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

Minor: Software Engineering
Wireless Sensor Networks & Mobile Communication
Course Code: RJMINCS351 & RJMINCS361

(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 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 program at the time of graduation will be benefited 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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T. Y. B. Sc Computer-Science Syllabus Semester V & VI

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)**

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** 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**

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 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**	

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

SEMESTER V (THEORY)		L	Cr
SOFTWARE ENGINEERING	**Paper Code: RJMINCS351**	30	2
UNIT I		15	
Introduction to Software Engineering			
1	**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models. **Software Development Models:** The waterfall model, incremental process models, RAD model, Spiral Model, V model, Agile model, Iterative Model, Prototype model, COCOMO model.		
UNIT II		15	
Software Requirements And Design Engineering			
1	**Software Requirements**: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.		
2	**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.		

References:

Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.

Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.

Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

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COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	V MINOR SUBJECT
TITLE OF THE SUBJECT/COURSE	:	**SOFTWARE ENGINEERING**
COURSE CODE	:	**RJMINCS351**
CREDITS	:	2
DURATION	:	30 LECTURES

LEARNING OBJECTIVES	
1	The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
2	Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).	1,2	1,2 Level
CO2	Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.	1,2	2,3 Level
CO3	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report	1,2	3,4 Level

SEMESTER V (PRACTICALS)		**L**	**Cr**
SOFTWARE ENGINEERING	**Paper Code: RJMINCSP351**	**40**	**2**
1	An introduction to software engineering.		
2	To study and draw various UML diagrams.		
3	To illustrate the use of class diagram.		
4	To draw an activity diagram.		
5	To illustrate the use of use-case diagram.		
6	Draw object diagram.		
7	Development of state transition diagram.		
8	Draw E-R diagram.		
9	Develop sequence diagram.		
10	Development of Component and deployment diagram.		

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	V ELECTIVE SUBJECT
TITLE OF THE SUBJECT/COURSE	:	**SOFTWARE ENGINEERING PRACTICAL**
COURSE CODE	:	**RJMINCSP351**
CREDITS	:	02
DURATION	:	40 LECTURES

LEARNING OBJECTIVES	
1	To understand the software engineering methodologies involved in the phases for project development
2	To gain knowledge about open-source tools used for implementing software engineering methods

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Ability to identify the minimum requirements for the development of application.	1,2	1,2 Level
CO2	Ability to develop, maintain efficient, reliable and cost-effective software solution.	1,2	2,3 Level
CO3	Ability to critically thinking and evaluate assumptions and arguments.	1,2	3,4 Level

SEMESTER VI (THEORY)			**L**	**Cr**
WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION		**Paper Code: RJMINCS361**	30	2
UNIT			15	
INTRODUCTION TO WSN, ACCESS CONTROL				
1	**Introduction**: Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.			
2	**Sensor Node Hardware and Network Architecture**: Single-node architecture, Hardware components & design constraints, Operating Systems and execution environments, introduction to TinyOS andnesC. Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts			
	Routing Protocols: Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks **Transport Control Protocols:** Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols			
UNIT II			15	
WIRELESS TRANSMISSION MEDIUM AND SATELLITE SYSTEMS				
1 **2** **3** **4**	**Access Control:** Applications, A short history of wireless communication. **Wireless Transmission:** Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. **Telecommunication, Satellite and Broadcast Systems:** GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; **Satellite Systems: History, Applications, Basics:** GEO, LEO, MEO; Routing, Localization, Handover in satellite.			

References:

1. **1. Dennis Roddy, "Satellite Communication", 4th Edition, Mc Graw Hill International, 2006.**
2. **2.Timothy, Pratt, Charles, W. Bostain, Jeremy E. Allnutt, "Satellite Communication", 2ndEdition, Wiley Publications,2002**

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	VI MINOR SUBJECT
TITLE OF THE SUBJECT/COURSE	:	**WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION**
COURSE CODE	:	**RJMINCS361**
CREDITS	:	02
DURATION	:	30 LECTURES

LEARNING OBJECTIVES	
1	After completion of this course, learners should be able to list various applications of wireless sensor networks, describe the concepts, protocols, design, implementation and use of wireless sensor networks.
2	Also implement and evaluate new ideas for solving wireless sensor network design issues

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	In this era of wireless and ad hoc networks, connecting different wireless devices and understanding their compatibility is very important.	1,2	BT Level 2
CO2	Information is gathered in many different ways from these devices. Learners should be able to conceptualize and understand the framework.	1,2	BT Level 5
CO3	On completion, will be able to have a firm grip over this very important segment of wireless network.	1,2	BT Level 3

SEMESTER VI (PRACTICALS)		**L**	**Cr**
WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION PRACTICAL	**Paper Code: RJMINCSP361**	**40**	**2**
1	Understanding the Sensor Node Hardware. (For Eg. Sensors, Nodes (Sensor mote), Base Station, Graphical User Interface.)		
2	Exploring and understanding TinyOS computational concepts:- Events, Commands and Tasks. a.nesC model b.nesC Components		
3	Create and simulate a simple adhoc network		
4	Understanding, Reading and Analyzing Routing Table of a network		
5	Create a basic MANET implementation simulation for Packet animation and Packet Trace.		
6	Implement a Wireless sensor network simulation		
7	Create MAC protocol simulation implementation for wireless sensor Network.		
8	Create a mobile network using Cell Tower, Central Office Server, Web browser and Web Server. Simulate connection between them.		
9	Simulate Mobile Adhoc Network with Directional Antenna		

COURSE OUTCOMES (COs) B. Sc. COMPUTER SCIENCE

SEMESTER	:	VI MINOR SUBJECT
TITLE OF THE SUBJECT/COURSE	:	**WIRELESS SENSOR NETWORKS & MOBILE COMMUNICATION PRACTICAL**
COURSE CODE	:	**RJMINCS361**
CREDITS	:	02
DURATION	:	40 LECTURES

LEARNING OBJECTIVES	
1	1) Explain the basic concepts of how to design wireless sensor networks,and send packets. 2) Describe and explain radio standards and communication protocols adopted in wireless sensor networks.
2	3) Describe and explain the hardware, software and communication for wireless sensor network nodes. 4) Learn the architectures, features, and performance for wireless sensor network systems and platforms. 5) describe and analyze the specific requirements of applications in wireless sensor networks routing and data transmission.

COURSE OUTCOME NUMBER	On completing the course, the student will be able to:	PSO Addressed	BLOOMS LEVEL
CO1	Learn the architectures, features, and performance for wireless sensor network systems and platforms	1,2	BT Level
CO2	Implement a Wireless sensor network simulation Create MAC protocol simulation implementation for wireless sensor Network.	1,2	BT Level
CO3	Create and simulate a simple ad hoc and MANET network	1,2	BT Level

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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.

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 ML	Employability in the field of data scientist, big data engineer

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