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 2019-20)

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

Course Structure (Information Technology)

Details of courses under B.Sc. Program with Computers

	Course	Credits	
		Theory	**Practical**
I	**Core Course (16 Papers)**	**16 X 2 = 32**	**16 X 2 = 32**
II	**Elective Course (2 Papers)**	**2 X 2 = 4**	**2 X 2 = 4**
III	**Ability Enhancement Courses (2 Papers)**	**2 X 2 = 4**	**2 X 2 = 4**
IV	**Skill Enhancement Courses (10 Papers)**	**10 X 2 = 20**	**10 X 2 = 20**
	Total	**60**	**60**

Total Credits (Theory + Practical) = 60 + 60 = 120

Hindi Vidya Prachar Samiti's Ramniranjan Jhunjhunwala College of Arts, Science & Commerce

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

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

INFORMATION TECHNOLOGY

Semester	Core Course (16)	Ability Enhancement Course(AECC) (2)	Skill Enhancement Course (SEC) (10)	Elective Discipline Specific (DSE) (2)
I	Imperative Programming	Business Communication Skills		
	Digital Electronics			
	Operating Systems			
	Discrete Mathematics			
II	Python Programming	Green Computing		
	Microprocessor Architecture			
	Web Programming			
	Numerical and Statistical Methods			
III	Data Structures		Python Programming	
	Computer Networks			
	Database Management Systems			
	Applied Mathematics			
IV	Introduction to Embedded Systems		Core Java	
	Computer Oriented Statistical Techniques			
	Software Engineering			
	Computer Graphics and Animation			
V			Software Project Management	Enterprise Java/ Next Generation Technologies
			Internet of Things	
			Advanced Web Programming	
			Linux Administrator	
VI			Software Quality Assurance	IT Service Management / Cyber Laws
			Security in Computing	
			Business Intelligence	
			Principles of Geographic Information Systems	

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SEMESTER	COURSE OPTED	COURSE NAME	CREDITS
I	Ability Enhancement Skill Course	Business Communication Skills	2
	Core Subject I	Imperative Programming	2
	Core Subject II	Digital Electronics	2
	Core Subject III	Operating Systems	2
	Core Subject IV	Discrete Mathematics	2
	Ability Enhancement Skill Course Practical	Business Communication Skills Practical	2
	Core Subject I Practical	Imperative Programming Practical	2
	Core Subject II Practical	Digital Electronics Practical	2
	Core Subject III Practical	Operating Systems Practical	2
	Core Subject IV Practical	Discrete Mathematics Practical	2
II	Core Subject I	Python Programming	2
	Core Subject II	Microprocessor Architecture	2
	Core Subject III	Web Programming	2
	Core Subject IV	Numerical and Statistical Methods	2
	Ability Enhancement Skill Course	Green Computing	2
	Core Subject I Practical	Python Programming Practical	2
	Core Subject II Practical	Microprocessor Architecture Practical	2
	Core Subject III Practical	Web Programming Practical	2
	Core Subject IV Practical	Numerical and Statistical Methods Practical	2
	Ability Enhancement Skill Course Practical	Green Computing Practical	2
III	Skill Enhancement Course	Python Programming	2
	Core Subject I	Data Structures	2
	Core Subject II	Computer Networks	2
	Core Subject III	Database Management Systems	2
	Core Subject IV	Applied Mathematics	2
	Skill Enhancement Course Practical	Python Programming Practical	2
	Core Subject I Practical	Data Structures Practical	2
	Core Subject II Practical	Computer Networks Practical	2
	Core Subject III Practical	Database Management Systems Practical	2
	Core Subject IV Practical	Mobile Programming Practical	2
IV	Skill Enhancement Course	Core Java	2
	Core Subject I	Introduction to Embedded Systems	2
	Core Subject II	Computer Oriented Statistical Techniques	2
	Core Subject III	Software Engineering	2
	Core Subject IV	Computer Graphics and Animation	2
	Skill Enhancement Course Practical	Core Java Practical	2
	Core Subject I Practical	Introduction to Embedded Systems Practical	2
	Core Subject II Practical	Computer Oriented Statistical Techniques Practical	2
	Core Subject III Practical	Software Engineering Practical	2
	Core Subject IV Practical	Computer Graphics and Animation	2

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		Practical	
V	Skill Enhancement Course I	Software Project Management	2
	Skill Enhancement Course II	Internet of Things	2
	Skill Enhancement Course III	Advanced Web Programming	2
	Skill Enhancement Course IV	Linux Administrator	2
	Discipline Specific Elective I	Enterprise Java/ Next Generation Technologies	2
	Skill Enhancement Course Practical I	Project Dissertation	2
	Skill Enhancement Course Practical II	Internet of Things Practical	2
	Skill Enhancement Course Practical III	Advanced Web Programming Practical	2
	Skill Enhancement Course IV Practical	Linux Administrator Practical	2
	Discipline Specific Elective I Practical	Enterprise Java Practical / Next Generation Technologies Practical	2
VI	Skill Enhancement Course I	Software Quality Assurance	2
	Skill Enhancement Course II	Security in Computing	2
	Skill Enhancement Course III	Business Intelligence	2
	Skill Enhancement Course IV	Principles of Geographic Information Systems	2
	Discipline Specific Elective I	IT Service Management / Cyber Laws	2
	Skill Enhancement Course Practical I	Project Implementation	2
	Skill Enhancement Course Practical II	Security in Computing Practical	2
	Skill Enhancement Course Practical III	Business Intelligence Practical	2
	Skill Enhancement Course IV Practical	Principles of Geographic Information Systems Practical	2
	Skill Enhancement Course V Practical	Advanced Mobile Programming Practical	2
Total Credits			**120**

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

DISTRIBUTION OF TOPICS AND CREDITS

T.Y.B.Sc. INFORMATION TECHNOLOGY SEMESTER V

Course	Nomenclature	Credits	Topics
RJSUIT501	Software Project Management	2	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	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	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		1. Introduction to Enterprise Linux, Managing software 2. Network in linux, users, groups and permissions 3. Cryptographic services 4. Server configuration 5. Shell Scripting

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RJSUIT505	Enterprise Java	2	1. Java EE architecture, Servlet API and lifecycle 2. Components – Cookies, session, Files 3. JSP action elements and expressions 4. Beans, JNDI 5. Mapping, persistence, Hibernate and Spring.
RJSUIT505	Next Generation Technologies		1. Big data, NoSQL, MongoDB 2. MongoDB Data model, storage engine, limitations 3. SSD and in – memory databases 4. JSON
RJSUITP501	Project Dissertation	2	
RJSUITP502	Internet of Things Practical	2	
RJSUITP503	Advanced Web Programming Practical	2	
RJSUITP504	Linux Administration Practical	2	
RJSUITP505	Enterprise Java Practical	2	
RJSUITP505	Next Generation Technologies Practical		

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T.Y.B.Sc. INFORMATION TECHNOLOGY 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	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
RJSUIT605	Enterprise Networking		1. Network Design and design models 2. Design – LAN, Data center, Wireless LAN 3. WAN Technologies 4. Network protocols 5. Managing Security
RJSUIT606	IT Service Management	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
RJSUIT607	Cyber Laws		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
RJSUITP601	Project Implementation	2	
RJSUITP602	Security in Computing Practical	2	
RJSUITP603	Business Intelligence Practical	2	
RJSUITP604	Principles of Geographic Information Systems Practical	2	
RJSUITP605	Enterprise Networking Practical		
RJSUITP606	Advanced Mobile Programming (for both electives)	2	

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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	Lect ures
I	**Introduction to Software Project Management**: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, 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. **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 Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. **An Overview of Project Planning** : Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and	12

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

	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	
II	**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.	12
III	**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. **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. **Resource Allocation**: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths,	12

	Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	
IV	**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). **Managing Contracts**: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. **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.	**12**
V	**Working in Teams:** Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. **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. **Project Closeout**: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	**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	6th	2018
2.	Project Management and Tools & Technologies – An overview	Shailesh Mehta	SPD	1st	2017
3.	Software Project Management	Walker Royce	Pearson		2005

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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	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 towork 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 theproject.

SOFTWARE AND BROAD AREAS OFAPPLICATION

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	-

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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 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

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

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

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	Lectures
I	**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? **M2M and IoT Fundamentals:** M2M Background, M2M communication, General technology and scientific trends, trends in information and communication technology, implications for IOT **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.	12
II	**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.	12

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	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.	
III	**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 Extension Boards, Developing onthe 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	**12**
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, GovernmentFunding, Crowd funding, Lean Startups.	**12**

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

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	WILEY	1st	2014
2.	The Future of IoT: Leveraging the Shift to a Data Centric World	Don DeLoach, Emil Berthelsen and WaelElrifai	BookBaby		2017
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	3rd	2016

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

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	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.

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

T.Y.B.Sc.I.T.	Semester V Theory
RJSUIT502 **Internet of Things**	Course Outcomes : 5.2 The course will enable the student to understand 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. Learning outcomes: ➢ 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**	Course Outcomes : The practical course will help the students to build prototypes using soc like Raspberry Pi ➢ Visitor monitoring system ➢ Controlling Raspberry pi with telegram app. ➢ Iot based RFID interface

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	Lectures
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	**12**

	Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	
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 **Styles, Themes, and Master Pages** : Styles, Themes, Master Page Basics, Advanced Master Pages,	12
IV	**ADO.NET Fundamentals**: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. **Data Binding**: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls, **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	12
V	**XML**: XML ExplainedThe XML Classes, XML Validation, XML Display and Transforms. **Security Fundamentals**: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication. **ASP.NET AJAX**: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.	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 4.6Web 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

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

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	50
	Internal	--	--

Practical No.	Details
1.	**Working with basic C# and ASP .NET**
a.	Create an application that obtains four int values from the user and displays the product.
b.	Create an application to demonstrate string operations.
c.	Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered.
2.	**Working with Object Oriented C# and ASP .NET**
a.	Create simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion
b.	Create simple application to demonstrate use of following concepts i.Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces
c.	Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling
3.	**Working with Web Forms and Controls**
a.	Create a simple web page with various sever controls to demonstrate setting and use

	of their properties. (Example : AutoPostBack)
b.	Demonstrate the use of Calendar control to perform following operations. a)Display messages in a calendar control b)Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference between two calendar dates
c.	Demonstrate the use of Treeview control performs following operations. a) Treeview control and datalist b) Treeview operations
4.	**Working with Form Controls**
a.	Create a Registration form to demonstrate use of various Validation controls.
b.	Create Web Form to demonstrate use of Adrotator Control.
c.	Create Web Form to demonstrate use User Controls.
5.	**Working with Navigation, Beautification and Master page.**
a.	Create Web Form to demonstrate use of Website Navigation controls and Site Map.
b.	Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.
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 Databinding using dropdown list control.
b.	Create a web application for to display the phone no of an author using database.
c.	Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).
8.	**Working with data controls**

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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 Creating own table format using GridView.
10.	**Working with AJAX and XML**
a.	Create a web application to demonstrate reading and writing operation 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**	Course Outcomes : 5.3 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 Learning outcomes: ➢ 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**	Course Outcomes : 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

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	**Introduction to Red Hat Enterprise Linux:** Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. **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 **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 **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	12

II	**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 **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 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	**12**
III	**Securing Server with ip tables:** Understanding Firewalls, Setting Upa 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 **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 **Configuring Server for File Sharing:** What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4,	**12**

	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.	
IV	**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 **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 **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	**12**
V	**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.	

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		12
	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 **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	

Books and References:

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

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B.Sc.(Information Technology)		Semester–V	
Course Name: Linux System Administration Practical		Course Code:RJSUITP504	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	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

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b	Setting Up Cryptographic Services
6	**Configuring Server for File Sharing**
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

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T.Y.B.Sc. I.T.	Semester V Theory
RJSUIT504 **Linux System Administration**	Course Outcomes : 5.4.2 1. Getting introduced to Linux operating system, starting up and shutting down of 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 non-secured 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 web server. Learning outcomes: ➢ 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.
RJSUITP504 **Linux System Administration Practical**	Course Outcomes : 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 system 3. Using Linux system administrative commands 4. Configuration of various servers – samba server, NFS file server, Apache web server, caching proxy server, mail server 5. Executing shell scripts on Linux operating system.

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B.Sc.(Information Technology)		Semester–V	
Course Name: Enterprise Java		Course Code: RJSUIT505 (Elective I)	
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	**Understanding Java EE:** What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server **Java EE Architecture, Server and Containers:** Types of System Architecture, Java EE Server, Java EE Containers. **Introduction to Java Servlets:** The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do? **Servlet API and Lifecycle:** Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet **Working With Servlets:** Getting Started, Using Annotations Instead of Deployment Descriptor. **Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.	12
II	**Request Dispatcher:** Request dispatcher Interface, Methods of Request Dispatcher, Request Dispatcher Application. **COOKIES:** Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing The Colors Of A Page **SESSION:** What Are Sessions? Lifecycle Of Http Session, Session Tracking With Servlet API, A Servlet Session Example	

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	Working With Files: Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application. **Working With Non-Blocking I/O:** Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp	**12**
III	**Introduction To Java Server Pages:** Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages **Getting Started With Java Server Pages:** Comments, JSP Document, JSP Elements, JSP GUI Example. **Action Elements:** Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean. **Implicit Objects, Scope And El Expressions:** Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language. **Java Server Pages Standard Tag Libraries:** What is wrong in using JSP Scriptlet Tags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.	**12**
IV	**Persistence, Object/Relational Mapping And JPA:** What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping, **Introduction to Java Persistence API:** The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications. **Writing JPA Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database And Tables in Mysql, Creating a Web Application, Adding the Required Library Files, Creating a Javabean Class, Creating Persistence Unit	

	[Persistence.Xml], Creating JSPS, The JPA Application Structure, Running The JPA Application. **Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works? **Writing Hibernate Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, Creating a Web Application, Adding The Required Library Files, Creating a Javabean Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.	**12**
V	**Introduction to Spring Framework:** Spring Framework, Spring Modules, Steps to create spring application. **Dependency Injection:** IoC Container, Dependency Injection in Spring, Dependency Injection by Constructor, Dependency Injection by setter method. **Spring JdbcTemplate:** Problems of JDBC API, Advantage of Spring JdbcTemplate, JdbcTemplate class, Example of PreparedStatement in Spring JdbcTemplate, Fetching Records by Spring JdbcTemplate. **Spring ORM:** Spring with ORM Frameworks, Hibernate and Spring Integration, Example of Spring and JPA Integration. **Spring Expression Language:** SPEL API, Operators in SPEL, Variable in SPEL. **Spring MVC:** Spring Web Model-View-Controller Introduction, Example,	**12**

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

Practical No	Details
1.	**Implement the following Simple Servlet applications.**
a.	Create a simple calculator application using servlet.
b.	Create a servlet for a login page. If the username and password are correct then it says message "Hello <username>" else a message "login failed"
c.	CreatearegistrationservletinJavausingJDBC.AcceptthedetailssuchasUsername, Password, Email, and Country from the user using HTML Form and store the registration details in the database.
2.	**Implement the following Servlet applications with Cookies and Sessions.**
a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.
b.	Create a servlet that uses Cookies to store the number of times a user has visitedservlet.
c.	Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.
3.	**Implement the Servlet IO and File applications.**

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a.	Create a Servlet application to upload and download a file.
b.	Develop Simple Servlet Question Answer Application using Database.
c.	Create simple Servlet application to demonstrate Non-Blocking Read Operation.
4.	**Implement the following JSP applications.**
a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
b.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
5.	**Implement the following JSP JSTL and EL Applications.**
a.	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
b.	Create a JSP page to demonstrate the use of Expression language.
c.	Create a JSP application to demonstrate the use of JSTL.
6.	**Implement the following JPA applications.**
a.	Develop a simple Inventory Application Using JPA.
b.	Develop a Guestbook Application Using JPA.
7.	**Implement the following JPA applications with ORM and Hibernate.**
a.	Develop a JPA Application to demonstrate use of ORM associations.
b.	Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
c.	Develop a Hibernate application to store and retrieve employee details in MySQL Database.
8.	**Implement the following Hibernate applications.**
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.
b.	Develop Hibernate application to enter and retrieve course details with ORM

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	Mapping.
c.	Develop a five page web application site using any two or three Java EE Technologies.
9.	**Programs on Spring**

T.Y.B.Sc. I.T.	Semester V Theory
RJSUIT505 **Enterprise** **Java**	Course Outcomes : 5.5.1 The Course will enable the student 1. To design web based applications 2. To understand the role of Java EE in the development of enterprise software in the Java language. 3. To understand the deployment process and know the general structure of web, JPA, Hibernate and spring. Learning outcomes: ➢ The students will be able to develop web applications
RJSUITP505 **Enterprise** **Java Practical**	Course Outcomes : The Course will enable the student: 1. To develop web applications. 2. To design and develop small websites.

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B.Sc.(Information Technology)		Semester–V	
Course Name: Next Generation Technologies		Course Code: RJSUIT505 (Elective I)	
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	**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 **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 **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	12

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II	**The MongoDB Data Model:** The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, Object- Oriented Programming, Schema Evolution **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 **MongoDB Architecture:** Core Processes, mongodb, 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 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	12
III	**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 andLimitations **MongoDB Use Cases:** Use Case 1 -Performance Monitoring, Schema Design,Operations,Sharding,ManagingtheData,UseCase2–Social	

		Networking, Schema Design, Operations, Sharding	
		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	**12**
		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	
IV		**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	**12**
		jQuery: Introduction, Traversing the DOM, DOM Manipulation with jQuery, Events, Ajax with jQuery, jQuery Plug-ins, jQuery Image Slider	
V		**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	**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	2nd	
3.	Next Generation Databases	Guy Harrison	Apress		
4.	Beginning JSON	Ben Smith	Apress		

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

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

Practical No	Details
1	**MongoDB Basics**
a	Write a MongoDB query to create and drop database.
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 expression.
b	Write a MongoDB query to use push and add ToSet expression.
c	Write a MongoDB query to use first and last expression.
4	**Replication, Backup and Restore**
a	Write a MongoDB query to create Replica of existing database.
b	Write a MongoDB query to create a backup of existing database.
c	Write a MongoDB query to restore database from the backup.
5	**Java and MongoDB**
a	Connecting Java with MongoDB and inserting, retrieving, updating and deleting.

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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

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T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT505 **Next Generation Technologies**	Course Outcomes : 5.5.2 After completion of this course student will be able to understand 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 Learning outcomes: ➢ 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 ➢ Effective use of jQuery ➢ Use of JSON data format.
RJSUITP505 **Next Generation Technologies** **Practical**	Course Outcomes : After completion of the course, student will be able to 1. Build basic MongoDB database and execute queries 2. Use the replication, backup and restore features of MongoDB 3. Using java, PHP and Python with MongoDB 4. Execute programs with jQuery 5. Create JSON file and import it to MongoDB

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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**

Unit	Details	Lectures
I	**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 SoftwareTools. **Software Quality:** Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation 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 QualityManagement.	**12**

II	**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), TestMethodologies/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	**12**
III	**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, **Equivalence Class Testing:**Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. **Decision Table–Based Testing:** Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations,	**12**

	Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guide lines and Observations, **Data Flow Testing:**Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	
IV	**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. **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	**12**
V	**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, TestingStages. **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	**12**

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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.	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Testing and Continuous Quality Improvement	William E. Lewis	CRC Press	3rd	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	3rd	
4.	Software Testing: A Craftsman's Approach	Paul C. Jorgenson	CRC Press	4th	2017

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

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

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT601 **Software Quality Assurance**	Course Outcomes : 6.1 After completion of the course student will be able to 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. Learning outcomes: ➢ 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 **Project Viva Voice Practical**	Course Outcomes : After successful completion of project, student will be able to 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 4. Test the prototype or product using various techniques

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	**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. **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.	12
II	**Authentication and Authorization**: Authentication, Authorization **Encryption**: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. **Storage Security**: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. **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	12

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III	**Secure Network Design**: Introduction to Secure Network Design, Performance, Availability, Security. **Network Device Security**: Switch and Router Basics, Network Hardening. **Firewalls**: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. **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.	**12**
IV	**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. **Operating System Security Models**: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	**12**
V	**Virtual Machines and Cloud Computing**: Virtual Machines, Cloud Computing. **Secure Application Design**: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security. **Physical Security**: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.	**12**

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

Books and References:

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

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d	Configuring IPv6 ACLs
5	**Configure IOS Intrusion Prevention System (IPS) Using the CLI**
a	Enable IOS IPS.
b	Modify an IPS signature.
6	**Layer 2 VLAN Security**
7	**Configure and Verify a Site-to-Site IPsec VPN Using CLI**
8	**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

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T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT602 **Security in Computing**	Course Outcomes : 6.2 1. At the end of the course, the students will have firm understanding onbasic 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 Learning outcomes: After studying this course, you should be able to: ➢ Define what information is ➢ Appreciate the value of information to the modern organisation ➢ 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**	Course Outcomes : After completion of this course student will be able to 1. Configure routers for different protocols in networks 2. Configure AAA authentication for network 3. Configure extended ACLs and numbered ACLs, assign IP ACLs to mitigate attacks 4. Configure firewalls and VLAN security 5. Configure site to site IPSec VPN using CLI

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

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,	12

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	Evaluation of clustering models	
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**
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 ExpertSystems:**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**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Business Intelligence: Data Mining and Optimization for Decision Making	Carlo Vercellis	Wiley	1st	2009
2.	Decision support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, DursunDelen	Pearson	9th	2011
3.	Fundamental of Business Intelligence	Grossmann W, Rinderle-Ma	Springer	1st	2015

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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 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 selecteddatabase.
	b	Create the cube with suitable dimension and fact tables based on ROLAP,MOLAP and HOLAPmodel.
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 Chartto perform dataanalysis.
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
	Course Outcomes : 6.3
	After this course student will be able to understand
	  1. The process of analysing 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
	
	Learning outcomes:
	  ➢ To understand importance of timely decisions and role of data, information and model
	  ➢ Use mathematical models for decision making
	  ➢ Perform data envelop analysis
	  ➢ Understanding of applications of expert systems

RJSUITP603
Business
Intelligence
Practical
	Course Outcomes :
	After this course student will be able to
	  1. Import the legacy data from different sources
	  2. Perform the Extraction Transformation and Loading process
	  3. Create the Data staging area and cube for selected database
	  4. Import the datawarehouse data and create pivot table
	  5. Apply the what – if Analysis for data visualization.
	  6. Perform the data classification and clustering using relevant algorithms
	  7. Perform the Linear and logistic regression on warehouse data

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

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**	**60**
	Internal	**--**	**40**

Unit	Details	Lectures
I	**A Gentle Introduction to GIS** **The nature of GIS:** Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, 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**

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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 for data management, The relational data model, Querying the relational database. **GIS and Spatial Databases:** Linking GIS and DBMS, Spatial database functionality.	**12**
III	**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 continuousdata	**12**

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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	
	Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis	**12**
	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	
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?	**12**
	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	

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

B.Sc.(Information Technology)		Semester–VI	
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	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 filesusing Plugins,Searching and Downloading Open Street Map Data
4	Working with attributes, terrain Data
5	Working with Projections and WMS Data
6	GeoreferencingTopo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
7	Managing Data Tables and Saptial 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

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Books and References:					
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	4th	2009
2.	Principles of Geographic Information Systems	P.A Burrough and R. A. McDonnell	Oxford University Press	3rd	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	4th	2009
5.	Introduction to Geographic Information Systems	Chang Kang-tsung (Karl),	McGrawHill	3rd	2013
6.	GIS Fundamentals: A First Text on Geographic Information Systems	Paul Bolsatd	XanEdu Publishing Inc	5th	

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T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT604 **Geographic Information Systems**	Course Outcomes : 6.4.1 1. This course introduces and studies about basic, practical understanding of GIS concepts, techniques and applications. Learning outcomes: Students will be able to: ➢ 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 ➢ Perform basic spatial analyses
RJSUITP604 **Geographic Information Systems Practical**	Course Outcomes : After completion of this course student will be able to 1. Creating and Managing Vector Data 2. Exploring and Managing Raster data 3. Making maps, Working with attributes, projection and terrain data 4. Understand and implement concept of Georeferencing 5. Managing data tables and spatial data sheets 6. Perform advanced GIS operations 7. 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	60
	Internal	--	40

Unit	Details	Lect ures
I	**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 **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	12

	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		
II	**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. **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	**12**	

		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.	
III		**Wireless LAN Design:** Wireless LAN Technologies, WLAN Standards, ISM and UNIIF requencies, 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, Intracontroller 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 forOutdoor Wireless, Mesh 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. **WAN Technologies and the Enterprise Edge:** WAN and Enterprise Edge	**12**

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.

WAN Design

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	
IV	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 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 Aggregatable 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	12

Multiprotocol Extensions (MP-BGP) forIPv6, IPv6 Addressing Design , Planning for Addressing with IPv6 , Route Summarization with IPv6 IPv6 Private Addressing

IPv6 for the Enterprise IPv6 Address Allocation , Partly Linked IPv4 Address into IPv6, Whole IPv4 Address Linked into IPv6

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

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,
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	
V		**Managing Security** 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 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	**12**

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Network Management Protocols, Simple Network Management ProtocolSNMPComponents,MIBSNMPMessageVersionsSNMPv1 SNMPv2 SNMPv3 , Other Network Management Technologies RMON , RMON2 NetFlow Compared to RMON and SNMP , CDP LLDPSyslog	

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	CCDA200-310Official Cert Guide	ANTHONY BRUNO, CCIE No. 2738 STEVE JORDAN, CCIE No. 11293	Cisco Press		
2.	Network Warrior	Gary A Donabue	O Reilly	2nd	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 I)	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	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**
a	Configuring OSPF for IPv6
b	Configuring 6to4 Tunnels
6	**VLANs and EtherChannel**

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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**	Course Outcomes : 6.4.2 After completion of this course student will be able to 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 Learning outcomes: ➢ To implement network designs using protocols for different network topologies ➢ The course will prepare student to take various network certifications.
RJSUITP604 **Enterprise Networking Practical**	Course Outcomes : After completing the course student will be able to – 1. Configure routers with different protocols 2. Configure authentication for local user on router 3. Configure and modify extended ACL

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	4. Configure Firewalls

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**	**60**
	Internal	**--**	**40**

Unit	Details	Lect ures
I	**Power of Arrest Without Warrant Under the IT Act, 2000:** A Critique, Crimes of this Millennium, Section80 of the IT Act, 2000–A Weaponora 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 NOPunishment! **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, CriminalJustice in India and Implications on Cyber Crime.	12
II	**Contracts in the Infotech World:** Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act,	

	1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts. **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 Stateof America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.	**12**
III	**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.	**12**
IV	**E-Commerce Taxation: Real Problems in the Virtual World:** A Tug of 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-	

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	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 aGlance. **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!	**12**
V	**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. **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 Foras, 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	**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: IT Services Management		Course Code: RJSUIT605 (Elective II)	
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	**IT Service Management:** Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the lifecycle. **Service Strategy Principles:** Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles. **Service Strategy:** Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution. **Challenges, Critical Success factors and risks:** Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.	12
II	**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 **Service Design Processes:** Service Catalogue Management, Service Level	

	Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Supplier Management **Challenges, Critical Success factors and risks:** Challenges, Risks	**12**
III	**Service Transition:** Fundamentals, **Service Transition Principles:** Principles Supporting Service Transition, Policies for Service Transition **Service Transition Processes:** Transition planning and support, Change Management, Service Asses Configuration Management, ServiceandDeploymentManagement,ServiceValidationandTesting, Evaluation, Knowledge Management. **Challenges, Critical Success factors and risks:** Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.	**12**
IV	**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 **Service Operation Processes:** Event Management, Incident Management, Request fulfillment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases. **Challenges, Critical Success factors and risks:** Challenges, Critical Success factors, Risks	**12**
V	**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. **CSI Process:** The seven step improvement process.	

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CSI Methods and Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes, **Organising for CSI:** Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training. **Technology considerations:** Tools to support CSI activities. **Implementing CSI:** Critical Considerations for implementing CSI, The start, Governance, CSI and organizational change, Communication Strategy and Plan	**12**	

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	ITIL v3 Foundation Complete Certification Kit				2009
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

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

B.Sc.(Information Technology)		Semester–VI	
Course Name: Advanced Mobile Programming Practical		Course Code: RJSUITP605	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

Practical No	Details
1	**Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals:** Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple "Hello World" program.
2	**Programming Resources** Android Resources: (Color, Theme, String, Drawable, Dimension, Image),
3	**Programming Activities and fragments** Activity Life Cycle, Activity methods, Multiple Activities, Life Cycle of fragments and multiple fragments.
4	**Programs related to different Layouts** Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View.
5	**Programming UI elements** AppBar, Fragments, UI Components
6	**Programming menus, dialog, dialog fragments**
7	**Programs on Intents, Events, Listeners and Adapters** The Android Intent Class, Using Events and Event Listeners
8	**Programs on Services, notification and broadcast receivers**
9	**Database Programming with SQLite**

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10	**Programming threads, handles and asynchronized programs**
11	**Programming Media API and Telephone API**
12	**Programming Security and permissions**
13	**Programming Network Communications and Services (JSON)**

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT605 **Cyber Laws**	Course Outcomes : 6.5.1 After completion of this course student will be able to 1. Understand the IT ACT 2000, the Penalties, Adjudication and Appeals under this act. 2. Understand Jurisdiction, Contracts and copyright in infosec world Learning outcomes: ➢ To differentiate between freedom and control of internet ➢ Understand and verify digital certificates obtained from standard governing bodies ➢ Work with E Commerce taxation.
RJSUIT605 **IT Services Management**	Course Outcomes : 6.5.2 After completion of this course student will be able to 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 Learning outcomes: ➢ To understand the importance of IT service management and implement the principle ➢ Implement the improvement process for service management.
RJSUITP605 **Advanced Mobile Programming Practical**	Course Outcomes : After completing the course student will be able to – 1. Build Simple android applications using open source android studio software 2. Creating UI using resources, Activities and Services 3. Creating mobile applications connected to SQL Lite Database 4. Programming Media API and Telephone API 5. Programming Security and permissions

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. Student 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.

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