



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

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for the T.Y.B.Sc.

Program: B.Sc. INFORMATION TECHNOLOGY

Program Code: RJSUIT

(CBCS 2023-24)

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

Eligibility Criteria

- A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates.
- Candidate who has passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course.

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SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc. PROGRAM

INFORMATION TECHNOLOGY

Semester	Core Course	Ability Enhancement Course (AECC)	Skill Enhancement Course (SEC)	Elective Discipline Specific (DSE)
I	Imperative Programming	Business Communication Skills		
	Digital Electronics			
	Fundamental of Database Management Systems			
	Discrete Mathematics		Professional Ethics and Human Values	
II	Python Programming	Green Computing		
	Microprocessor Architecture			
	Web Programming			
	Numerical and Statistical Methods		Minor Project	
III	Data Structures		Object Oriented Programming	Design and Analysis of Algorithms/ Object Oriented Analysis and Design/ Introduction to Machine Learning
	Computer Networks			

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	Database Management Systems			
	Applied Mathematics			
IV	Introduction to Embedded Systems		Advanced Java	
	Computer Oriented Statistical Techniques			
	Software Engineering			
	Computer Graphics and Animation			
V		Search Engine Optimization and Web Analytics	Software Project Management	Enterprise Java/ Next Generation Technologies
			Internet of Things	
			Advanced Web Programming	
			Linux Administration	
VI		Human Computer Interaction	Software Quality Assurance	IT Service Management / Cyber Laws
			Security in Computing	
			Business Intelligence	
			Principles of Geographic Information Systems	

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI**Course Structure****SEMESTER V**

Course	Nomenclature	Credits	Topics
RJSUIT501	Software Project Management	2	<ol style="list-style-type: none"> 1. Overview of Project Planning, Software Efforts estimation- Function Point, COCOMO-II 2. Activity Network Planning 3. Risk Management, Software Quality 4. Managing Contracts
RJSUIT502	Internet of Things	2	<ol style="list-style-type: none"> 1. Overview of Internet of things & Principles 2. Prototyping of Embedded Devices & Online Components 3. Writing Embedded code 4. Manufacturing and ethics in project development
RJSUIT503	Advanced Web Programming	2	<ol style="list-style-type: none"> 1. Introduction to .NET and C# language 2. Fundamentals of web forms 3. Error Handling , State Management and themes 4. ADO.Net, Data Binding and XML
RJSUIT504	Linux System Administration	2	<ol style="list-style-type: none"> 1. Introduction to Enterprise Linux, Managing software 2. Network in Linux, users, groups and permissions 3. Cryptographic services 4. Server configuration 5. Shell Scripting
RJSUIT505	Next Generation Technologies	2	<ol style="list-style-type: none"> 1. Big data, NoSQL, MongoDB 2. MongoDB Data model, storage engine, limitations 3. SSD and in – memory databases 4. JSON
RJSUIT506	Search Engine Optimization and Web Analytics	3	<ol style="list-style-type: none"> 1. Search engine basics ,Search engine optimization, key concepts and terminologies of web analytics, 2. Working of web analytics and their impact. 3. The principles, tools and methods of web analytics

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			4. Apply analytics for business situations and measuring success 5. case study / practical implementation
RJSUITP501	Project Dissertation	2	
RJSUITP502	Internet of Things Practical	2	
RJSUITP503	Advanced Web Programming Practical	2	
RJSUITP504	Linux Administration Practical	2	
RJSUITP505	Next Generation Technologies Practical	2	
Total		23	

SEMESTER VI

Course	Nomenclature	Credits	Topics
RJSUIT601	Software Quality Assurance	2	1. Introduction to quality & Software quality 2. Testing fundamentals, Unit testing, Table based testing, Data testing, Path testing etc. 3. Software Verification & Validation 4. Levels of testing and V tests
RJSUIT602	Security in Computing	2	1. Overview of InfoSec, Risk Analysis 2. Authentication, Authorization, Encryption 3. Storage, Database security 4. Secure networks, firewalls 5. Intrusion detection and prevention 6. Virtual Machines and Cloud computing
RJSUIT603	Business Intelligence	2	1. BI and Decision support systems 2. Mathematical models for decision making 3. Data mining and preparation 4. Classification, Clustering of data 5. Applications of BI 6. Knowledge Management, AI & Expert systems

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RJSUIT604	Principles of Geographic Information Systems (Elective-I)	2	1. Introduction to GIS, Models and representations 2. Data Management and processing systems 3. Spatial Referencing and Positioning, Data Entry and Preparation 4. Spatial data analysis 5. Data Visualization
RJSUIT604	Enterprise Networking (Elective-II)		1. Network Design and design models 2. Design – LAN, Data center, Wireless LAN 3. WAN Technologies 4. Network protocols 5. Managing Security
RJSUIT605	IT Service Management (Elective-I)	2	1. IT service management, Service Strategy Principles and risks 2. Service design principle and processes 3. Service Transition principles and processes 4. Service operation 5. Continual Service Improvement
RJSUIT605	Cyber Laws (Elective-II)		1. IT Act 2000 – Arrest without warrant, Crime and criminal justice 2. Contracts in Infotech 3. Jurisdiction in cyber world 4. Copyright protection 5. E commerce taxation, Digital signature and E Governance 6. Protection of cyber-Consumers in India
RJSUIT606	Human Computer Interaction	3	1. Foundations of Human Computer Interaction. 2. The design technologies for individuals and persons with disabilities. 3. Mobile HCI. 4. Case Study / Practical implementation
RJSUITP601	Software Quality Assurance Practical using tools – Selenium, AutoIT	2	
RJSUITP602	Security in Computing Practical	2	
RJSUITP603	Business Intelligence Practical	2	

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RJSUITP604	Principles of Geographic Information Systems Practical (Elective-I)	2	
RJSUITP604	Enterprise Networking Practical (Elective-II)		
RJSUITP605	Project Implementation (for both electives)	2	
Total		23	

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI**Mapping of the courses to employability / entrepreneurship / skill development
SEMESTER V**

Course Code	Course Name	Topics
RJSUIT501	Software Project Management	Skill Enhancement, Employability Unit I :Introduction to Software Project Management, Project Evaluation and Programme Management, Overview of Project Planning Unit II:Selection of an Appropriate Project Approach, Software Efforts Estimation Unit III :Activity Planning, Risk Management, Resource Allocation Unit IV :Monitoring and Control, Managing Contracts, Managing People in Software Environments Unit V :Working in Teams, Software Quality, Project Closeout
RJSUIT502	Internet of Things	Skill Enhancement Unit I :Overview of Internet of things, Design Principles for Connected Devices, Internet Principles, M2M and IoT Fundamentals Unit II:Thinking About Prototyping, Prototyping Embedded Devices, An Overview, IP,TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses Unit III :Prototyping the Physical Design, Prototyping Online Components Writing Embedded code, Prototyping Embedded Devices Unit IV :Techniques for Writing Embedded Code, Business Models Unit V : Moving to Manufacture, Ethics
RJSUIT503	Advanced Web Programming	Skill Enhancement, Employability Unit I :Introduction to .NET and C# language, Types, Objects, and Namespaces Unit II:Web forms Fundamentals, Form Controls Unit III :Error Handling, Logging, and Tracing, State Management, Styles, Themes, and Master Pages Unit IV :ADO.Net Fundamentals, Data Binding, The Data Controls Unit V :XML, Security Fundamentals, ASP.NET AJAX
RJSUIT504	Linux System Administration	Skill Enhancement, Employability Unit I :Introduction to Red Hat Enterprise Linux, Command Line, System Administration Tasks, Managing Software

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		Unit II:Configuring and Managing Storage, Connecting to the Network,Working with Users, Groups, and Permissions Unit III :Securing Server with ip tables, Setting Up Cryptographic Services, Configuring Server for File Sharing Unit IV :Configuring DNS and DHCP, Setting Up a Mail Server, Configuring Apache on Red Hat Enterprise Linux Unit V :Introducing Bash Shell Scripting, High-Availability Clustering, Setting Up an Installation Server
RJSUIT505	Next Generation Technologies	Skill Enhancement Unit I :Big data, NoSQL, Introduction to MongoDB Unit II:The MongoDB Data model, Using MongoDB Shell, MongoDB Architecture Unit III :MongoDB Storage Engine, MongoDB Use Cases, MongoDB Limitations, MongoDB Best Practices Unit IV :The End of Disk? SSD and In-Memory Databases, jQuery Unit V :JSON
RJSUIT506	Search Engine Optimization and Web Page Analytics	Skill Enhancement Unit I:SystemsSearch Engine Basics, Algorithm based Ranking Systems,Determining SEO Objective and Finding Your Site's Audience Unit II:Search Engine Optimization,Conduct SEO/Website SWOT analysis,Keyword Generation, Creating Pages, Website Structure, Creating Content, Creating Communities, building Links Using Google Analytics, Social Media Optimization, Unit III:Web Analytics, Web Analytics Importance, Process of Web Analytics, Key Metrics,Data Collection, Clickstream Data, Weblogs, Beacons, JavaScript Tags, Packet Sniffing, Outcomes data, Competitive data, Search Engine Data Unit IV:Web Analytics Working,Interacting with Data in Google Analytics Unit V:Clickstream and Qualitative Analysis,Measuring Success ,Moving Beyond Conversion Rates,Non-ecommerce Website
RJSUITP501	Project Dissertation	Skill Enhancement

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RJSUITP502	Internet of Things Practical	Skill Enhancement
RJSUITP503	Advanced Web Programming Practical	Skill Enhancement, Employability
RJSUITP504	Linux Administration Practical	Skill Enhancement, Employability
RJSUITP505	Next Generation Technologies Practical	Skill Enhancement

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI**SEMESTER VI**

Course Code	Course Name	Topics
RJSUIT601	Software Quality Assurance	Skill Enhancement, Employability Unit I: Introduction to Quality, Software Quality Unit II: Fundamentals of testing. Unit III: Unit Testing: Boundary Value Testing, Equivalence Class Testing, Decision Table–Based Testing, Path Testing, Data Flow Testing. Unit IV: Software Verification and Validation, V-test Model Unit V: Levels of Testing, Special Tests
RJSUIT602	Security in Computing	Skill Enhancement Unit I: Information Security Overview, Risk Analysis, Secure Design Principles Unit II: Authentication and Authorization, Encryption, Storage Security, Database Security Unit III: Secure Network Design, Network Device Security, Firewalls, Wireless Network Security Unit IV: Intrusion Detection and Prevention Systems, Voice over IP (VoIP) and PBX Security, Operating System Security Models Unit V: Virtual Machines and Cloud Computing, Secure Application Design, Physical Security
RJSUIT603	Business Intelligence	Skill Enhancement Unit I: Business intelligence, Decision support systems Unit II: Mathematical models for decision making, Data mining, Data preparation Unit III: Classification, Clustering Unit IV: Business intelligence applications: Marketing models, Logistic and production models, Data envelopment analysis Unit V: Knowledge Management, Artificial Intelligence and Expert Systems
RJSUIT604	Principles of Geographic Information Systems	Skill Enhancement Unit I: The nature of GIS, Geographic Information and Spatial Database Models and Representations of the real world, Organizing and Managing Spatial Data the Temporal Dimension Unit II: Data Management and Processing Systems Hardware and Software Trends, Stages of Spatial Data handling, GIS and Spatial Databases

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		<p>Unit III: Spatial Referencing and Positioning, Satellite-based Positioning, Data Entry and Preparation, Point Data Transformation</p> <p>Unit IV: Spatial Data Analysis, Classification of analytical GIS Capabilities, GIS and Application models, Error Propagation in spatial data processing</p> <p>Unit V: Data Visualization, GIS and Maps, The Visualization Process Visualization, Strategies: Present or explore? Map Cosmetics, Map Dissemination, The cartographic toolbox</p>
RJSUIT604	Enterprise Networking	<p>Skill Enhancement</p> <p>Unit I: General Network Design, Network Design Models</p> <p>Unit II: Enterprise LAN Design, Data Center Design</p> <p>Unit III: Wireless LAN Design, WAN Technologies and the Enterprise Edge, WAN Design</p> <p>Unit IV: Internet Protocol Version 4, case Study, Internet Protocol Version 6</p> <p>Unit V: Managing Security</p>
RJSUIT605	IT Service Management	<p>Skill Enhancement</p> <p>Unit I: IT Service Management, Service Strategy Principles, Service Strategy, Challenges, Critical Success factors and risks</p> <p>Unit II: Service Design, Service Design Principles, Service Design Processes, Challenges, Critical Success factors and risks</p> <p>Unit III: Service Transition, Service Transition Principles, Service Transition Processes, Challenges, Critical Success factors and risks</p> <p>Unit IV: Service Operation, Service Operation Principles, Service Operation Processes, Challenges, Critical Success factors and risks</p> <p>Unit V: Continual Service Improvement (CSI) Principles, CSI Process, CSI Methods and Techniques, organising for CSI, Technology considerations, Implementing CSI</p>
RJSUIT605	Cyber Laws	<p>Skill Enhancement</p> <p>Unit I: Power of Arrest Without Warrant Under the IT Act, 2000, Cyber Crime and Criminal Justice:</p>

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		<p>Penalties, Adjudication and Appeals Under the IT Act, 2000</p> <p>Unit II: Contracts in the Infotech World, Jurisdiction in the Cyber World</p> <p>Unit III: Battling Cyber Squatters and Copyright Protection in the Cyber World</p> <p>Unit IV: E-Commerce Taxation: Real Problems in the Virtual World, Digital Signature, Certifying Authorities and E-Governance</p> <p>Unit V: The Indian Evidence Act of 1872 v. Information Technology Act, 2000, Protection of Cyber Consumers in India</p>
RJSUIT606	Human Computer Interaction	<p>Skill Enhancement</p> <p>Unit I: FOUNDATIONS OF HCI</p> <p>Unit II: DESIGN & SOFTWARE PROCESS</p> <p>Unit III: MODELS AND THEORIES HCI</p> <p>Models, Cognitive models, Socio-Organizational issues and stakeholder requirements, Communication and collaboration models</p> <p>Unit IV: MOBILE HCI, Mobile Ecosystem, Mobile 2.0, Mobile Design</p> <p>Unit V: WEB INTERFACE DESIGN, Drag & Drop, Contextual Tools,</p> <p>Unit VI: Paradigms, Case Study</p>
RJSUITP601	Software Quality Assurance Practical using tools – Selenium, AutoIT	<p>Skill Enhancement:</p> <ol style="list-style-type: none"> 1. Manual Testing 2. Automation Testing using Selenium- IDE, WebDriver, AutoIT and WAPT
RJSUITP602	Security in Computing Practical	Skill Enhancement
RJSUITP603	Business Intelligence Practical	Skill Enhancement
RJSUITP604	Principles of Geographic Information Systems Practical	Skill Enhancement

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RJSUITP604	Enterprise Networking Practical	Skill Enhancement
RJSUITP605	Project Viva Voce	Skill Enhancement, Employability

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B.Sc.(Information Technology)		Semester–V	
Course Name: Software Project Management		Course Code: RJSUIT501	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lecture
I	<p>Introduction to Software Project Management: Introduction, why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Projects, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.</p> <p>Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programme, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management.</p> <p>An Overview of Project Planning: Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step7: Allocate Resources, Step8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning</p>	12
II	<p>Software Effort Estimation: Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom- up Estimating, The Top-down Approach and Parametric Models, Expert Judgment, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.</p>	12

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III	<p>Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.</p> <p>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.</p> <p>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.</p>	12
IV	<p>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM).</p> <p>Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.</p> <p>Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.</p>	12
V	<p>Working in Teams: Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership.</p> <p>Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.</p> <p>Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.</p>	12

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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall	TMH	6 th	2018
2.	Project Management and Tools & Technologies – An overview	Shailesh Mehta	SPD	1st	2017
3.	Software Project Management	Walker Royce	Pearson		2005

B.Sc.(Information Technology)		Semester–V	
Course Name: Project Dissertation		Course Code: RJSUITP501	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Project Viva Voce Part I	2½ 2	50
	External	--	--

Guidelines

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. Students are encouraged to work in the areas listed below. However, it is ***not mandatory*** for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory.** If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI**SOFTWARE AND BROAD AREAS OF APPLICATION**

FRONT END / GUI Tools	.Net Technologies, Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R, Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), Tcl/Tk,
.NET Platform	F#, C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB
UNIX INTERNALS	Device Drivers, RPC, Threads, Socket programming
NETWORK/WIRELESS TECHNOLOGIES	-
REALTIME OPERATING SYSTEM/ EMBEDDED SKILLS	LINUX, Raspberry Pi, Arduino, 8051
APPLICATION AREAS	Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking-Communication Software development/ E-Commerce/ERP/MRP/TCP-IP programming/Routing protocols programming/ Socket programming.

The project report should be documented with a scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The student should start the documentation process from the first phase of software development so that one can easily identify the issues to be focused upon in the ultimate project report. The student should also include the details from the project diary, in which they will record the progress of their project throughout the course. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices

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Project report must contain relevant documents from the list given below –

- Title Page
- Original Copy of the Approved Performa of the Project Proposal
- Certificate of Authenticated work (From College and from company in case of live projects)
- Role and Responsibility Form (if applicable)
- Abstract
- Acknowledgement
- Table of Contents

CHAPTER 1: INTRODUCTION

- 1.1 Background
- 1.2 Objectives
- 1.3 Purpose, Scope, and Applicability
 - 1.3.1 Purpose
 - 1.3.2 Scope
 - 1.3.3 Applicability

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

- 3.1 Problem Definition
- 3.2 Requirements Specification
- 3.3 Planning and Scheduling (Gantt chart)
- 3.4 Software and Hardware Requirements
- 3.5 Preliminary Product Description
- 3.6 Conceptual UML Models (use case, class diagram, sequence diagram)

CHAPTER 4: SYSTEM DESIGN

- 4.1 Basic Modules
- 4.2 Data Design (E-R diagram)
 - 4.2.1 Schema Design
 - 4.2.2 Data Integrity and Constraints
- 4.3 Procedural Design
 - 4.3.1 Logic Diagrams
 - 4.3.2 Data Structures
 - 4.3.3 Algorithms Design
- 4.4 User interface design
- 4.5 Security Issues
- 4.6 Test Cases Design

The documentation could use tools like star UML, Visio for windows, Rational Rose for design as part of Software Project Management Practical Course.

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T.Y.B.Sc.I.T.	Semester V Theory
RJSUIT501 Software Project Management	<p>Course Outcomes: 5.1</p> <p>The course will enable the student to</p> <ol style="list-style-type: none">1. Identify and describe the key phases of project management2. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.3. Understand and evaluate Project Risks using CPM and PERT. <p>Learning outcomes:</p> <ul style="list-style-type: none">□ Planning, Scheduling, Monitoring and Controlling project activities.
RJSUITP501 Project Dissertation	<p>Course Outcomes:</p> <p>Project Dissertation will help the students to understand the scope and functionalities of the project/product.</p> <ul style="list-style-type: none">□ Application of UML concepts for analyzing the project's requirements.□ Requirements and design analysis.

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–V	
Course Name: Internet of Things		Course Code: RJSUIT502	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>The Internet of Things: An Overview: The Flavor of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?</p> <p>M2M and IoT Fundamentals: M2M Background, M2M communication, General technology and scientific trends, trends in information and communication technology, implications for IOT</p> <p>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, and Affordances.</p>	12
II	<p>Internet Principles: Internet Communications: An Overview, IP,TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.</p> <p>Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalization, Climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community.</p>	12
III	<p>Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, Developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and</p>	12

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	Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness. Limitations and Challenges : IOT for the sake of IOT – lack of practical usefulness, compelling but limited features, lack of control, Basic challenges of security and privacy, security is given but it can be a myth, privacy is not given	
IV	Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging, Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.	12
V	Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community. Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	WILEY	1 st	2014
2.	The Future of IoT: Leveraging the Shift to a Data Centric World	Don DeLoach, Emil Berthelsen and WaelElrifai	BookBaby		2017

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3.	From Machine-to Machine to internet of things	Jan Holler, VlasiosTsiatsis and Catherine Mulligan	Academic Press		2014
4.	Getting Started withRaspberry Pi	Matt Richardson andShawn Wallace	SPD	3 rd	2016

B.Sc.(Information Technology)		Semester–V	
Course Name: Internet of Things Practical		Course Code: RJSUITP502	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	Internal	--	--

Practical No.	Details
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
1	Displaying different LED patterns with Raspberry Pi.
2	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi
3	Raspberry Pi Based Oscilloscope
4	Controlling Raspberry Pi with Terminal.
5	Setting up Wireless Access Point using Raspberry Pi
6	Fingerprint Sensor interfacing with Raspberry Pi
7	Raspberry Pi GPS Module Interfacing
8	Visitor Monitoring with Raspberry Pi and Pi Camera
9	Interfacing Raspberry Pi with RFID.
10	Building Google Assistant with Raspberry Pi.

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T.Y.B.Sc.I.T.	Semester V Theory
RJSUIT502 Internet of Things	<p>Course Outcomes: 5.2</p> <p>The course will enable the student to understand</p> <ol style="list-style-type: none">1. The concept of 'internet of things' and enchanted objects.2. Building a prototype of iot project.3. The process of moving from prototype to manufacture of iot project. <p>Learning outcomes:</p> <ul style="list-style-type: none">□ Students will learn about the hardware and software components involved in building iot applications□ Students will learn to use or develop business models to build iot projects.
RJSUITP502 Internet of Things Practical	<p>Course Outcomes:</p> <p>The practical course will help the students to build prototypes using soc like Raspberry Pi</p> <ul style="list-style-type: none">□ Visitor monitoring system□ Controlling Raspberry pi with telegram app.□ Iot based RFID interface

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B.Sc.(Information Technology)		Semester–V	
Course Name: Advanced Web Programming		Course Code: RJSUIT503	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	12
II	Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	12
III	Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options	12

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	Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages.	
IV	<p>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.</p> <p>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls.</p> <p>The Data Controls: The GridView, Formatting the GridView, Selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView.</p>	12
V	<p>XML: XML ExplainedThe XML Classes, XML Validation, XML Display and Transforms.</p> <p>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.</p> <p>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.</p>	12

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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Beginning ASP.NET 4.5 in C#	Matthew MacDonald	Apress		2012
2.	C# 2015	Anne Bohem and Joel Murach	Murach	Third	2016
3.	Murach's ASP.NET 4.6 Web Programming in C#2015	Mary Delamater and Anne Bohem	SPD	Sixth	2016
4.	ASP.NET4.0programming	J. Kanjilal	Tata McGraw-Hill		2011
5.	Programming ASP.NET	D. Esposito	Microsoft Press (Dreamtech)		2011

B.Sc.(Information Technology)		Semester–V	
Course Name: Advanced Web Programming Practical		Course Code: RJSUITP503	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	Internal	--	--

Practical No.	Details
1.	Working with basic C# and ASP .NET

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c.	Create a web application to demonstrate various states of ASP.NET Pages.
6.	Working with Database
a.	Create a web application bind data in a multiline textbox by querying in another textbox.
b.	Demonstrate the use of Data list link control.
7.	Working with Database
a.	Create a web application to display Data Binding using dropdown list control.
b.	Create a web application to display the phone no of an author using a database.
c.	Create a web application for inserting and deleting records from a database. (Using Execute-Non Query).
8.	Working with data controls
a.	Create a web application to demonstrate various uses and properties of SqlDataSource.
b.	Create a web application to demonstrate data binding using DetailsView and FormView Control.
c.	Create a web application to display Using Disconnected Data Access and Data binding using GridView.
9.	Working with GridView control
a.	Create a web application to demonstrate use of GridView control template and GridView hyperlink.
b.	Create a web application to demonstrate use of GridView button column and GridView events.
c.	Create a web application to demonstrate GridView paging and Create own table format using GridView.
10.	Working with AJAX and XML
a.	Create a web application to demonstrate reading and writing operations with XML.
b.	Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties.
c.	Create a web application to demonstrate use of various Ajax controls.
11.	Programs to create and use DLL

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T.Y.B.Sc.I.T.	Semester V Theory
RJSUIT503 Advanced Web Programming	<p>Course Outcomes: 5.3</p> <ol style="list-style-type: none">1. Introduce students to the use of various web programming language concepts and structures for writing programs.2. provide students with skills to select the best language to solve a particular problem with respect to web page design and development <p>Learning outcomes:</p> <ul style="list-style-type: none">□ Understanding the major areas and challenges of web programming.□ Using advanced topics in HTML5, CSS3, JavaScript□ Using a server-side scripting language, PHP□ Using a relational DBMS, MySQL□ Using PHP to access a MySQL database.□ Designing and implementation of typical static web pages and interactive web applications as well as dynamic web applications
RJSUITP503 Advanced Web Programming Practical	<p>Course Outcomes:</p> <ol style="list-style-type: none">1. Implement interactive web page(s) using HTML, CSS and JavaScript.2. Design a responsive web site using HTML5 and CSS3.3. Demonstrate Rich Build Dynamic web site using server side PHP Programming and Database connectivity

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B.Sc.(Information Technology)		Semester–V	
Course Name: Linux System Administration		Course Code: RJSUIT504	
Periods per week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lectures
I	<p>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.</p> <p>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files</p> <p>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, Using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Log rotate</p> <p>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages</p>	12
II	<p>Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes</p> <p>Connecting to the Network: Understanding Network Manager, Working with Services and Run levels, Configuring the Network with Network Manager, Working with system-config-network, Network Manager Configuration Files, Network Service Scripts, Networking from the</p>	12

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	<p>Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key- Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access</p> <p>Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes</p>	
II I	<p>Securing Server with ip tables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with ip tables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced ip tables Configuration, Configuring Logging, The Limit Module, Configuring NAT</p> <p>Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: the Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files</p> <p>Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services.</p>	12
I V	<p>Configuring DNS and DHCP: Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server</p> <p>Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP</p> <p>Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, Creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL</p>	12

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V	<p>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.</p> <p>High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems</p> <p>Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, Creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File</p>	12
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Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Red Hat Enterprise Linux 6 Administration	Sander van Vugt	John Wiley and Sons		2013
2.	Red hat Linux Networking and System Administration	Terry Collings and Kurt Wall	Wiley	3 rd	
3.	Linux Administration: A Beginner's Guide	Wale Soyinka	TMH	5 th	

B.Sc.(Information Technology)	Semester–V
Course Name: Linux System Administration Practical	Course Code: RJSUITP504

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Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	Internal	--	--

Practical No	Details
0	Installation of RHEL 6.X
1	Graphical User Interface and Command Line Interface and Processes
a	Exploring the Graphical Desktop
b	The Command Line Interface
c	Managing Processes
2	Storage Devices and Links, Backup and Repository
a	Working with Storage Devices and Links
b	Making a Backup
c	Creating a Repository
3	Working with RPMsm Storage and Networking
a	Using Query Options
b	Configuring and Managing Storage
c	Connecting to the Network
4	Working with Users, Groups, and Permissions
5	Firewall and Cryptographic services
a	Securing Server with iptables
b	Setting Up Cryptographic Services
6	Configuring Server for File Sharing

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a	Configuring NFS Server and Client
b	Configuring FTP
7	DNS, DHCP and Mail Server
a	Configuring DNS
b	Configuring DHCP
c	Setting Up a Mail Server
8	Web Server
a	Configuring Apache on Red Hat Enterprise Linux
b	Writing a Script to Monitor Activity on the Apache Web Server
c	Using the select Command
9	Shell Scripts and High-Availability Clustering
a	Writing Shell Scripts
b	Configuring Booting with GRUB
c	Configuring High Availability Clustering
10	Setting Up an Installation Server
a	Configuring Network Server as an Installation Server
b	Setting Up a TFTP and DHCP Server for PXE Boot

T.Y.B.Sc. I.T.	Semester V Theory
RJSUIT504 Linux System Adminstr ation	<p>Course Outcomes : 5.4.2</p> <ol style="list-style-type: none"> 1. Getting introduced to the Linux operating system, starting up and shutting down a Linux system. 2. Understanding the role and duties of a system administrator 3. Use of system configuration files in Linux and TCP/IP network configuration files. 4. Use of windows configuration server, time server and caching proxy server 5. Use of secured and unsecured internet services – FTP, SSH etc. 6. Understanding the concept of domain name server, types of DNS. 7. Configuring mail services in Linux system 8. Configuring and using a web server.

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	<p>Learning outcomes:</p> <ul style="list-style-type: none">□ Make appropriate decisions during the configuration process to create a properly functioning Linux environment.□ Use programs and utilities to administer a Linux machine.□ Explain how a Linux server can be integrated within a multi-platform environment.□ Analyse the need for security measures for a Linux environment.□ Identify the different uses and advantages of Linux in a business environment in order to participate in discussions regarding network servers and services.
<p>RJSUITP5 04 Linux System Administ ration Practical</p>	<p>Course Outcomes:</p> <ol style="list-style-type: none">1. Installation of Red hat Linux operating system – partitioning the hard drive, setting up the boot loader, setting up the network configuration.2. Installing software packages in Linux operating system3. Using Linux system administration commands4. Configuration of various servers – samba server, NFS file server, Apache web server, caching proxy server, mail server5. Executing shell scripts on Linux operating system.

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–V	
Course Name: Next Generation Technologies		Course Code: RJSUIT505	
Periods per week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>Big Data: Getting Started, Big Data, Facts About Big Data, Big Data Sources, Three Vs of Big Data, Volume, Variety, Velocity, Usage of Big Data, Visibility, Discover and Analyze Information, Segmentation and Customizations, Aiding Decision Making, Innovation, Big Data Challenges, Policies and Procedures, Access to Data, Technology and Techniques, Legacy Systems and Big Data, Structure of Big Data, Data Storage, Data Processing, Big Data Technologies</p> <p>NoSQL: SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer's Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases</p> <p>Introducing MongoDB: History, MongoDB Design Philosophy, Speed, Scalability and Agility, Non-Relational Approach, JSON-Based Document Store, Performance vs. Features, Running the Database Anywhere, SQL Comparison</p>	12
II	<p>The MongoDB Data Model: The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, Object- Oriented Programming, Schema Evolution</p> <p>Using MongoDB Shell: Basic Querying, Create and Insert, Explicitly Creating Collections, Inserting Documents Using Loop, Inserting by Explicitly Specifying _id, Update, Delete, Read, Using Indexes, Stepping Beyond the Basics, Using Conditional Operators, Regular Expressions, MapReduce, aggregate(), Designing an Application's Data Model, Relational Data Modeling and Normalization, MongoDB Document Data Model Approach</p> <p>MongoDB Architecture: Core Processes, mongod, mongo, mongos, MongoDB Tools, Standalone Deployment, Replication, Master/Slave Replication, Replica Set, Implementing Advanced Clustering with Replica Sets, Sharding, Sharding Components, Data Distribution Process, Data</p>	12

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	Balancing Process, Operations, Implementing Sharding, Controlling Collection Distribution (Tag-Based Sharding), Points to Remember When Importing Data in a Sharded Environment, Monitoring for Sharding, Monitoring the Config Servers, Production Cluster Architecture, Scenario 1, Scenario 2, Scenario 3, Scenario 4	
III	<p>MongoDB Storage Engine: Data Storage Engine, Data File (Relevant for MMAPv1), Namespace (.ns File), Data File (Relevant for WiredTiger), Reads and Writes, How Data Is Written Using Journaling, GridFS – The MongoDB File System, The Rationale of GridFS, GridFS under the Hood, Using GridFS, Indexing, Types of Indexes, Behaviors and Limitations</p> <p>MongoDB Use Cases: Use Case 1 -Performance Monitoring, Schema Design, Operations, Sharding, Managing the Data, Use Case 2 – Social Networking, Schema Design, Operations, Sharding</p> <p>MongoDB Limitations: MongoDB Space Is Too Large (Applicable for MMAPv1), Memory Issues (Applicable for Storage Engine MMAPv1), 32-bit vs. 64-bit, BSON Documents, Namespaces Limits, Indexes Limit, Capped Collections Limit - Maximum Number of Documents in a Capped Collection, Sharding Limitations, Shard Early to Avoid Any Issues, Shard Key Can't Be Updated, Shard Collection Limit, Select the Correct Shard Key, Security Limitations, No Authentication by Default, Traffic to and from MongoDB Isn't Encrypted, Write and Read Limitations, Case-Sensitive Queries, Type-Sensitive Fields, No JOIN, Transactions, MongoDB Not Applicable Range</p> <p>MongoDB Best Practices: Deployment, Hardware Suggestions from the MongoDB Site, Few Points to be Noted, Coding, Application Response Time Optimization, Data Safety, Administration, Replication Lag, Sharding, Monitoring</p>	12
IV	<p>The End of Disk? SSD and In-Memory Databases: The End of Disk?, Solid State Disk, The Economics of Disk, SSD-Enabled Databases, In-Memory Databases, TimesTen, Redis, SAP HANA, VoltDB, Oracle 12c "in-Memory Database, Berkeley Analytics Data Stack and Spark, Spark Architecture</p> <p>jQuery: Introduction, Traversing the DOM, DOM Manipulation with jQuery, Events, Ajax with jQuery, jQuery Plug-ins, jQuery Image Slider</p>	12
V	<p>JSON: Introduction, JSON Grammar, JSON Values, JSON Tokens, Syntax, JSON vs. XML, Data Types, Objects, Arrays, Creating JSON, JSON Object, Parsing JSON, Persisting JSON, Data Interchange, JSON PHP, JSON HTML, JSONP</p>	12

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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Practical MongoDB	Shakuntala Gupta Edward NavinSabharwal	Apress		
2.	Beginning jQuery	Jack Franklin Russ Ferguson	Apress	2 nd	
3.	Next Generation Databases	Guy Harrison	Apress		
4.	Beginning JSON	Ben Smith	Apress		

B.Sc.(Information Technology)		Semester–V	
Course Name: Next Generation Technologies Practical		Course Code: RJSUITP505	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	Internal	--	--

Practical No	Details
1	MongoDB Basics
a	Write a MongoDB query to create and drop databases.
b	Write a MongoDB query to create, display and drop collection
c	Write a MongoDB query to insert, query, update and delete a document.
2	Simple Queries with MongoDB
3	Implementing Aggregation
a	Write a MongoDB query to use sum, avg, min and max expressions.

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b	Write a MongoDB query to use push and add ToSet expressions.
c	Write a MongoDB query to use the first and last expression.
4	Replication, Backup and Restore
a	Write a MongoDB query to create a Replica of existing databases.
b	Write a MongoDB query to create a backup of the existing database.
c	Write a MongoDB query to restore the database from the backup.
5	Java and MongoDB
a	Connecting Java with MongoDB and inserting, retrieving, updating and deleting.
6	PHP and MongoDB
a	Connecting PHP with MongoDB and inserting, retrieving, updating and deleting.
7	Python and MongoDB
a	Connecting Python with MongoDB and inserting, retrieving, updating and deleting.
8	Programs on Basic jQuery
a	jQuery Basic, jQuery Events
b	jQuery Selectors, jQuery Hide and Show effects
c	jQuery fading effects, jQuery Sliding effects

T.Y.B.Sc. I.T.	Semester V Theory
RJSUIT505 Next Generation Technologies	<p>Course Outcomes : 5.5.2</p> <p>After completion of this course student will be able to understand</p> <ol style="list-style-type: none"> 1. The concept of big data and its aid to decision making 2. New generation database management systems like NoSQL and MongoDB 3. Architecture, best practices and limitations of MongoDB 4. JSON data format, its grammar and use with PHP and HTML <p>Learning outcomes:</p> <ul style="list-style-type: none"> □ Use big data and relevant technologies in various applications. □ Understand and use alternative database technique NoSQL □ Use open source DBMS MongoDB and its Document Object Model

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	<ul style="list-style-type: none">□ Effective use of jQuery□ Use of JSON data format.
RJSUITP505 Next Generation Technologies Practical	<p>Course Outcomes :</p> <p>After completion of the course, student will be able to</p> <ol style="list-style-type: none">1. Build basic MongoDB database and execute queries2. Use the replication, backup and restore features of MongoDB3. Using java, PHP and Python with MongoDB4. Execute programs with jQuery5. Create JSON file and import it to MongoDB

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B.Sc.(Information Technology)		Semester–V	
Course Name: Search Engine Optimization and Web Analytics		Course Code: RJSUIT506	
Periods per week (1 Period is 50 minutes)		5	
Credits		3	
		Hours	Marks
Evaluation System	Theory Examination	3	60
	Internal	--	40
	Practical/Case Study	1	25

UNIT	Topics	Hours
I	Basics of Search Engine Search Engine Basics, Algorithm based Ranking Systems: Determining Searcher Intent and Delivering Relevant, Fresh Content, Analyzing Ranking Factors, Using Advanced Search Techniques, Vertical Search Techniques, Country Specific search engines. Determining SEO Objective and Finding Your Site's Audience: Setting SEO Goals and Objective Developing SEO plans Prior to Site Development, SEO for Raw traffic, Ecommerce Sales, Mindshare/Branding, Direct Marketing, Reputation Management, Ideological Influence.	12
II	Search Engine Optimization Getting started SEO: Defining Your Site's Information Architecture, Auditing an Existing Site to identify SEO Problems, Identifying Current Server Statistic Software and Gaining Access, Determining Top competitors, Benchmarking Current Indexing Status, Current Rankings, Benchmarking Current Traffic Source and Volumes, Conduct SEO/Website SWOT analysis. Keyword Generation, Creating Pages, Website Structure, Creating Content, Creating Communities, building Links Using Google Analytics, Social Media Optimization, Creating Pay-per-click Campaigns, Optimizing PPC Campaigns through Quality Score optimization, Tracking Results and Measuring Success	12
III	Introduction to Web Analytics What is Web Analytics, Web Analytics Importance, Process of Web Analytics, Key Metrics Web Analytics and User Experience, Get to Know Your Website, A Model of Analysis, Showing Your Work, Context	12

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	Matters, Data Collection, Clickstream Data, Weblogs, Beacons, JavaScript Tags, Packet Sniffing, Outcomes data, Competitive data, Search Engine Data.	
IV	Web Analytics Working & Google Analytics Web Analytics Working: Log File Analysis, Page Tagging (Cookies, Accuracy, Accounts and Profiles, Click Analytics). Metrics and Dimensions: Visits, Unique Visitors, Pageviews, Pages/Visit, Average Visit Duration, Bounce Rate, % New Visits. Interacting with Data in Google Analytics: Plot Rows, Secondary Dimension, Sort Type, Search, Beyond Tables, Analytics, Cookies, Accounts vs Property, Tracking Code, Tracking Unique Visitors, Demographics, Page Views & Bounce Rate Acquisitions, Custom Reporting.	12
V	Clickstream and Qualitative Analysis Understanding Visitor Acquisition Strengths, Click Density Analysis, Measuring Visits to Purchase, Sources of Traffic, Visitor Analysis, Traffic Analysis, Internal Site Search Analysis, Search Engine Optimization (SEO) Analysis, Pay Per Click/Paid Search Analysis, Direct Traffic Analysis, Email Campaign Analysis, Rich Experience Analysis(Flash, Video, and Widgets), Customer Centricity, Site Visits, Surveys, Questionnaires, Website Surveys, Post visits, Creating and Running, Benefits of surveys, Critical components of successful strategy. Measuring Success, Actionable Outcome KPIs:Moving Beyond Conversion Rates, Measuring Success for a Non-ecommerce Website	12

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	The Art of an SEO	Eric Enge, Stephan Spencer, Jessie Stricchiola	O'Reilly Publication	3 rd Edition	2015
2	Advance Internet Technology	Dr. Deven Shah	Dreamtech Publication	1st Edition	2014
3	Web Analytics 2.0: The Art of Online Accountability and Science Of	Avinash Kaushik	Sybex	1st Edition	2009

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	Customer Centricity				
4	Practical Web Analytics for User Experience: How Analytics can help you Understand your Users	Michael Beasley	Morgan Kaufmann	1st Edition	2013
5	Successful Analytics: Gain Business Insights by Managing Google Analytics	Brian Clifton	Advanced Web Metrics Ltd	1st Edition	2013
6	Google Analytics	Justin Cutroni	O'Reilly		2010
7	Google Analytics Breakthrough	Eric Fettman, Shiraz Asif, Feras Alhlou	Wiley		2016

T.Y.B.Sc.I.T.	Semester V Theory
RJSUIT506 Search Engine Optimization and Web Page Analytics	<p>Course Outcomes: 5.6</p> <p>The course will enable the student ,</p> <ol style="list-style-type: none"> 1. To gain an in-depth understanding of search engine basics, search engine optimization, key concepts and terminologies of web analytics, working of web analytics and their impact. 2. To understand the principles, tools and methods of web analytics, 3. To learn to apply analytics for business situations and measuring success by actionable KPI's using quantitative and qualitative methods for web analytics <p>Learning outcomes:</p> <ul style="list-style-type: none"> □ Determine SEO Objectives and Develop SEO plan prior to Site Development.

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	<ul style="list-style-type: none">□ Explain Search Engine Optimization Techniques and Develop Keyword Generation.□ Know the concepts and terminologies related to web analytics.□ Explore various parameters used for web analytics and their impact□ Get experience on websites, web data insights and conversions using Clickstream and Qualitative Analysis.□ Explore Measuring Success by actionable KP'Is.
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T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI**SEMESTER- VI**

B.Sc.(Information Technology)		Semester–VI	
Course Name: Software Quality Assurance		Course Code: RJSUIT601	
Periods per week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Uni t	Details	Lect ures
I	<p>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.</p> <p>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organization Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.</p>	12

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II	<p>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies /Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing</p>	12
III	<p>Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing,</p> <p>Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations.</p> <p>Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations,</p> <p>Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guide lines and Observations,</p> <p>Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.</p>	12
IV	<p>Software Verification and Validation: Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.</p> <p>V-test Model: Introduction, V-model for software, Testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities</p>	12

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V	<p>Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages.</p> <p>Special Tests: Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusinesse Commerce Testing, AgileDevelopment Testing, Data Warehousing Testing.</p>	12
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Testing and Continuous Quality Improvement	William E. Lewis	CRC Press	3 rd	2016
2.	Software Testing: Principles, Techniques and Tools	M. G. Limaye	TMH		2017
3.	Foundations of Software Testing	Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black	Cengage Learning	3 rd	
4.	Software Testing: A Craftsman's Approach	Paul C. Jorgenson	CRC Press	4 th	2017

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: Software Quality Assurance Practical		Course Code: RJSUITP601	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No.		Details
Manual testing		
1.		Functional Testing Techniques:
	a.	Boundary Value Analysis, Equivalence Partitioning
	b.	State Transition Testing, Decision Testing
2.		Structural Testing Technique
	a.	Path Testing (Compute Cyclomatic complexity)
Testing Tools: Selenium IDE (Selenium Integrated Development Environment)		
3.		Selenium IDE Download Installation and Core Features Introduction (Creating a Selenium IDE Script- Recording, Playback and Saving)
4.		Use Firebug for Creating Selenium Scripts (Introduction to Firebug, Installing Firebug and Creating Selenium Script using Firebug)
5.		Locate/ Identify Web Elements (Text box, Button, Drop Down, Hyperlink, Check Box, Radio Button) In Selenium
Testing Tools: Selenium WebDriver		
6.		WebDriver Entire Setup and Installation with Eclipse Implementation of Our First WebDriver Script
7.		Check Visibility Of Web Elements (buttons, drop boxes, checkboxes, radio buttons, labels etc) Using WebDriver Commands-isDisplayed(), isSelected(), isEnabled()

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Testing Tool: AutoIT		
8.		Implement Iterative and decision-making structures
9.		Handling different windows application (Calculator, MS Excel, MS Word, Notepad) using AutoIt
Testing Tool: WAPT		
10		To perform Load and performance testing

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T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT601 Software Quality Assurance	<p>Course Outcomes : 6.1</p> <p>After completion of the course student will be able to</p> <ol style="list-style-type: none">1. Define quality from different perspectives – customer, supplier and product developer and understand need of quality in software product development.2. Understand fundamentals of testing and different types of testing. <p>Learning outcomes:</p> <ul style="list-style-type: none">□ Shift from ‘q’ to ‘Q’ for software product development organization□ Understand roles of different stakeholders in quality maintenance.□ Write test cases using various testing methodologies
RJSUITP601 Software Quality Assurance Practical	<p>Course Outcomes :</p> <p>After successful completion of project, student will be able to</p> <ol style="list-style-type: none">1. Perform manual testing.2. Download, install and write scripts using Selenium IDE and AutoIT3. Perform Load and Performance Testing using WAPT

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: Security in Computing		Course Code: RJSUIT602	
Periods per Week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lectures
I	<p>Information Security Overview : The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.</p> <p>Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis. Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.</p>	12
II	<p>Authentication and Authorization: Authentication, Authorization</p> <p>Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.</p> <p>Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.</p> <p>Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database- Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring</p>	12
III	<p>Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.</p> <p>Network Device Security: Switch and Router Basics, Network Hardening.</p> <p>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.</p> <p>Wireless Network Security: Radio Frequency Security Basics, Data- Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.</p>	12

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IV	<p>Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.</p> <p>Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.</p>	12
V	<p>Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing.</p> <p>Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.</p> <p>Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The Complete Reference: Information Security	Mark Rhodes-Ousley	McGraw-Hill	2 nd	2013
2.	Essential Cyber security Science	Josiah Dykstra	O'Reilly	5 th	2017
3.	Principles of Computer Security: CompTIA Security+ and Beyond	Wm.Arthur Conklin, GregWhite	McGraw Hill	2 nd	2010

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: Security in Computing Practical		Course Code: RJSUITP602	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
1	Configure Routers
a	OSPF MD5 authentication.
b	NTP.
c	To log messages to the syslog server.
d	To support SSH connections.
2	Configure AAA Authentication
a	Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA
b	Verify local AAA authentication from the Router console and the PC-A client
3	Configuring Extended ACLs
a	Configure, Apply and Verify an Extended Numbered ACL
4	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs
a	Verify connectivity among devices before firewall configuration.
b	Use ACLs to ensure remote access to the routers is available only from management station PC-C.
c	Configure ACLs on to mitigate attacks.
d	Configuring IPv6 ACLs

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5	Configuring a Zone-Based Policy Firewall
6	Configure IOS Intrusion Prevention System (IPS) Using the CLI
a	Enable IOS IPS.
b	Modify an IPS signature.
7	Layer 2 Security
a	Assign the Central switch as the root bridge
b	Secure spanning-tree parameters to prevent STP manipulation attacks
c	Enable port security to prevent CAM table overflow attacks
8	Layer 2 VLAN Security
9	Configure and Verify a Site-to-Site IPsec VPN Using CLI
10	Configuring ASA Basic Settings and Firewall Using CLI
a	Configure basic ASA settings and interface security levels using CLI
b	Configure routing, address translation, and inspection policy using CLI
c	Configure DHCP, AAA, and SSH
d	Configure a DMZ, Static NAT, and ACLs

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT602 Security in Computing	<p>Course Outcomes : 6.2</p> <ol style="list-style-type: none"> 1. At the end of the course, the students will have firm understanding on basic terminology and concepts related to network and system level security, basics of computers and networking including Internet Protocol, routing, Domain Name Service, and network devices. 2. They are also exposed to basic cryptography, security management, and network security techniques. 3. They also look at policies as a tool to effectively change an organization's culture towards a better secure environment <p>Learning outcomes: After studying this course, you should be able to:</p> <ul style="list-style-type: none"> □ Define what information is □ Appreciate the value of information to the modern organization

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	<ul style="list-style-type: none">□ Understand the CIA triad of Confidentiality, Integrity and Availability□ Appreciate the difficulties that arise when valuable information needs to be shared
RJSUITP602 Security in Computing Practical	<p>Course Outcomes :</p> <p>After completion of this course student will be able to</p> <ol style="list-style-type: none">1. Configure routers for different protocols in networks2. Configure AAA authentication for network3. Configure extended ACLs and numbered ACLs, assign IP ACLs to mitigate attacks4. Configure firewalls and VLAN security5. Configure site to site IPSec VPN using CLI

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B.Sc.(Information Technology)		Semester–VI	
Course Name: Business Intelligence		Course Code: RJSUIT603	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

Unit	Details	Lect ures
I	Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	12
II	Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	12
III	Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	12
IV	Business intelligence applications: Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	12

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V	Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	12
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Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Business Intelligence: Data Mining and Optimization for Decision Making	Carlo Vercellis	Wiley	1 st	2009
2.	Decision support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, Dursun Delen	Pearson	9 th	2011
3.	Fundamental of Business Intelligence	Grossmann W, Rinderle-Ma	Springer	1 st	2015

B.Sc.(Information Technology)		Semester–VI	
Course Name: Business Intelligence Practical		Course Code: RJSUITP603	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
1.	Import the legacy data from different sources such as (Excel, SqlServer, Oracle

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		etc.) and load in the target system. (You can download sample database such as Adventure works, Northwind, foodmart etc.)
2.		Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
3.	a	Create the Data staging area for the selected database.
	b	Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.
4.	a	Create the ETL map and setup the schedule for execution.
	b	Execute the MDX queries to extract the data from the data warehouse.
5	a.	Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart.
	b.	Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.
6.		Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
7.		Perform the data classification using classification algorithm.
8.		Perform the data clustering using clustering algorithm.
9.		Perform the Linear regression on the given data warehouse data.
10.		Perform the logistic regression on the given data warehouse data.

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT603 Business Intelligence	<p>Course Outcomes : 6.3</p> <p>After this course student will be able to understand</p> <ol style="list-style-type: none"> 1. The process of analyzing data and presenting information used to make decision. 2. Understand and represent decision making systems 3. Data mining process and analysis methodologies 4. Classification of problems and clustering 5. Supply chain optimization and optimization models 6. Knowledge management and expert systems <p>Learning outcomes:</p> <ul style="list-style-type: none"> □ To understand importance of timely decisions and role of data, information and model □ Use mathematical models for decision making

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	<ul style="list-style-type: none">□ Perform data envelop analysis□ Understanding of applications of expert systems
RJSUITP603 Business Intelligence Practical	<p>Course Outcomes :</p> <p>After this course student will be able to</p> <ol style="list-style-type: none">1. Import the legacy data from different sources2. Perform the Extraction Transformation and Loading process3. Create the Data staging area and cube for selected database4. Import the data warehouse data and create pivot table5. Apply the what – if Analysis for data visualization.6. Perform the data classification and clustering using relevant algorithms7. Perform the Linear and logistic regression on warehouse data

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B.Sc.(Information Technology)		Semester–VI	
Course Name: Principles of Geographic Information Systems		Course Code: RJSUIT604 (Elective I)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 2	60
	Internal	--	40

Unit	Details	Lect ures
I	A Gentle Introduction to GIS The nature of GIS: Some fundamental observations, Defining GIS, GI Systems, GI Science and GI Applications, Spatial data and Geo information. The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis Geographic Information and Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects Organizing and Managing Spatial Data The Temporal Dimension	12
II	Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives	12

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	for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.	
II I	Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, Temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data	12
IV	Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification Overlay functions: Vector overlay operators, Raster overlay operators Neighborhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis Analysis: Network analysis, interpolation, terrain modeling GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation	12
V	Data Visualization GIS and Maps, The Visualization Process Visualization Strategies: Present or explore? The cartographic toolbox: What kind of data do I have?, How can I map my data? How to map?: How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination	12

B.Sc.(Information Technology)	Semester–VI
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Course Name: Principles of Geographical Information System Practical		Course Code: RJSUITP604 (Elective I)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	Internal	--	--

Practical No	Details
0	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
1	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files using Plugins, Searching and Downloading Open Street Map Data
4	Working with attributes, terrain Data
5	Working with Projections and WMS Data
6	Geo referencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
7	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
8	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas

Books and References:

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Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Principles of Geographic Information Systems- An Introductory Text Book	Editors: Otto Huisman and Rolf A.	The International Institute of Geoinformation Science and Earth Observation	4 th	2009
2.	Principles of Geographic Information Systems	P.A Burrough and R. A. McDonnell	Oxford University Press	3 rd	1999
3.	Fundamentals of Spatial Information Systems,	R. Laurini and D. Thompson,	Academic Press		1994
4.	Fundamentals of Geographic Information Systems	Michael N. Demers	Wiley Publications	4 th	2009
5.	Introduction to Geographic Information Systems	Chang Kang-tsung (Karl),	McGrawHill	3 rd	2013
6.	GIS Fundamentals: A First Text on Geographic Information Systems	Paul Bolsatd	XanEdu Publishing Inc	5 th	

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT604 Geographic Information Systems	<p>Course Outcomes : 6.4.1</p> <p>1. This course introduces and studies about basic, practical understanding of GIS concepts, techniques and applications.</p> <p>Learning outcomes:</p> <p>Students will be able to:</p> <ul style="list-style-type: none"> □ Identify, locate, and acquire spatial data to projects. □ Understand the data creation process and create simple data sets and/or add to existing data □ Create spatial data from tabular information that includes a spatial reference

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	<input type="checkbox"/> Perform basic spatial analyses
RJSUITP604 Geographic Information Systems Practical	<p>Course Outcomes :</p> <p>After completion of this course student will be able to</p> <ol style="list-style-type: none">1. Creating and Managing Vector Data2. Exploring and Managing Raster data3. Making maps, Working with attributes, projection and terrain data4. Understand and implement concept of Georeferencing5. Managing data tables and spatial data sheets6. Perform advanced GIS operations7. Validating maps

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: Enterprise Networking		Course Code: RJSUIT604 (Elective II)	
Periods per week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 2	60
	Internal	--	40

Unit	Details	Lect ures
I	<p>General Network Design: Network Design Methodology, Architectures for the Enterprise, Borderless Networks Architecture, Collaboration and Video Architecture, Data Center and Virtualization Architecture, Design Lifecycle: Plan, Build, Manage Plan Phase Build Phase Manage Phase Prepare, Plan, Design, Implement, Operate, and Optimize Phases Prepare Phase Plan Phase Design Phase Implement Phase Operate Phase Optimize Phase Summary of PPDIOO Phases Project Deliverables Design Methodology Identifying Customer Design Requirements Characterizing the Existing Network Steps in Gathering Information Network Audit Tools Network Checklist Designing the Network Topology and Solutions Top-Down Approach Pilot and Prototype Tests Design Document</p> <p>Network Design Models: Hierarchical Network Models Benefits of the Hierarchical Model, Hierarchical Network Design, Core Layer, Distribution Layer, Access Layer, Hierarchical Model Examples, Hub- and-Spoke, Design Collapsed Core, Design Enterprise Architecture Model, Enterprise Campus Module, Enterprise Edge Area, E- Commerce Module, Internet Connectivity Module, VPN/Remote Access, Enterprise WAN, Service Provider Edge Module, Remote Modules, Enterprise Branch Module, Enterprise Data Center Module, Enterprise Teleworker Module, High Availability Network Services, Workstation-to-Router Redundancy and LAN, High Availability Protocols, ARP Explicit Configuration, RDP, RIP, HSRP, VRRP, GLBP, Server Redundancy, Route Redundancy, Load Balancing, Increasing Availability, Link Media Redundancy</p>	12

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II	<p>Enterprise LAN Design: LAN Media, Ethernet Design Rules, 100Mbps Fast Ethernet Design Rules, Gigabit Ethernet Design Rules, 1000BASE-LX Long-Wavelength Gigabit Ethernet, 1000BASE-SX Short-Wavelength Gigabit Ethernet, 1000BASE-CX Gigabit Ethernet over Coaxial Cable, 1000BASE-T Gigabit Ethernet over UTP 86, 10 Gigabit Ethernet Design Rules, 10GE Media Types, Ether Channel, Comparison of Campus Media LAN Hardware, Repeaters, Hubs, Bridges, Switches, Routers, Layer 3 Switches, Campus LAN Design and Best Practices Best Practices for Hierarchical Layers, Access Layer Best Practices, Distribution Layer Best Practices, Core Layer Best Practices, STP Design Considerations, STP Toolkit, Port Fast, Uplink Fast, Backbone Fast, Loop Guard, Root Guard, BPDU Guard, BPDU Filter, VLAN and Trunk Considerations, Unidirectional Link Detection (UDLD) Protocol, Large-Building LANs, Enterprise Campus LANs, Edge Distribution, Medium-Size LANs, Small and Remote Site LANs, Server Farm Module, Server Connectivity Options, Enterprise Data Center Infrastructure, Campus LAN QoS Considerations, Multicast Traffic Considerations, CGMP, IGMP Snooping.</p> <p>Data Center Design: Enterprise DC Architecture, Data Center Foundation Components, Data Center Topology Components, Data Center Network Programmability, SDN, Controllers, APIs, ACI, Challenges in the DC, Data Center Facility Aspects, Data Center Space, Data Center Power, Data Center Cooling, Data Center Heat, Data Center Cabling, Enterprise DC Infrastructure, Data Center Storage, Data Center Reference Architecture, Defining the DC Access Layer, Defining the DC Aggregation Layer, Defining the DC Core Layer, Security in the DC, Fabric Extenders, Virtualization Overview, Challenges, Defining Virtualization and Benefits, Virtualization Risks, Types of Virtualization, Virtualization Technologies, VSS, VRF, vPC, Device Contexts, Server Virtualization, Server Scaling, Virtual Switching, Network Virtualization Design Considerations, Access Control, Path Isolation, Services Edge, Data Center Interconnect, DCI Use Cases, DCI Transport Options, DCI L2 Considerations, Load Balancing in the DC, Application Load Balancing, Network Load Balancing.</p>	12
III	<p>Wireless LAN Design: Wireless LAN Technologies, WLAN Standards, ISM and UNII frequencies, Summary of WLAN Standards, Service Set Identifier, WLAN Layer 2 Access Method, WLAN Security, Unauthorized Access, WLAN Security Design Approach, IEEE 802.1X-2001 Port-Based Authentication, Dynamic WEP Keys and LEAP, Controlling WLAN Access to Servers, WLAN Authentication, Authentication Options, WLAN Controller Components, WLC Interface Types, AP Controller Equipment Scaling, Roaming and Mobility Groups, Intra controller Roaming, Layer 2 Intercontroller Roaming, Layer 3 Intercontroller Roaming, Mobility Groups, WLAN Design, Controller Redundancy Design: Deterministic vs. Dynamic, N+1 WLC Redundancy, N+N WLC Redundancy, N+N+1 WLC Redundancy, Radio Management and Radio Groups, RF Groups, RF Site Survey, Using EoIP Tunnels for Guest Services, Wireless Mesh for Outdoor Wireless, Mesh</p>	12

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	<p>Design Recommendations, Campus Design Considerations, Power over Ethernet (PoE), Wireless and Quality of Service (QoS), Branch Design Considerations, Local MAC, REAP, Hybrid REAP, Branch Office Controller Options.</p> <p>WAN Technologies and the Enterprise Edge: WAN and Enterprise Edge Overview, Definition of WAN, WAN Edge Module, Enterprise Edge Modules, WAN Transport Technologies, ISDN, ISDN BRI Service, ISDN PRI Service, Digital Subscriber Line, Cable, Wireless, Frame Relay, Time-Division Multiplexing, Metro Ethernet, SONET/SDH, Multiprotocol Label Switching (MPLS), Dark Fiber, Dense Wavelength-Division Multiplexing, Ordering WAN Technology and Contracts, WAN and Edge Design Methodologies, Response Time, Throughput, Reliability, Bandwidth Considerations, WAN Link Categories, Optimizing Bandwidth Using QoS, Queuing, Traffic Shaping and Policing, Classification, Congestion Management, Priority Queuing, Custom Queuing, Weighted Fair Queuing, Class-Based Weighted Fair Queuing, Low-Latency Queuing, Traffic Shaping and Policing, Link Efficiency, Window Size, DMZ Connectivity, Segmenting DMZs, DMZ Services, Internet Connectivity, Centralized Internet(Branch) vs. Direct Internet(Branch), High Availability for the Internet Edge, VPN Network Design.</p> <p>WAN Design</p> <p>Traditional WAN Technologies Hub-and-Spoke Topology Full-Mesh Topology Partial-Mesh Topology Point-to-Point Topology Remote Site Connectivity Enterprise VPN vs. Service Provider VPN Enterprise Managed VPN: IPsec IPsec Direct Encapsulation Generic Routing Encapsulation IPsec DMVPN IPsec Virtual Tunnel Interface Design GETVPN Service Provider–Managed Offerings ,Metro Ethernet Service Provider VPNs: L2 vs. L3 ,Virtual Private Wire Services VPWS L2 VPN Considerations ,Virtual Private LAN Services VPLS L2 VPN Considerations ,MPLS, MPLS Layer 3 Design Overview MPLS L3 VPN Considerations ,VPN Benefits WAN Backup Design WAN Backup over the Internet Enterprise WAN Architecture Cisco Enterprise MAN/WAN Enterprise WAN/MAN Architecture Comparison ,Enterprise WAN Components Comparing Hardware and Software Enterprise Branch Architecture Branch Design Branch Connectivity Redundancy for Branches Single WAN Carrier vs. Dual WAN Carriers Single MPLS Carrier Site ,Dual MPLS Carriers Hybrid WAN:L3 VPN with IPsec VPN, Internet for Branches Flat Layer2 vs. Collapsed Core ,Enterprise Branch Profiles Small Branch Design Medium Branch Design Large Branch Design Enterprise Teleworker Design, ISRs for Teleworkers</p>	
IV	<p>Internet Protocol Version 4 Design, IPv4 Header ToS IPv4 Fragmentation IPv4 Addressing ,IPv4 Address Classes Class A Addresses Class B Addresses ,Class C Addresses Class D Addresses Class E Addresses, IPv4 Address Types IPv4 Private Addresses NAT, IPv4 Address Subnets Mask Nomenclature IP Address Subnet Design Example Determining the Network Portion of an IP Address Variable- Length Subnet Masks, Loopback</p>	12

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

	<p>Addresses IP Telephony Networks, IPv4 Addressing Design Goal of IPv4 Address Design, Plan for Future Use of IPv4 Addresses , Performing Route Summarization , Plan for a Hierarchical IP Address Network , Private and Public IP Address and NAT Guidelines , Steps for Creating an IPv4 Address Plan Case Study: IP Address Subnet Allocation , Address Assignment and Name Resolution , Recommended Practices of IP Address Assignment, BOOTP DHCP DNS , Internet Protocol Version 6 Design, IPv6 Header IPv6 Address Representation IPv4-Compatible IPv6 Addresses IPv6 Prefix Representation IPv6 Address Scope Types and Address Allocations IPv6 Address Allocations IPv6 Unicast Address Global Unicast Addresses Link-Local Addresses , Unique Local IPv6Address Global Aggregable IPv6 Address , IPv4-Compatible IPv6 Address IPv6 Anycast Addresses , IPv6 Multicast Addresses IPv6 Mechanisms ICMPv6 , IPv6 Neighbor Discovery Protocol IPv6 Name Resolution , Path MTU Discovery IPv6 Address-Assignment Strategies , Manual Configuration SLAAC of Link-Local Address , SLAAC of Globally Unique IPv6 Address DHCPv6 , DHCPv6 Lite IPv6 Security IPv6 Routing Protocols RIPng OSPFv3 , BGP4 Multiprotocol Extensions (MP-BGP) forIPv6, IPv6 Addressing Design , Planning for Addressing with IPv6 , Route Summarization with IPv6 IPv6 Private Addressing</p> <p>IPv6 for the Enterprise IPv6 Address Allocation , Partly Linked IPv4 Address into IPv6, Whole IPv4 Address Linked into IPv6</p> <p>IPv6 Addresses Allocated Per Location and/or Type , IPv4-to-IPv6 Transition Mechanisms and Deployment Models , Dual-Stack Mechanism IPv6 over IPv4 Tunnels, Protocol Translation Mechanisms IPv6 Deployment Models , Dual-Stack Model Hybrid Model Service Block Model ,IPv6 Deployment Model Comparison IPv6 Comparison with IPv4, OSPF, BGP, Route Manipulation, and IPMulticast,OSPFv2 OSPFv2 Metric OSPFv2 Adjacencies and Hello Timers , OSPFv2 Areas OSPF Area Design Considerations OSPF Router Types OSPF DRs LSA Types Autonomous System External Path Types OSPF Stub Area Types Stub Areas Totally Stubby Areas , NSSAs Virtual Links OSPFv2 Router Authentication , OSPFv2 Summary OSPFv3 OSPFv3 Changes from OSPFv2, OSPFv3 Areas and Router Types OSPFv3 LSAs OSPF v3 Summary BGP BGP Neighbors eBGPIBGP Route Reflectors</p> <p>Confederations BGP Administrative Distance, BGP Attributes, Weight, and the BGP Decision Process BGP Path Attributes Next-Hop Attribute Local Preference Attribute Origin Attribute Autonomous System Path Attribute MED Attribute Community Attribute Atomic Aggregate and Aggregator Attributes Weight BGP Decision Process , BGP Summary,</p> <p>Route Manipulation PBR Route Summarization Route Redistribution Default Metric OSPF Redistribution Route Filtering Transit Traffic Routing Protocols on the Hierarchical Network Infrastructure IP Multicast Review , Multicast Addresses Layer 3 to Layer 2 Mapping IGMP , IGMPv1 IGMPv2 IGMPv3 CGMPIGMP Snooping, Sparse Versus Dense Multicast Multicast Source and Shared Trees PIM PIM-SM PIM DR Auto-RP PIMv2 Bootstrap Router , DVMRP IPv6 Multicast Addresses</p>	
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V	<p>Managing Security</p> <p>Network Security Overview Security Legislation Security Threats Reconnaissance and Port Scanning Vulnerability Scanners Unauthorized Access Security Risks Targets Loss of Availability Integrity Violations and Confidentiality Breaches , Security Policy and Process Security Policy Defined , Basic Approach of a Security Policy Purpose of Security Policies, Security Policy Components Risk Assessment , Risk Index Continuous Security Integrating Security Mechanisms into Network Design Trust and Identity Management , Trust Domains of Trust Identity Passwords Tokens Certificates , Network Access Control Secure Services Encryption Fundamentals Encryption Keys VPN Protocols , Transmission Confidentiality Data Integrity Threat Defense , Physical Security Infrastructure Protection Security Management Solutions Security Solution Network Security Platforms , Trust and Identity Technologies Firewall Fundamentals , Types of Firewalls Next-Gen Firewalls NAT Placement , Firewall Guidelines Firewall ACLs , Identity and Access Control Deployments Detecting and Mitigating Threats IPS/IDS Fundamentals IPS/IDS Guidelines , Threat Detection and Mitigation Technologies , Threat-Detection and Threat-Mitigation Solutions , Fire POWER IPS Security Management Applications , Security Platform Solutions Security Management Network</p> <p>Integrating Security into Network Devices IOS Security , ISR G2 Security Hardware Options Securing the Enterprise , Implementing Security in the Campus Implementing Security in the Data Center Implementing Security in the Enterprise Edge</p> <p>Network Management Protocols, Simple Network Management ProtocolSNMPComponents,MIBSNMPMessageVersionsSNMPv1 SNMPv2 SNMPv3 , Other Network Management Technologies RMON , RMON2 NetFlow Compared to RMON and SNMP , CDP LLDP Syslog</p>	12
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Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	CCDA200-310 Official Cert Guide	ANTHONY BRUNO, CCIE No. 2738 STEVE JORDAN, CCIE No. 11293	Cisco Press		
2.	Network Warrior	Gary A Donabue	O Reilly	2 nd	2011

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: Enterprise Networking Practical		Course Code: RJSUITP604 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	Internal	--	--

Practical No	Details
1	Configuring OSPF – I
a	Single-Area OSPF Link Costs and Interface Priorities
b	Multi-Area OSPF with Stub Areas and Authentication
2	Configuring OSPF – II
a	OSPF Virtual Links and Area Summarization
b	OSPF over Frame Relay
3	Redistribution and Administrative Distances
a	Redistribution Between RIP and OSPF
b	Manipulating Administrative Distances
4	BGP
a	Configuring BGP with Default Routing
b	Using the AS_PATH Attribute
c	BGP Route Reflectors and Route Filters
5	IPv6

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a	Configuring OSPF for IPv6
b	Configuring 6to4 Tunnels
6	VLANs and EtherChannel
a	Static VLANs, VLAN Trunking, and VTP Domains and Modes
b	Configuring EtherChannel
7	Spanning Tree Protocol
a	Spanning Tree Protocol (STP) Default Behavior
b	Modifying Default Spanning Tree Behavior
8	VLAN and Spanning Tree
a	Per-VLAN Spanning Tree Behavior
b	Multiple Spanning Tree

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT605 Enterprise Networking	<p>Course Outcomes : 6.4.2</p> <p>After completion of this course student will be able to</p> <ol style="list-style-type: none"> 1. Understand the different network and data centre designs. 2. Study various network protocols and understand how protocols are configured. 3. Understand how network security is managed using different security protocols <p>Learning outcomes:</p> <ul style="list-style-type: none"> □ To implement network designs using protocols for different network topologies □ The course will prepare student to take various network certifications.
RJSUITP604 Enterprise Networking Practical	<p>Course Outcomes :</p> <p>After completing the course student will be able to –</p> <ol style="list-style-type: none"> 1. Configure routers with different protocols 2. Configure authentication for local user on router 3. Configure and modify extended ACL 4. Configure Firewalls

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: IT Services Management		Course Code: RJSUIT605 (Elective I)	
Periods per week(1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 2	60
	Internal	--	40

Unit	Details	Lectures
I	<p>IT Service Management: Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialization and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the lifecycle.</p> <p>Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles.</p> <p>Service Strategy: Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution.</p> <p>Challenges, Critical Success factors and risks: Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.</p>	12
II	<p>Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models</p> <p>Service Design Processes: Service Catalogue Management, Service Level</p>	
	<p>Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Supplier Management</p> <p>Challenges, Critical Success factors and risks: Challenges, Risks</p>	12

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III	<p>Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition</p> <p>Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management.</p> <p>Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.</p>	12
IV	<p>Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, Achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation</p> <p>Service Operation Processes: Event Management, Incident Management, Request fulfillment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases.</p> <p>Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks</p>	12
V	<p>Continual Service Improvement(CSI) Principles: CSI Approach, CSI and organizational change, Ownership, CSI register, External and Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and outputs.</p> <p>CSI Process: The seven step improvement process.</p>	
	<p>CSI Methods and Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes,</p> <p>Organizing for CSI: Organizational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training.</p> <p>Technology considerations: Tools to support CSI activities.</p> <p>Implementing CSI: Critical Considerations for implementing CSI, The start, Governance, CSI and organizational change, Communication Strategy and Plan</p>	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	ITIL v3 Foundation Complete Certification				2009

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	Kit				
2.	ITIL v3 Service Strategy		OGC/TSO		
3.	ITIL v3 Service Transition		OGC/TSO		
4.	ITIL v3 Service Operation		OGC/TSO		
5.	ITIL Continual Service Improvement		TSO	2011	2011

B.Sc.(Information Technology)		Semester–VI	
Course Name: Cyber Laws		Course Code: RJSUIT605 (Elective II)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2 2	60
	Internal	--	40

Unit	Details	Lectures
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T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

I	<p>Power of Arrest Without Warrant Under the IT Act, 2000: A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000—A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for “About to Commit” an Offence Under the IT Act: A Tribute to Draco, Arrest, But No Punishment!</p> <p>Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of “Cyber Crime” and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act, 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.</p>	12
II	<p>Contracts in the Infotech World: Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act,</p>	
	<p>1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts.</p> <p>Jurisdiction in the Cyber World: Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act, 2000, Foreign Judgments in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.</p>	12
III	<p>Battling Cyber Squatters and Copyright Protection in the Cyber World: Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.</p>	12
IV	<p>E-Commerce Taxation: Real Problems in the Virtual World: A Tug of</p>	

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	<p>War on the Concept of 'Permanent Establishment', Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the IncomeTaxAct,1961,Tax Agents of Non-Residents under the Income Tax Act,1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance.</p> <p>Digital Signature, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E- Governance in India: A Warning to Babudom!</p>	12
V	<p>The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934.</p> <p>Protection of Cyber Consumers in India: Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Forums, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000</p>	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	VivekSood	TMHEducation		2001
2.	Cyber security Law	Jeff Kosseff	Wiley		2017

T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

B.Sc.(Information Technology)		Semester–VI	
Course Name: Project Viva Voce		Course Code: RJSUITP605	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	150
	Internal	--	--

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT605 IT Service Management	<p>After completion of the course student will be able to</p> <ol style="list-style-type: none"> 1. Understand the principle, concepts and strategy of service management. 2. Understand the IT service design processes. 3. Understand the service transition process and deal with the challenges faced and risk as well as success factors 4. Understand the service improvement principle <p>Learning outcomes:</p> <ul style="list-style-type: none"> □ To understand the importance of IT service management and implement the principle <p>Implement the improvement process for service management.</p>
RJSUIT605 Cyber Laws	<p>Course Outcomes : 6.5.1</p> <p>After completion of this course student will be able to</p> <ol style="list-style-type: none"> 1. Understand the IT ACT 2000, the Penalties, Adjudication and Appeals under this act. 2. Understand Jurisdiction, Contracts and copyright in infosec world <p>Learning outcomes:</p> <ul style="list-style-type: none"> □ To differentiate between freedom and control of internet □ Understand and verify digital certificates obtained from standard governing bodies □ Work with E Commerce taxation.
RJSUITP605 Project Viva Voce Practical	<p>Course Outcomes :</p> <p>After successful completion of project, student will be able to</p> <ol style="list-style-type: none"> 1. Perform all phases of SDLC. 2. Analyse requirements and design a prototype using relevant technique 3. Develop a completely working prototype or actual product

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	4. Test the prototype or product using various techniques
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B.Sc.(Information Technology)		Semester–VI	
Course Name: HUMAN COMPUTER INTERACTION		Course Code: RJSUIT606	
Periods per week (1 Period is 50 minutes)		5	
Credits		3	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40
	Practical /Case Study	1	25

Unit	Details	Lecture
I	FOUNDATIONS OF HCI The Human: Introduction , I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity (Reference Book 1)	12
II	DESIGN & SOFTWARE PROCESS Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques : What Is Evaluation? - Goals Of Evaluation,Evaluation Through Expert Analysis-Evaluation Through User Participation-Choosing An Evaluation Method-Summary Universal Design: Introduction,Universal Design Principles (Reference Book 1)	12
III	MODELS AND THEORIES HCI Models Cognitive models: Introduction-Goal And Task Hierarchies-Linguistic Models-The Challenge Of Display-Based Systems-Physical And Device Models-Cognitive Architectures-Summary Socio-Organizational issues and stakeholder requirements – Introduction-Organizational Issues-Capturing Requirements-Summary Communication and collaboration models- Hypertext, Multimedia and WWW. (Reference Book 1)	12

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IV	MOBILE HCI Mobile Ecosystem: Platforms - Application frameworks Types of Mobile Applications: Widgets, Applications, Games Mobile Information Architecture: What Is Information Architecture? -Mobile Information Architecture-Different Information Architecture for Different Devices-The Design Myth Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools-Designing for the Right Device- Designing for Different Screen Sizes. (Reference Book 2)	12
V	WEB INTERFACE DESIGN Designing Web Interfaces – Drag & Drop: Interesting Moments - Purpose of Drag and Drop -Drag and Drop Module - Drag and Drop List - Drag and Drop Object - Drag and Drop Action - Drag and Drop Collection - The Challenges of Drag and Drop Direct Selection: Toggle Selection - Collected Selection - Object Selection - Hybrid Selection Contextual Tools: Interaction in Context - Fitts's Law - Contextual Tools - Always-Visible Tools - Hover-Reveal Tools - Toggle-Reveal Tools - Multi-Level Tools - Secondary Menu Overlays: Dialog Overlay - Detail Overlay - Input Overlay Inlays: Dialog Inlay - List Inlay - Detail Inlay - Tabs - Inlay Versus Overlay? Virtual Pages: Virtual Scrolling -Inline Paging - Scrolled Paging: Carousel - Virtual Panning - Zoomable User Interface - Paging Versus Scrolling (Reference Book 3)	12

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Human Computer Interaction, (UNIT I, II & III)	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale,	Pearson Education,	3rd Edition,	2004
2.	Mobile Design and Development (UNIT – IV)	Brian Fling	O'Reilly Media Inc	First Edition	2009
3.	Designing Web Interfaces (UNIT-V)	Bill Scott and Theresa Neil	O'Reilly,	First Edition	2009

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Semester VI Theory

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RJSUIT606 Human Computer Interaction	<p>Course Outcomes: 6.6</p> <p>The course will enable the student ,</p> <ol style="list-style-type: none">1. To learn the foundations of Human Computer Interaction.2. To become familiar with the design technologies for individuals and persons with disabilities.3. To be aware of mobile HCI.4. To learn the guidelines for user interface. <p>Learning outcomes:</p> <ul style="list-style-type: none">□ Design effective dialog for HCI□ Design effective HCI for individuals and persons with disabilities.□ Assess the importance of user feedback.□ Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Websites.□ Develop a meaningful user interface.
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T.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester V & VI

Scheme of Examinations

1. Two Internals of 20 marks each. Duration 30 min for each.
2. One External (Semester End Examination) of 60 marks. Duration: 2 hours.
3. Practical Examination for each subject at the end of Semester. Total five practical components, one each subject 50 marks each with separate passing out of 50
4. Minimum marks for passing Theory and Practical Exam is 40 %.
5. Students must appear for at least one of the two Internal Tests to be eligible for the Semester End Examination.
6. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of T.Y. B.Sc. Information Technology or a certificate from the Coordinator / Head of the Institute to the effect that the candidate has completed the practical course of T.Y. B.Sc. Information Technology as per the minimum requirements.
7. In case of loss of journal, a candidate must produce a certificate from the Head of the department /Institute that the practicals for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination, but the marks allotted for the journal will not be granted.
8. Decision of the coordinator, in consultation with the Principal, shall remain final and abiding to all.