

**Hindi Vidya Prachar Samiti's, Ramniranjan Jhunjhunwala College of Arts, Science & Commerce
(Empowered Autonomous College)
T. Y. B. Sc Computer-Science Syllabus Semester V & VI**



**Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College
of Arts, Science & Commerce
(Empowered Autonomous College)**

Affiliated to UNIVERSITY OF MUMBAI

Syllabus for the T. Y. B.Sc.

Program: B.Sc. COMPUTER-SCIENCE

**Program Code: RJSUCS
National Education Policy (NEP 2020)
Level 5.5**

**DSC (Discipline Specific Course): Service Oriented Architecture & Advanced Database Management System
Course Code: RJDSCCS352 & RJDSCCS362**

(REVISED in 2025-26 in alignment with the NEP2020)

(CBCS 2025-2026)

THE PREAMBLE

Why Computer Science?

Computer Science (CS) has been evolving as an important branch of science and engineering throughout the world in the last couple of decades and it has carved out space for itself like any other disciplines of basic science and engineering. Computer Science is a discipline that spans theory and practice, and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, healthcare, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. The B.Sc. Computer Science course structure therefore needed a fresh outlook and complete overhaul.

Why Computer Science at R J College?

The Computer Science department was established in the year 1999 with strength of 60 Students and M. Sc CS with strength of 40 Seats was introduced in the year 2001. Today the strength has reached 120 at UG level and 48 at PG level. The department offers both UG and PG programs in the subject of CS and is affiliated to and recognized by the University of Mumbai. College facilitates a departmental library with nearly 1200+ books. There are 3 well-upgraded dedicated laboratories for the CS department. With the management's extensive support, the department believes in "**1 Student 1 PC policy**" which helps students to practice rigorously and focus. Projects, hands-on training sessions, guest lectures, laboratory experimentation, lecture-based learning, industry visits etc. motivate students to explore more in terms of applications of the subject. Under autonomy, the department has made curriculum more robust by incorporating skill-based learning and value-added courses that impart practical knowledge of the subject to the students. Department of CS (DBT), New Delhi has identified CS Department of R J College as DBT Star College Department which has further strengthened our hands in being able to provide hands-on training to the students to satisfy their curiosity.

Our Curriculum, Your Strength

The syllabus of CS (Under NEP 2020) for a total eight semesters is meticulously designed so as to make students understand the various programming languages and other many subjects of Indian Knowledge, Communication, Ethics etc. The TY level syllabus has great potential to serve the needs of students for being a strong basic foundation in computer science. Then gradually stepping ahead the students at higher complexities at every subsequent semester, till semester 8. All subjects that are covered in these 8 semesters give adequate knowledge in the fields of Computer Science as well as other streams. Practical's of all semesters and Project at Final year boost high level of confidence of students to crack immense career opportunities.

PROGRAM OUTCOMES OF GENERAL UNDERGRADUATE DEGREE PROGRAMS

Students of all Postgraduate degree programs at the time of graduation will benefit and will be able to:

Critical Thinking

Comprehend the matter they come across and be capable of taking a sound viewpoint about things which will highlight their intellectual acumen as well as enable them to look at the world through multiple lenses.

Effective communication

Listen, speak, read and write. They should communicate properly by conveying their thoughts. They will use technology for communication. Will be able to network with people with all available channels. They will be developing communication skills in English, Hindi and a local language would be an added advantage.

Social Interaction

Respect each other and should be able to resolve conflicts and help in reaching an amicable solution. They should be able to work in diverse teams. They should be able to distinguish when and what is socially acceptable.

Responsible citizen

Contribute to Nation development through social service. Being empathetic and Sympathetic to fellow beings.

Honesty and Integrity, Ethics

Recognize different values and systems and respect them. In decision making moral values should be given prime importance.

Environmental and Sustainability

Environmental issues would be considered and problem solving with sustainable development would be chosen.

Life-Long learning

Enjoy learning in every situation.

Programme Specific Outcome B.Sc Program with Computer Science

BSc Computer Science course allows the candidates to learn technology-oriented knowledge and ability to develop creative solutions. An ability to critically analyze a problem and to design, implement, and evaluate a computing solution that meets requirements. An ability to work effectively in small groups on medium scale computing projects. This program provides the students with knowledge, general competence, and analytical skills on an advanced level, needed in academic and industry.

PSO1:	Ability to be technology-oriented with the knowledge and ability to develop creative solutions and better understand the effects of future developments of computer systems and technology on people and society. Enrich the knowledge in areas like Artificial Intelligence, M/C and Deep Learning, Paradigm of Programming language, Design and Analysis of Algorithms, computing subjects.
PSO2:	Students understand all dimensions of the concepts of software applications and projects. Students understand the computer subjects with demonstration of all programming and theoretical concepts. Developed in-house applications in terms of projects. Interact with IT experts, knowledge by IT visits. Get industrial exposure through the Industrial Visit in the IT industry. To make them employable according to the current demand of the IT Industry and responsible citizens.

Teaching Learning Process

The teaching learning process in the learning outcome-based curriculum framework in the subject of Computer Science is designed to develop the cognitive skills of every learner. The program offers the required skills for a profession and opportunities to get jobs in various IT sectors. A good number of practical courses included in the program to promote the learner to acquire the required skills for employment by experiential learning.

Project development is made part of the curriculum, which provides the most needed opportunity for each student to learn in the process of implementation of the project.

An interesting combination of teaching learning processes is adopted in which the teacher and learners are actively involved.

Some of the salient teaching learning processes are

- ☐ Class lectures
- ☐ Presentations
- ☐ Group Discussion, workshops.
- ☐ Peer teaching and learning
- ☐ Flipped classroom, project-based learning, quiz, seminars, exhibitions, posters.
- ☐ Hands on learning with practical assignments carefully designed.
- ☐ Technology enables self-learning.
- ☐ Internships

The effective teaching strategies would address the requirements of learners to learn at their own pace. The teaching pedagogy was adopted to ensure inculcate higher order skills in the learner. The entire program is also designed to foster human values and environmental consciousness for an equable society. The teaching learning processes adopted would aim at participatory pedagogy.

RAMNIRANJAN JHUNJHUNWALA COLLEGE											
TYBSC COMPUTER SCIENCE 2025-26											
	S E M	MAJOR					Minor	Vocational Skill Course	Field Project	OJT	TOTAL
		Discipline Specific Course SUB 1	Discipline Specific Course SUB 2	Discipline Specific Course SUB 3	Discipline Specific Course SUB 4	Discipline Specific Elective					
LEVEL 5.5	5	Artificial Intelligence	Service Oriented Architecture	Artificial Intelligence & Service Oriented Architecture		Linux System Administration / Software Testing & Quality Assurance	Software Engineering	Information & Network Security	Field Project		
		(3 Credits) (75 T Marks)	(3 Credits) (75 T Marks)	(1 + 1 = 2 Credits) (25 + 25 = 50 Marks)		(2 + 2 = 4 Credits) (50 T + 50 P Marks)	(2 + 2 Credit) (50 T+ 50 P Marks)	(2 + 2 Credit) (50 T + 50 P Marks)	(2 Credits) (50 Marks)		22 Credits (550 Marks)
	6	Data Science	Advance Database Management Systems	Data Science & Advance Database Management Systems	Operating System	DIP / Ethical Hacking	Wireless Sensor Networks And Mobile Communication			On Job Training	
		(3 Credits) (75 T Marks)	(3 Credits) (75 T Marks)	(1 + 1 = 2 Credits) (25 + 25 = 50 Marks)	(2 Credits) (50 Marks)	(2 + 2 Credits) (50 T + 50 P Marks)	(2 + 2 Credits) (50 T + 50 P Marks)			(4 Credits) (100 Marks)	22 Credits (550 Marks)
Total Credits											44 Credits (1100 Marks)

DISTRIBUTION OF TOPICS AND CREDITS

T. Y. B.Sc. COMPUTER-SCIENCE SEMESTER V

Course Code	Unit	Topic Headings	Credits	L / Week
RJDSCCS351	Paper Title: Artificial Intelligence			
	I	Introduction to AI and Problem Solving	3	1
	II	Knowledge Reasoning and Planning		1
	III	Learning and Applications of AI		1
Course Code	Unit	Topic Headings	Credits	L /Week
RJDSCCS352	Paper Title: Service Oriented Architecture			
	I	Introduction to SOA	3	1
	II	Registering and Discovering Services		1
	III	SOA and web services security consideration		1
Course Code	Topic Headings		Credits	
RJDSCCSP351	Paper Title: Practical of RJDSCCS351 (AI) and Practical of RJDSCCS352 (SOA)		2	
	AI Implementation of search strategies, knowledge representation and reasoning, Build Expert System, Data analysis using Machine learning models, Generative AI. SOA Creation and registration of different types of services like SOAP, REST by using different languages Java,.NET, PHP.			

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T. Y. B. Sc Computer-Science Syllabus Semester V & VI

Course Code	Unit	Topic Headings	Credits	L/Week
RJDSECS351	Paper Title: Linux System Administration			
	I	Introduction, Single-Host Administration	2	2
	II	Networking and Security, Internet Services		
Course Code	Topic Headings		Credits	
RJDSECSP351	Paper Title: Practical of RJDSECS351 (LSA)		2	
	Installation & Configuration of Linux based softwares			
Course Code	Unit	Topic Headings	Credits	L/Week
RJDSECS352	Paper Title: Software Testing & Quality Assurance			
	I	Introduction to S/w Testing, Software Testing Strategies	2	1
	II	Software Testing Strategies, Defect Management And Software Quality Assurance		1
Course Code	Topic Headings		Credits	
RJDSECSP352	Paper Title: Practical of RJDSECS352 (STQA)		2	
	Software Testing Strategies Software Quality Assurance			

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Course Code	Unit	Topic Headings	Credits	L/Week
RJMINCS351	Paper Title: Software Engineering			
	I	Introduction to Software Engineering	2	1
	II	Software requirements and design engineering		1
Course Code	Topic Headings		Credits	
RJMINCSP351	Paper Title: Practical of RJMINCS351(Software Engineering)		2	
	SE practical’s deal with the design, development, testing, and maintenance of software applications			
Course Code	Unit	Topic Headings	Credits	L/Week
RJVSCCS351	Paper Title: Information & Network Security			
	I	Introduction To Security, Message Security And Electronic Mail	2	2
	II	Web Security, Malicious Software And Detection And Prevention Techniques		
Course Code	Topic Headings		Credits	
RJVSCCSP351	Paper Title: Practical of RJVSCCS351 (INS)		2	
	Practical on Substitution Cipher Techniques, Transposition Cipher Techniques, DES Algorithm, AES Algorithm, RSA algorithm, Diffie-Hellman Key Agreement algorithm and MD5 algorithm			
Course Code	Unit	Topic Headings	Credits	L/Week
RJFPCS351		Field Project	2	

T. Y. B. Sc Computer-Science Syllabus Semester V & VI

T. Y. B. Sc. COMPUTER-SCIENCE SEMESTER VI

Course Code	Unit	Topic Headings	Credits	L/Week
RJDSCCS361	Paper Title: Data Science			
	I	Introduction to Data Science	3	1
	II	Data Curation, Management and Organization		1
	III	Statistical Modeling and Machine Learning		1

Course Code	Unit	Topic Headings	Credits	L/Week
RJDSCCS362	Paper Title: Advanced Database Management System			
	I	Distributed Databases, Parallel Database System	3	1
	II	Object Oriented Databases, Temporal Databases		1
	III	Active Database, XML Database, NoSQL Basics		1

Course Code	Topic Headings	Credits
RJDSCCSP361	Paper Title: Practical of RJDSCCS361 (DS) and Practical of RJDSCCS362 (ADBMS)	2
	DS Data Handling using NO-SQL database, preprocess, transform and analyse data using data science techniques. ADBMS Practical's based on Distributed Database, Object Oriented Databases, Temporal Databases, Active Database, XML Database	

Course Code	Unit	Topic Headings	Credits	L/Week
RJDSCCS363	Paper Title: Operating System			
	I	Introduction to OS, Processes & Process Synchronization	2	1
	II	CPU Scheduling, Deadlocks, Memory & System Architecture		1

T. Y. B. Sc Computer-Science Syllabus Semester V & VI

Course Code	Unit	Topic Headings	Credits	L/Week
RJDSECS361	Paper Title: Digital Image Processing			
	I	Introduction to Digital Image Processing	2	2
	II	Image Filtering, Restoration and Transformation		
	III	Image Compression, Morphology and Segmentation		
Course Code	Topic Headings		Credits	
RJDSECSP361	Paper Title: Practical of RJDSECS361 (DIP)		2	
	Apply transformation techniques on digital images, Noise removal, Morphology processing, Colour processing, Image segmentation on digital image.			

Course Code	Unit	Topic Headings	Credits	L/Week
RJDSECS362	Paper Title: Ethical Hacking			
	I	INTRODUCTION TO SECURITY BREACHING ETHICAL HACKING	2	1
	II	PRE-ATTACK And COMPROMISING WEB SERVERS AND WEB APPLICATIONS		1
Course Code	Topic Headings		Credits	
RJDSECSP362	Paper Title: Practical of RJDSECS362 (EH)		2	
	It involves testing web applications for vulnerabilities like SQL injections, cross-site scripting (XSS), and security misconfigurations. Ethical hackers focus on identifying flaws that could allow unauthorized access or data breaches.			

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Course Code	Unit	Topic Headings	Credits	L/Week
RJMINCS361	Paper Title: Wireless Sensor Network			
	I	INTRODUCTION TO WSN	2	2
	II	ACCESS CONTROL		
	III	WIRELESS TRANSMISSION AND MEDIUM		
Course Code	Topic Headings		Credits	
RJMINCSP361	Paper Title: Practical of RJMINCS361 (WSN)		2	
	Practical based on MANET, Ad HocNetwork, Routing Table Analysis, MAC Protocol Simulation, Simulation of			
	Wireless Network, Simulation of Wireless Network by using Antenna, Cell Tower, Central office Server.			
Course Code	Unit	Topic Headings	Credits	L/Week
RJOJTCS361		On Job Training	4	

T. Y. B.Sc. COMPUTER-SCIENCE SEMESTER V

SEMESTER V (THEORY)		L	Cr
Service Oriented Architecture	Paper Code: RJDSCCS352	30	3
UNIT I		10	
Introduction to SOA			
1	Introduction: Concepts of Distributed Computing, XML, Fundamental of SOA, evolution of SOA.		
2	Web Services Fundamental and Standard: Web Services: Definition, Architectures and Standards. Directory services, SOAP, REST WSDL.		
3	Principles of Service-Oriented Architecture-Service Orientation and object-orientation, SOA Standards Stack, SOA with Web Services, Key Principles of SOA.		
UNIT II		10	
Registering and Discovering Services			
1	Registering and Discovering Services: The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.		
UNIT III		10	
SOA and web services security considerations			
1	SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WSMetadata Exchange.		

T. Y. B. Sc Computer-Science Syllabus Semester V & VI

References:

1. Frank P.Coyle,—XML, Web Services and theData Revolution, Pearson Education, 2002.
2. Eric Newcomer, Greg Lomow, Understanding SOA with Web Services, Pearson Education, 2005.
3. Sandeep Chatterjee and James Webber,—Developing Enterprise Web Services: An Architect's Guide, Prentice Hall, 2004.
4. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, Java Web. Services Architecture, Morgan Kaufmann Publishers, 2003.

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	V MAJOR (CORE) SUBJECT
TITLE OF THE SUBJECT/COURSE	:	SERVICE ORIENTED ARCHITECTURE
COURSE CODE	:	RJDSCCS352
CREDITS	:	03
DURATION	:	30 LECTURES

LEARNING OBJECTIVES

1	The student should be made to be exposed to build applications based on XML. Understand the key principles behind SOA. Be familiar with the web services technology elements for realizing SOA. Students will learn the various web service standards.
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COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	To Understand Web Services and implementation model for SOA.	1,2	1,2,3
CO2	To Understand the SOA, its Principles and Benefits	1,2	4,5
CO3	To Understand paradigms needed for testing Web Services	1,2	4,5,6
CO4	To explore different Test Strategies for SOA-based applications	1,2	4,5
CO5	To implement functional testing, compliance testing and load testing of Web Services	1,2	4,5,6

SEMESTER VI (THEORY)		L	Cr
ADVANCE DATABASE MANAGEMENT SYSTEM	Paper Code: RJDSCCS362	45	3
UNIT I		15	
Distributed Databases, Parallel Database System			
1	Distributed Database Concepts: Definition of Distributed databases and Distributed Database Management System (DDBMS), Distributed transparent system. DDBMS Architecture, Distributed database design, Design problem of distributed systems, Design, strategies (top-down, bottom-up), Fragmentation, Allocation and replication of fragments. Query Processing Overview, Query Optimization. Distributed Reliability Protocols, Two phase commit protocol, Three phases commit protocol.		
2	Parallel Database System: Definition of Parallel Database Systems. Parallel query evaluation: Speed up and scale up, Query Parallelism: I/O Parallelism (Data Partitioning) Intra-query Parallelism, Inter -Query Parallelism, Intra Operation Parallelism, Inter Operation Parallelism.		
UNIT II		15	
Object Oriented Databases, Temporal Databases			
1	Object Oriented Database: Object Identity, Object structure, Type Constructors, Encapsulation of Operations, Methods, Persistence, Type and Class Hierarchies, Inheritance, Complex Objects, Object-oriented DBMS, Languages and Design: ODMG Model, Object Definition Languages (ODL), Object Query Languages (OQL).		

2	Temporal Database: Introduction to Temporal Database: Time ontology, structure, and granularity, Temporal data models, Temporal relational algebras.		
UNIT III		15	
Active Database, XML Database, NoSQL Basics			
1	Active Database: Languages for rule specification: Events, Conditions, Actions.		
2	XML Database: Structure of XML Data, XML Document Schema, Querying and Transformation, Storage of XML Data.		
3	NoSQL Basics: Characteristics of NoSQL, NoSQL storage types, Advantages and drawbacks, NoSQL products. Interfacing and interacting with NoSQL: Storing data in and accessing data from MangoDB, Redis, HBase and Apache Cassandra, Language.		

Textbook:

Distributed Database; Principles & Systems By Publications, Stefano Ceri and Giuseppe Pelagatti,, McGraw-Hill International Editions (1984)

Database Management Systems, 3rd edition, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill (2002).

Fundamentals of Database Systems, 6thEdition, Elmasri and Navathe, Addison. Wesley (2003).

Unifying temporal data models via a conceptual model, C.S. Jensen, M.D. Soo, and R.T. Snodgrass: Information Systems, vol. 19, no. 7, pp. 513-547, 1994.

Spatial Databases: A Tour by Shashi Shekhar and Sanjay Chawla, Prentice Hall, 2003 (ISBN 013-017480-7)

Principles of Multimedia Database Systems, Subramanian V. S. Elsevier Publishers, 2013.

References:

Principles of Distributed Database Systems; 2nd Edited By M. Tamer Ozsu and Patrick Valduriez, Person Education Asia.

Database System Concepts, 5th edition, Avi Silberschatz, Henry F. Korth, S. Sudarshan: McGraw-Hill (2010)

Database Systems: Concepts, Design and Applications, 2nd edition, Shio Kumar Singh, Pearson Publishing, (2011).

Multi-dimensional aggregation for temporal data. M. Böhlen, J. Gamper, and C.S. Jensen. In Proc. of EDBT-2006, pp. 257-275, (2006).

Moving objects databases (chapter 1 and 2), R.H. Güting and M. Schneider: Morgan Kaufmann Publishers, Inc., (2005)

Advanced Database Systems, (chapter 5, 6, and 7), Zaniolo et al.: Morgan Kaufmann Publishers, Inc., (1997).

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	VI MAJOR (CORE) SUBJECT
TITLE OF THE SUBJECT/COURSE	:	ADVANCE DATABASE MANAGEMENT SYSTEM
COURSE CODE	:	RJDSCCS362
CREDITS	:	03
DURATION	:	45 LECTURES

LEARNING OBJECTIVES

1	This module aims to give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture, the system catalog, query processing and optimization, transaction processing concepts, concurrency control techniques, database recovery techniques, database security and authorization, enhanced data models for advanced applications, temporal databases, deductive databases, database technology for decision support systems, distributed databases and client server architecture, advanced database concepts, and emerging technologies and applications.
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COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Understand distributed database management system (DDBMS) and its components.	1,2	1,2 Level
CO2	Analyze how database implementation is affected by different levels of data and process distribution.	1,2	3,4 Level
CO3	Understand and analyze the concepts of Temporal, XML databases.	1,2	1,2,3,4 Level

Scheme of Examinations**SEMESTER - V**

Sr. No.	Course Code	Course Name	Total Marks		
			Internal	External	Total
1.	Major Subject 1 (RJDSCCS351)	ARTIFICIAL INTELLIGENCE	25	50	75
2.	Major Subject 2 (RJDSCCS352)	SERVICE ORIENTED ARCHITECTURE	25	50	75
3.	Major Subject 3 Practical (RJDSCCSP351)	ARTIFICIAL INTELLIGENCE & SERVICE ORIENTED ARCHITECTURE PRACTICAL	-	50	50
4	Elective Subject A (RJDSECSP351)	LINUX SYSTEM ADMINISTRATION	20	30	50
5	Elective Subject A Practical (RJDSECSP351)	LINUX SYSTEM ADMINISTRATION PRACTICAL	-	50	50
6.	Elective Subject B (RJDSECS352)	SOFTWARE TESTING & QUALITY ASSURANCE	20	30	50
7.	Elective Subject B Practical (RJDSECSP352)	SOFTWARE TESTING & QUALITY ASSURANCE PRACTICAL	-	50	50
8.	Minor Subject 1 (RJMINCS351)	SOFTWARE ENGINEERING	20	30	50
9	Minor Subject 1 Practical (RJMINCS351)	SOFTWARE ENGINEERING	-	50	50

10.	VOCATIONAL SKILL COURSE 1 (RJVSCCS351)	INFORMATION & NETWORK SECURITY	20	30	50
11.	VOCATIONAL SKILL COURSE 1 Practical (RJVSCCSP351)	INFORMATION & NETWORK SECURITY PRACTICAL	-	50	50
12.	Field Project (RJFPCS351)	FIELD PROJECT		50	50
Total			110	440	550

SEMESTER-VI

Sr. No.	Course Code	Course Name	Total Marks		
			Internal	External	Total
1.	Major Subject 1 (RJDSCCS361)	DATA SCIENCE	25	50	75
2.	Major Subject 2 (RJDSCCS362)	ADVANCED DATABASE MANAGEMENT SYSTEM	25	50	75
3.	Major Subject 3 Practical (RJDSCCSP361)	DATA SCIENCE & ADVANCE DATABASE MANAGEMENT SYSTEM PRACTICAL	-	50	50
4.	Major Subject 3 (RJDSCCS363)	OPERATING SYSTEM	20	30	50
5.	Elective Subject A (RJDSECS361)	DIGITAL IMAGE PROCESSING	20	30	50
6.	Elective Subject A Practical (RJDSECSP361)	DIGITAL IMAGE PROCESSING PRACTICAL	-	50	50
7.	Elective Subject B (RJDSECS362)	ETHICAL HACKING	20	30	50
8	Elective Subject B Practical (RJDSECSP362)	ETHICAL HACKING PRACTICAL	-	50	50
9	Minor Subject 1 (RJMINCS361)	WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION	20	30	50
10	Minor Subject 1 Practical (RJMINCSP361)	WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION PRACTICAL	-	50	50
11	On Job Training (RJOJTCS361)	ON JOB TRAINING		100	100
Total			110	440	550

Evaluation and Assessment**➤ Evaluation Theory - Total Marks 75, Passing marks 30**

SEM V : RJDSCCS351, RJDSCCS352

SEM VI : RJDSCCS361, RJDSCCS322

Theory

- CIA - 25 Marks
 - CIA - 25 Marks Assignment / Case Study / Presentation
- Semester End Examination - 50 Marks
 - Question paper with questions each covering one unit.
 - Internal choice in each question.

Question Paper format for Semester End Examination (50 Marks)

Q1	Unit 1	Answer the following (Attempt any 3)	15
	A	Understanding / knowledge based	5
	B	Understanding / knowledge based	5
	C	Understanding / knowledge based	5
	D	Application / Analysis	5
	E	Application / Analysis	5
	F	Application / Analysis	5
Q2	Unit 2	Answer the following	15
	A	Understanding / knowledge based	5
	B	Understanding / knowledge based	5
	C	Understanding / knowledge based	5

	D	Application / Analysis	5
	E	Application / Analysis	5
	F	Application / Analysis	5
Q3	Unit 3	Answer the following	15
	A	Understanding / knowledge based	5
	B	Understanding / knowledge based	5
	C	Understanding / knowledge based	5
	D	Application / Analysis	5
	E	Application / Analysis	5
	F	Application / Analysis	5
Q4	All Units	Fill in the blanks	5

> Evaluation Theory - Total Marks : 50, Passing marks : 12

SEM V : RJDSECS351, RJDSECS352, RJMINCS351, RJVSCCS351

SEM VI : RJDSCCS363, RJDSECS361, RJDSECS362, RJMINCS361

Theory

- CIA - 20 Marks
 - CIA - 20 Marks Assignment / Case Study / Presentation
- Semester End Examination - 30 Marks
 - Question paper with questions each covering one unit.
 - Internal choice in each question.

Question Paper format for Semester End Examination (30 Marks)

Q1	Unit 1	Answer the following (Attempt any 2)	10
	A	Understanding / knowledge based	5
	B	Understanding / knowledge based	5
	C	Application / Analysis	5
	D	Application / Analysis	5
Q2	Unit 2	Answer the following (Attempt any 2)	10
	A	Understanding / knowledge based	5
	B	Understanding / knowledge based	5
	C	Application / Analysis	5
	D	Application / Analysis	5
Q3	Unit 1, 2	Answer the following (Attempt any 2)	10
	A	Understanding / knowledge based	5
	B	Understanding / knowledge based	5
	C	Application / Analysis	5
	D	Application / Analysis	5

➤ Evaluation Practical - Total Marks 50, Passing marks 20

SEM V : RJDSCCSP353, RJDSECSP351, RJDSECSP352, RJMINCSP351, RJVSCCSP351, RJFPCS351

SEM VI : RJDSCCSP363, RJDSECSP361, RJDSECSP362, RJMINCSP361

Practical

- Semester End Examination - 50 Marks

Mapping of the course to Employability/ Entrepreneurship/skill development

Class	Course Name	Course Code	Unit No. And topics focusing on Employability / Entrepreneurship / Skill development	Employability / Entrepreneurship / Skill development
TYBSC SEM V				
TYBSC	ARTIFICIAL INTELLIGENCE	RJDSCCS351	UNIT 1: Introduction to AI and Problem Solving UNIT 2: Knowledge Reasoning and Planning UNIT 3: Learning and Applications of AI	Employability in the field of data scientist, data engineer
TYBSC	SERVICE ORIENTED ARCHITECTURE	RJDSCCS352	UNIT 1: Introduction to SOA UNIT 2: Registering and Discovering Services UNIT 3: SOA and web services security consideration	Employability in the field of service developer
TYBSC	LINUX SYSTEM ADMINISTRATION	RJDSECS351	UNIT 1: Introduction, Single-Host Administration UNIT 2: Networking and Security, Internet Services UNIT 3: Security	Employability in the field of system or server administration
TYBSC	SOFTWARE TESTING & QUALITY ASSURANCE	RJDSECS352	UNIT 1: Introduction to S/w Testing, Software Testing Strategies UNIT 2: Software testing strategies, Defect management And Software quality assurance	Employability in the field of software testing

TYBS C	SOFTWARE ENGINEERING	RJMINCS351	UNIT 1: Introduction to Software Engineering UNIT 2: Software requirements and design Engineering	Employability in the field of system requirement
TYBS C	INFORMATION & NETWORK SECURITY	RJVSCCS351	UNIT 1: Classical Encryption Techniques, Public-Key Cryptography and RSA UNIT 2: Key Management, Message Authentication and Hash Functions, Digital Signatures and Authentication, Authentication Applications UNIT 3: Electronic Mail Security, IP Security, Web Security, Intrusion, Malicious Software and Detection and prevention Techniques, Firewall	Skill development includes technical expertise in cryptography, network defense, and vulnerability assessment, along with critical thinking, problem-solving, and ethical awareness. This combination ensures professionals can effectively protect systems, detect threats, and communicate security issues in real-world scenarios.
TYBS C	FIELD PROJECT	RJFPCS351		Skill development

TYBSC SEM VI				
TYBSC	DATA SCIENCE	RJDSCCS361	UNIT 1: Introduction to Data Science UNIT 2: Data Curation, Management and Organization UNIT 3: Statistical Modeling and	Employability in the field of data scientist, big data engineer

			Machine Learning	
TYBSC	ADVANCED DATABASE MANAGEMENT SYSTEMS	RJDSCCS362	UNIT 1: Distributed Databases, Parallel Database System UNIT 2: Object Oriented Databases, Temporal Databases UNIT 3: Active Database, XML Database, NoSQL Basics	Employability in the field of Database manager, Database administrator.
TYBSC	OPERATING SYSTEM	RJDSCCS363	UNIT 1: Introduction to OS, Processes & Process synchronization UNIT 2: CPU scheduling, Deadlock, Memory & System Architecture	Employability in the field system administration AND Skill developement
TYBSC	DIGITAL IMAGE PROCESSING	RJDSECS361	UNIT 1: Introduction to Digital Image Processing UNIT 2: Image Filtering, Restoration & Transformation UNIT 3: Image compression, Morphology & Segmentation	Employability in the field of digital imaging

TYBSC	ETHICAL HACKING	RJDSECS362	UNIT 1: Introduction to security breaching ethical hacking UNIT 2: Pre-attack and compromising web servers and web applications	Employability in the field of security
TYBSC	WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION	RJMINCS361	UNIT 1: Introduction to wireless sensor network and architecture UNIT 2: Access Control, Routing Protocols, Transport Control Protocols UNIT 3: Telecommunication, Satellite and Broadcast System, Satellite Systems: History, Applications, Basics	Employability in the field of Wireless Sensor Network, Network Administrator AND Skill development
TYBSC	ON JOB TRAINING			Skill development