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. (Under NEP)

Program: B.Sc. COMPUTER-SCIENCE

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

DSC (Discipline Specific Course): Artificial Intelligence & Data Science
Course Code: RJDSCCS351 & RJDSCCS361

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

(CBCS 2025-2026)

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

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 a 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 laborites 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.

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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 academics, 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 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.

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Credit Structure for T. Y. B.Sc. Semester-V and Semester-VI as per NEP 2020
To be implemented from the academic year 2025-2026.

RAMNIRANJAN JHUNJHUNWALA COLLEGE

TYBSC COMPUTER SCIENCE 2025-26

	SEM	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)**

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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.	

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			

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**	

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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** Practicals 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**

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.			

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 Hoc Network, 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**	

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

SEMESTER V (THEORY)		L	Cr
Artificial Intelligence	**Paper Code: RJDSCCS351**	45	3
UNIT I		15	
Introduction to AI and Problem Solving			
1	**Introduction:** What is AI? Foundation of AI, History of AI Intelligent Agents: Agents and Environment, concept of Rationality, Nature of Environments, Structure of Agents.		
2	**Problem Solving:** Problem Solving Agents, Example Problems, searching for solutions, Uninformed search strategies – (Breadth First, Uniform cost, Depth First, Depth Limited, Iterative deepening depth first, bidirectional), informed search strategies – (Greedy best first, A*, Optimality of A*, Memory bounded), Heuristic Functions.		
3	**Beyond Classical Search:** Local search algorithms and optimization problems, local search in continuous spaces, searching with non-deterministic actions, searching with partial observations, online search agents and unknown environments. **Adversarial Search:** Games, Optimal decision in games, Alpha-Beta Pruning, Imperfect RealTime Decisions, Stochastic Games, Partially Observable Games, Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs.		
UNIT II		15	
Knowledge Reasoning and Planning			
1	**Logical Agents** Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking.		
2	**First Order Logic** Syntax and Semantics of First-Order Logic, using First order logic, Knowledge Engineering in First-Order Logic.		
3	**Inference in First Order Logic** Unification and Lifting, Forward Chaining, Backward chaining, resolution.		
UNIT III		15	
	Learning and Applications of AI		

1	**Learning in Artificial Intelligence** Forms of Examples, Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, A Logical formulation of Learning, Knowledge in Learning, Learning using Relevant Information, Inductive Logic Programming, Reinforcement Learning, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning		
2	**Applications of Artificial Intelligence Natural** Language Processing, Expert Systems, Neural Networks.		
3	**Generative AI:** Introduction to Generative AI, Generative AI Tools & Techniques, Generative AI Applications		

References:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig,3rd Edition, Pearson, 2010.
2. Artificial Intelligence: Foundations of Computational Agents, David L Poole,Alan K. Mackworth, 2nd Edition, Cambridge University Press ,2017.
3. Artificial Intelligence, Kevin Knight and Elaine Rich, 3rd Edition, 2017

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	V MAJOR (CORE) SUBJECT
TITLE OF THE SUBJECT/COURSE	:	**ARTIFICIAL INTELLIGENCE**
COURSE CODE	:	**RJDSCCS351**
CREDITS	:	03
DURATION	:	45 LECTURES

LEARNING OBJECTIVES	
1	The objective of an AI course is to equip students with a deep understanding of key AI concepts, including machine learning, deep learning, and natural language processing. Students will learn to design, implement, and evaluate AI models using industry-standard tools. The course aims to develop critical thinking regarding the ethical and societal implications of AI. Additionally, students will apply AI techniques to address real-world challenges across different sectors.

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Enhanced Problem-Solving Skills using AI models	1,2	BT Level 2
CO2	Gain proficiency in collecting, cleaning, and analyzing large datasets to train AI models.	1,2	BT Level 4
CO3	Acquire the ability to design Real-World Application Development	1,2	BT Level 6
CO4	To understand the impact of generative AI in various fields.	1,2	BT Level 4

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

SEMESTER VI (THEORY)		L	Cr
DATA SCIENCE	**Paper Code: RJDSCCS361**	45	3
UNIT I		15	
Introduction to Data Science			
1	**Introduction to Data Science:** What is Data? Different kinds of data, Introduction to high level programming language + Integrated Development Environment (IDE), Exploratory Data Analysis (EDA) + Data Visualization, Different types of data sources.		
2	**Data Management:** Data Collection, Data cleaning/extraction, Data Analysis & Modeling.		
UNIT II		15	
Data Curation, Management and Organization			
1	**Data Curation:** Query languages and Operations to specify and transform data, Structured/schema-based systems as users and acquirers of data Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data.		
2	**Data Curation, Management and Organization** Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, Large scale data systems, Amazon Web Services (AWS). Large-scale data systems ● Paradigms for distributed data storage ● Practical access to example systems (e.g. MongoDB, HBase, NoSQL systems) ● Amazon Web Services (AWS) provides public data sets in Landsat, Genomics, multimedia		

UNIT III		15	
Statistical Modeling and Machine Learning			
1	**Statistical Modeling and Machine Learning:** Introduction to model selection: Regularization, bias/variance tradeoff e.g.parsimony, AIC, BIC, Cross validation, Ridge regressions and penalized regression e.g. LASSO.		
2	**Data transformations:** Dimension reduction, Feature extraction, Smoothing and aggregating.		
3	**Supervised Learning:** Regression, linear models, Regression trees, Time-series Analysis, Forecasting, Classification: classification trees, Logistic regression, separating hyperplanes, k-NN. **Unsupervised Learning:** Principal Components Analysis (PCA), k-means clustering, Hierarchical clustering, Ensemble methods.		

References:

1. Doing Data Science, Rachel Schutt and Cathy O'Neil, O'Reilly,2013
2. Mastering Machine Learning with R, Cory Lesmeister, PACKT Publication,2015
3. Hands-On Programming with R, Garrett Grolemund,1st Edition, 2014
4. An Introduction to Statistical Learning, James, G., Witten, D., Hastie, T.

1) Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016

2) CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	VI MAJOR (CORE) SUBJECT
TITLE OF THE SUBJECT/COURSE	:	**DATA SCIENCE**
COURSE CODE	:	**RJDSCCS361**
CREDITS	:	03
DURATION	:	45 LECTURES

LEARNING OBJECTIVES	
1	Data Preparation: Learn to collect, clean, and preprocess data for analysis.
2	Exploratory Analysis: Develop skills in analyzing and visualizing data to uncover insights.
3	Modeling and Evaluation: Build and assess machine learning models to solve real-world problems.
4	Communication: Effectively present data-driven findings to both technical and non-technical audiences.

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Ability to preprocess, clean, and transform data for analysis.	1,2	BT Level 4
CO2	Proficiency in applying statistical techniques and machine learning models to extract insights.	1,2	BT Level 3
CO3	Competence in visualizing and interpreting data to support decision-making.	1,2	BT Level 5
CO4	Understanding of ethical considerations and the ability to communicate results effectively.	1,2	BT Level 2

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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**

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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.

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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

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

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 ADMINISTRATIO N	RJDSECS351	**UNIT 1:** **I**ntroduction, 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

TYBSC	SOFTWARE ENGINEERING	RJMINCS351	**UNIT 1:** Introduction to Software Engineering **UNIT 2:** Software requirements and design Engineering	Employability in the field of system requirement
TYBSC	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.
TYBSC	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 COMMUNICATIO N	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