data Visualization Practical	Core Course Practical	2
7	21UBDS307	Cloud Computing Practical	Core Course Practical	2
8	21UBDS308	Information Retrieval Practical	Core Course Practical	2
Total				24

Semester – IV				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	21UBDS401	Deep Learning	Ability Enhancement Course	4
2	21UBDS402	Social Network Analysis	Core Course	4
3	21UBDS403	Natural Language Processing	Core Course	4
4	21UBDS404	Project	Core Course	6
5	21UBDS405	Deep Learning Practical	Skill Enhancement Course	2
6	21UBDS406	Social Network Analysis Practical	Core Course Practical	2
7	21UBDS407	Natural Language Processing Practical	Core Course Practical	2
Total				24

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SEMESTER I

M.Sc (Data Science)		Semester – I	
Course Name: Python Programming		Course Code: 20PMDS101	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – I	
Course Name: Python Programming Practical		Course Code: 20PMDS105	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate the use of built-in objects of Python	Remembering & Understanding	1, 2
2	Use significant experience with python program development environment and apply the concept for solution building	Understanding & Applying	2, 3, 5
3	Implement numerical programming, data handling and visualization through NumPy, Pandas and MatplotLib modules.	Applying and Analyzing	1, 2, 3, 5

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M. Sc (Data Science)		Semester – I	
Course Name: Advance Database Management System		Course Code: 20PMDS102	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – I	
Course Name: Advance Database Management System Practical		Course Code: 20PMDS106	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand advanced database concepts distributed, parallel and object-oriented databases.	Remembering & Understanding	1, 2, 5
2	Understand and apply the concept of data warehousing.	Understanding & Applying	1, 2, 5
3	Understand and apply the concept of data mining and differentiate between classification and clustering methods.	Understanding, Applying and Analyzing	1, 2, 5

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M. Sc (Data Science)		Semester – I	
Course Name: Statistics I		Course Code: 20MSDS103	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – I	
Course Name: Statistics I Practical		Course Code: 20MSDS107	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the terminology and special notation of statistical analysis.	Remembering & Understanding	1, 2, 3
2	Apply and interpret the various measures of central tendency, dispersion skewness, Kurtosis	Applying & Analyzing	1, 2, 3
3	Classify correlation coefficient, linear regression equation and use R Studio for descriptive Statistics	Understanding, Applying & Analyzing	2, 4, 5

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M. Sc (Data Science)		Semester – I	
Course Name: Research Methodology		Course Code: 20PMDS104	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – I	
Course Name: R Programming Practical		Course Code: 20PMDS108	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define research and describe the research process and research methods, follow research ethics	Remembering & Understanding	1, 2, 3, 4, 6, 7, 8
2	Understand and apply basic research methods including research design, data analysis, and interpretation	Applying & Analyzing	1, 2, 3, 4, 5, 6, 7
3	Assess the basic function and working of analytical instruments used in research and propose the required numerical skills necessary to carry out research and prepare report/ dissertation/ thesis	Applying, Analyzing, Evaluating & Creating	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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SEMESTER II

M.Sc (Data Science)		Semester – II	
Course Name: Data Science with Python		Course Code: 20PMDS201	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – II	
Course Name: Data Science with Python Practical		Course Code: 20PMDS205	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand and conceptualize basics of Data Science.	Remembering & Understanding	1, 2
2	Understand machine learning concept and classify the various techniques in machine learning.	Understanding, Analyzing & Evaluating	2, 3, 4
3	Apply pyhton concept to design solution for machine learning problems.	Applying	1, 2, 3, 5

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M. Sc (Data Science)		Semester – II	
Course Name: Big Data Analytics		Course Code: 20PMDS202	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – II	
Course Name: Big Data Analytics Practical		Course Code: 20PMDS206	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.	Remembering & Understanding	1, 2
2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and Big SQL in big data analytics.	Understanding, Analyzing & Evaluating	2, 3, 4
3	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.	Applying	1, 2, 3, 5

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M. Sc (Data Science)		Semester – II	
Course Name: Statistics II		Course Code: 20PMDS203	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – II	
Course Name: Statistics II Practical		Course Code: 20PMDS207	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcome

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Apply probabilistic and statistical reasoning to describe and analyse essential features of data sets and problems in real-life business situations	Remembering & Understanding	1, 2, 3
2	Understand statistical techniques to estimate the population mean, proportion and variance, and acquire techniques to test hypothesis with an assumption on the population means, proportions and variances under different circumstances.	Understanding, Analyzing	2, 3, 4, 6, 7
3	Use and extend knowledge of inferential statistics and their applications in real-life business situations.	Applying , Analyzing	1, 2, 3, 5, 6,7

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M. Sc (Data Science)		Semester – II	
Course Name: Artificial Intelligence		Course Code: 20PMDS204	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

M. Sc (Data Science)		Semester – II	
Course Name: Artificial Intelligence		Course Code: 20PMDS208	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define & Understand knowledge of the building blocks of AI as presented in terms of intelligent agents	Remembering & Understanding	1
2	Study and apply various searching algorithms, Understand concept of propositional and first order logic.	Understand & Applying	2, 5
3	Analyze and formalize the problem based on different techniques to solve them	Analysing	2, 3

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SEMESTER III

SEMESTER III

M. Sc (Data Science)		Semester – 3	
Course Name: Machine Learning		Course Code: 21PMDS301	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – 3	
Course Name: Machine Learning		Course Code: 21PMDS305	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

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

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Develop learning algorithms based on logistic regression, Support Vector Machines to predict discrete-valued output given a training data comprising of features and corresponding class labels.	Remember, Understanding & Applying	1, 2, 3, 4
2	Design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms.	Analyzing, Evaluating & Creating	2, 3, 4, 5
3	Design and develop Linear Models for Regression using Bias-Variance Decomposition, Bayesian Linear Regression.	Applying & Creating	2, 3, 4, 5

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M. Sc (Data Science)		Semester – 3	
Course Name: DATA VISUALIZATION		Course Code: 21PMDS302	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc ((Data Science)		Semester – 3	
Course Name: DATA VISUALIZATION		Course Code: 21PMDS306	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the importance of data visualization and the design and use of many visual components.	Remembering & Understanding	1, 2
2	Apply visualizations techniques for different types of data sets and application scenarios and basics of colors, views, and other popular and important visualization-based issues.	Understand & Applying	2, 3, 4
3	Apply visualization structures such as tables, spatial data, time-varying data, tree and network and Analyze the basic algorithms in data visualization	Applying & Analyzing	2, 3, 5

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M. Sc (Data Science)		Semester – 3	
Course Name: Cloud Computing		Course Code: 21PMDS303	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – 3	
Course Name: Cloud Computing		Course Code: 21PMDS307	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand virtualization of clusters and Data centers along with various cloud computing and Service Models-PaaS, SaaS, IaaS.	Remembering & Understanding	1, 2, 3
2	Design of computer clusters for scalable parallel computing.	Applying	2, 3, 4
3	Apply and evaluating various aspects of security to cloud clusters	Applying & Evaluating	2, 3, 5

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M. Sc (Data Science)		Semester – 3	
Course Name: INFORMATION RETRIEVAL		Course Code: 21PMDS304	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – 3	
Course Name: INFORMATION RETRIEVAL		Course Code: 21PMDS308	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain and describe principles of Information Retrieval, the pre-processing methods for Information Retrieval.	Remembering & Understanding	1, 2
2	Apply appropriate compression techniques for dictionary files, posting files, and text data and examine the performance of IR system with various metrics like precision, recall and F-Measure.	Applying and Evaluating	2, 3, 4. 5
3	Construct and parse XML documents for a given real time scenario.	Applyng & Creating	2, 3, 5

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SEMESTER IV

M. Sc (Data Science)		Semester – 4	
Course Name: DEEP LEARNING		Course Code: 21PMDS401	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc ((Data Science)		Semester – 4	
Course Name: DEEP LEARNING		Course Code: 21PMDS405	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate concepts, architectures and algorithms of Neural Networks to solve real world problems.	Remembering & Understanding	1, 2
2	Identify deep feed-forward networks and different regularization techniques used in Deep Learning and challenges in Neural Network optimization and different optimization algorithms used in Deep learning models	Applying	2, 3, 4, 5
3	Analyze deep learning algorithms which are more appropriate for various types of learning tasks in various domains	Analyzing	2, 3, 4

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M. Sc (Data Science)		Semester –	
Course Name: SOCIAL NETWORK ANALYSIS		Course Code: 21PMDS402	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc ((Data Science)		Semester –	
Course Name: SOCIAL NETWORK ANALYSIS		Course Code: 21PMDS406	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

On the successful completion of the course, students will be able to

1)

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Represent knowledge using ontology.	Remembering & Understanding	1, 2
2	Develop semantic web related applications.	Understand & Applying	2, 3, 4
3	Predict human behavior in social web and related communities. Visualize social networks	Analyzing & Creating	2, 3, 4, 5

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M. Sc (Data Science)		Semester – 4	
Course Name: Natural Language Processing		Course Code: 21PMDS403	
Lectures per week (1 Period is 50 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

M. Sc (Data Science)		Semester – 4	
Course Name: Natural Language Processing		Course Code: 21PMDS407	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain and understand NLP syntax, semantics and concepts of morphology, syntax, semantics and pragmatics of the language.	Remembering & Understanding	1, 2, 3
2	Apply machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars and analyze the current methods for statistical approaches to machine translation.	Applying & Analyzing	2, 3, 4, 5
3	Compare and contrast the clustering and unsupervised methods, log-linear and discriminative models and the EM algorithm as applied within NLP.	Evaluating	2, 3, 5

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M. Sc (Data Science)		Semester – 4	
Course Name: Project		Course Code: 21PMDS404	
Lectures per week (1 Period is 50 minutes)		5	
Credits		6	
Evaluation System		Hours	Marks
	IMPLEMNTATION & VIVA VOCE	2 Hrs.	60
	PROJRCT REPORT	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Students will be able to communicate with Clients and define the requirements based on problems in the existing system.	Remembering, Understanding, Analysing & Evaluating	1, 2, 4, 5, 6, 7, 10
2	Students will be able to design, develop and deploy solution to meet all the user and system requirements.	Understanding, Applying, Analysing & Creating	2, 4, 5, 6, 8, 9, 10, 11
3	Students will be able to design use cases and test cases to evaluate the performance of system & estimate the cost and efforts.	Applying, Analysing and Evaluating	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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Programme: Master of Science
Specialization: Artificial Intelligence

Program Outcomes

Sr no.	Programme Outcome
PO1.	**Scientific knowledge:** Apply the knowledge of mathematics, science, and computing to the solution of complex scientific problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and applied sciences.
PO3	**Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tools usage:** Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modelling to complex scientific activities with an understanding of the limitations.
PO6	**The software engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional practice.
PO7	**Environment and sustainability:** Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex activities with the scientific community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management:** Demonstrate knowledge understanding of the scientific and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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Program Specific Outcomes

Programme	Programme Specific Outcomes
M.Sc. Artificial Intelligence	A graduate with a M.Sc. in Artificial Intelligence will have the ability to **PSO1.** Demonstrate mastery of Artificial Intelligence in the following core knowledge areas: • Communicate artificial intelligence concepts, research, designs, and solutions effectively and professionally • Mathematics & Statistics, Programming Languages • Big data, data security • Artificial Intelligence, Machine Learning, Deep Learning, sentiment analysis, speech recognition, robotic process automation **PSO2.** Apply knowledge of computing to produce effective designs and solutions for specific problems

Eligibility

Master of Science (Artificial Intelligence) M.Sc. (A.I.)

The Bachelor's degree in the Faculty of Science/ Technology of this University or equivalent degree of recognized Universities with major and ancillary Subjects at undergraduate level as detailed below:

Major	Ancillary
Mathematics	
Physics	Mathematics (4 Units)
Statistics	Mathematics (4 Units)
Life Sciences	Biochemistry or Chemistry with Mathematics or Statistics in first and second year OR Computer Sciences OR Information Technology up to second year of Bachelor's Degree
Bachelor's Degree in Technology (B.Tech./B.E.) in Engineering/ Computer Sciences/ Information Technology	
Bachelor's Degree in Computer Sciences B.C.A/B.C.S/ Information	

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Programme Structure

(To be implemented from Academic Year- 2020-2021)

M.Sc Part I (Artificial Intelligence)

Semester – I				
Sr. No.	Course Code	Course Title	Course Type	Credits
1	21PMAI101	Python Programming	Skill Enhancement Course	4
2	21PMAI102	Internet of Things	Core Course	4
3	21PMAI103	Maths and Stats	Core Course	4
4	21PMAI104	Data Warehouse & Data Mining	Core Course	4
5	21PMAI105	Python Programming Practical	Skill Enhancement Practical	2
6	21PMAI106	Internet of Things Practical	Core Course Practical	2
7	21PMAI107	Maths and Stats Practical	Core Course Practical	2
8	21PMAI108	Data Warehouse & Data Mining Practical	Core Course Practical	2
Total				24

Semester – II				
Sr. No.	Course Code	Course Title	Course Type	Credits
1	21PMAI201	Machine Learning and Pattern Recognition	Core Course	4
2	21PMAI202	Information Retrieval	Core Course	4
3	21PMAI203	Artificial Intelligence for Real World application	Core Course	4
4	21PMAI204	Research Methodology	Skill Enhancement Course	4
5	21PMAI205	Machine Learning and Pattern Recognition Practical	Core Course Practical	2
6	21PMAI206	Information Retrieval Practical	Core Course Practical	2
7	21PMAI207	Artificial Intelligence for Real World application Practical	Core Course Practical	2
8	21PMAI208	Research Methodology Practical	Skill Enhancement Practical	2
Total				24

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Programme Structure

(To be implemented from Academic Year- 2020-2021)

M.Sc Part II (Artificial Intelligence)

Semester – III				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	22PMAI301	Application of Deep Learning and Neural Networks	Skill Enhancement Course	4
2	22PMAI302	Design Thinking	Core Course	4
3	22PMAI303	Speech Recognition	Core Course	4
4	22PMAI304	Mixed Reality (Practical on AI related Tool)	Core Course	4
5	22PMAI305	Application of Deep Learning and Neural Networks Practical	Skill Enhancement Practical	2
6	22PMAI306	Design Thinking Practical	Core Course Practical	2
7	22PMAI307	Speech Recognition Practical	Core Course Practical	2
8	22PMAI308	Mixed Reality (Practical on AI related Tool) Practical	Core Course Practical	2
Total				24

Semester – IV				
Sr. No.	**Course Code**	**Course Title**	**Course Type**	**Credits**
1	22PMAI401	Social Media and Text Analytics	Core Course	4
2	22PMAI402	Conversational Experiences	Core Course	4
3	22PMAI403	Robotic Process Automation	Core Course	4
4	22PMAI404	Project	Skill Enhancement Course	6
5	22PMAI405	Social Media and Text Analytics Practical	Core Course Practical	2
6	22PMAI406	Conversational Experiences Practical	Core Course Practical	2
7	22PMAI407	Robotic Process Automation	Core Course Practical	2
Total				24

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SEMESTER I

M. Sc (Artificial Intelligence)	Semester – I		
Course Name: Python Programming	Course Code: 21PMAI101		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

M. Sc (AI)		Semester – I	
Course Name: Python Programming Practical		Course Code: 20PMDS105	
Lectures per week (1 Period is 50 minutes)		5	
Credits		3	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Demonstrate the use of built-in objects of Python	Remembering & Understanding	1, 2
2	Use significant experience with python program development environment and apply the concept for solution building	Understanding & Applying	2, 3, 5
3	Implement numerical programming, data handling and visualization through NumPy, Pandas and MatplotLib modules.	Applying and Analyzing	1, 2, 3, 5

M. Sc (Artificial Intelligence)	Semester – II		
Course Name: Internet of Things	Course Code: 21PMAI102		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60

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	Internal	—	40
	Total Marks		100

B. Sc (Information Technology)		Semester – I	
Course Name: Internet of Things Practical		Course Code: 20PMDIT106	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Acquire good understanding of the Internet of Things concept and systems architecture	Remembering & Understanding	1, 3
2	Conceptualize the standard security and privacy preserving mechanisms, and understand different cloud integration methods	Understanding & Applying	2, 5
3	Operate with wireless technologies and networking protocols specific to IoT systems & Design, implement, test and create IoT system equipped with sensors and wireless transceivers to help the society	Applying Evaluating and Creating	2, 3, 5, 6, 7

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M. Sc (Artificial Intelligence)	Semester – I		
Course Name: Mathematics & Statistics	Course Code: 21PMAI103		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the elements of structured data and data distribution for binary as well as categorical data.	Remembering & Understanding	1, 3
2	Apply the knowledge of sampling and distribution algorithms to evaluate the real distribution of sampling data.	Understanding & Applying	2, 5
3	Apply the knowledge of significance testing, use of null value hypothesis to outline the conditions for a particular test and evaluate and analyze the results of confusion matrix.	Applying Evaluating	2, 3, 5, 6, 7

M. Sc (Artificial Intelligence)	Semester – I		
Course Name: Data Warehouse & Data Mining	Course Code: 21PMAI104		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

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B. Sc (Information Technology)	Semester – I		
Course Name: Data Warehouse & Data Mining Practical	Course Code: 21PMAI108		
Lectures per week (1 Period is 50 minutes)	3		
Credits	2		
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand data warehouse, Knowledge data discovery and mining concept	Remembering & Understanding	1, 3
2	Classify various clustering and classification techniques and apply the concept for sampling	Applying & Evaluating	2, 5
3	Understand the use of tools in data warehousing and mining to apply the concept and create cube and dimensions.	Understanding, Applying & Creating	2, 3, 5, 6, 7

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SEMESTER II

M. Sc (Artificial Intelligence)	Semester – II		
Course Name: Machine Learning and Pattern Recognition	Course Code: 21PMAI201		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	----	40
	Total Marks		100

M. Sc (Information Technology)		Semester – II	
Course Name: Machine Learning and Pattern Recognition Practical		Course Code: 21PMAI205	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the fundamentals of pattern recognition and machine learning and the issue of dimensionality and apply suitable feature extraction methods considering the characteristics of a given problem.	Remembering, Understanding & Applying	1, 3
2	Apply parametric and non-parametric methods for pattern recognition in real-world problems and create solutions to real-world problems using pattern recognition and machine intelligence algorithms	Applying & Creating	2, 5
3	Analyze the performance of machine learning algorithms, effect of parameters and tuning of parameters.	Analyzing	2, 3, 5, 6, 7

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M. Sc (Artificial Intelligence)	Semester – II		
Course Name: Information Retrieval	Course Code: 21PMAI202		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

B. Sc (Information Technology)		Semester – II	
Course Name: Information Retrieval Practical		Course Code: 21PMAI206	
Lectures per week (1 Period is 50 minutes)		3	
Credits		2	
Evaluation System		Hours	Marks
	Practical Examination	2 Hrs.	50
	Internal	------	

Course Outcome:

On successful completion of course learner/student will be able to

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand Document as Vector and search Engine functionality	Remembering & Understanding	1, 2
2	Evaluate metric for IR and	Evaluating	2, 3, 4
3	Understand and apply various Supervised and Unsupervised learning Method	Understanding & Applying	1, 2, 3, 5

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M. Sc (Artificial Intelligence)	Semester – II		
Course Name: Artificial Intelligence for Real World application	Course Code: 21PMAI203		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

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M. Sc (Artificial Intelligence)	Semester – II		
Course Name: Research Methodology	Course Code: 21PMAI204		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

M. Sc (AI)	Semester – II		
Course Name: Research Methodology Practical	Course Code: 21PMAI208		
Lectures per week (1 Period is 60 minutes)	3		
Credits	2		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Define research and describe the research process and research methods, follow research ethics	Remembering & Understanding	1, 2, 3, 4, 6, 7, 8
2	Understand and apply basic research methods including research design, data analysis, and interpretation	Applying & Analyzing	1, 2, 3, 4, 5, 6, 7
3	Assess the basic function and working of analytical instruments used in research and propose the required numerical skills necessary to carry out research and prepare report/ dissertation/ thesis	Applying, Analyzing, Evaluating & Creating	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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SEMESTER III

M. Sc (Information Technology)		Semester – IV	
Course Name: Social Media and Text Analytics		Course Code: 22PMAI401	
Lectures per week (1 Period is 50 minutes)		5	
Credits		2	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
Total Marks			100

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain the text analytics framework, social media and analyze various sources of text data.	Remembering, Understanding & Analyzing	1, 2, 3
2	Interpret the results, gain insights, and recommend possible actions from analytics performed on text data.	Applying, Analyzing	2, 3, 4, 5
3	Collect social media data, develop social media strategy and measure social media campaign effectiveness.	Applying and Evaluating	2, 3, 5, 6, 7

M. Sc (Artificial Intelligence)		Semester – IV	
Course Name: Conversational Experiences		Course Code: 22PMAI402	
Lectures per week (1 Period is 60 minutes)		5	
Credits		4	
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	------	40
	Total Marks		100

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Study and understand the fundamental concept of conversational system, block programming, node and natural language processing.	Remembering & Understanding	1, 2, 3
2	Identify and evaluate lexical knowledge network, and understand the lexical syntax, semantic and part of speech tagging to apply semantic analysis.	Applying, Analyzing & Evaluating	2, 3, 4
3	Implement concept of natural language processing using python.	Applying	2, 3, 5

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M. Sc (Artificial Intelligence)	Semester – III		
Course Name: Application of Deep Learning and Neural Networks	Course Code: 22PMAI301		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Explain the basic concepts in Neural Networks and applications	Remembering & Understanding	1, 2, 3
2	Distinguish different types of ANN architectures	Understanding & Analyzing	2, 3, 4
3	Explain and apply the deep learning concepts using Back Propagation Network	Understanding & Applying	2, 3, 5

M. Sc (Artificial Intelligence)	Semester – III		
Course Name: Design Thinking	Course Code: 22PMAI302		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Examine Design Thinking concepts and principles	Remembering & Understanding	1, 2, 3
2	Practice the methods, processes, and tools of Design Thinking	Understanding & Analyzing	2, 3, 4, 5
3	Apply the Design Thinking approach and model to real world situations	Applying & Analyzing and Creating	2, 3, 5, 6, 7

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M. Sc (Artificial Intelligence)	Semester – III		
Course Name: Speech Recognition	Course Code: 22PMAI303		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

Course Outcomes:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand the basic concepts of speech and fundamental signal processing approaches to speech	Remembering & Understanding	1, 2, 3
2	Analyze various features of speech and understand the techniques of extracting the features and pattern comparison techniques.	Understanding & Analyzing	2, 3, 4
3	Understand the architecture and various models of continuous speech recognition system, apply methods of text to speech synthesis for different applications and Investigate recent developments in speech recognition	Applying & Evaluating	2, 3, 5

M. Sc (Artificial Intelligence)	Semester – III		
Course Name: Mixed Reality	Course Code: 22PMAI304		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			

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1	Understand the fundamentals of virtual, augmented and mixed reality and architecture of mixed reality systems	Remembering & Understanding	1, 2, 3
2	Apply mixed reality development tools for implementing various techniques of mixed reality and analyze the vital techniques required to turn a vision into reality.	Applying & Analyzing	2, 3, 4
3	Design MR interfaces and Develop mixed reality systems for real-world applications.	Applying & Creating	2, 3, 5

SEMESTER IV

M. Sc (Artificial Intelligence)	Semester – IV		
Course Name: Robotic Process Automation	Course Code: 22PMAI403		
Lectures per week (1 Period is 60 minutes)	5		
Credits	4		
Evaluation System		Hours	Marks
	Theory Examination	2 Hrs.	60
	Internal	——	40
	Total Marks		100

M. Sc (Artificial Intelligence)	Semester – IV	
Course Name: Robotic Process Automation Practical	Course Code: 22PMAI403	
Lectures per week (1 Period is 60 minutes)	5	
Credits	3	
Evaluation System	Hours	Marks
Theory Examination	2 Hrs.	50
Internal	------	------

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Understand basic programming concepts and its operation from RPA perspective and Robotic Process Automation and its applications.	Remembering & Understanding	1, 2, 3
2	Develop familiarity and deep understanding of UiPath tools and apply automation to image, text, data tables, citrix, pdf, email, execute exception handling and apply various functionalities of orchestrator.	Applying	2, 3, 4
3	Analyze opportunities of research in Artificial Intelligence with respect to RPA.	Analyzing	2, 3, 5

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M. Sc (Artificial Intelligence)		Semester – 4	
Course Name: PROJECT		Course Code: 22PMAI404	
Lectures per week (1 Period is 50 minutes)		5	
Credits		6	
Evaluation System		Hours	Marks
	IMPLEMNTATION & VIVA VOCE	2 Hrs.	60
	PROJRCT REPORT	------	40

Course Outcome:

CO	Course Outcomes	Bloom's Taxonomy	PO
By the end of this course, learner will be able to:			
1	Students will be able to communicate with Clients and define the requirements based on problems in the existing system.	Remembering, Understanding, Analysing & Evaluating	1, 2, 4, 5, 6, 7, 10
2	Students will be able to design, develop and deploy solution to meet all the user and system requirements.	Understanding, Applying, Analysing & Creating	2, 4, 5, 6, 8, 9, 10, 11
3	Students will be able to design use cases and test cases to evaluate the performance of system & estimate the cost and efforts.	Applying, Analysing and Evaluating	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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