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SARVAJANIK UNIVERSITY
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Course Curriculum

BACHELOR OF SCIENCE (Hons.) COMPUTER SCIENCE Sem-5 and 6

The Course Curriculum of Bachelor of Science (Computer Science) was proposed and drafted by **Academic and Curriculum Committee of Computer Science and Information Technology** under the Faculty of Science in the meeting held on 21-07-2025 and recommended to **'BOARD OF STUDIES'** for approval.

Prof. Jayesh Pushtiwala **Chairman, Academic** **& Curriculum Committee** **Science**	**Place of the meeting** **Sarvajanik University Office**	**Sign**

The proposed Course Curriculum was approved by **Board of Studies; Science** under the Faculty of Science in the meeting held on 08-08-2025 and was recommended to the **'FACULTY'** for approval.

Dr. Chaulami Desai **Chairman,** **Board of Studies- Science**	**Place of the meeting** **Sarvajanik University Office**	**Sign**

The Course Curriculum approved by the **Faculty of Science** in the meeting held on 08-08-2025 and was recommended to **'ACADEMIC COUNCIL'** for approval.

Dr. Chaulami Desai **Chairman & Dean,** **Faculty of Science**	**Place of the meeting** **Sarvajanik University Office**	**Sign**

The Course Curriculum approved by the **'Academic Council of Sarvajanik University** 'in the meeting held on 22-08-2025.

Mr. Ashish Desai **Member Secretary,** **Academic Council** **& I/c. Registrar,** **Sarvajanik University**	**Place of the meeting** **Sarvajanik University Office**	**Sign**

- ***The approved curriculum of Bachelor of Science (Hons.) Computer Science is with effect from the Academic year 2025–26 and to be reviewed before 2028 –29***

CURRICULUM FOR

"BACHELOR OF SCIENCE (HONS.)"

B.Sc. (Hons.) Computer Science

SEM - 5

w.e.f. Academic Year 2025-26

॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society

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creating an enlightened society...

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Constituent Institute:

Shree Ramkrishna Institute of Computer Education and Applied Sciences (SRKI)

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

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Faculty of Science
B. Sc. (Honors)
Computer Science
SEM - 5

DETAILED CURRICULUM
(W.E.F. 2025-26)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

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MAJOR SUBJECTS

SEM 5

DETAILED CURRICULUM

(W.E.F. 2025-26)

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences							
Faculty	Science			**Program**	B.Sc. Computer Science		
Year	2025			**Version**	1.0		
Semester	V			**Effective From**	June, 2025		
Course Code	BSCS31518	**Course Name**	Advanced Database Technologies				
Teaching Scheme				**Examination Scheme**			
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Semester end examinations (SEE)**	**Total**	
3	3	-	-	40	35	75	

Purpose of Course	The purpose of course is to make students use the four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column-oriented and Graph).
Course Objective	To provide Fundamental knowledge of the detailed architecture, define objects, load data, query data and performance tune NoSQL databases.
Pr-requisite	Basic understanding of Database Concepts.
Course Out come	After completing this course, a learner will be able to identify what type of NoSQL database to implement based on business requirements, can able to apply NoSQL data modeling from application specific queries
Course Content	**Unit 1: Database Basics** **[7 Hrs]** 1.1 Type of Database Systems 1.1.1 Relational Database Design 1.1.2 E-commerce Application 1.1.3 Early Database Management Systems 1.1.4 Flat File Data Management Systems

1.1.5 Organization of Flat File Data Management Systems

1.1.6 Hierarchical Data Model Systems

Unit 2: Variety of NoSQL Databases **[6 Hrs]**

2.1 Data Management with Distributed Databases

2.2 Store Data Persistently, Maintain Data Consistency, Ensure Data Availability

2.3 Balancing Response Times, Consistency, and Durability Consistency, Availability, and Partitioning: The CAP Theorem

2.4 ACID and BASE

2.4.1 ACID: Atomicity, Consistency, Isolation, and Durability

2.4.2 BASE: Basically Available, Soft State, Eventually Consistent

Unit 3: Types of NoSQL Databases **[8 Hrs]**

3.1 Key-Value Pair Database

3.2 Document Database

3.3 Column Family Databases

3.4 Graph Databases

3.5 Time-series Database

3.6 In-Memory Database

Unit 4: MongoDB Database **[12 Hrs]**

4.1 The Document Data Model

4.2 Documents and Collections, Mongo Shell

4.3 Working Database – create, drop

4.4 Working with collections – create, drop

4.5 Working with Document – Adding batch of document, find document, modify document, find selected fields, removing document

4.6 Indexing, Writing to Shards

4.7 MongoDB as a File System

Unit 5: Neo4j - Graph Database **[6 Hrs]**

5.1 The Graph Databases – navigational db, relational db, NoSQL db

5.2 Neo4j building blocks, Key value stores

5.3 Cypher Query Language – Nodes, relationships

	Unit 6: Firebase **[6 Hrs]** 6.1 Introduction to Firebase 6.2 Working with real-time data 6.3 Firebase Environment setup
Reference Book	1. Designing Data-Intensive Applications By Martin Kleppmann-O'Reilly 2. NoSQL for Mere Mortals® By Dan Sullivan-O'Reilly 3. Pro MongoDB™ Development By Deepak Vohra 4. MongoDB in Action By Kyle Banker 5. Cassandra: The Definitive Guide By Eben Hewitt 6. Nosql Web Development With Apache Cassandra by Deepak Vohra 7. Learning Neo4j By Rik Van Bruggen

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences				
Faculty	Science		**Program**	B.Sc. Information Technology
Year	2025		**Version**	1.0
Semester	III		**Effective From**	June, 2025
Course Code	BSCS31521	**Course Name**	Advanced Database Technologies	

Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Semester end examinations (SEE)**	**Total**
1	–	-	1	15	10	25

Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques studied in courses of semester 5.
Course Objective	The objective of these course is to enable students to learn practical implementation of Advanced Database Technologies
Pre-requisite	As per theory papers of Major - Advanced Database Technologies
Course Out come	After completion of this course, the student will be capable of performing practical application of subject - Advanced Database Technologies
Course Content	The students will be required to carry out practical on Advanced Database Technologies using the methods and tools discussed A Journal must be prepared for the practical work done.
Practical	List of practicals will be prepared at the beginning of each semester
Reference Books	As per paper Major - Advanced Database Technologies

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences				
Faculty	Science		**Program**	B.Sc. (Computer Science)
Year	3		**Version**	1.0
Semester	5		**Effective From**	June, 2025
Course Code	BSCS31516	**Course Name**	Major: Fundamentals of Cloud Computing and Internet of Things	

Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
3	3	0	0	40	35	75

Purpose of Course	• The course gives students an idea about Cloud Computing Fundamentals And Cloud Based Systems • The purpose of this course is to impart knowledge on Internet of Things(IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications
Course Objective	• To provide comprehensive knowledge of cloud computing and aspects related to it • The purpose of this course is to impart knowledge on Internet of Things(IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications
Pr-requisite	• Basic understanding of operating system,computer network and Internet, Basic programming knowledge
Course Out come	• After completion of this course, the student will gain comprehensive knowledge of Cloud based systems and aspects related to it • Understanding about the architectural detail of IoT • Knowledge about domain specific applications of IoT • Exposure to working with Arduino
Course Content	**Unit 1 : Introduction to Cloud Computing (6 Hours)**

	1.1 Basics of Cloud Computing: Definition, Features, and Benefits 1.2 Evolution of Cloud Computing and Comparison with Traditional Computing 1.3 Advantages and Challenges of Cloud Computing 1.4 Cloud Service Models: IaaS, PaaS, SaaS 1.5 Cloud Service Providers- AWS, Azure, Google Cloud **Unit 2 : Cloud Deployment Models and Virtualization (6 Hours)** 2.1 Cloud Deployment Models: Public, Private, Hybrid, Community 2.2 Virtualization in Cloud Computing: Concept, Types, and Benefits 2.3 Role of Hypervisors in Cloud Computing 2.4 Virtual Machines (VMs) vs. Containers **Unit-3 : Cloud Security, Compliance and Future Trends (7 Hours)** 3.1 Security Risks in Cloud Computing: Data Breaches, Account Hijacking 3.2 Cloud Security Measures: Encryption, Access Control, Firewalls 3.3 Service Level Agreement 3.4 Cloud in Business and Enterprise Applications 3.5 Role of Cloud computing in IoT 3.6 Big Data and AI in Cloud Computing 3.7 Serverless Computing and Edge Computing 3.8 Future Trends: Quantum Computing, Cloud Automation **Unit-4 : Introduction to Internet of Things (IoT) (6 Hours)** 4.1 Definition and Characteristics of IoT 4.2 Components of IoT: Devices, Gateways, Cloud, and Applications 4.3 IoT Architecture and Communication Models 4.4 Benefits and Challenges of IoT **Unit-5 : IoT Applications and Security (6 Hours)** 5.1 IoT in Smart Homes, Smart Cities, Healthcare, Agriculture, Manufacturing, Energy and Grid.

	5.2 IoT Data Management and Analytics 5.3 Security Challenges in IoT: Threats, Privacy, and Mitigation Techniques 5.4 Ethical Considerations in IoT **Unit-6 : Building Applications Using Arduino (7 Hours)** 6.1 Introduction to Arduino 6.2 Flavors of Arduino 6.3 Architecture of Arduino board 6.4 Arduino Toolchain 6.5 Installing Arduino Desktop IDE 6.6 Installing Board drivers, configuring board type, uploading the Program
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	1. Cloud Computing: Principles and Paradigms - R. Buyya et al - Wiley2010 2. Cloud Computing : Principles Systems and Application - LGillametal- Springer 2010 3. Cloud Computing Bible - Sosinsky - Wiley - India, 2011 4. Cloud Computing Second Edition Dr. Kumar Saurabh - Wiley-India,2012 5. Cloud Computing - Insight into New Era Infrastructure - Dr KumarSaurabh - Wiley India 2012 6. IoT & Applications I.A. Dhotre Technical Publication 7. Designing the Internet of Things Adrian McEwen and CassimallyWiley 8. The Internet of Things Connection objects to web Edited byHakimaChauchi Wiley 9. Introduction to Embedded System -By Shibu KV, McGrawHill 10. Getting Started with Internet of Things –By Cuno Pfister, O'Reilly

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (Computer Science)		
Year	3		**Version**	1.0		
Semester	5		**Effective From**	June, 2025		
Course Code	BSCS31519	**Course Name**	Major: Fundamentals of Cloud Computing and Internet of Things			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
1	0	0	2	10	15	25

Purpose of Course	• The purpose of this course is to impart practical knowledge on Internet of Things(IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications
Course Objective	• The purpose of this course is to impart knowledge on Internet of Things(IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications
Pr-requisite	• Basic understanding of operating system,computer network and Internet, Basic programming knowledge
Course Out come	• Understanding about the architectural detail of IoT • Knowledge about domain specific applications of IoT • Exposure to working with Arduino
Course Content	The students will be required to carry out practical on IoT using the methods and tools discussed in their theory. A Journal must be prepared for the practical work done.
Practical	List of practical will be prepared at the beginning of each semester

Reference Books	As per paper Major - Fundamentals of Cloud Computing and Internet of Things

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (Computer Science)		
Year	3		**Version**	1.0		
Semester	5		**Effective From**	June, 2025		
Course Code	BSCS31517	**Course Name**	Major: Web Application Development-III(TH)			

Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
3	3	0	0	40	35	75

Purpose of Course	• The purpose of this course is to equip students with the knowledge of React.js fundamentals, including components, state management, routing, Redux, and Hooks, to build dynamic web applications.
Course Objective	• The course aims to help students understand React.js concepts, implement state management, work with routing, and utilize Hooks for efficient application development.
Pr-requisite	• Basic knowledge of JavaScript, HTML, and CSS.
Course Out come	• After completing this course, a learner will be able to develop interactive React applications using Redux, Hooks, and effective state management techniques.
Course Content	**Unit 1: Introduction to React** **(6 Hours)** 1.1 Basic concept of React

	1.2 Difference between AngularJS and ReactJS 1.3 React features **Unit 2: React Basics** **(6 Hours)** 2.1 ECMA Script 2.2 React with JSX 2.2.1 React elements as JSX 2.3 Basic React Components 2.3.1 Stateless functional component 2.3.2 Stateful component 2.3.3 Higher order component 2.3.4 Nesting component 2.4 State and props in React **Unit 3: React Forms** **(7 Hours)** 3.1 React Form 3.2 Forms in React (Controlled vs. Uncontrolled Components) 3.3 Different form elements 3.4 Manage Control and Actions with Forms **Unit 4: React Routing** **(6 Hours)** 4.1 Life cycle of ReactJS 4.1.1 Mounting

	4.1.2 Updating 4.1.3 Unmounting 4.2 React Routing 4.2.1 Router properties 4.2.2 Nesting Router 4.3 React Router (React-Router-DOM) 4.4 Navigation between pages (Link, NavLink) 4.5 Dynamic Routing with Forms **Unit 5: Introduction to Redux** **(6 Hours)** 5.1 Introduction to Redux 5.2 Redux building parts – State, Actions, Reducers 5.3 Concept of the store, Action creators, middleware **Unit 6: React – Redux and Hooks** **(7 Hours)** 6.1 Explicitly passing the store 6.2 Presentational Vs container component 6.3 The React Redux provider 6.4 React Redux Connect 6.5 Introduction to Hooks 6.6 Cypher Query Language – Nodes, relationships
Practical	List of practical will be prepared at the beginning of each semester

Reference Books	1. Pro React 16 by Adam Freeman 2. Learning React: Learning React: Functional Web Development with React and Redux , O'Reilly 3. Learning React: Modern Patterns for Developing React Apps, O'Reilly 4. Fullstack React: The complete guide to ReactJS and Friends 5. Learning React by Kirupa Chinnathambi **6.** Pro MERN Stack by Vasan Subramanian

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (Computer Science)		
Year	3		**Version**	1.0		
Semester	5		**Effective From**	June, 2025		
Course Code	BSCS31520	**Course Name**	Major: Web Application Development-III(PR)			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
1	0	0	2	10	15	25

Purpose of Course	• The purpose of this course is to equip students with the knowledge of React.js fundamentals, including components, state management, routing, Redux, and Hooks, to build dynamic web applications.
Course Objective	• The course aims to help students understand React.js concepts, implement state management, work with routing, and utilize Hooks for efficient application development.
Pr-requisite	• Basic knowledge of JavaScript, HTML, and CSS.
Course Out come	• After completing this course, a learner will be able to develop interactive React applications using Redux, Hooks, and effective state management techniques.
Course Content	The students will be required to carry out practical on ReactJs using forms,routing, and rendering discussed in their theory.

	A Journal must be prepared for the practical work done.
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	As per paper Major - Web Development - III

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MINOR SUBJECTS

SEM 5

DETAILED CURRICULUM

(W.E.F. 2025-26)

ARTIFICIAL INTELLIGENCE-I

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. Computer Science		
Year	2025		**Version**	1.0		
Semester	V		**Effective From**	April, 2025		
Course Code	BSCS32505	**Course Name**	**Artificial Intelligence -I**			

Teaching Scheme				Examination Scheme		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Semester end examinations (SEE)**	**Total**
4	4	-	-	40	35	75

Purpose of Course	The purpose of the course is to establish foundations of concepts, approaches, methods and techniques artificial intelligence
Course Objective	This subject aims to create a solid foundation in the principles and techniques of Artificial Intelligence, enabling them to understand, analyze, and apply AI concepts to solve problems and develop intelligent systems.
Pr-requisite	Basic concepts of Data Structure and Algorithms
Course Out come	After completion of this course, the student will be able to understand and solve real world AI problems, application areas and state of the art AI concepts which are being used in practical implementation.
Course Content	**Unit 1 Introduction to AI** **[6 hrs]** 1.1 Types of Intelligence, Human Vs. Machine Intelligence, 1.2 Composition of intelligence - Reasoning, Learning, Problem Solving, Perception, Linguistic Intelligence 1.3 AI Agents & Environments -Human agent, robotic agent and software agent, ideal rational agent, structure of intelligent agents 1.4 Types of Agents **Unit 2 : Problem Solving By Search** **[7 hrs]** 2.1 Problem Formulation and State Space Representation 2.2 8-Puzzle, 8-Queens, missionaries and cannibals problem, Robot Navigation Problem, Water Jug Problem 2.2 Search techniques for Solution Search 2.2.1. Uninformed search strategies - BFS, DFS 2.2.2 Informed search strategies

	Unit 3 : Planning **[4 hrs]** 3.1 Planning Problem - Air cargo Transport, spare tire problem, the blocks world 3.2 Planning with state space search, Goal stack planning, Plan Space Planning **Unit 4 : Knowledge Representation** **[5 hrs]** 4.1 Knowledge-Based agents, systems & Machine Intelligence 4.2 Overview of Logical and Procedural Representation Schemes 4.3 Structured Representation Schemes - Semantic Network, Description Logic, Ontology, Conceptual Graphs 4.4 First Order Predicate Logic and Rule Based Systems **Unit 5 : Real Life Application Areas of AI** **[6 hrs]** 5.1 Expert Systems - Characteristics, Importance, Applications, Examples, Rule based system architecture 5.2 Robotics-Sensors and Effectors, Applications, Robotic Perception, Movement Planning 5.3 Natural Language Processing 5.4 Generative AI and Language Modelling **Unit 6 : Introduction to LLM** **[7 hrs]** 6.1 Language Modelling 6.2 Large Language Models 6.3 Applications of LLMs 6.4 Types of LLMs **Unit 7 : Prompt Engineering** **[7 hrs]** 7.1 What is Prompt 7.2 Prompt Designing 7.3 Task Formulation using Prompts 7.4 Prompt Patterns 7.5 Prompt Tuning Techniques **Unit 8 : Introduction to Langchain** **[7 hrs]** 8.1 Langchain Framework 8.2 Langchain Use cases 8.3 Langchain Tools
Text and Reference Literature	1. A First Course in Artificial Intelligence by Deepak Khemani, McGrawHill, ISBN :978-1-25-902998-1 2. Introduction to Artificial Intelligence and Expert System by Dan W. Patterson, PHI, ISBN : 978-93-325-5194-7 3. Artificial Intelligence –A Modern Approach (2nd Edition 2004) by Stuart J. Russell and Peter Norvig, Pearson Education, ISBN: 978-81-775-8367-0 4. Introduction to Artificial Intelligence by Rajendra Akerkar, PHI, ISBN : 978-81-203-2864-8 5. Artificial Intelligence -Structures and Strategies for Complex Problem Solving (4th Edition 2004) by George F. Luger, Pearson Education 6. Foundation of Artificial Intelligence and Expert Systems by V.S. Janakiraman, K. Sarukesi, P. Gopalakrishnan, Mc Millan

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences			
Faculty	Science	**Program**	B.Sc. Computer Science
Year	2025	**Version**	1.0
Semester	V	**Effective From**	July, 2025
Course Code	BSCS32506	**Course Name**	Information Security and Cyber Security I

Teaching Scheme				Examination Scheme		
Credits	**Lecture (L)**	**Tutorial(T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Semester end examinations (SEE)**	**Total**
4	4	-	-	50	50	100

Purpose of the Course	The purpose of the course is to make students capable of concepts to protect valuable information and systems from unwanted access and attacks.
Course Objectives	This subject aims to cover various privacy techniques on digital assets, ensuring data availability and mitigating risk. Learning cryptosystems and ways to move towards Cybersecurity culture to Global security.
Pre requisite	Basic concepts of computer systems and networks
Course out come	After completion of this course, the student will able to understand the importance of data protection and take career paths towards cybersecurity
Course content	**1. Introduction to Information Security [6 Hours]** 1.1. Computer security, Information security, Threats, Attacks, Malicious Logic, Need of information security. 1.2. Principles of CIA concepts: Policies , procedure, guidelines and standards from security perspective. 1.3. Administrative measure and technical measure to enforce CIA (goals/foundation of IS) 1.4. Security risk at common ports and services, Risk at esource sharing, User account configuration in operating systems. 2. **Cryptography [6 Hours]** 2.1. Evolution and history of Cryptography 2.2. Cryptanalysis and cryptosystems 2.3. Monoalphabetic and polyalphabetic ciphers 2.4. Applications of cryptography 2.5. Benefits and limitation of cryptography 2.6. Future of cryptography (Quantum, Blockchain, Post-Quantum) 2.7. Types of cryptography 2.8. Challenges in cryptography.

Course content	**3. Symmetric Key Cryptography (Stream and block) [9 Hours]** 3.1. Stream based Cryptography - Traditional/Classic/Substitution Ciphers (Caesar cipher, Vigenere cipher, Substitution cipher, Monoalphabetic and polyalphabetic cipher, Transposition cipher, Playfair cipher, ZEBRA technique, Railfence cipher, hill cipher) 3.2. Block cipher - BLOWFISH 3.3. Data Encryption Standard - DES and Tripple DES 3.4. Advance Encryption Standard – AES 3.5. Contemporary symmetric cipher **4. Asymmetric Key Cryptography [9 Hours]** 4.1. Rivest-Shamir-Adelman – RSA 4.2. Diffie-Hellman key exchange 4.3. Digital signature standard – DSS and digital certificate 4.4. Elliptic curve digital signature algorithm – ECDSA 4.5. Elliptic curve cryptography – ECC 4.6. Kerckhoff's principle for cryptosystem 4.7. Secure soceket layer - SSL 4.8. Hash algorithm – MD5, SHA1 5. **Introduction to cyber crime and cyber offences [9 Hours]** 5.1. Introduction to cybercrime, types and category of cyber crime 5.2. Techniques of Cyber Crimes 5.3. E-Mail spoofing, Spamming, Cyberdefamation, Salami attack, Data diddling, Hacking, Online fraud, Software Piracy, computer Sabotage, Email bombing, Computer network Intrusions, Password sniffing, Credit card frauds 5.4. How criminal plans attacks 5.5. Reconnaissance attack, Active attack, Passive attack, Scanning and scrutinizing of information, gaining and maintaining system access 5.6. Cyberstaking:- Types of cyberstaking, cases of cyberstaking, how stalking works 5.7. Botnets and Honeypot 6. **Cyber Crime: Mobile and Wireless Devices [9 Hours]** 6.1. Proliferation of mobile and wireless devices in diverse environment 6.2. Types and techniques of debit and credit card frauds 6.3. Security challenges and system settings for mobile devices 6.4. Authentication services security for mobile devices 6.5. LDAP Security of hand-held mobile devices, RAS security for mobile devices, Media player control security and DRM, Network API security for mobile computing applications 6.6. Attacks on mobile phones 6.6.1. Phishing, Vishing, Smishing 6.6.2. Types of Bluetooth vulnerabilities - Hacking bluetooth 6.6.3. Unconventional Storage Device threat through stolen devices 6.6.4. Protecting data on lost device 6.6.5. Organizational Measures for handling Mobile devices 6.7. Computer languages in cyber security 7. **CyberSecurity Frameworks [6 Hours]**

	7.1. Framework needs, objectives, components 7.2. NIST Network safety system (CSF) 7.3. NIST Risk management framework (RMF) 7.4. Government hazards and approval (FedRAMP) 7.5. SANS Basic security controls 7.6. Benefits and limitations of cyber security frameworks. 8. **Cyberspace** **[6 Hours]** 8.1. Need and importance of cyberspace 8.2. Inherent characteristics of cyberspace 8.3. Forms of cyberspace regulations 8.4. Cyberspace regulatory 8.5. Industry best practices
Practical	Web Link for Practical application: • Crypto Hashes and Collisions | Practical Cryptography for Developers • Programming Languages for Cryptography | Cryptography Guide • Nmap: the Network Mapper - Free Security Scanner • How Does Trend Micro Smart Protection Server Work?
Reference Books	1. Computer security: Art and Science, Matt Bishop, Addison –Wesley 2. Introduction to computer security, Matt Bishop, Addison –Wesley 3. Information security – William stalling 4. Information security, Dhien patel, PHI 5. Cryptography and network security, Fourth edition, William stalling 6. Cyber security understanding cyber crimes computer forensics and legal perspectives by Nina Godbole , Sunit belapur by Wiley India Publications. 7. Internet forensic using digital evidences to solve computer crime by Robert Jones O"Reilly. 8. Windows forensic - The field guide for conducting corportate computer investigations by Chad Steel Wiley India publications. 9. Digital evidence and computer crime 3rd Edition by Eoghan Casey Academic Press 10. Cyber crimes and fraud management by Petrick kishore, macmillan Education 11. E-Material: Cyber Security

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SKILL ENHANCEMENT COURSE (SEC) SUBJECTS

SEM 5

DETAILED CURRICULUM

(W.E.F. 2025-26)

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (Computer Science)		
Year	3		**Version**	1.0		
Semester	5		**Effective From**	June, 2025		
Course Code	BSCS35508	**Course Name**	SEC: Minor Project			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
2	0	0	4	25	25	50

Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques studied in practical courses and activities of software engineering
Course Objective	• Introduce the fundamental concepts and principles of system analysis and design in the context of software development. • Enable students to identify, analyze, and document system requirements effectively. • Develop the ability to design logical and physical models of systems using appropriate tools and techniques. • Familiarize students with different system development life cycle (SDLC) models and their applications. • Equip students with skills to prepare professional system documentation and communicate technical designs clearly.
Pr-requisite	Knowledge of latest technologies, tools and software engineering
Course Out come	• **Understand** the role of system analysis and design in software project development. • **Apply** requirement gathering and analysis techniques to define system specifications. • **Use** diagrammatic tools such as DFDs, ER diagrams, and UML diagrams to represent system requirements and designs.

	• **Evaluate** different SDLC models and select appropriate methods for a given project. • **Design** logical and physical system models for real-life business applications. • **Prepare** clear and well-structured system documentation. • **Demonstrate** teamwork and communication skills in presenting system analysis and design work.
Course Content	**Project Documentation** **(As per standard academic format)** 1. Title Page 2. Certificate 3. Acknowledgement 4. Abstract 5. Table of Contents 6. Introduction of Project 7. Problem Statement 8. Objectives and Scope 9. Literature Review / Existing System 10. Proposed System 11. System Analysis (DFD, Use Case, ER diagrams) 12. System Design (screens, database, architecture) 13. Implementation Details 14. Testing and Results 15. Conclusion and Future Scope References **Project Presentation & Viva** • Preparing project presentation (PPT) • Demonstrating the working project • Handling viva questions on design, coding, and implementation • Time management and presentation skills

CURRICULUM FOR

"BACHELOR OF SCIENCE (HONS.)"

B.Sc. (Hons.) Computer Science

SEM - 6

w.e.f. Academic Year 2025-26

॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society

SARVAJANIK UNIVERSITY

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creating an enlightened society...

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Constituent Institute:

Shree Ramkrishna Institute of Computer Education and Applied Sciences (SRKI)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

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Faculty of Science

B. Sc. (Honors) Computer Science

SEM - 6

DETAILED CURRICULUM

(W.E.F. 2025-26)

Sarvjanik University
Faculty of Science
Exam Scheme for B.Sc. (Hons.) Computer Science A.Y. 2025-26

Semester - VI (2025-26)										
Sr No	Course Code	Group	Subjects	Credit	Hours / Week			CEE	SEE	Total
					Lecture	Practical	Total	Marks	Marks	Marks
1	BSCS31622	Major	Mobile Application Development-I (Th)	3	3	-	3	40	35	75
	BSCS31625		Mobile Application Development-I (Pr)	1	-	1	2	10	15	25
	BSCS31623		Web Application Development-IV (Th)	3	3	-	3	40	35	75
	BSCS31626		Web Application Development-IV (Pr)	1	-	1	2	10	15	25
	BSCS31624		Operating System	4	4	-	4	50	50	100
2	BSCS32607	Minor	Artificial Intelligence-II	4	4	-	4	50	50	100
	BSCS32608		Information and Cyber Security-II							
3	BSCS35609	SEC	Internship	4	-	4	12	50	50	100
4	BSGN34609	AEC	Professional Skills	2	2	-	2	25	25	50
	BSGN34610		Human Values and Professional Ethics (Mulya Pravah 2.0)							
		Total		**22**	**16**	**6**	**32**	**275**	**275**	**550**

SARVAJANIK UNIVERSITY
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MAJOR SUBJECTS

SEM 6

DETAILED CURRICULUM

(W.E.F. 2025-26)

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences				
Faculty	Science		**Program**	B.Sc. (Computer Science)
Year	3		**Version**	1.0
Semester	6		**Effective From**	June, 2025
Course Code	BSCS31622	**Course Name**	Major: Mobile Application Development-1	

Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
3	3	0	0	40	35	75

Purpose of Course	• To introduce the most demanding and developing mobile app technology. Fundamentals of android open-source technology
Course Objective	• To make students understand the fundamentals of mobile app technology. • To make students understand various inbuilt features of android. • To make students understand the android design essentials. • To make students understand android user interface design basics.
Pr-requisite	• Fundamentals of java programming.
Course Out come	• Students will have knowledge about android which is widely used Mobile OS and open-source technology and its concepts. Various features of android like Application Design Essentials, User Interface Design Essentials, Use of Common data storage using SQLite.
Course Content	**Unit 1 : Introduction to Android and it's tool chain** **[5 Hours]** 1.1 Evolution and Versions of Android 1.2 Architecture of Android 1.3 Android Development Tools 1.3.1 Android SDK and SDK Manager

	1.3.2 The Android Virtual Device, Emulator 1.3.3 Dalvik Debug Monitor Service (DDMS) 1.3.4 Android Debug Bridge (ADB) **Unit 2 : Android - Key Components** **[5 Hours]** 2.1 Components of Android Application - Activities, Services, Broadcast Receivers, Content Providers 2.2 Directory Structure of Android Application 2.1.1 AndroidManifest.xml 2.1.2 Layouts & Drawable Resources 2.1.3 Activity Java file 2.1.4 Gradle **Unit-3 : Designing Android User Interface** **[7 Hours]** 3.1 Basic UI elements – EditText, TextView, Button, RadioButton, CheckBox, Spinner, Listview,Imageview 3.2 Designing User Interfaces with Layouts 3.2.1 Relative Layouts 3.2.2 Linear Layouts 3.2.3 Constraint Layouts **Unit-4 : Navigating across activities** **[6 Hours]** 4.1 Intent and IntentFilter 4.2 Menus – Context menu, Option menu 4.3 Toast Message 4.4 Alert Dialog box **Unit-5 : Using Shared Preferences** **[5 Hours]** 5.1 Purpose of Shared Preferences 5.2 Shared Preference Modes 5.3 Writing to shared Preferences 5.4 Methods of editor class 5.5 Reading from Shared Preference

	Unit-6 : Preserving and Saving data in Local Database **[6 Hours]** 6.1 Introduction to SQLite 6.2 SqliteOpenHelper Class 6.3 SQlite Methods - ExecSQL, Rawquery, Insert, Update, Delete
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	1. Professional Android 4 Application Development Reto Meier, WROX Publication-2015 2. Android for Programmers-An App Driven Approach, Deitel, Deitel, Deitel and Morgano, Pearson Publication-2012 3. Android Programming Unleashed, Harwani, Pearson Publication-2013 4. Professional Android Programming-with MONO McClure,Blevins, Croft, Dick and Hardy, Wiley India-2012 5. Android application development for java programmer, James C Sheusi, Cenage Learning-2013 6. Android Essentials, Chris Haseman, Apress Publication, 2009 7. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd, 2009 8. Pro Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd, APress-2009

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (Computer Science)		
Year	3		**Version**	1.0		
Semester	6		**Effective From**	June, 2025		
Course Code	BSCS31625	**Course Name**	Major: Mobile Application Development-1			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
1	0	0	2	10	15	25

Purpose of Course	• To introduce the most demanding and developing mobile app technology. Fundamentals of android open-source technology
Course Objective	• To make students understand the fundamentals of mobile app technology. • To make students understand various inbuilt features of android. • To make students understand the android design essentials. • To make students understand android user interface design basics.
Pr-requisite	• Fundamentals of java programming.
Course Out come	• Students will have knowledge about android which is widely used Mobile OS and open-source technology and its concepts. Various features of android like Application Design Essentials, User Interface Design Essentials, Use of Common data storage using SQLite.
Course Content	The students will be required to carry out practical on android using the methods and tools discussed in their theory. A Journal must be prepared for the practical work done.
Practical	List of practical will be prepared at the beginning of each semester

Reference Books	As per paper Major - Mobile Application Development-1

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences					
Faculty	Science		**Program**	B.Sc(Computer Science)	
Year	3		**Version**	1.0	
Semester	6		**Effective From**	July, 2025	
Course Code	BSCS31624	**Course Name**	Operating Systems (OS)		

Teaching Scheme				Examination Scheme		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
4	4	0	0	50	50	100

Purpose of Course	Conceptualize the students with the theoretical concepts of Operating Systems.
Course Objective	Familiarization with different objectives of operating system components like process management and inter-process communication; Experiments on process scheduling and other operating system tasks through simulation/implementation under a simulated environment
Prerequisite	Fundamental knowledge of Computer Organization.
Course Outcome	• Deep understaing of various components of Operating systems. • Case study of Unix operating systems to analyze the different services provided by UNIX Operating System • Design and implement various system calls and concurrent processes requiring synchronization. • Optimum resource management.
Course Content	**Unit- 1: Operating System Concepts** [6 hrs] 1.1. Operating system fundamental and its types 1.2. Components of operating system 1.3. BIOS, Booting process and kernel 1.4. Functions of operating systems 1.5. Interrupt and System call, Data bus and Address bus **Unit- 2: I/O Device and File Management** [8 hrs] 2.1 I/O Devices, Device controllers and drivers, DMA, Programmed I/O,Interrupt driven I/O, I/O using DMA 2.2 Disk space Management 2.3 Allocation and Disk Arm Scheduling Methods 2.3.1 FCFS 2.3.2 SSTF 2.3.3 SCAN 2.3.4 C-SCAN 2.4 Drivers for different devices.

Unit- 3: Files structure **[7 hrs]**

3.1 File storage mechanism,
- 3.1.1 File allocation table
- 3.1.2 Directory and File structure,
- 3.1.3 Attributes, Types, Access, Operations, Protection, and sharing and remote access.

3.2 File system management and optimization –
- 3.2.1 Disk space management
- 3.2.2 Backup, consistency, Performance
- 3.2.3 Defragmentation

Unit- 4: Memory Management **[9 hrs]**

4.1 Address space
- 4.1.1 Contiguous and non- contiguous allocation
- 4.1.2 Managing free space

4.2 Virtual memory
- 4.2.1 Paging, Page size, Page table, Page fault
- 4.2.2 Demand Paging
- 4.2.3 Page replacement algorithms
  - 4.2.3.1 FIFO
  - 4.2.3.2 LRU
  - 4.2.3.3 2nd Chance NRU Optimal Shared page

4.3 Segmentation
- 4.3.1 Implementation of pure segmentation
- 4.3.2 segmentation with paging.

Unit- 5: Process Management **[9 hrs]**

5.1 Process
- 5.1.1 Process states
- 5.1.2 PCB
- 5.1.3 Process scheduling

5.2 Scheduling Algorithms

5.3 Study of Round-robin
- 5.3.1 FCFS
- 5.3.2 SJF
- 5.3.3 SRTF
- 5.3.4 priority algorithms

5.4 Overview of deadlock

5.5 Deadlock avoidance, prevention and recovery

5.6 Overview of Inter process communication

Unit- 6: Security and Protection in operating systems **[5 hrs]**

6.1 Main features of security and protection

6.2 Different security concerns

6.3 Ways available in OS to protect the system

6.4 Inbuilt security features of operating system

6.5 Group policy

Unit- 7: Introduction to Unix operating system **[7 hrs]**

7.1 Introduction: History of Unix, features

7.2 Unix system architecture and kernel

	7.3 Unix command format 7.3.1 Unix internal and external commands 7.3.2 Directory commands 7.3.3 File related commands 7.3.4 Disk related commands 7.3.5 general utilities **Unit- 8: File, Process and memory management in Unix operating systems [9hrs]** 8.1 Unix file system 8.1.1 Boot inode, super and data block, Directories 8.1.2 Conversion of pathname to inode 8.1.2.1 inode to a new file 8.1.3 Disk block allocation 8.2 Process management in Unix 8.2.1 Process state and data structures of a process 8.2.1.1 User Vs kernel node 8.2.2 Context of a process 8.2.3 Background processes 8.2.4 Process scheduling commands 8.2.5 Process terminating and examining commands 8.3 Storage management in Unix 8.3.1 Formatting, making file system 8.3.2 Checking disk space 8.3.3 Mountable file system 8.3.4 Disk partitioning 8.3.5 File compression 8.4 Special tools and utilities 8.4.1 Filters, Stream editor SED and AWK 8.4.2 Unix system calls and library functions, Processes 8.4.3 signals and Interrupts, storage and compression facilities 8.5 Basic shell programming concepts.
Text and Reference Literature	1. Operating System Concepts, James Peterson McGrawHill 2. An OS Concept ,Silberschatz AdditionWesley Publication 3. An Operating Systems, W.Stallings Pearson Education 4. Understanding Operating Systems, I.M.Flinn, A.M. Mchoes – Thomson Learning 5. Operating Systems, Donovan M McGrawHill Publication 6. Operating Systems: A Design Oriented Approach, Crowley TataMcGrawHill 7. Operating Systems, S. Godbole TMH. 8. OperatingSystems: Designand Implementation, Tanenbaum & Woodhull 9. The Design of the Unix Operating System, Maurice J. Bach PHI
Teaching Methodology	The course is composed of Lectures, assignments and a group project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on end semester written examination

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences				
Faculty	Science		**Program**	B.Sc. (Computer Science)
Year	3		**Version**	1.0
Semester	6		**Effective From**	June, 2025
Course Code	BSCS31623	**Course Name**	Web Application Development-IV	

Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
3	3	0	0	40	35	75

Purpose of Course	To introduce Java EE for developing Enterprise applications
Course Objective	• Understand the core concepts of Enterprise Java (Jakarta EE). • Develop web-based and enterprise applications using Java technologies. • Implement Servlets, JSP, EJB and JDBC for scalable applications. • Integrate Java applications with databases and web services. • Deploy applications in an enterprise environment.
Pr-requisite	Fundamentals of java programming.
Course Out come	Upon completing the course, students will master advanced programming concepts and technologies such as Java EE, JSP, Servlets and EJB, enabling them to develop robust, scalable Java applications.
Course Content	**Unit 1: Introduction to Enterprise Java (6 Hours)** 1.1. Evolution of Java EE (Jakarta EE) 1.2. Java EE Architecture and Components 1.3. Java SE vs Java EE 1.4. Overview of Java EE APIs (Servlets, JSP, EJB, JPA, etc.) 1.5. Setting up a Java EE development environment (JDK, Payara, Tomcat, Eclipse/IntelliJ)

	Unit 2: Servlets – Web Application Foundation (7 Hours) 2.1. Servlet Architecture 2.2. Request and Response Handling 2.3. Servlet Lifecycle 2.4. Session Management (Cookies, URL Rewriting, HttpSession) Servlet Filters and Listeners **Unit 3: Java Server Pages (JSP) (7 Hours)** 3.1. JSP Lifecycle and Compilation Process 3.2. JSP Directives, Implicit Objects, and Scripting Elements 3.3. Expression Language (EL) 3.4. JSP Tag Libraries (JSTL) **Unit 4: Enterprise JavaBeans (10 Hours)** 4.1. Introduction to EJB and Types (Session Beans, Message-Driven Beans) 4.2. Stateful vs Stateless Beans 4.3. Dependency Injection in EJB 4.4. Transactions and Security in EJB **Unit 5: JDBC -Database Connectivity (10 Hours)** 5.1. JDBC Architecture 5.2. Types of JDBC Drivers 5.3. DriverManager class and Connection Interface 5.4. Interfaces : Statement, ResultSet, PreparedStatement, CallableStatement 5.5. ResultSet Operations 5.6. Creating CRUD Application **Unit 6: Application Deployment & Security (8 Hours)** 6.1. Deployment of Java EE Applications (WAR, EAR files) 6.2. Role-based Security and Authentication – Java Web Tokens 6.3. Web Application Performance Optimization 6.4. RESTful Web Services in Java EE
Reference Books	1. Professional Android 4 Application Development Reto Meier, WROX Publication-2015 2. Android for Programmers-An App Driven Approach, Deitel, Deitel, Deitel and Morgano, Pearson Publication-2012 3. Android Programming Unleashed, Harwani, Pearson Publication-2013

	4. Professional Android Programming-with MONO McClure,Blevins, Croft, Dick and Hardy, Wiley India-2012 5. Android application development for java programmer, James C Sheusi, Cenage Learning-2013 6. Android Essentials, Chris Haseman, Apress Publication, 2009 7. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd, 2009 8. Pro Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd, APress-2009

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences					
Faculty	Science		**Program**	B.Sc. (Computer Science)	
Year	3		**Version**	1.0	
Semester	6		**Effective From**	June, 2025	
Course Code	BSCS31626	**Course Name**	Web Application Development-IV		

Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CA)**	**Term end examinations (TEE)**	**Total**
1	0	0	2	15	10	25

Purpose of Course	To introduce Java EE for developing Enterprise applications
Course Objective	• Understand the core concepts of Enterprise Java (Jakarta EE). • Develop web-based and enterprise applications using Java technologies. • Implement Servlets, JSP, EJB and JDBC for scalable applications. • Integrate Java applications with databases and web services. • Deploy applications in an enterprise environment.
Pr-requisite	Fundamentals of java programming.
Course Out come	Upon completing the course, students will master advanced programming concepts and technologies such as Java EE, JSP, Servlets and EJB, enabling them to develop robust, scalable Java applications.
Course Content	The students shall carry out practical using the methods and tools discussed. A Journal must be prepared for the practical work done.
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	As per paper Major - Web Application Development-IV

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MINOR SUBJECTS

SEM 6

DETAILED CURRICULUM

(W.E.F. 2025-26)

ARTIFICIAL INTELLIGENCE-II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences			
Faculty	Science	**Program**	B.Sc. Computer Science
Year	2025	**Version**	1.0
Semester	VI	**Effective From**	April, 2025
Course Code	BSCS32607	**Course Name**	**Artificial Intelligence -II**

Teaching Scheme				Examination Scheme		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Semester end examinations (SEE)**	**Total**
3	3	-	-	40	35	75

Purpose of Course	The purpose of the course is to establish foundations of concepts, approaches, methods and techniques artificial intelligence
Course Objective	The course aims to develop the ability to design, implement, and evaluate machine learning models for solving real-world problems, with a focus on both theoretical understanding and practical skills using modern tools and techniques.
Pr-requisite	Understanding of Statistics, Mathematics and Algorithms
Course Out come	After completion of this course, the student will be able to understand and solve real world ML problems, application areas and state of the art ML concepts which are being used in practical implementation.
Course Content	**Unit 1 : Introduction to Machine Learning** **[5 hrs]** 1.1 Types of Problem in ML 1.2 Supervised Machine Learning 1.3 Unsupervised Machine Learning 1.4 Reinforcement Learning **Unit 2 : Supervised Learning Techniques** **[7 hrs]** 2.1 Classification 2.2 Naïve Bayes Classifier 2.3 Regression 2.4 Linear Regression **Unit 3 Machine Learning Model Implementation -sckitlearn** **[6 hrs]** 3.1 Role of Dataset and Instances 3.2 Train-Test Set, Validation Set 3.3 ML model training-testing process

	3.4 ML Process Flow with sklearn **Unit 4 Classification** **[7 hrs]** 4.1 Classification: Examples and Applications 4.2 Classification Algorithms -NB , SVM 4.3 Classification Algorithms - KNN 4.4 Rule based ML - Decision Trees **Unit 5 Evaluation Metrics for Classification** **[7 hrs]** 5.1 Confusion Matrix 5.2 Accuracy and Precision 5.3 Precision and F1-Score 5.4 Evaluation and Fine Tuning of Model **Unit 6 Working with Continuous Data Regression** **[7 hrs]** 6.1 Multiple Linear Regression 6.2 Polynomial Regression 6.3 Evaluation Metrics for Regression 6.4 Result Visualization **Unit 7: Model Validation** **[6 hrs]** **7.1** Purpose of Model Validation 7.2 Validation Techniques (Cross-Validations) 7.3 Feature Reduction/Dimensionality reduction 7.4 Generalization, Overfitting, and Underfitting. Relation of Model Complexity to Dataset Size **Unit 8: Advanced Machine Learning Concepts** **[6 hrs]** 8.1 Introduction to ML Ops 8.2 Transfer Learning 8.3 Federated Learning
Text and Reference Literature	1. AI an Machine Learning, Vinod Chandra SS, Anans Hareendran S. PHI Publication 2. Machine Learning with Python, Abhishek Vijayvargia, BPB Publication 3. Machine Learning Hand-On for Developers and Technical Professionals, Jason Bell, Wiley Publication 4. Machine Learning for Beginners: Learn to Build Machine Learning Systems Using Python , Harsh Bhasin, BPB Publication 5. Machine Learning - Tom M. Mitchell, McgrewHill Publication

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. Computer Science		
Year	2025		**Version**	1.0		
Semester	VI		**Effective From**	July, 2025		
Course Code	BSCS32608	**Course Name**	Information Security and Cyber Security II			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial(T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Semester end examinations (SEE)**	**Total**
4	4	-	-	50	50	100

Purpose of the Course	The purpose of the course is to make students capable of concepts to protect valuable information and systems from unwanted access and attacks.
Course Objectives	This subject aims to cover various privacy techniques on digital assets, ensuring data availability and mitigating risk. Learning cryptosystems and ways to move towards Cybersecurity culture to Global security.
Pre requisite	Basic concepts of computer systems and networks
Course out come	After completion of this course, the student will able to understand the importance of data protection and take career paths towards cybersecurity
Course content	**1. Introduction to Information Security [6 Hours]** **1.1.** Active and Passive attacks 1.2. Ciphertext Only Attacks (COA), Known Plaintext Attack (KPA), Chosen Plaintext Attack (CPA), Brute Force Attack (BFA) , Dictionary Attack, Birthday Attack (attack on hash function), Man in Middle Attack (MIM) , Side Channel Attack (SCA) , Timing Attack, Power Analysis Attacks, Fault analysis Attacks, Rainbow table attack. **1.3.** Biometrics: Types of Biometric Techniques: False Rejection, False Acceptance, Crossover Error Rates. **1.4.** Password authentication/multi-factor , Password Authentication, Password Vulnerabilities & Attacks, password policies Cryptanalysis tool. 2. **Virus, Worms, Trojan attacks [6 Hours]** 2.1. Virus - design factors, life cycle, Taxonomies of malicious program, phases of virus, technical, physiological, legal and Ethical effect of virus. system sector/boot viruses, Batch file virus, 2.2. Macro viruses: parasitic (file) viruses, cluster viruses, companion viruses,

Course content	2.3. Virus detection (1st to 4th generation), Anti-virus technologies (Scanners (interceptors, disinfectors, Heuristic), Inoculators, Integrity checkers, NBAR/QoS, anti-virus packages integrity checkers) 2.4. Worms : differentiate virus and worms, Morries internet worms (internet worms), change in system administration by first worm, components of worms (Reconnaissance, specific attacks, command interface, intelligence capabilities, unused and non-attack capabilities, communication mechanisms) 2.5. Trojans : Logic bombs, Unix backdoors, Phishing, Clickjacking, Scareware. 2.6. Business Impact analysis : Event damage (negligible, minor, major), Recovery time (recovery point objective and recovery time objective: disaster recovery plan, Restoration plan). 2.7. High availability solutions: Raid, Fault tolerance server, SAN, Network disaster recovery (redundancy, alternative routing, diverse routing, last-mile circuit protection, long-haul network diversity, voice recovery) **3. Vulnerabilities** **[9 Hours]** 3.1. Vulnerabilities , Threats (categories and sources) and Risk Relationship between Risk, Threats and Vulnerabilities. 3.2. Network Vulnerabilities: Overview of vulnerability scanning, Open Port / Service Identification, Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. 3.3. Networks Vulnerability Scanning (Netcat, Socat), Network Sniffers and Injection tools. 3.4. Web attack: Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks **4. Threats System and Application** **[9 Hours]** **4.1.** Threats and Security on Cloud **4.2.** Threats and Security on IOT **4.3.** IP and Network Threats and Security **4.4.** OS Threats and Security / Protection **4.5.** Administrative Threats and Security **4.6.** DevOps Threats and Security Automation **4.7.** Applications Threats and Security 5. **Introduction to Investigation and digital forensic** **[9 Hours]** 5.1. Investigation 5.1.1. Undersrtading digital evidance 5.1.2. Evidance collection and handling 5.1.3. Data acquisition techniqes 5.1.4. Chain of custody 5.1.5. Hasing and verification 5.2. Overview of digital forensic 5.2.1. OS Forensic 5.2.2. File system analysis 5.2.3. Data recovary 5.2.4. Image fornesic 5.2.5. Memory forensic

	5.2.6. Network forensic 5.3. Security audit 5.3.1. Compliance Audits. 5.3.2. Vulnerability Assessments. 5.3.3. Penetration Testing. 5.3.4. Risk Assessment Audits. 5.3.5. Internal Security Audits. 5.3.6. External Security Audits. 5.4. Introduction to disaster recovery 5.4.1. Key elements of cyber attack disaster recovery 6. **Introduction to Cyber Crime Investigation** **[9 Hours]** 6.1. Firewalls and Packet Filters 6.2. Password Cracking, 6.3. Keyloggers and Spyware, 6.4. Steganography 6.5. DOS and DDOS attack, 6.6. SQL injection, 6.7. Buffer Overflow, 6.8. Attack on wireless Networks 7. **Web application scanning tools** **[6 Hours]** 7.1. Nikto, W3af, HTTP utilities: Curl, OpenSSL and Stunnel, 7.2. Application Inspection tools: Zed Attack Proxy, Sqlmap, DVWA, Webgoat, 7.3. Password cracking and brute-force tools: John the Ripper, L0htcrack, Pwdump, 7.4. HTC-Hydra 8. **Introduction to Cyber law** **[6 Hours]** 8.1. Cyber crime and legal landscape around the world, IT Act 2000 and its amendments. limitations of IT Act 2000. 8.2. Cyber crime and punishments, Cyber laws and legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and social media, Cyber laws of other countries, Case studies.
Practical	Web Link for Practical application: • Crypto Hashes and Collisions | Practical Cryptography for Developers • Programming Languages for Cryptography | Cryptography Guide • Nmap: the Network Mapper - Free Security Scanner • How Does Trend Micro Smart Protection Server Work?
Reference Books	1. Computer security: Art and Science, Matt Bishop, Addison –Wesley 2. Introduction to computer security, Matt Bishop, Addison –Wesley 3. Information security – William stalling 4. Information security, Dhien patel, PHI 5. Cryptography and network security, Fourth edition, William stalling 6. Cyber security understanding cyber crimes computer forensics and legal perspectives by Nina Godbole , Sunit belapur by Wiley India Publications. 7. Internet forensic using digital evidences to solve computer crime by Robert Jones O"Reilly.

	8. Windows forensic - The field guide for conducting corportate computer investigations by Chad Steel Wiley India publications. 9. Digital evidence and computer crime 3rd Edition by Eoghan Casey Academic Press 10. Cyber crimes and fraud management by Petrick kishore, macmillan Education 11. E-Material: Cyber Security

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ABILITY ENHANCEMENT COURSE (AEC) SUBJECTS

SEM 6

DETAILED CURRICULUM

(W.E.F. 2025-26)

Sarvajanik University
Faculty of Science
B.Sc. (Hons)

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (All)		
Year	3		**Version**	3		
Semester	VI		**Effective From**	July 2025		
Course Code	BSGN34610	**Course Name**	Human Values and Professional Ethics (Mulya Pravah 2.0)			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Term end examinations (SEE)**	**Total**
2	2	0	0	25	25	50

Sarvajanik University
Faculty of Science
B.Sc. (Hons)

Human Values and Professional Ethics (*Mulya Pravah 2.0*)

Name of Faculty: Sciences	**Department:** All
Program: B.Sc. (Hons)	**Type:** AEC
Subject: Human Values and Professional Ethics (*Mulya Pravah 2.0*)	
Credit: 02	**Total teaching hours: 30**
Course description: This course on "Mulya Pravah" creates a new paradigm towards an equitable world for all. It draws upon the innate space of universal values within individuals and communities to plan and implement strategic change and generate measurable results. It develops the capacity of individuals, groups, and communities to look within themselves to source their inner potential and universal values to ensure that their actions enable justice and equity for all. It strengthens them to envision new patterns and leverages systemic and cultural change and economic and social transformation, through equitable actions.	
Learning Outcomes: By the end of the course, students will be able to: • Understand India's rich cultural legacy and human values of which we are the custodians. • Focus on professional ethics, which help citizens to discern desirable and undesirable actions • Understand constitutional values, universal values, and holistic education to create integrated citizens.	

Reference:

- Blanchard, Kenneth and Peale, Norman Vincent. 1988. The Power of Ethical Management. New York: William Morrow and Company, Inc.
- Gandhi, Mohandas Karamchand. 1971. Pathway to God compiled by MS Deshpande. Ahmedabad: Navajivan Mudranalaya, Navjivan Trust.
- Kashyap, Subhash C. 2019 .Constitution of India. A handbook for students. New Delhi: National Book Trust.
- Lama, D. 1999. Ethics for the New Millennium. New York: Riverhead Books
- Lama, D. 2012. Beyond Religion: Ethics for a Whole World. India: Harper Collins.
- Mahadevan, B., Bhat, V.R. and Nagendra, P.R.N. 2022. Introduction to Indian Knowledge System. Delhi: PHI.
- Niti Shatak, Chaukhamba Prakashan, Varanasi
- Rodriguez, S. and Juvva, S. 2018. Embodying Universal Values and Ethical Leadership in Higher Education: Creating Change Agents for Social Transformation. In B. Chatterjee, A. Banerji and P. Arya (Eds.). Resolution to Resolve: Sustainability Practices in Industry and Education. New Delhi: Bloomsbury [ISBN: 978-938-74-7168-9].

Sarvajanik University
Faculty of Science
B.Sc. (Hons)

Unit-1: Introduction to Indian Ethos **(07 Hours)**

1.1 Meaning of ethos and cultural essence of India

1.2 Scriptures as the base of the Indian Knowledge System (IKS)

1.3 Integrating the two methodologies: interiorization process for self-exploration, and exterior scientific pursuit for the prosperity of world

1.4 The Law of Karma and Nishkama Karma (The Law of action and selfless action)

Unit-2: Human Values and Ethics **(08 Hours)**

2.1 Knowing the Self and the universal values that we stand for. This is self enquiry & self discovery.

2.2 Background conversations and deep listening, recognizing the assumptions that we make the biases we have, and the implications for ethical action.

2.3 Self-identity: distinguishing and embracing oneself (and others) four profiles (inner potential, social, professional, personality)

2.4 Distinguish ideology, perspectives beliefs from embodying values.

Unit-3: Constitutional Values and Global Citizenship **(07 Hours)**

3.1 Values embedded in the Preamble of the Indian Constitution Integration of Human Rights and duties

3.2 Directive principles and responsibilities as citizens of India

3.3 Sensibility and responsibilities towards global environment, Loksangraha and Vasudhaiva Kutumbakam.

Unit-4: Integrated Personality and Well-being **(08 Hours)**

4.1 The three gunas (qualities of sattva—purity and harmony, rajas —activity and passion, tamas —darkness and chaos), the four antah-karanas (inner instruments), and panch kosha (five sheaths).

4.2 Stress management: meditated personality and agitated personality.

4.3 Oneness, non-duality, and equanimity

4.4 Physical, mental, social, and spiritual well-being

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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		**Program**	B.Sc. (All)		
Year	3		**Version**	3		
Semester	VI		**Effective From**	July 2025		
Course Code	BSGN34609	**Course Name**	Professional Skills			
Teaching Scheme				**Examination Scheme**		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Continuous Assessments (CCE)**	**Term end examinations (SEE)**	**Total**
2	2	0	0	25	25	50

Name of Faculty: Science	Department: All
Program: UG	Type: AEC- 6
Subject: Professional Skills	

Credit: 02	Total Learning Hours: 30 Hours

The Objectives are to help learners

- Acquire career skills and fully pursue to partake in a successful career path
- Prepare a good résumé
- Prepare for interviews and group discussions
- Understand the significance of Team Skills
- Acquire Team Skills
- Design, develop, and adapt to situations as an individual and as a team member

Student Learning Outcome:

After completion of the course the student will be able to

- Prepare their résumé on an appropriate template without grammatical and other errors andusing proper syntax.
- Actively participate in group discussions towards gainful employment.
- Perform appropriately and effectively in group discussions.
- Explore and Identify career opportunities.
- Demonstrate a set of non-cognitive skills such as empathy, creativity, teamwork, and collaboration, for the smooth and efficient functioning at a workplace.
- Actively use and operate online team communication tools, such as: Webinar, Skype, Zoom,Google, and Hangout.
- Demonstrate a set of cognitive skills and non-cognitive skills such as critical thinking, problem-solving, ability tolearn for maintaining good interpersonal relations, smooth and efficient functioning at a workplace, empathy, creativity and teamwork skills.

Unit -1

1.1 Résumé Skills: Preparation and Presentation **(03 hours)**

- Introduction of Résumé and Related Terms
- Importance of Preparing a Good Résumé
- Difference between a CV, Résumé, and Biodata
- Essential Components of a Good Résumé

1.2 Résumé Skills: Common Errors

- Common Errors
- Guidelines for Résumé Preparation

Unit -2

2.1 Interview Skills: Preparation and Presentation **(06 hours)**

- Meaning of Interview
- Types of Interviews

- STAR Approach for Facing an Interview

2.2. Interview Procedure

- Dos and Don'ts
- Important Questions Generally Asked in a Job Interview

2.3 Interview Skills: Common Errors

- Common Errors
- Interview Questions for Assessing Your Strengths and Weaknesses

2.4 Simulation

- Job Simulation Formats
- Comment Critically on Simulated Interviews

2.5 Demonstrate an Ideal Interview

Unit – 3

3.1 Meaning and Importance of a Group Discussion (GD) **(06 hours)**

- Meaning of a Group Discussion
- Importance of a Group Discussion
- Types of Group Discussions.

3.2 Procedure of a Group Discussion

- Methodology
- Ground Rules
- Evaluation of a Group Discussion

3.3 Group Discussion: Common Errors

3.4 Group Discussion: Simulation

Unit – 4

4.1 Process of Career Exploration **(03 hours)**

- Knowing Yourself — Personal Characteristics
- Knowledge about the World of Work, Requirements of Jobs Including Self-employment.
- Sources of Career Information
- Preparing for a Career Based on Potentials of Learners and Availability of Opportunities

Unit –5

5.1 Cognitive Skills: Meaning, types of cognitive skills, strategies to develop cognitive skills. **(06 hours)**

- Critical Thinking Skills.
- Problem-solving Skills
- Ability to Learn.

5.2 Non-cognitive Skills

- Empathy
- Creativity
- Teamwork
- Collaboration
- Resilience

- Interpersonal skills
- Perseverance
- Social Control
- Social Skill

Unit – 6

6.1 Presentation: Meaning and Types **(6hours)**

- Meaning of Presentation
- Types of Presentations
- Presentation for Internal and External Communication
- Presentation Strategies
- Ways to Improve Presentation Skills Over Time

Recommended Reading:

1. Plomin, R. (1999). Genetics and general cognitive ability, Nature, 402, C25-C29.
2. Plomin, R. & Von Stumm, S. (2018). The new genetics of intelligence, Nature Reviews Genetics, 19 (3): 148-159.
3. Mumford, M. D., Todd, E. M., Higgs, C. & McIntosh, T. (2017). Cognitive skills and leadership performance: The nine critical skills, The Leadership Quarterly, 28(1): 24-39.
4. Welsh, J. A., Nix, R. L., Blair, C., Bierman, K. L. and Nelson, K. E. (2010). The Developmentof cognitive skills and gains in academic school readiness for children from low-incomefamilies, J Educ Psychol. 102(1): 43–53.
5. Nickerson, R.S. (1999). "Enhancing Creativity" ed. Sternberg, R.J. *Handbook of Creativity*, Cambridge University Press.
6. Snee, R. D. (2001). "Dealing with the Achilles Heel of Six Sigma—Project Selection Is the Key to Success," *Quality Progress* 66–72.
7. Scholtes, P. R., Joiner, B. L. and Streibel, B. J. (2003). *The Team Handbook*, 3rd ed. (Madison,WI: Joiner Associates.
8. Ibid.
9. GOAL/QPC & Joiner Associates, *The Team Memory Jogger* (Madison, WI: 1996).
10. Doyle, M. and Straus, D. (1982). *How to Make Meetings Work;* New York: Jove Books.
11. Snee, R. D., Kelleher, K. H. and Reynard, S. (May 1998). "Improving Team Effectiveness," *Quality Progress,* 43–48.
12. Hoerl, R. and Snee, R. (2012). *Statistical Thinking: Improving Business Performance, Second Edition* Copyright ©
13. Berber, N., Slavić, A. and Aleksić M. (2020). Relationship between perceived teamwork effectiveness and team performance in banking sector of Serbia, *Sustainability, 12*(20), 8753 (https://doi.org/10.3390/su12208753)
14. Gutman, L. M., & Schoon, I. (2013). The Impact of Non-Cognitive Skills on Outcomes for Young People (pp. 1-5). London: Education Endowment Foundation. Leading Educationand Social Research.

15. Megargee, E. I. (1966). Undercontrolled and overcontrolled personality types in extreme antisocial aggression. *Psychological Monographs: General and Applied, 80*(3), 1–29. https://doi.org/10.1037/h0093894

16. Kjøbli, John and Ogden, Terie (2014). A randomized effectiveness trial of individual child social skills training: Six-month follow-up, Child and Adolescent Psychiatry and MentalHealth 8 (31)

17. Driskell, J. E., Salas, E. & Driskell, T. (2018). Foundations of teamwork and collaboration. American Psychologist, 73 (4), 334-338. (https:/doi.org/10.1037/amp0000241)

Web links

1. https://www.edubloxtutor.com/what-are-cognitive-skills/
2. https://mybrainware.com/cognitive-skills/cognitive-skills-foundation-for-learning/

https://www.thebalancecareers.com/cognitive-skills-definition-and-examples-2063736

3. https://www.rungila.com/en/cognitive_skill
4. https://news.harvard.edu/gazette/story/2015/03/smarter-by-the-minute-sort-of/
5. https://en.wikipedia.org/wiki/Cognitive_skill
6. https://www.indeed.com/career-advice/career-development/cognitive-skills-how-to- improve-them
7. https://www.skillsyouneed.com/ips/problem-solving.html/

Videos

1. https://www.youtube.com/watch?v=k-8K9lksLh8
2. https://youtu.be/y0FtXhSu0J0
3. https://youtu.be/RuQjYzP9PMo
4. https://youtu.be/4ET3SvXJyhw
5. https://youtu.be/FXJUDyqobbM
6. https://youtu.be/UzPMMSKfKZQ
7. https://youtu.be/EGvI1BTCm5w
8. https://www.youtube.com/watch?v=E2jYdEO18nU Self Control: Teaching Students About Their Greatest Inner Strength with Nathan DeWall-
9. https://www.youtube.com/watch?v=mZUTZKbe4hI Self control is the key to success. Lessons from the Marshmallow Test
10. https://www.youtube.com/watch?v=4StLXX1k_9I How Instant Gratification is HarmingSociety and What to Do About It | John Davidson | TEDxCSUS
11. https://www.youtube.com/watch?v=E2jYdEO18nU Self Control: Teaching Students About Their Greatest Inner Strength with Nathan DeWall-
12. https://www.youtube.com/watch?v=mZUTZKbe4hI Self control is the key to success. Lessons from the Marshmallow Test
13. https://www.youtube.com/watch?v=4StLXX1k_9I How Instant Gratification is HarmingSociety and What to Do About It | John Davidson | TEDxCSUS
14. https://www.youtube.com/watch?v=lw_2qDIeV8s How To Develop Self-Control To CreateAn Amazing Life"