Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College of Arts, Science & Commerce

(Autonomous College)

Affiliated to
UNIVERSITY OF MUMBAI

Syllabus for the F.Y.B.Sc.

Program: B.Sc. INFORMATION TECHNOLOGY
Program Code: RJSUIT

(CBCS 2021-22)

Refer to page no: 05

highlighting component

of Research Project

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

THE PREAMBLE

Why IT?

The world around us is rapidly changing! The change is carried by the technology. Information Technology has become the fourth basic need of human after food, shelter and clothing. Be it buying essentials online; connecting to friends and family; online learning or entertainment; IT is integral part of normal life. IT has really become the "New Normal". The increasing popularity and luxury turning into necessity has created a large number of opportunities in the field of Information Technology.

Information Technology is an application-oriented program where students learn core technologies and apply their skills in developing solutions for different problems in a variety of domains. The applications may lead students to master a niche skill and bag a unique career opportunity. Core technology areas covered, to name a few are Mathematics, Statistics, Logic, Digital Electronics and Computer Science. To name a few technology areas covered in the UG IT program – Programming, Digital Logic circuits, Operating Systems, Discrete Mathematics, Database Management systems, Networking, Internet Security, Software Engineering, Embedded Systems, Mobile app development, Business Intelligence, GIS etc.

Why IT at R J College?

Department of IT was established in the year 2007-08. Since its inception, department has been center of attention of the college with vibrant activities and several success stories of their students. Strength of the department is talented, experienced faculty members, state of the art laboratories, rich in resource departmental library, hardworking students and a very strong industrial connect. The PG program started in the year 2016 and has received excellent response. In the journey of 15 years, students of department of IT secured top rank in university examinations in both UG and PG programs. Department of Biotechnology (DBT), New Delhi has granted DBT star scheme grant to the department of IT jointly with department of Computer Science.

At RJIT, a special attention is given to the overall grooming of the students and making them industry – ready. SkillUp, mentor mentee program of the department, facilitates every student to have personal attention of the faculty members, where academic interests and opportunities for the students are discussed on regular basis. Various options of online learning and certification are discussed with students and they are also mentored about internships available on different authentic platforms.

TechConnect is an initiative of the department where expert alumni members share their

expertise and experiences with the students. Communication skill of the students is polished though various activities including presentations of case studies and project work. RJIT hosts an intercollegiate techfest, "Symposium" every alternate year, where students get a good opportunity to develop leadership qualities, organizing skills and showcase their talent.
Faculty being the core strength of the education system, there have been many collaborations with giants like Patni computers for strengthening our faculty in the past. Faculty members regularly undergo trainings on different new technologies to keep up with ever changing, dynamic IT field.
Placement of our students is considered most important and they are trained vigorously not only in technical skills but also in communication skill and personality development. A consistent effort from the department, in association with the always proactive placement cell of the college has seen excellent results and our students are placed in most reputed IT companies in India, TCS, Wipro, Capgemini, LTI, TechMahendra and Infosys to name a few.

Our Curriculum Your Strength

Department of IT has been instrumental in incorporating new technologies in teaching learning process as per the needs and standards of the industry. After receiving autonomy, new tools and techniques are being added, on regular interval.
The syllabus of BSc IT program is divided into six semester and systematically includes all aspects of technologies in the field of Information Technology. Semester I and II cover the foundation of most of the technologies covered during the course. Practical component added with each course, ensures sound understanding and application of the concepts learnt in theory. A case study or a small project done by the students from time to time ensures thorough knowledge and understanding of the subject.
Value added courses are meticulously designed for the students to gain extra knowledge in new and upcoming technologies. These courses not only make the students rich in knowledge but also give them additional credit points ensuring an edge over other learners.
New practical components like the study of Arduino uno or light weight handy mobile app development using the App inventor make the students agile in use of latest technology. The syllabus sees constant upgrade through brainstorming sessions with industry experts and teaching experts from different universities.
The students of RJIT learn new technologies and most importantly they learn to learn new

technology. This is the most required learning skill which will take them very far in the ever-changing world of technology.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Eligibility

A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates.

COURSE STRUCTURE
SEMESTER I

Course	Nomenclature	Credits	Topics
RJSUIT101	Imperative Programming	2	● Basic Programming Concepts ● Arrays, Pointers and Structures
RJSUIT102	Digital Electronics	2	● Numbering system and Boolean Algebra ● Sequential and combinational Logic
RJSUIT103	Operating Systems	2	● Basic OS concepts ● Virtualization concepts
RJSUIT104	Discrete Mathematics	2	● Set Theory, Number theory and related concepts ● Graphs, Trees and Probability
RJSUIT105	Communication Skills	2	● Business Communication ● Soft Skills & Communication Needs
RJSUSEC106	Professional Ethics and Human Values	1	● Human Values ● Social Responsibilities and Awareness
RJSUITP101	Imperative Programming Practical	2	
RJSUITP102	Digital Electronics Practical	2	
RJSUITP103	Operating Systems Practical	2	
RJSUITP104	Discrete Mathematics Practical	2	
RJSUITP105	Communication Skills Practical	2	
Total		21	

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

SEMESTER II

Course	Nomenclature	Credits	Topics
RJSUIT201	Python Programming	2	● Basic Programming Concepts. ● Functions, Lists, Tuples, Dictionaries. ● Object Oriented Concepts using python ● Regular Expressions.
RJSUIT202	Microprocessor Architecture	2	● 8-bit Microprocessor architecture and Assembly Language ● Next Generation Microprocessors
RJSUIT203	Web Programming	2	● Internet and WWW ● HTML, PHP, JavaScript and MySQL
RJSUIT204	Numerical and Statistical Methods	2	● Mathematical Modeling and Engineering Problem Solving ● Regression, Linear Programming and ● Probability distribution
RJSUIT205	Green Computing	2	● Issues and Minimizing Power usage ● Going Paperless, Recycling and Greening
RJSUITP201	Python Programming Practical	2	
RJSUITP202	Microprocessor Architecture Practical	2	
RJSUITP203	Web Programming Practical	2	
RJSUITP204	Numerical and Statistical Methods Practical	2	
RJSUITP205	Green Computing Practical	2	
RJSUITP206	Minor Project	1	● Implement programming / designing skills
Total		21	

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Mapping of the courses to employability / entrepreneurship / skill development

SEMESTER I

Course Code	Course Name	Unit wise topics focusing on Employability / Entrepreneurship / Skill development
RJSUIT101	Imperative Programming	**Skill Enhancement** Unit I : Expressions and constants using basic data types Unit II : Effective use of operators and Expressions Unit III : Using functions for reusability of code Unit V : Use of Pointers, Structures and Unions , Working with file
RJSUIT102	Digital Electronics	**Skill Enhancement** Unit II :Boolean Algebra, designing circuits with minimum ICs and gates. Unit III :Implementation of logic circuits for real life problems.
RJSUIT103	Operating Systems	**Skill Enhancement** Unit II : Effective Memory Management, File Systems Unit III : Deadlocks, detection and prevention Unit V : Case Study on LINUX and ANDROID, Case Study on Windows
RJSUIT104	Discrete Mathematics	**Skill Enhancement** Unit IV :Graphs and Trees, Relations implementation of techniques in problem solving
RJSUIT105	Communication Skills	**Skill Enhancement** Unit I : Understanding Business Communication Unit II: Writing Business Messages and Documents, Presentation Process Unit III : Developing Oral Communication Skills for Business -Interviews, Meetings Unit IV : Developing Oral Communication Skills for Group Discussions and Team Presentations, Communication Across Functional Areas Unit V: Understanding Specific Communication Needs
RJSUISEC101	Professional Ethics and Human Values	**Skill Enhancement** Unit I : Human Values Unit II: Engineering Ethics Unit III: Social Responsibilities and Awareness Case Study Based Assignment
RJSUITP101	Imperative Programming Practical	**Skill Enhancement** Practical 1 - 6

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

		Writing basic programs to perform mathematical and logical operations using C++ Programming Language Practical – 7, 8 Implementation of data structures – array, structures & unions using C++ Practical 9 Implementation of pointers Practical 10 Implement file handling techniques using C++
RJSUITP102	Digital Electronics Practical	**Skill Enhancement** Practical 2 & 3 Reducing Boolean expressions and building logic circuits using gates Practical 4 Implementation of code converters Practical 5, 6, 7 Implementation of combinational circuits for arithmetic and logic operation Practical 8, 9, 10 Implementation of sequential circuits like flip flops and counters
RJSUITP103	Operating Systems Practical	**Skill Enhancement, Employability** Practical 1 Installation of Virtual Machines and OS – Linux, Windows Practical 4, 5, 6, 7 Linux commands and DOS commands Practical 10 Installing utility software on windows and linux
RJSUITP104	Discrete Mathematics Practical	**Skill Enhancement** Practical 1 Implementation of set theory Practical 2 Implementation of built in functions in scilab Practical 4 , 5 Implementation of Probability theory, Graph theory
RJSUITP105	Communication Skills Practical	**Skill Enhancement, Employability** Practical 2 Effective Communication Practical 7 Using tools for business communication Practical 9 Presentation skills

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

SEMESTER II

Course	Course Name	Unit wise topics focusing on Employability / Entrepreneurship / Skill development
RJSUIT201	Python Programming	**Skill Enhancement:** Unit II – Using Python Functions, String operations Unit IV – Implementation of Object Oriented Concepts using python Unit V - Regular Expressions.
RJSUIT202	Microprocessor Architecture	**Skill Enhancement** Unit II & III: Writing assembly language programs for 8085 microprocessor Unit IV : Study of Software Development System and Unit V : study of advanced microprocessors like 80386 and 80486, SPARC and Pentium
RJSUIT203	Web Programming	**Skill Enhancement, Employability** Unit II: Use of HTML5 to design Forms and Media Unit III : Use of JavaScript, Operators, Statements, Document and its associated objects, Events and Event Handlers Unit IV : Using PHP Unit V :Advanced PHP concepts and MySQL
RJSUIT204	Numerical and Statistical Methods	**Skill Enhancement** Unit I :Mathematical Modeling and Engineering Problem Solving, Approximations and Round-Off Errors Truncation Errors Unit II: Solutions of Algebraic and Transcendental Equations, Interpolation Unit IV :Least-Squares Regression, Linear Programming Unit V : Probability distributions
RJSUIT205	Green Computing	**Skill Enhancement, Employability** Unit II: Techniques to Minimize Power Usage Unit III : Changing the Way of Work, Going Paperless Unit V :Greening Your Information Systems, Staying Green
RJSUITP201	Python Programming Practical	**Skill Enhancement, Employability** Practical 1 to 5 Use of python programming language to use functions to work with data structure Practical 6 Use of python programming language for file handling

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

		Practical 7 Using python for object oriented programming Practical 8 Use python programming for exception handling Practical 9 Use python with Database
RJSUITP202	Microprocessor Architecture Practical	**Skill Enhancement** Practical 1, 2, 4, 5 Arithmetic, Logical operations, code conversions Practical 3 Code conversion Practical 8 String operation Practical 9 Assembly programs with subroutines
RJSUITP203	Web Programming Practical	**Skill Enhancement, Employability** Practical 1, 2 Creating simple web page with different elements Practical 3, 4 Using JavaScript Practical 5, 6, 7, 8 Using PHP for basic and advanced operations using database Practical 9 Creating a program to send Email attachment Practical 10 Demonstration of sessions and cookies
RJSUITP204	Numerical and Statistical Methods Practical	**Skill Enhancement** Practical 3 Implementation of interpolation Practical 8 Implementation of linear and non linear regression Practical 9, 10 Implementation of probability distribution
RJSUITP205	Green Computing Practical	**Skill Enhancement, Employability** Case study on topics like Reducing carbon footprint, E-waste recycling, Energy conservation, Water conservation and purification
RJSUSEC201	Minor Project	**Skill Enhancement, Employability**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc. (Information Technology)		**Semester–I**	
Course Name: Imperative Programming		**Course Code:RJSUIT101**	
Periods per week (1 Period is 50 minutes)		**5**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**2**	**60**
	Internal	**1**	**40**

Unit	Details	Lectures
I	**Introduction:** Simple program logic, program development cycle, algorithms, pseudo code, flowchart, Structure of a program, Preprocessor directive - #define and #include, Compilation and Execution of a Program. **Tokens, Data Types, Expressions and constants:**Tokens, identifiers, keywords, data types – basic, user defined and derived, type casting, constants – symbolic and defined, variables - declarations, initialization and use, expressions – operators & operator precedence, macros	**12**
II	**Types of Operators:**Arithmetic operators, Assignment operators, relational operators, logical operators, Boolean operators, increment and decrement operators, conditional operators and special operators. **Data Input and output:**Single character input and output, Accepting user input and displaying output, manipulators. **Control Statements:** Decision Making Within A Program, Conditions, If Statement, If-Else Statement, Switch Statement **Iterative statements:**While Loop, Do While, For Loop, Nested Loops, Infinite Loops.	**12**
III	**Arrays:**Declaration, definition and initialization of an array, accessing array elements, multidimensional arrays. **Functions:**Overview, built in and user defined functions, function prototype, function definition, function call - call by value, call by reference, return by reference, default arguments, constant arguments, Function Overloading, recursive function, passing arrays to functions, returning array from function.	**12**
IV	**Storage classes**: automatic, external, static and register storage classes. **Structures, Unions and Enumerations:**Structure Variables, Initialization, Assignment, Structures and Functions, Structures and Arrays, Arrays of Structures, Unions**,** Enumerations.	**12**

V	**Pointers:** declaration, initialization, pointer expressions, pointer arithmetic, pointers and strings. **Working with Files:** Classes for file stream operations, opening a file, closing file, reading a file, writing into a file. File pointers and their manipulations, Sequential Input and Output operations, Updating a file, Error Handling during file operations.	**12**

Books and References

Sr.No	Title	Authors	Publisher	Edition	Year
1.	Object oriented programming with C++	E Balagurusamy	Tata Mc GRAW- Hill		
2.	The Complete Reference C++	K R Venugopal,Rajkumar Buyya,T Ravishankar	Tata Mc GRAW- Hill		
3.	Mastering C++	K R Venugopal,Rajkumar Buyya,T Ravishankar	Tata Mc GRAW- Hill		
4.	C++ for Beginners	B. M. Hirwani	SPD		

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Imperative Programming Practical		**Course Code:RJSUITP101**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	Details
1.	**Basic Programs:**
a)	Write a program to declare some variables of type int, float and double. Assign some values to these variables, type cast them and display these values.
b)	Write a program to use different types of operators.
2.	**Programs on variables**
a)	Write a program to swap two numbers with and without using third variable.
b)	Write a program to find the area of rectangle, square and circle. Also find the volume of a cube, sphere, and cylinder.
3.	**Conditional statements and loops(basic)**
a)	Write a program to check whether the number is even or odd. Also check whether the number is positive, negative or zero.
b)	Write a program to find the factorial of a number.
c)	Write a program to find the largest of three numbers.(Note:- Use conditional operator).
d)	Write a program to enter a number from the user and display the month name. If number > 13 then display invalid input using switch case
e)	Write a program to check whether the entered number is prime or not.
4.	**Conditional statements and loops(advanced)**
a)	Write a program to find the sum of squares of digits of a number.

b)	Write a program to check whether the entered number is Armstrong or not.
c)	Write a program to print the Fibonacci series.
d)	Write a program to find the reverse of a number.
e)	Write a program to find whether a given number is palindrome or not.
f)	Write a program to count the digit in a number
5.	**Programs on patterns:**
a)	Programs on different patterns.
6.	**Functions:**
a)	Programs on Functions.
b)	Write a program to find the factorial of a number using a recursive function.
c)	Write a program to find the sum of natural numbers using a recursive function.
7.	**Arrays**
a)	Write a program to find the largest value that is stored in the array.
b)	Write a program using pointers to compute the sum of all elements stored in an array.
c)	Write a program to arrange the 'n' numbers stored in the array in ascending and descending order.
d)	Write a program that performs addition and subtraction of matrices.
8.	**Structures and Unions**
a)	Programs on structures.
b)	Programs on unions.
9.	**Pointers**
a)	Write a program to demonstrate the use of pointers.
b)	Write a program to perform addition and subtraction of two pointer variables.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

10.	**File Handling**
a)	Write a program to write content into a file.
b)	Write a program to read a file and copy its content in another file.

F.Y. B.Sc. I.T.	Semester I Theory
RJSUIT101 **Imperative Programming**	Course Outcomes : The Course will enable the student 1. To understand programming languages and problem solving techniques. 2. To develop programming skills using the fundamentals and basics of C++ Language. 3. To effectively use arrays, structures, functions, pointers and File handling. 4. To develop logics to help them in creating programs and applications in C++. Learning outcomes: ➢ After the completion of this course, the students will be able to develop programs and small applications.
RJSUITP101 **Imperative Programming Practical**	Course Outcomes : 1. Problem solving using standard programming techniques and Turbo C compiler

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Digital Electronics		**Course Code: RJSUIT102**	
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	**Number System:**Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess–3 code, Gray code, Alphanumeric codes–ASCII Code, EBCDIC, Error detection and correction, Universal Product Code, Code conversion. **Binary Arithmetic:**Binary addition, Binary subtraction, Negative number representation, Subtraction using1's complement and 2's complement Binary multiplication and division, BCD and Excess–3 arithmetic.	**12**
II	**Boolean Algebra and Logic Gates:**Introduction, Logic(AND OR, NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level. **Minterm, Maxterm and Karnaugh Maps:** Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps–2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine McCluskey Method.	**12**
III	**Combinational Logic Circuits:**Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations **Arithmetic Circuits:**Introduction, Adder, BCD Adder, Excess– 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator.	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

IV	**Multiplexer, Demultiplexer, ALU, Encoder and Decoder:** Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders. **Sequential Circuits: Flip-Flop:**Introduction, Terminologies used, S-R flip-flop, D flip-flop, J K flip-flop, Race-around condition, Master–slave JK flip-flop, T flip-flop, Conversion from one type of flip-flop to another, Application of flip-flops.	**12**
V	**Counters:**Introduction, Asynchronous counter, Terms related to counters, IC7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Preset table counter, IC7490, IC7492, Synchronous counter ICs, Analysis of counter circuits. **Shift Register:**Introduction, parallel and shift registers, serial shifting, serial–in serial–out, serial–in parallel–out, parallel–in parallel–out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Digital Electronics and Logic Design	N. G. Palan	Technova		
2.	Modern Digital Electronics	R. P. Jain	TataMcGraw Hill	3rd	
3.	Digital Principles and Applications	Malvino and Leach	McGraw Hill		
4.	Digital Electronics: Principles, Devices and Applications	Anil K. Maini	Wiley		2007

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Digital Electronics Practical		**Course Code:RJSUITP102**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	Details
1.	**Study of Logic gates and their ICs and universal gates:**
a.	Study of AND, OR, NOT, XOR, XNOR, NAND and NOR gates
b.	IC7400, 7402, 7404, 7408,7432, 7486, 74266
c.	Implement AND, OR, NOT, XOR, XNOR using NAND gates.
d.	Implement AND, OR, NOT, XOR, XNOR using NOR gates.
2.	**Implement the given Boolean expressions using a minimum number of gates.**
a.	Verifying De Morgan's laws.
b.	Implement other given expressions using a minimum number of gates.
c.	Implement other given expressions using a minimum number of ICs.
3.	**Implement combinational circuits.**
a.	Design and implement combinational circuits based on the problem given and minimizing using K-maps.
4.	**Implement code converters.**
a.	Design and implement Binary–to–Gray code converter.
b.	Design and implement Gray–to–Binary code converter.
c.	Design and implement Binary–to–BCD code converter
5.	**Implement Adder and Subtractor Arithmetic circuits.**
a.	Design and implement Half adder and Full adder.
b.	Design and implement BCD adder.
d.	Design and implement binary subtractor.
e.	Design and implement BCD subtractor.
6.	**Implement Arithmetic circuits.**
a.	Design and implement a 2-bit by 2-bit multiplier.
b.	Design and implement a 2- bit comparator.
7.	**Implement Encode and Decoder and Multiplexer and Demultiplexers.**
a.	Design and implement 8:3 encoder.
b.	Design and implement 3:8 decoder.
c.	Design and implement 4:1 multiplexer. Study of IC 74153, 74157
d.	Design and implement 1:4 demultiplexer. Study of IC 74139
e.	Implement the given expression using IC 74151 8:1 multiplexer.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

8.	**Study of flip-flops and counters.**
a.	Study of IC 7473.
b.	Study of IC 7474.
c.	Study of IC 7476.
d.	Conversion of Flip-flops.
e.	Design of 3-bit synchronous counter using 7473 and required gates.
f.	Design of 3-bit ripple counter using IC 7473.
9.	**Study of counter ICs and designing Mod-N counters.**
a.	Study of IC7490, 7492, 7493 and designing mod-n counters using these.
b.	Designing mod-n counters using IC 7473 and7400 (NAND gates)
10.	**Design of shift registers and shift register counters.**
a.	Design serial – in serial – out, serial – in parallel–out, parallel–in serial–out, parallel – in parallel – out and bidirectional shift registers using IC7474.
b.	Study of ID 7495.

F.Y. B.Sc. I.T.	Semester I Theory
RJSUIT102 **Digital Electronics**	**Course Outcomes :** 1. To understand and implement the concepts in Boolean algebra and design logic circuits based on these concepts. 2. Implement the sequential and combinational logic circuits to build applications **Learning outcomes:** ➢ After completion of this course, students will be able to build small digital circuits, like the ALU, multiplexers and shift registers. ➢ They can understand the formation of complex designs like microcontrollers based on the basic logic circuits.
RJSUITP102 **Digital Electronics Practical**	**Course Outcomes :** 1. Study of logic gates, their IC's and universal gates. 2. Formulate and employ a Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms. 3. Design and implement combinational logic circuits using reprogrammable logic devices for Binary Arithmetic. 4. Interfacing with the Analog World: Multiplexing, Demultiplexing, Encoder and decoder. 5. Implementing sequential Circuits: Latches, Clock Signals and Clocked Flip-Flops.

B.Sc.(Information Technology)	**Semester–I**	
Course Name: Operating Systems	**Course Code: RJSUIT103**	
Periods per week 1 Period is 50 minutes	**5**	
Credits	**2**	
	Hours	**Marks**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Evaluation System	**Theory Examination**	**2**	**60**
	Internal	**--**	**40**

Unit	Details	Lectures
I	**Introduction:**What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure. **Processes and Threads:**Processes concept, Process scheduling, Operations on processes, Inter process communication, IPC problems, Threads-usage, classical thread model, implementing threads in user and kernel space.	**12**
II	**Memory Management:**Swapping, Contiguous memory Allocation, Paging, Page table structure, Page Replacement Algorithm, Design Issues of Paging, Segmentation, Virtual Memory and Implementation Issues. **File Systems:**Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIXV7 file system, CDROM file system.	**12**
III	**Input-Output:**Principles of I/O hardware, Application I/ O Interface, Kernel I/O Subsystems, Streams, disks, clocks, power management. **Deadlocks:**Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues.	**12**
IV	**Virtualization and Cloud:** History, requirements for virtualization, type1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernels, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs, Clouds. **Multiple Processor Systems, Multiprocessors**, multi computers, distributed systems.	**12**
V	**Case Study on LINUX and ANDROID:** History of Unix and Linux, Linux Overview, Processes in Linux, Memory management in Linux, Linux file system, security in Linux. Android **Case Study on Windows:** History of windows through Windows10, system structure, processes and threads in windows, memory management, caching in windows, Windows NT file system.	**12**

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

1.	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin Gagne	Wiley	8th	
2.	Modern Operating Systems	Andrew S. Tanenbaum	Pearson	$_4^{th}$	2014
3.	Operating Systems– Internals and Design Principles	Willaim Stallings	Pearson	$_8^{th}$	2009
4.	Operating Systems	Godbole and Kahate	McGraw Hill	$_3^{rd}$	

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Operating Systems Practical		**Course Code:RJSUITP103**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	Details
1.	Installation of virtual machine software.
2.	Installation of Linux operating system (RedHat/Ubuntu) on virtual machine.
3.	Installation of Windows operating system on virtual machine.
4.	**Linux commands: Working with Directories:**
a.	pwd, cd, absolute and relative paths, ls, mkdir, rmdir,
b.	file, touch, rm, cp.mv, rename, head, tail, cat, tac, more, less, strings, chmod
5.	**Linux commands: Working with files:**
a.	ps, top, kill, pkill, bg, fg,
b.	grep, locate, find, locate.
c.	date,cal,uptime,w,whoami,finger,uname,man,df,du,free,whereis,which.
d.	Compression: tar, gzip.
6.	**Windows (DOS) Commands–1**
a.	Date, time, prompt, md, cd, rd, path.
b.	Chkdsk, copy, xcopy, format, fidsk, cls, defrag, del, move.
7.	**Windows (DOS) Commands–2**
a.	Diskcomp, diskcopy, diskpart, doskey, echo
b.	Edit, fc, find, rename, set, type, ver
8.	**Working with Windows Desktop and utilities**
a.	Notepad
b.	Wordpad
c.	Paint
d.	Taskbar
e.	Adjusting display resolution
f.	Using the browsers
g.	Configuring simple networking
h.	Creating users and shares
9.	**Working with Linux Desktop and utilities**
a.	The vi editor.
b.	Graphics
c.	Terminal
d.	Adjusting display resolution

e.	Using the browsers
f.	Configuring simple networking
g.	Creating users and shares
10.	**Installing utility software on Linux and Windows**

F.Y. B.Sc. I.T.	Semester I Theory
RJSUIT103 **Operating Systems**	Course Outcomes : 1. To understand OS as a resource manager and how various resources like Processor, Memory and I/O are handled by Operating System. Learning Outcomes: ➢ To gain knowledge on process scheduling, synchronization, implementation of virtualization using paging and segmentation, various techniques to implement file structures, I/O management and resource deadlock.
RJSUITP103 **Operating Systems Practical**	Course Outcomes : 1. Installing virtual machine and various operating systems on VM 2. To understand the use of various LINUX Commands like, files related, directory related, process related and system admin related. 3. To understand the use of DOS Commands. 4. To understand the working of various desktop utilities in like, word, paint, browsers, configuring network settings and creating users, vi editor etc. 5. To install utility software on WINDOWS and LINUX.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Discrete Mathematics		**Course Code: RJSUIT104**	
Periods per week(1 Period is 50 minutes)		**5**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**2**	**60**
	Internal	**1**	**40**

Unit	Details	Lectures
I	**Set Theory:** Definitions and the Element Method of Proof, Properties of Sets, Disproof's, Algebraic Proofs, Boolean Algebras **The Logic of Compound Statements:** Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments **Quantified Statements:** Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements.	**12**
II	**Elementary Number Theory and Methods of Proof**: Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling. **Indirect Argument:** Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms.	**12**
III	**Sequences, Mathematical Induction, and Recursion:** Sequences, Mathematical Induction, Strong Mathematical Induction and the Well Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively, solving recurrence relations by iteration, Second order linear homogenous recurrence relations with constant coefficients. general recursive definitions and structural induction. **Functions:** Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions, Cardinality with Applications to Computability.	**12**
IV	**Graphs and Trees**: Definitions and Basic Properties, Trails, Paths, and Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs, Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest paths. **Relations:** Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations	**12**
V	**Counting and Probability**: Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the Multiplication Rule, Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, rCombinations with Repetition Allowed, Probability Axioms and Expected Value, Conditional Probability, Bayes' Formula, and Independent Events.	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Discrete Mathematics with Applications	Sussana S. Epp	Cengage Learning	4th	2010
2.	Discrete Mathematics, Schaum's Outlines Series	Seymour Lipschutz, Marc Lipson	Tata MCGraw Hill		2007
3.	Discrete Mathematics and its Applications	Kenneth H. Rosen	Tata MCGraw Hill		
4.	Discrete mathematical structures	B Kolman RC Busby, S Ross	PHI		
5.	Discrete structures	Liu	Tata MCGraw Hill		

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Discrete Mathematics Practical		**Course Code:RJSUITP104**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**-**

Practical No.	**Details**
	Write the programs for the following using SCILAB
1.	**Set Theory** a. Inclusion Exclusion principle. b. Power Sets c. Mathematical Induction
2.	**Implement in-built mathematical functions in Scilab** a. gcd b. lcd c. factorial d. poly and more…
3.	**Counting** a. Sum rule principle b. Product rule principle c. Factorial d. Binomial coefficients

	e. Permutations f. Permutations with repetitions g. Combinations h. Combinations with repetitions i. Ordered partitions j. Unordered partitions
4.	**Probability Theory** a. Sample space and events b. Finite probability spaces c. Addition Principle d. Conditional Probability e. Multiplication theorem for conditional probability
5.	**Graph Theory** a. Paths and connectivity b. Minimum spanning tree c. Isomorphism
6.	**Properties of integers** a. Division algorithm b. Primes c. Euclidean algorithm d. Fundamental theorem of arithmetic e. Congruence relation f. Linear congruence equation
7.	**Boolean Algebra** a. Basic definitions in Boolean Algebra
8.	**Recurrence relations** a. Linear homogeneous recurrence relations with constant coefficients b. Solving linear homogeneous recurrence relations with constant coefficients c. Solving general homogeneous linear recurrence relations

F.Y. B.Sc.I.T.	Semester I Theory
RJSUIT104 **Discrete Mathematics**	Course Outcomes : 1. This course emphasizes problem solving in main areas of discrete mathematics, which provide important knowledge and skills for the applied scientists. 2. The subject demonstrates the importance of the discrete mathematical topics in applied science. Learning outcomes: Students will be able to: ➢ Understand the basic principles of sets and operations in sets. ➢ Apply counting principles to determine probabilities. ➢ Demonstrate an understanding of relations and functions and will be able to determine their properties.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

	➢ Model problems in Computer Science using graphs and trees.
RJSUITP104 **Discrete Mathematics Practical**	Course Outcomes : 1. Installation of the software Scilab. Basic syntax, Mathematical Operators, Predefined constants, Built in functions 2. Complex numbers, Polynomials, Vectors, Matrix. Handling these data structures using built in functions 3. Programming - Functions - Loops - Conditional statements - Handling .sci files

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Communication Skills		**Course Code:RJSUIT105**	
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 Seven C's of Effective Communication:**Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness **Understanding Business Communication:**Nature and Scope of Communication, Non-verbal Communication, Cross-cultural communication, Technology-enabled Business Communication	**12**
II	**Writing Business Messages and Documents:**Business writing, Instructions Business Reports and Proposals, Career building and Resume writing **Developing Oral Communication Skills for Business:**Business Presentations, **Presentation Process:** Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps/concept maps, executing stage: chunking theory, creating outlines, Use of templates. Adding graphics to your presentation: Visual communication, Impress stage: use of font, colour, layout.	**12**
III	**Developing Oral Communication Skills for Business:**Effective Listening, Public Speaking, Interviews, Meetings and Conferences.	**12**
IV	**Developing Oral Communication Skills for Business:** Group Discussions and Team Presentations, Team Briefing **Understanding Specific Communication Needs:**Communication across Functional Areas	**12**
V	**Understanding Specific Communication Needs:**Corporate Communication, Persuasive Strategies in Business Communication, Ethics in Business Communication, Business Communication Aids	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Business Communication	Meenakshi Raman and Prakash Singh	Oxford University Press	2nd	
2.	Professional Communication	Aruna Koneru	Tata McGraw Hill		
3.	Strategies for improving your business communication	Prof. M. S. Rao	Shroff		2016
4.	Business Communication	Dr. Rishi pal and Dr. Jyoti Sheoran	SPD		2014
5.	Graphics for Learning: Proven Guidelines for Planning, Designing, and Evaluating Visuals in Training Materials	Ruth C. Clark, Chopeta Lyons,	Pfeiffer, Wiley		2011
6.	Basic Business Communication: Skills for Empowering the Internet Generation	Lesikar Raymond V and Marie E. Flatley.	Tata McGraw-Hill	10th	2005
7.	Nonverbal Communication: Notes on the Visual Perception of Human Relations	Ruesh, Jurgen and Weldon Kees	Universityof CaliforniaPress		1966
8.	Business Communication Today	Bovee,CourtlandL.Thill, John V.	Pearson Education Ltd.		2015
9.	Communication Skills	Dr. Nageshwar Rao Dr. Rajendra P. Das	Himalaya		

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Communication Skills Practical		**Course Code:RJSUITP105**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	**Details**
1.	Communication Origami, Guessing Game, Guessing the emotion
2.	The Name Game, Square Talk (Effective Communication), Room101 (Influential and persuasive skills)
3.	Back to Back Communication, Paper Shapes (Importance of two-way communication), Memory Test (Presentation Skills)
4.	Exercises on Communication Principles
5.	Exercises on communication icebreakers
6.	Communication Exercises
	For the following practical purposes, Microsoft Office, Open Office, Libre Office or any other software suite can be used.
7.	Use of word processing tools for communication
8.	Use of spreadsheet tools for communication
9.	Use of presentation tools for communication

F.Y. B.Sc. I.T.	Semester I Theory
RJSUIT105 **Communication Skills**	Course Outcomes : 1. To offer critical knowledge about the complexities of modern communication in organizations. 2. With equal opportunity to develop and practice the verbal, nonverbal, written and digital communication techniques. Learning outcomes: ➢ Conducting effective business research and communicating the process and findings in a range of business documents and oral presentations. ➢ Planning and managing a business project and communication strategy. ➢ Demonstrating advanced interpersonal communication, business etiquette and relationship building skills. ➢ Utilizing constructive negotiation and conflict management skills. ➢ Embedding ethical considerations in all communication modes.
RJSUITP105	Course Outcomes :

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Communication Skills Practical	1. To improve overall communication skill ability towards empathy, friendliness and professionalism in speaking and attitude. 2. To infuse healthy feeling of completion and positive behavior and collaborative efforts in solving problems

B.Sc.(Information Technology)		**Semester–I**	
Course Name: Professional Ethics and Human Values		**Course Code: RJSUIT106**	
Periods per week (1 Period is 50 minutes)		**2**	
Credits		**1**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**-**	**-**
	Internal	**--**	**25**

Units	Details	Lectures
I	**Human Values:** Objectives, Morals, Values, Ethics, Integrity, Work Ethics, Service Learning, Virtues, Respect for Others, Living Peacefully, Caring, Sharing, Honesty, Courage, Valuing Time, Co-operation, Commitment, Empathy, Self Confidence, Challenges in WorkPlace, Spirituality. **Case Study Based Assignment #1**	6
II	**Engineering Ethics:** Overview, Sense of Engineering Ethics, Variety of Moral Issues, Types of Inquiries, Moral Dilemma, Moral Autonomy, Moral Development (Theories), Consensus and Controversies, Profession, Models of Professional Roles, Responsibility, Theory about right action, Self-Control, Self Interest, Self-Respect. **Case Study Based Assignment # 2**	6
III	**Safety, Responsibilities and Rights:** Safety Definitions, Safety and Risk, Risk Analysis, Assessment of Safety and Risk Human rights, Employee rights, Intellectual property rights, **Globalization:** Multinational corporations . Environmental ethics, Computer ethics . Weapons development, Engineers as managers, Engineers as advisors in planning and policy making, Moral leadership, codes of ethics, Engineering council of India, Codes of ethics for TATA group. Ethics and codes of business conduct in MNC **Case Study Based Assignment # 2**	6

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	A text book on Professional Ethics and Human Values	R. S. Naagarazan	New Age International publishers		2006
2.	Professional Ethics and Human Values	M. Govindarajan V. S. Senthilkumar, M.S. Natarajan	PHI		2013

F.Y. B.Sc. I.T.	Semester I Theory
RJSUIT106 **Professional Ethics and Human Values**	Course Outcomes : 1. To inculcate human values in students 2. To introduce work ethics and familiarize students with work codes of business in the IT industry. Learning outcomes: ➢ Understand and practice basic human values – sharing, respecting others, valuing time, honesty in workplace ➢ To understand challenges and ways to overcome them in business and corporate environments. ➢ Identifying different risks and understand risk analysis

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Python Programming		**Course Code: RJSUIT201**	
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:** The Python Programming Language, History, features, Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, **Variables and Expressions:** Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. **Conditional Statements:** if, if-else, nested if –else **Looping**: for, while, nested loops **Control statements:** Terminating loops, skipping specific conditions	**12**
II	**Functions:** Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types **Strings:** A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

III	**Lists:** Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods **Tuples and Dictionaries:** Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods **Files:** Text Files, The File Object Attributes, Directories **Exceptions:** Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions	**12**
IV	**Regular Expressions:** Concept of regular expression, various types of regular expressions, using match function. **Classes and Objects:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding **Multithreaded Programming:** Thread Module, creating a thread, synchronizing threads, multithreaded priority queue **Modules:** Importing module, Creating and exploring modules, Math module, Random module, Time module	**12**
V	**Creating the GUI Form and Adding Widgets:** **Widgets:** Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox. Handling Standard attributes and Properties of Widgets. **Layout Management:** Designing GUI applications with proper Layout Management features. **Look and Feel Customization**: Enhancing Look and Feel of GUI using different appearances of widgets. **Storing Data in Our MySQL Database via Our GUI:** Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Think Python	Allen Downey	O'Reilly	1st	2012

2.	An Introduction to Computer Science using Python 3	Jason Montojo, Jennifer Campbell, Paul Gries	SPD	1st	2014
3.	Python GUI Programming Cookbook	Burkhard A. Meier	Packt		2015
4.	Introduction to Problem Solving with Python	E. Balagurusamy	TMH	1st	2016
5.	Murach's Python programming	Joel Murach, Michael Urban	SPD	1st	2017
6.	Object-oriented Programming in Python	Michael H. Goldwasser, David Letscher	Pearson Prentice Hall	1st	2008
7.	Exploring Python	Budd	TMH	1st	2016

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Python Programming Practical		**Course Code: RJSUITP201**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	Details
1.	Write the program for the following:
a.	Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
b.	Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
c.	Write a program to generate the Fibonacci series.
d.	Write a function that reverses the user defined value.
e.	Write a function to check the input value is Armstrong and also write the function for Palindrome.
f.	Write a recursive function to print the factorial for a given number.
2.	Write the program for the following:
a.	Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.
b.	Define a function that computes the *length* of a given list or string.
c.	Define a *procedure* histogram() that takes a list of integers and prints a histogram to the screen. For example, histogram([4, 9, 7]) should print the following: **** ********* *******
3.	Write the program for the following:
a.	A *pangram* is a sentence that contains all the letters of the English alphabet at least once, for example: *The quick brown fox jumps over the lazy dog*. Your task here is to write a function to check a sentence to see if it is a pangram or not.

b.	Take a list, say for example this one: a=[1,1,2,3,5,8,13,21,34,55,89] and write a program that prints out all the elements of the list that are less than 5
4.	Write the program for the following:
a.	Write a program that takes two lists and returns True if they have at least one common member.
b.	Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.
c.	Write a Python program to clone or copy a list
5.	Write the program for the following:
a.	Write a Python script to sort (ascending and descending) a dictionary by value.
b.	Write a Python script to concatenate following dictionaries to create a new one. Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60} Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
c.	Write a Python program to sum all the items in a dictionary.
6.	Write the program for the following:
a.	Write a Python program to read an entire text file.
b.	Write a Python program to append text to a file and display the text.
c.	Write a Python program to read last n lines of a file.
7.	Write the program for the following:
a.	Design a class that store the information of student and display the same
b.	Implement the concept of inheritance using python
c.	Create a class called Numbers, which has a single class attribute called MULTIPLIER, and a constructor which takes the parameters x and y (these should all be numbers). i. Write a method called add which returns the sum of the attributes x and y. ii. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER.

	iii. Write a static method called subtract, which takes two number parameters, b and c, and returns b - c. iv. Write a method called value which returns a tuple containing the values of x and y. Make this method into a property, and write a setter and a deleter for manipulating the values of x and y.
8.	Write the program for the following:
a.	Open a new file in IDLE ("New Window" in the "File" menu) and save it as geometry.py in the directory where you keep the files you create for this course. Then copy the functions you wrote for calculating volumes and areas in the "Control Flow and Functions" exercise into this file and save it. Now open a new file and save it in the same directory. You should now be able to import your own module like this: importgeometry Try and add print dir(geometry) to the file and run it. Now write a function pointy Shape Volume(x, y, squareBase) that calculates the volume of a square pyramid if squareBase is True and of a right circular cone if squareBase is False. x is the length of an edge on a square if squareBase is True and the radius of a circle when squareBase is False. y is the height of the object. First use squareBase to distinguish the cases. Use the circleArea and squareArea from the geometry module to calculate the base areas.
b.	Write a program to implement exception handling.
9.	Design the database applications for the following:
a.	Design a simple database application that stores the records and retrieve the same.

F.Y. B.Sc. I.T.	Semester II Theory
RJSUIT201 **Python Programming**	Course Outcomes 2.1 : Students will be able to 1. Understand basics of Python programming. 2. Use object oriented concepts using Python. Learning outcomes: ➢ Students will design, code, test and debug Python language programs.
RJSUITP201 **Python Programming Practical**	Course Outcomes : 1. Students will be able to design, code, test, and debug Python language programs.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Microprocessor Architecture		**Course Code:RJSUIT202**	
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	**Microprocessor, microcomputers, and Assembly Language:** Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Micro controllers Applications. **Microprocessor Architecture and Microcomputer System:** Microprocessor Architecture and its operation's, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing, Microprocessor-Based System Application. **8085 Microprocessor Architecture and Memory Interface:** Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer, Memory Interfacing, Testing and Troubleshooting Memory Interfacing Circuit.	**12**
II	**Interfacing of I/O Devices** Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits. **Introduction to 8085 Assembly Language Programming:** The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Overview of 8085 Instruction Set, Writing and Assembling Program. **Introduction to 8085 Instructions:** Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program.	**12**
III	**Programming Techniques With Additional Instructions:** Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bi t Arithmetic Instructions, Arithmetic Instruction Related to Memory, Logic Operations: Rotate, Logics Operations: Compare, Dynamic Debugging. **Counters and Time Delays:** Counters and Time Delays, Illustrative Program: Hexadecimal Counter, Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs. **Stacks and Sub-Routines:** Stack, Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts.	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

IV	**Code Conversion, BCD Arithmetic, and 16-Bit Data Operations:** BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-to-Seven-Segment-LED Code Conversion, Binary-to-ASCII and ASCII-to-Binary Code Conversion, BCD Addition, BCD Subtraction, Introduction To Advanced Instructions and Applications, Multiplication, Subtraction With Carry. **Software Development System and Assemblers:** Microprocessors- Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers, Writing Program Using Cross Assemblers. **Interrupts:** The 8085 Interrupt,8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes.	**12**
V	**Introduction to 16 bit microprocessor – 8086 :** 8086 Microprocessor family overview, Features of 8086, Architecture of 8086, Bus Interface Unit, Additional Instructions in 8086, comparison between 8085 and 8086 **Introduction to 32 bit microprocessor -80286, 80386 and 80486:**The Intel 80286 microprocessor - Architecture, signals, New Enhanced Instructions,	
	The Intel 80386 microprocessor - Architecture, operating modes, enhanced instructions, Intel 80486 microprocessor - internal block diagram and functional signal groups. **Introduction to Intel Pentium Processor** Operating modes, Memory model, New instructions of Pentium processors, The P6 pro family processors, i3, i5, i7 processors and their features, SPARC microprocessors, Features, data types and instruction format.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Microprocessors Architecture, Programming and Applications with the 8085.	Ramesh Gaonkar	PENRAM	5th	2012
2.	Computer System Architecture	M. Morris Mano	PHI		1998
3.	Structured Computer Organization	Andrew C. Tanenbaum	PHI		
4.	Microprocessors and Interfacing	Douglas V Hall	TMH		

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Microprocessor Architecture Practical		**Course Code: RJSUITP202**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	Details
1.	**Perform the following Operations related to memory locations.**
a.	Store the data byte 32 H into memory location 8000H.
b.	A block of data consisting of 256 bytes is stored in memory starting at 8000H. write an assembly language program to shift this block in memory from 8050H onwards.
c.	Exchange the contents of memory locations 8000H and 9000H
2.	**Simple assembly language programs for arithmetic operations.**
a.	Add two 8 bit numbers
b.	Subtract the contents of memory location 8001H from the memory location 8000 Hand place the result in memory location 8002H.
c.	Add the16-bit number in memory locations 8000H and 8001H to the16-bit number in memory locations 8002H and 8003H. The most significant eight bits of the two numbers to be added are in memory locations 8001H and 8003H. Store the result in memory locations 8004H and 8005H with the most significant byte in memory location 8005H.
d.	Subtract the16-bit number in memory locations 8002H and 8003H from the16-bit number in memory locations 8000H and 8001H.The most significant eight bits of the two numbers are in memory locations 8001H and 8003H.Store the result in memory locations 8004H and 8005H with the most significant byte in memory location 8005H.
e.	Find the l's complement of the number stored at memory location 8400H and store the complemented number at memory location 8300H.
f.	Find the 2's complement of the number stored at memory location 8200H and store the complemented number at memory location 8300H.
3.	**Packing and unpacking operations.**
a.	Write a simple program to Split a HEX data into two nibbles and store it in memory
b.	Pack the two unpacked BCD numbers stored in memory locations 8200H and 8201H and store the result in memory location 8300H. Assume the least significant digit is stored at 8200H.
c.	Two digit BCD number is stored in memory location 8200H. Unpack the BCD number and store the two digits in memory locations 8300H and 8301H such that memory location 8300H will have a lower BCD digit.

4.	**Register Operations.**
a.	Write a program to shift an eight bit data four bits right. Assume that data is in register C.
b.	Program to shift a16-bit data1bit left. Assume data is in the HL register pair
c.	Write a program to count the number of l's in the contents of D register and store the count in the B register.
5.	**Operations with Memory locations.**
a.	Calculate the sum of a series of numbers. The length of the series is in memory location 8200H and the series begins from memory location 8201H. a. Consider the sum to be an 8 bit number. So, ignore carries. Store the sum at memory location 8300H. b. Consider the sum to be a 16 bit number. Store the sum at memory locations 8300H and 8301H
b.	Calculate the sum of a series of even numbers from the list of numbers. The length of the list is in memory location 8200H and the series itself begins from memory location 8201H. Assume the sum to be 8 bit number so you can ignore carries and store the sum at memory location 8000 H
c.	Multiply two8-bit numbers stored in memory locations 8200H and 8201H by repetitive addition and store the result in memory locations 8300H and 8301H.
d.	Divide 16 bit number stored in memory locations 8200H and 8201H by the 8 bit number stored at memory location 8202H. Store the quotient in memory locations 8300H and 8301H and remainder in memory locations 8302H and 8303H.
e.	Find the number of negative elements (most significant bit 1) in a block of data. The length of the block is in memory location 8200H and the block itself begins in memory location 8201H. Store the number of negative elements in memory location 8300H
f.	Find the square of the given numbers from memory location 8100H and store the result from memory location 9000H
6.	**Search and sort data with respect to memory locations.**
a.	Write a program to sort given 10 numbers from memory location 2200H in the ascending order.
b.	Search the given byte in the list of 50 numbers stored in the consecutive memory locations and store the address of memory location in the memory locations 8200H and 8201H. Assume the byte is in the C register and the starting address of the list is 8000H. If byte is not found store 00 at 8200H and 8201H
c.	Find the largest number in a block of data. The length of the block is in memory location 2200H and the block itself starts from memory location 2201H. Store the maximum number in memory location 2300H. Assume that the numbers in the block are all 8 bit unsigned binary numbers.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

7.	**Assembly programs on memory locations.**
a.	Write an assembly language program to separate even numbers from the given list of 10 numbers and store them in another list starting from 2300H. Assume starting address of 10 number list is 2200H
b.	Add even parity to a string of 7-bit ASCII characters. The length of the string is in memory location 2040H and the string itself begins in memory location 2041H. Place even parity in the most significant bit of each character.
c.	A list of 20 numbers is stored in memory, starting at 8000H. Find number of negative, zero and positive numbers from this list and store these results in memory locations 9000H, 9001H, and 9002H respectively
d.	Write an assembly language program to generate Fibonacci numbers.
e.	Program to calculate the factorial of a number between 0 to 8.
8.	**String operations in assembly programs.**
a.	Write an 8085 assembly language program to insert a string of four characters from the tenth location in the given array of 50 characters
b.	Write an 8085 assembly language program to delete a string of 4 characters from the tenth location in the given array of 50 characters.
9.	**Subroutine**
a.	DAA instruction is not present. Write a Sub routine which will perform the same task as DAA.
b.	Multiply two 8-bit numbers stored in memory locations 8200H and 8201H by repetitive addition and store the result in memory locations 8300H and 8301H. Write a subroutine to store the content of carry to register B.
10.	**Operations on BCD numbers.**
a.	Add two 4 digit BCD numbers in HL and DE register pairs and store the result in memory locations, 2300H and 2301H. Ignore carry after 16 bits.
b.	Subtract the BCD number stored in E register from the number stored in the D register
c.	Write an assembly language program to multiply 2 BCD numbers

F.Y. B.Sc. I.T.	Semester II Theory
RJSUIT202 **Microprocessor Architecture**	Course Outcomes : 1. To study the architecture and assembly language for the 8085 microprocessor. 2. Understand the functionality of new generation microprocessors. Learning outcomes: ➢ After this course students will be able to write assembly language program ➢ Students will be able to design basic interface of hardware components such as memory devices

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

RJSUITP202 **Microprocessor Architecture Practical**	Course Outcomes : 1. Developing and implementing assembly language programs to perform arithmetic and logical operations 2. Perform various memory related operations with an 8085 microprocessor. 3. Utilize internal register structure of 8085 microprocessor to perform various operations.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Web Programming		**Course Code:RJSUIT203**	
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	**Internet and the World Wide Web:** What is the Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL), browsers–internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. Search engine, web saver–apache, IIS, proxy server, HTTP protocol **HTML5:** Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets.	**12**
II	**HTML5 Page layout and navigation:** Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions. **HTML5 Tables, Forms and Media:** Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using checkboxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

III	**JavaScript:** Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, Javascript Security, **Operators**: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void **Statements:** Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with, **Core JavaScript (Properties and Methods of Each):** Array, Boolean, Date, Function, Math, Number, Object, String, regExp **Document and its associated objects:** document, Link, Area, Anchor, Image, Applet, Layer **Events and Event Handlers:** General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload	**12**
IV	**PHP:** Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, super global arrays, strings and string functions, arrays, number handling, basic PHP errors/problems	**12**
V	**Advanced PHP and MySQL:** PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, E-Mail	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Web Design The Complete Reference	Thomas Powell	Tata McGraw Hill		-
2.	HTML5 Step by Step	Faithe Wempen	Microsoft Press		2011
3.	PHP5.1 for Beginners	Ivan Bayross Sharanam Shah,	SPD		2013

4.	PHP Project for Beginners	Sharanam Shah,Vaishali Shah	SPD		2015
5.	PHP6 and MySQL Bible	Steve Suehring, Tim Converse, Joyce Park	Wiley		2009
6.	JavaScript 2.0: The Complete Reference	Thomas Powell and Fritz Schneider	Tata McGraw Hill	2nd	

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Web Programming Practical		**Course Code:RJSUITP203**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	**Details**
1.	**Use of Basic Tags**
a.	Design a web page using different text formatting tags.
b.	Design a web page with links to different pages and allow navigation between web pages.
c.	Design a web page demonstrating all Style sheet types
2.	**Image maps, Tables, Forms and Media**
a.	Design a web page with Image maps.
b.	Design a web page demonstrating different semantics
c.	Design a web page with different tables. Design web pages using tables so that the content appears well placed.
d.	Design a web page with a form that uses all types of controls.
e.	Design a web page embedding with multimedia features.
3.	**JavaScript**
a.	Using JavaScript design, a web page that prints factorial/Fibonacci series/any given series.
b.	Design a form and validate all the controls placed on the form using JavaScript.
c.	Write a JavaScript program to display all the prime numbers between 1 and 100.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

a.	Write a JavaScript program to accept a number from the user and display the sum of its digits.
d.	Write a program in Java Script to accept a sentence from the user and display the number of words in it. (Do not use split() function).
e.	Write a javascript program to design a simple calculator.
4.	**Control and looping statements and JavaScript references**
a.	Design a web page demonstrating different conditional statements.
b.	Design a web page demonstrating different looping statements.
c.	Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp)
5.	**Basic PHP I**
a.	Write a PHP Program to accept a number from the user and print it factorial.
b.	Write a PHP program to accept a number from the user and print whether it is prime or not.
6.	**Basic PHP II**
a.	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.
b.	Write a PHP program to display the following Binary Pyramid: 1 0 1 1 0 1 0 1 0 1
7.	**String Functions and arrays**
a.	Write a PHP program to demonstrate different string functions.
b.	Write a PHP program to create a one dimensional array.
8.	**PHP and Database**
a.	Write a PHP code to create: ● CreateadatabaseCollege ● Create a table Department (Dname, Dno, Number_Of_faculty)
b.	Write a PHP program to create a database named "College". Create a table named "Student" with following fields (sno, sname, percentage).Insert 3 records ofyourchoice.Displaythenamesofthestudentswhosepercentageisbetween35to75 in a tabular format.
9.	**Email**
a.	Write a program to send email with attachment.
10.	**Sessions and Cookies**
a.	Write a program to demonstrate use of sessions and cookies

F.Y. B.Sc. I.T.	Semester II Theory
RJSUIT203 **Web Programming**	Course Outcomes : 1. To introduce students about various web programming language concepts and structures for writing programs.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

	2. Provide students with skills to solve problems 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 ➢ Understanding server-side scripting language, PHP using a relational DBMS, MySQL ➢ Designing and implementation of typical static web pages and interactive web applications.
RJSUITP203 **Web Programming Practical**	Course Outcomes : 1. Implementing web programming concepts of HTML, javascript and php. 2. To attain expertise in building web sites with advanced programming features.

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Numerical and Statistical Methods		**Course Code: RJSUIT204**	
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	**Mathematical Modeling and Engineering Problem Solving:** A Simple Mathematical Model, Conservation Laws and Engineering Problems **Approximations and Round-Off Errors:** Significant Figures, Accuracy and Precision, Error Definitions, Round-Off Errors **Truncation Errors and the Taylor Series:**The Taylor Series, Error Propagation, Total Numerical Errors, Formulation Errors and Data Uncertainty	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

II	**Solutions of Algebraic and Transcendental Equations:** The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. **Interpolation:** Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation.	**12**
III	**Solution of simultaneous algebraic equations (linear) using iterative methods:** Gauss-Jordan Method, Gauss-Seidel Method. **Numerical differentiation and Integration:** Numerical differentiation, Numerical integration using Trapezoidal Rule, Simpson's $1/3^{rd}$and $3/8^{th}$rules. **Numerical solution of 1^{st} and 2^{nd} order differential equations:** Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for $1^{st}$and 2^{nd}Order Differential Equations.	**12**
IV	**Least-Squares Regression:** Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, Non linear Regression **Linear Programming:** Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution.	**12**
V	**Random variables:** Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance. **Distributions:** Discrete distributions: Uniform, Binomial, Poisson, Bernoulli, Continuous distributions: uniform distributions, exponential, (derivation of mean and variance only and state other properties and discuss their applications) Normal distribution state all the properties and its applications.	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Introductory Methods of Numerical Methods	S. S. Shastri	PHI	Vol – 2	
2.	Numerical Methods for Engineers	Steven C. Chapra, Raymond P. Canale	Tata McGraw Hill	6th	2010
3.	Numerical Analysis	Richard L. Burden, J. Douglas Faires	Cengage Learning	9th	2011
4.	Fundamentals of Mathematical Statistics	S. C. Gupta, V. K. Kapoor			
5.	Elements of Applied Mathematics	P. N. Wartikar and J. N. Wartikar	A. V. Grih, Pune	Volume 1 and 2	

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Numerical and Statistical Methods Practical		**Course Code:RJSUITP204**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Practical No.	**Details**
1.	**Iterative Calculation**
a.	Program for iterative calculation.
b.	Program to calculate the roots of a quadratic equation using the formula.
c.	Program to evaluate using infinite series.
2.	**Solution of algebraic and transcendental equations:**
a.	Program to solve algebraic and transcendental equations by bisection method.
b.	Program to solve algebraic and transcendental equations by false position method.
c.	Program to solve algebraic and transcendental equations by Secant method.
d.	Program to solve algebraic and transcendental equations by Newton Raphson method.
3.	**Interpolation**
a.	Program for Newton's forward interpolation.

b.	Program for Newton's backward interpolation.
c.	Program for Lagrange's interpolation.
4.	**Solving linear system of equations by iterative methods**
a.	Program for solving linear systems of equations using Gauss Jordan method.
b.	Program for solving linear systems of equations using Gauss Seidel method.
5.	**Numerical Differentiation**
a.	Programming to obtain derivatives numerically.
6.	**Numerical Integration**
a.	Program for numerical integration using Trapezoidal rule.
b.	Program for numerical integration using Simpson's $1/3^{rd}$rule.
c.	Program for numerical integration using Simpson's $3/8^{th}$rule.
7.	**Solution of differential equations**
a.	Program to solve differential equation using Euler's method
b.	Program to solve differential equations using modified Euler's method.
c.	Program to solve differential equation using Runge-kutta 2^{nd}order and 4^{th}order methods.
8.	**Regression**
a.	Program for Linear regression.
b.	Program for Polynomial Regression.
c.	Program for multiple linear regression.
d.	Program for non-linear regression.
9.	**Random variables and distributions**
a.	Program to generate random variables.
b.	Program to fit binomial distribution.
c.	Program to fit Poisson distribution.
10.	**Distributions**
a.	Program for Uniform distribution.
b.	Program for Bernoulli distribution
c.	Program for Negative binomial distribution.

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

F.Y. B.Sc. I.T.	Semester II Theory
RJSUIT204 **Numerical and Statistical Methods**	Course Outcomes : 1. To learn basic modelling and engineering of problem solving 2. To learn essential statistical concepts like Regression and distribution. Learning outcomes: ➢ After this course students will be able to solve mathematical problems using various approximations.
RJSUITP204 **Numerical and Statistical Methods Practical**	Course Outcomes : 1. Implementation and application of numerical methods to solve complex engineering problems. 2. Use Scilab and programming as a tool in solving problems.

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Green Computing		**Course Code: RJSUIT205**	
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	**Overview and Issues:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

II	**Minimizing Power Usage:** Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data Deduplication, Virtualization, Management, Bigger Drives, Involving the Utility Company, Low-Power Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software. **Cooling:** Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, HP's Solution, Optimizing Airflow, Hot Aisle/Cold Aisle, Raised Floors, Cable Management, Vapour Seal, Prevent Recirculation of Equipment Exhaust, Supply Air Directly to Heat Sources, Fans, Humidity, Adding Cooling, Fluid Considerations, System Design, Data Centre Design, Centralized Control, Design for Your Needs, Put Everything Together.	**12**
III	**Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analysing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource. **Going Paperless:** Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Hand held Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange(EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles.	**12**
IV	**Recycling:** Problems, China, Africa, Materials, Means of Disposal, Recycling, Refurbishing, Make the Decision, Life Cycle, from beginning to end, Life, Cost, Green Design, Recycling Companies, Finding the Best One, Checklist, Certifications, Hard Drive Recycling, Consequences, cleaning a Hard Drive, Pros and cons of each method, CDs and DVDs, good and bad about CD and DVDs disposal, Change the mind-set, David vs. America Online **Hardware Considerations:** Certification Programs, EPEAT, RoHS, Energy Star, Computers, Monitors,Printers, Scanners, All-in-Ones, Thin Clients, Servers, Blade Servers, Consolidation, Products, Hardware Considerations, Planned Obsolescence, Packaging, Toxins, Other Factors, Remote Desktop, Using Remote Desktop, Establishing a Connection, In Practice	**12**

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

V	**Greening Your Information Systems:** Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling. **Staying Green:** Organizational Check-ups, Chief Green Officer, Evolution, Sell the CEO, SMART Goals, Equipment Check-ups, Gather Data, Tracking the data, Baseline Data, Benchmarking, Analyse Data, Conduct Audits, Certifications, Benefits, Realities, Helpful Organizations.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Green IT	Toby Velte, Anthony Velte, Robert Elsenpeter	McGraw Hill		2008
2.	Green Data Center: Steps for the Journey	Alvin Galea, Michael Schaefer, Mike Ebbers	Shroff Publishers and Distributors		2011
3.	Green Computing and Green IT Best Practice	Jason Harris	Emereo		
4.	Green Computing Tools and Techniques for Saving Energy, Money and Resources	Bud E. Smith	CRC Press		2014

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Green Computing Practical		**Course Code:RJSUITP205**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

Project and Viva Voce	
1.	A project should be done based on the objectives of Green Computing. Are ports of minimum 50 pages should be prepared. The report should have a font size of 12, Times new roman and 1.5 line spacing. The headings should have font size 14. Their port should be hard bound.
2.	The project can be done individually or a group of two students.
3.	The students will have to present the project during the examination.
4.	A certified copy of the project report is essential to appear for the examination.

F.Y. B.Sc. I.T.	Semester II Theory
RJSUIT205 **Green Computing**	Course Outcomes : 1. Develop an understanding of the emerging problem of electronic waste and various ways to effectively handle it. 2. Various global level initiatives and standards in Green IT to help reduce the use of hazardous materials for electronics. Learning outcomes: ➢ Students understand the global level E-waste problem, power usage problem in data centres, measuring carbon footprints, and adopting various other practices like going paperless, telecommuting etc.
RJSUITP205 **Green Computing Practical**	Course Outcomes : 1. To do a small research project on any environmental related topic like, Carbon Footprint, Energy Conservation, Recycling, Data centers design for efficient energy usage, Review of Green Initiatives in India and abroad

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

B.Sc.(Information Technology)		**Semester–II**	
Course Name: Mini Project Implementation		**Course Code:RJSUITP206**	
Periods per week(1 Period is 50 minutes)		**2**	
Credits		**1**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**1½**	**25**
	Internal	**--**	**--**

Project and Viva Voce	
1.	A project should be done based on one of the technologies learned in the duration of Semester I or / and Semester II; or using any other suitable software. Sample problem definitions are given below. Students can choose the topic of their interest and develop a mini project after getting the topic approved by the respective project guide. **Problem Statement 1** **Create your own website:** 1. Define goals and objectives for your website 2. Organize content and make content list 3. Create a task list for the following – a. UI Design b. Database Tables c. Server side programming d. Client side programming 4. Create site design and navigation structure. Students can use any technology and / or tool to build the site. Marks will be allotted to design of the website, Impressive UI design, Database design and connectivity, Client side validations. **Problem Statement 2** **Create a Python or C++ Program to create an application**: Few application ideas are given below. Students can use any of the given problems, or choose a different topic with approval of their project guide. 1. Number Guessing game: Generate a random number. Allow a user to enter their details and guess the number (number can be one digit, two digit or three digit number) Allot reward points to users if their guess is correct. User's data can be kept in a data structure / database and retrieved, if asked. Make an attractive graphical interface design for the application. 2. Word Guessing game (Hangman): create a GUI to allow the user to select a three / four / five letter word. Initially prompt the user with one alphabet. User can have a max of three chances. Each wrong answer will bring the hangman closer

	to the death trap. Provide one clue for the word at each chance. Database can be used to store the word and clues. 3. Create a phonebook application using technology of your choice. This will facilitate the user to enter, search and update records. Create a suitable interface.
2.	The project can be done individually or a group of two students.
3.	The students will have to present the project during the examination. They must create a presentation including following details – 1. Technology used 2. About the project – Objective and features 3. Actual working
4.	Soft copy of the presentation and executable of the implementation / video or screen recording of the working project should be uploaded in the examination portal provided. (google classroom or any other)

F.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester I & II

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 the Theory and Practical Exam is 40 %.
5. Students must appear for at least one of the two Internal Tests to be eligible for the Semester End Examination.
6. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of F.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 F.Y. B.Sc. Information Technology as per the minimum requirements.
7. In case of loss of a journal, a candidate must produce a certificate from the Head of the department /Institute that the practical 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.

Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College of Arts, Science & Commerce (Autonomous College)

Affiliated to
UNIVERSITY OF MUMBAI

Syllabus for the S.Y.B.Sc.

Program: B.Sc. INFORMATION TECHNOLOGY
Program Code: RJSUIT

(CBCS 2022-23)

Refer to page no: 05

highlighting component

of Research Project

COURSE STRUCTURE

SEMESTER III

Course	Nomenclature	Credits	Topics
RJSUIT301	Object Oriented Programming	2	• Object Oriented Principles • Introduction to Java • Exception Handling, Multithreading • File Handling • Packages
RJSUIT302	Data Structures	2	• Introduction to DS • Arrays, LinkedList, Stacks, Queues, Trees, Graphs, • Sorting, Searching and Hashing techniques
RJSUIT303	Computer Networks	2	• OSI and TCP/IP network model • Details of different layers • Wireless LAN
RJSUIT304	Database Management Systems	2	• Introduction to databases and data models • Relational Database model, relational algebra and normalization • Constraints, views, Triggers • Transaction management and Concurrency Control
RJSUIT305	Applied Mathematics	2	• Matrices • Complex Numbers • Linear Differential Equations with Constant Coefficients • The Laplace Transform • Multiple Integrals • Beta and Gamma Functions • Error Function
RJSUITP301	Object Oriented Programming Practical	2	
RJSUITP302	Data Structures Practical	2	
RJSUITP303	Computer Networks Practical	2	
RJSUITP304	Database Management Systems Practical	2	

RJSUITP305	Mobile Programming Practical	2	
RJSUDSE301	DSE (Discipline Specific Elective)	2	Students to select from one of the following courses ● Design and Analysis of Algorithms ● Object Oriented Analysis and Design ● Introduction to Machine Learning
Total		22	

S.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester III & IV

SEMESTER IV

Course	Nomenclature	Credits	Topics
RJSUIT401	Advanced Java	2	• GUI Programming using JAVA Database Connectivity using JDBC Servlet, Cookies, Session object • Introduction to JSP • Networking with Java • Hibernate Programming
RJSUIT402	Introduction to Embedded Systems	2	• Introduction to embedded system core • Types and components of embedded systems • 8051 micro controller • Arduino uno
RJSUIT403	Computer Oriented Statistical Techniques	2	• Measures of central tendency and dispersion • Sampling, Decision and Estimation theory • Correlation theory
RJSUIT404	Software Engineering	2	• Software Development Process Models, Agile S/W development • Requirements engineering processes • System models, Architectural designs • Project management • Software testing
RJSUIT405	Computer Graphics and Animation	2	• Introduction to Computer Graphics • Different drawing algorithms Scaling, Translation, Reflection, Rotation and Shearing
			• Visible surface detection, viewing in 3D • Planes, Curves and surface. • Animation
RJSUITP401	Advanced Java Practical	2	
RJSUITP402	Introduction to Embedded Systems Practical	2	

RJSUITP403	Computer Oriented Statistical Techniques Practical	2	
RJSUITP404	Software Engineering Practical	2	
RJSUITP405	Computer Graphics and Animation Practical	2	
RJSUDSE401	Mini Project	2	
Total		22	

Mapping of the courses to employability / entrepreneurship / skill development

SEMESTER III

Course Code	Course Name	Unit No. And topics focusing on Employability / Entrepreneurship / Skill development
RJSUIT301	Object Oriented Programming	**Core Course/Skill Enhancement:** **Unit-I:** Principles of OOPS: OOPS, Introduction to classes and Objects. **Unit-II:** Introduction to JAVA Basic Concepts **Unit -III:** Polymorphism, Inheritance **Unit - IV:** Interfaces, Multi-threaded programming. **Unit- V:** Exception handling, Packages, Managing I/O files.
RJSUIT302	Data Structures	**Skill Enhancement** **Unit I:** Introduction, Array **Unit II:** Linked List **Unit III:** Stack, Queue **Unit IV:** Sorting and Searching Techniques, Tree, Advanced Tree Structures **Unit V:** Hashing Techniques, Graph
RJSUIT303	Computer Networks	**Skill Enhancement, Employability** **Unit I:** Introduction, Network Models, Introduction to Physical layer, Digital and Analog transmission **Unit II:** Bandwidth Utilization: Multiplexing and Spectrum Spreading, Transmission media, Switching, Introduction to the Data Link Layer **Unit III:** Data Link Control, Media Access Control, Wireless LANs, Connecting devices **Unit IV:** Introduction to the Network Layer, Unicast Routing, Next generation IP **Unit V:** Introduction to the Transport Layer, Standard Client Server Protocols

RJSUIT304	Database Management Systems	**Skill Enhancement, Employability** **Unit I:** Introduction to Databases, Data Models, ER Diagram and Database Schema. **Unit II:** Relational database model, Relational Algebra and Calculus Relational algebra, Calculus **Unit III:** Constraints, Views and SQL **Unit IV:** Transaction management and Concurrency **Unit V:** PL-SQL
RJSUIT305	Applied Mathematics	**Skill Enhancement** **Unit I:** Matrices, Complex Numbers **Unit II:** Equation of the first order and of the first degree, Linear Differential Equations with Constant Coefficients **Unit III:** The Laplace Transform, Inverse Laplace Transform **Unit IV:** Multiple Integrals, Applications of integration **Unit V:** Beta and Gamma Functions, Differentiation Under the Integral Sign, Error Functions
RJSUITP301	Object Oriented Programming Practical	**Skill Enhancement** Object Oriented Programming with JAVA Practical
RJSUITP302	Data Structure Practical	**Skill Enhancement**
RJSUITP303	Computer Networks Practical	**Skill Enhancement**
RJSUITP304	Database Management Systems Practical	**Skill Enhancement, Employability**
RJSUITP305	Mobile Programming Practical	**Skill Enhancement** Android development using App Inventor and App Inventor IDE
RJSUDSE301	DSE (Discipline Specific Elective)	**Skill Enhancement**

SEMESTER IV

Course Code	Course Name	Topics
RJSUIT401	Advanced Java	**Skill Enhancement, Employability** **Unit -I:** Introduction- Applet, AWT, Event Handling **Unit - II:** Java EE Architecture, Server and Containers, Working with Servlet **Unit - III:** Working with databases (JDBC) **Unit - IV:** Introduction To Java Server Pages **Unit - V:** Networking in Java, Introduction to Hibernate
RJSUIT402	Introduction to Embedded Systems	**Skill Enhancement, Employability** **Unit I:** Introduction, Core of embedded systems, **Unit II:** Embedded Systems – Application and Domain Specific, Embedded Hardware, Peripherals **Unit III:** The 8051 Microcontrollers, 8051 Programming in C **Unit IV:** Arduino Programming **Unit V:** Real Time Operating System (RTOS), Design and Development
RJSUIT403	Computer Oriented Statistical Techniques	**Skill Enhancement** **Unit I:** The Mean, Median, Mode, and Other Measures of Central Tendency, The Standard Deviation and Other Measures of Dispersion, Introduction to R **Unit II:** Moments, Skewness, and Kurtosis, Elementary Probability Theory, Elementary Sampling Theory **Unit III:** Statistical Estimation Theory, Statistical Decision Theory, Statistics in R **Unit IV:** Small Sampling Theory, The Chi-Square Test **Unit V:** Curve Fitting and the Method of Least Squares, Correlation Theory
RJSUIT404	Software Engineering	**Skill Enhancement** **Unit I:** Introduction, Software Requirements, Software Processes, Software Development Process Models, Agile software development **Unit II:** Socio-technical system, Critical system, Requirements Engineering Processes, System Models **Unit III:** Architectural Design, User Interface Design, Project Management, Quality Management **Unit IV:** Verification and Validation, Software Testing, Software Measurement, Software Cost Estimation **Unit V:** Process Improvement, Service Oriented Software Engineering, Software reuse, Distributed software engineering

RJSUIT405	Computer Graphics and Animation	**Skill Enhancement** **Unit I:** Scan conversion **Unit II:** Two-Dimensional Transformations, Three-Dimensional Transformations **Unit III:** Viewing in 3D, Light, Color Models and Color Applications **Unit IV:** Visible-Surface Determination, Plane Curves and Surfaces **Unit V:** Computer Animation, Image Manipulation and Storage
RJSUITP401	Advanced Java Practical	**Skill Enhancement** Practical on all concepts in advanced Java.
RJSUITP402	Introduction to Embedded Systems Practical	**Skill Enhancement, Employability** Arduino Programming
RJSUITP403	Computer Oriented Statistical Techniques Practical	**Skill Enhancement**
RJSUITP404	Software Engineering Practical	**Skill Enhancement**
RJSUITP405	Computer Graphics and Animation Practical	**Skill Enhancement**
RJSUDSE401	Mini Project	**Skill Enhancement, Employability**

B.Sc. (Information Technology)		**Semester–III**	
Course Name: Object Oriented Programming		**Course Code: RJSUIT301**	
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	**Object Oriented Methodology:** Introduction, Advantages and Disadvantages of Procedure Oriented Languages, what is Object Oriented? What is Object Oriented Development? Object Oriented Themes, Benefits and Application of OOPS. **Principles of OOPS:** OOPS Paradigm, Basic Concepts of OOPS: Objects, Classes, Data Abstraction and Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing **Introduction to classes and Objects:** Class fundamentals, Declaring objects, Assigning object reference variables, Defining member functions, passing object as an argument, Returning object from functions, access specifier, static method, garbage collection **Reference:** 1	**12**
II	**Introduction to Java:** Java features, How java differ from C++,Java Environment, Java Runtime Environment, Java development kit, Simple java program, Java program structure, Java tokens, Implementing A Java program, Java Virtual Machine, **Constants, Variables, Data types, operators and Expressions, Decision Making: branching and looping** **ByteStreams:** InputStream, OutputStream, FileInputStream, FileOutputStream, CharacterStream: Reader, Writer, FileReader, FilerWriter, BufferedReader, BufferedWritter, PrintWriter **Reference: 1, 3 (bytestream)**	**12**
III	**Polymorphism:** Concept of function overloading, overloaded operators, Data Conversion between objects and basic types, constructors and destructors **Inheritance:** Inheritance basics, defining derived classes, single inheritance, making private member inheritable, multilevel, multiple inheritance, hybrid, hierarchical inheritance, constructors in derived classes, limitations of using inheritance in java **Reference: 2** **Virtual Functions:** Introduction and need, Pure Virtual Functions, **Abstract class**	**12**

IV	**Interfaces:** Multiple inheritance in java, defining, extending and implementing interfaces. Accessing interface variables, Abstract methods and classes, final methods, variables and classes, this and super keywords. **Multithreaded Programming:** creating threads, extending thread class, stopping and blocking a thread, lifecycle of thread, using thread method **Reference: 2**	**12**
V	**Managing Errors and Exceptions:** Types of errors, Exceptions, Syntax of Exception handling code, multiple catch statement, using finally statement, throwing our own exception, using exceptions for debugging. **Packages:** Introduction, creating and accessing packages **Managing I /o files:** using the file class, creation of files, reading / writing characters, reading/ writing bytes, concatenating and buffering files, random access files **Reference: 2**	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Object Oriented Programming with C++	E. Balagurusamy	Tata McGraw Hill	4th	
2.	Programming with Java A Primer	E. Balagurusamy	Tata McGrawHill	4th Edition	
3.	The Complete Reference Java	Herbet Schildt			
4.	Core Java for Beginners	Sharnam Shah Vaishali Shah	SPD		

B.Sc. (Information Technology)		**Semester–III**	
Course Name: Object Oriented Programming Practical		**Course Code: RJSUITP301**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

List of Practical: To be implemented using C++ and Java	
1.	**Classes and methods**
a.	Write a C++ / Java program to design an employee class for reading and displaying the employee information, the getInfo() and displayInfo() methods will be used respectively. (use C++ and Java programming)
b.	Write a C++ / Java program to design the class student containing getData() and displayData() as two of its methods which will be used for reading and displaying the student information respectively. Where getData() will be private method
c.	Write a Java Program to design the class Demo which will contain the following methods: readNo(), factorial() for calculating the factorial of a number, reverseNo() will reverse the given number, is Palindrome() will check the given number is palindrome, isArmstrong() which will calculate the given number is arm Strong or not. Where readNo() will be private method.
d.	Write a Java program to demonstrate function definition outside class and accessing class members in function definition.
2.	**Constructors and method overloading.**
a.	Write a C++ program to design a class "Complex" for adding the two complex numbers. Use constructor. (Use C++)
b.	Write a Java Program to design a class Geometry containing the methods area() and volume() and also overload the area() function.
c.	Write a Java Program to demonstrate basic String handling
d.	Write a Java program to count the letters, spaces, numbers and other characters of an input string.
3.	**Inheritance**
a.	Write a C++/ Java program to implement single level inheritance.
b.	Write a java program to implement method overriding
c.	Write a C++ / java program to implement multiple inheritance.
d.	Write a C++ program to implement the hierarchical inheritance.
4.	**Virtual functions and abstract classes**
a.	Write a C++ / Java program to implement the concept of method overriding.
b.	Write a java program to show the use of virtual function
c.	Write a java program to show the implementation of abstract class.
5.	**Multithreading**

a.	Write a java program to implement multithreading.
6.	**Exception handling**
a.	Write a java program to show the implementation of exception handling
b.	Write a java program to show the implementation for exception handling for strings
7.	**File handling**
a.	Write a java program to open a file and display the contents in the console window.
b.	Write a java program to copy the contents from one file to other file.
c.	Write a java program to read the student data from user and store it in the file.
8.	**Packages and Arrays**
a.	Create a package, Add the necessary classes and import the package in java class.
b.	Write a java program to add two matrices and print the resultant matrix.
c.	Write a java program for multiplying two matrices and print the product for the same.

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT301 **Object Oriented Programming**	Course Outcomes 3 1 : Students will be able to 1. Understand object-oriented principals 2. Create C++ and Java Implementations for Object oriented principal 3. Understand concepts of Multithreading, packages, File and Exception handling. Learning outcomes: ➢ Students will design, code, test and debug C++ and Java language programs.
RJSUITP301 **Object Oriented Programming Practical**	Course Outcomes: 1. Students will be able to design, code, test, and debug Object Oriented programs using C++ and Java.

B.Sc. (Information Technology)		**Semester–III**	
Course Name: Data Structures		**Course Code: RJSUIT302**	
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:** Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. **Array**: Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, General Multi- Dimensional Arrays, Sparse Arrays, Sparse Matrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.	**12**
II	**Linked List:** Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, CircularLinked List, Applications of Circular Linked List, Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List,Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures.	**12**
III	**Stack**: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion**.** **Queue:** Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue, Application of Priority Queue, Applications of Queues.	**12**

IV	**Sorting and Searching Techniques** Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary, Indexed Sequential Searches, Binary Search. **Tree:** Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap, Operation on Heap, Heap Sort. **Advanced Tree Structures:** Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree, B-Tree.	**12**
V	**Hashing Techniques** Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Buckethashing, Deletion and rehashing **Graph**: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	A Simplified Approach to Data Structures	Lalit Goyal, Vishal Goyal, Pawan Kumar	SPD	1st	2014
2.	An Introduction to Data Structure with Applications	Jean – Paul Tremblay and Paul Sorenson	Tata MacGraw Hill	2nd	2007
3.	Data Structure and Algorithm	Maria Rukadikar	SPD	1st	2017
4.	Schaum's Outlines Data structure	Seymour Lipschutz	TataMcGraw Hill	2nd	2005
5.	Data structure – A Pseudocode Approach with C	AM Tanenbaum, Y Langsam and MJ Augustein	Prentice Hall India	2nd	2006
6.	Data structure and Algorithm Analysis in C	Weiss, Mark Allen	Addison Wesley	1st	2006

S.Y. B.Sc. INFORMATION TECHNOLOGY Syllabus Semester III & IV

B.Sc. (Information Technology)		**Semester–III**	
Course Name: Data Structures Practical		**Course Code: RJSUITP302**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	Details
1.	**Implement the following:**
a.	Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]
b.	Read the two arrays from the user and merge them and display the elements in sorted order. [Menu Driven]
c.	Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]
2.	**Implement the following for Linked List:**
a.	Write a program to create a single linked list and display the node elements in reverse order.
b.	Write a program to search the elements in the linked list and display the same
c.	Write a program to create double linked list and sort the elements in the linked list.
3.	**Implement the following for Stack:**
a.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.
b.	Write a program to convert an infix expression to postfix and prefix conversion.
c.	Write a program to implement Tower of Hanoi problem.
4.	**Implement the following for Queue:**
a.	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
b.	Write a program to implement the concept of Circular Queue
c.	Write a program to implement the concept of Deque.
5.	**Implement the following sorting techniques:**
a.	Write a program to implement bubble sort.
b.	Write a program to implement selection sort.
c.	Write a program to implement insertion sort.
6.	**Implement the following data structure techniques:**
a.	Write a program to implement merge sort.
c.	Write a program to search the element using binary search.
7.	**Implement the following data structure techniques:**

a.	Write a program to create the tree and display the elements.
8.	**Implement the following data structure techniques:**
a.	Write a program to insert the element into maximum heap.
b.	Write a program to insert the element into minimum heap.
9.	**Implement the following data structure techniques:**
a.	Write a program to implement the collision technique.
b.	Write a program to implement the concept of linear probing.
10.	**Implement the following data structure techniques:**
a.	Write a program to generate the adjacency matrix.
b.	Write a program for shortest path diagram.

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT302 **Data Structures**	Course Outcomes 3.2: Students will be able to 1. Understand advantages and disadvantages of specific algorithms and data structure, array and its representation in memory. 2. Define basic static and dynamic data structures like linked list, trees, graphs, heap, queue, hash tables and relevant standard algorithms for them Learning outcomes: ➢ Students will understand use of different data structures. ➢ Students will understand how different basic operations are performed on different data structures.
RJSUITP302 **Data Structures Practical**	Course Outcomes : Students will be able to 1. Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. 2. Implement algorithms of various data structure for operations like Creation, Insertion, Deletion, Searching and Sorting.

B.Sc.(Information Technology)		**Semester–III**	
Course Name: Computer Networks		**Course Code: RJSUIT303**	
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:** Data communications, networks, network types, Internet history, standards and administration. **Network Models:** Protocol layering, TCP/IP protocol suite, The OSI model. **Introduction to Physical layer:** Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. **Digital and Analog transmission:** Digital-to-digital conversion, analog-todigital conversion, transmission modes, digital-to-analog conversion, analogto-analog conversion.	**12**
II	**Bandwidth Utilization: Multiplexing and Spectrum Spreading:** Multiplexing, Spread Spectrum **Transmission media:** Guided Media**,** Unguided Media **Switching:** Introduction, circuit switched networks, packet switching, and structure of a switch. **Introduction to the Data Link Layer:** Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.	**12**
III	**Data Link Control:** DLC services, data link layer protocols, HDLC, Point-topoint protocol. **Media Access Control**: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet **Wireless LANs:** Introduction, IEEE 802.11 project, Bluetooth, Cellular telephony, Satellite networks. **Connecting devices**	**12**
IV	**Introduction to the Network Layer**: Network layer services, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP **Unicast Routing:** Introduction, routing algorithms, unicast routing protocols. **Next generation IP:** IPv6 addressing, IPv6 protocol, transition from IPv4 to IPv6.	**12**
V	**Introduction to the Transport Layer**: Introduction, Transport layer protocols , Sliding Window Protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, **Standard Client0Server Protocols:** Worldwide-web and HTTP, FTP, Electronic mail, Domain name system.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw Hill	5th	2013
2.	TCP/IP Protocol Suite	Behrouz A.Forouzan	Tata McGraw Hill	4th	2010
3.	Computer Networks	Andrew Tanenbaum	Pearson	5th	2013

B.Sc.(Information Technology)		**Semester–III**	
Course Name: Computer Networks Practical		**Course Code: RJSUITP303**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	Details
	IPv4 Addressing and Subnetting a) Given an IP address and network mask, determine other information about the IP address such as: ● Network address ● Network broadcast address ● Total number of host bits ● Number of hosts b) Given an IP address and network mask, determine other information about the IP address such as: ● The subnet address of this subnet ● The broadcast address of this subnet ● The range of host addresses for this subnet ● The maximum number of subnets for this subnet mask ● The number of hosts for each subnet ● The number of subnet bits ● The number of this subnet
2.	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.
3.	Configure IP static routing.
4.	Configure IP routing using RIP.
5.	Configuring Simple OSPF.
6.	Configuring DHCP server and client.
7.	Create virtual PC based network using virtualization software and virtual NIC.
8.	Configuring DNS Server and client.

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT303 **Computer Networks**	Course Outcomes 3.3 : Students will be able to 1. Build and understand the fundamental concepts of computer networking. 2. Familiarize with the basic taxonomy and terminology of the computer networking area. 3. Enumerate the layers of OSI model and TCP/IP model. Learning outcomes: ➢ Students will acquire knowledge of Application layer, Presentation layer, Session layer, Transport layer and Physical layer paradigms and protocols. ➢ Students will gain core knowledge of Network layer routing protocols, IP addressing, data link layer concepts, design issues, and protocols.
RJSUITP303 **Computer Networks Practical**	Course Outcomes: Students will be able to 1. To design network topologies using Packet Tracer. 2. To implement network layer routing protocols such as RIP,OSPF etc. 3. Learn to configure DHCP and DNS server and client. 4. Use Wireshark to scan and check the packet information of different protocol.

B.Sc.(Information Technology)		**Semester–III**	
Course Name: Database Management Systems		**Course Code: RJSUIT304**	
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 Databases** What is database system, purpose of database system, view of data, relational databases, database architecture, Database administrator, Role of DBA **Data Models:** The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction. **ER Diagram and Database Schema:** Database design and E R Model: overview, ER Model: Entity set, Relationship set, Attributes, Types of attributes, Degree of relationship, Mapping Constraints, relationship participation, E R Diagrams, E R D Issues, weak entity sets, Codd's rules, Reduction of ER Schema to Tables	**12**
II	**Relational database model:** Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF). **Relational Algebra and Calculus Relational algebra:** introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. **Calculus**: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities	**12**
III	**Constraints, Views and SQL:** Constraints, types of constraints, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	**12**
IV	**Transaction management and Concurrency Control** Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	**12**
V	**PL-SQL:** Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Control Structures, Cursors and Transaction, Collections and composite data types, Procedures and Functions, Exceptions Handling, Packages, With Clause and Hierarchical Retrieval, Triggers.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw-Hill	5th	
2.	Introduction to Database System	C. J. Date Pearson		1st	2003
3.	Database Systems	Rob Coronel Cengage Learning		12th	
4.	Programming with PL/SQL for Beginners	H. D and, R. Patil and T. Sambare X–Team		1st	2011

B.Sc.(Information Technology)		Semester–III	
Course Name: : Database Management System Practical		Course Code: RJSUITP304	
Periods per week(1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½ 2	50
	External	--	--

Practical No	Details
1.	**Creating and Managing Tables**
a.	Creating and Managing Tables
b.	Including Constraints
2.	**Manipulating Data**
a.	Using INSERT statement
b.	Using DELETE statement
c.	Using UPDATE statement
3.	**SQL Statements – 1**
a.	Writing Basic SQL SELECT Statements
b.	Restricting and Sorting Data
c.	Single-Row Functions
4.	**SQL Statements – 2**
a.	Displaying Data from Multiple Tables
b.	Aggregating Data Using Group Functions
c.	Subqueries
5.	**Creating and managing other database objects**
a.	Creating Views
b.	Other Database Objects
c.	Controlling User Access
6.	**Using SET operators, Date/Time Functions, GROUP BY clause (advanced features) and advanced subqueries**
a.	Using SET Operators
b.	Datetime Functions
c.	Enhancements to the GROUP BY Clause
d.	Advanced Subqueries
7.	**PL/SQL Basics**
a.	Declaring Variables
b.	Writing Executable Statements
c.	Interacting with the Oracle Server
d.	Writing Control Structures
8.	**Composite data types, cursors and exceptions.**
a.	Working with Composite Data Types
b.	Writing Explicit Cursors
c.	Handling Exceptions

9.	**PL/SQL - Procedures and Functions**
a.	Creating Procedures
b.	Creating Function
10.	**PL/SQL - Creating Database Triggers**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw-Hill	5th	
2.	Programming with PL/SQL for Beginners	H. D and , R. Patil and T. Sambare	X –Team	1st	2011
3.	PL/SQL Programming	Ivan Bayross	BPB	1st	2010

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT304 **Database Management Systems**	Course Outcomes 3.4: Students will be able to 1. Give a good knowledge on the relational data model. 2. Give an introduction to systematic approaches to conceptual design and logical design. 3. Present the problems and solutions related to transaction management in multi user database environments. Learning outcomes: ➢ Students will understand the concept of Relational Database Model like Keys, Integrity Rules, and Normalization. ➢ Students will understand serializability, concurrency control in Transaction Management along with database Recovery Management.
RJSUITP304 **Database Management Systems Practical**	Course Outcomes: Students will be able to 1. Design and implement a database schema for a given problem domain. 2. Populate and query a database using SQL DML/DDL commands. 3. Declare and enforce integrity constraints on a database. 4. Program PL/SQL including procedures, functions, cursors, packages and triggers.

B.Sc.(Information Technology)		**Semester–III**	
Course Name: Applied Mathematics		**Course Code: RJSUIT305**	
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	**Matrices:** Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, Caley- Hamilton Theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix which has elements as characteristics values. **Introduction to Complex Numbers:** Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of x+iy for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram	**12**
II	**Complex Numbers:** Circular functions of complex angles, Definition of hyperbolic function, Relations between circular and hyperbolic functions, Inverse hyperbolic functions, Differentiation and Integration, Graphs of the hyperbolic functions, Logarithms of complex quality, j(=i)as an operator(Electrical circuits) **Introduction to Application of Derivatives** **Equation of the first order and of the first degree:** Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution. **Linear Differential Equations with Constant Coefficients:** Introduction, The Differential Operator, Linear Differential Equation f(D) y = 0, Different cases depending on the nature of the root of the equation f(D) = 0, Linear differential equation f(D) y = X, The complimentary Function, The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X; the general methods, Particular integral : Short methods, Particular integral : Other methods, Differential equations reducible to the linear differential equations with constant coefficients.	**12**
III	**The Laplace Transform:** Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives, **Inverse Laplace Transform:** Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function, Periodic Functions, Heaviside Unit Step Function, Dirac-delta Function(Unit Impulse Function)	**12**

IV	**Introduction to Partial derivatives** **Multiple Integrals:** Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. **Applications of integration:** Areas, Volumes of solids.	**12**
V	**Beta and Gamma Functions –** Definitions**,** Properties and Problems. Duplication formula. **Differentiation Under the Integral Sign:** Introduction, DUIS with one parameter, Leibniz theorem for DUIS **Error Functions:** Definition, Complimentary error function definition, Properties and Problems	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Higher Engineering Mathematics	Ravish Singh &Mukul Bhutt	Mcgraw Hill		
2.	A text book of Applied Mathematics Vol I	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
3.	Applied Mathematics II	P. N. Wartikar and J. N. Wartikar	Pune Vidyathi Graha		
4.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications		

B.Sc.(Information Technology)		**Semester–III**	
Course Name: Mobile Programming Practical		**Course Code: RJSUITP305**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	Details
1	**Introduction to App Inventor and App Inventor IDE** **Introduction to User Interface components** 1. Design an app to demonstrate use of button, label and notifier component 2. Design an app to demonstrate the use of math and logic block 3. Design a sequence calculator app using of slider component
2	**Introduction to Layout component** 1. Design an app for the Kilometer Converter 2. Design an app to calculate Test Average 3. Design an app with layout components and Color Blocks
3	**Introduction to Sensor component** 1. Design an app that demonstrates the use of TexttoSpeech component 2. Design an app that demonstrates the use of Accelerometer Sensor component 3. Design an app that demonstrates the use of Speech Recognizer component
4	**Introduction to Media component** 1. Design an app that uses the Camcorder component to capture a video and play it back using the VideoPlayer component 2. Design an app using camera component to capture image
5	**Introduction to Drawing and Animation component** 1. Design an app that demonstrates the use of canvas component 2. Design an app that demonstrates the use of a ball and an ImageSprite to simulate a golf game
6	**Introduction to Map component and Social component** 1. Design an app that demonstrates the use of ContactPicker and PhoneNumberPicker component 2. Design an app that demonstrates the use of Map component
7	**Introduction to storage component** 1. Design an app uses the PhoneNumberPicker and a TinyDB to store a contact in a list and make a phone call to a contact from that list.
8	1. Design a Game Swat a Mosquito 2. Design an app that can be used as a replacement for a physical dice 3. Design a Scratch card with App Inventor

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Starting Out with App Inventor for Android	Tony Gaddis and Rebecca Halsey	Pearson Education Limited	First	2015
2.	App Inventor 2: Create Your Own Android Apps	David Wolber, Hal Abelson, Ellen Spertus	OReilly	Second	2014

S.Y. B.Sc. I.T.	Semester III Theory
RJSUIT305 **Applied Mathematics**	Course Outcomes 3.5: Students will be able to 1. Understand matrices and perform various transformations on matrices. 2. Perform basic algebraic manipulation with complex numbers. 3. Describe basic definitions and terminology with differential equations and their solutions. 4. Solve linear differential equations with constant coefficients and unit step functions using Laplace Transform. 5. Understand computation of double and triple integrals. 6. Use Beta and Gamma functions and error functions. Learning outcomes: 1. Students will understand concepts of transformations of matrices. 2. Students will be familiar with complex forms of integrals. 3. Students will understand the use of beta and gamma functions.
RJSUITP305 **Mobile Programming Practical**	Course Outcomes: Students will be able to 1. Use the basic user interface components of MIT App Inventor to create Android applications. 2. Extend applications to include database connectivity 3. Debug the app and previewing it in an emulator or in actual device.

B.Sc.(Information Technology)		**Semester–III**	
Course Name: Discipline Specific Elective		**Course Code: RJSUDSE301**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Theory Examination Online Mode**	**1**	**60**
	Internal	**--**	**40**

	Discipline Specific Elective All students must select one of the following electives. An online course of 8 weeks must be completed by the students in the given time frame. They must complete the weekly assignment. Assignments must be uploaded on regular basis. Students will be evaluated in continuous evaluation system based on regular completion of the assignments. Online exam of respective subject will be conducted at the end of the semester.
Elective 1: (8 Weeks)	**Design and analysis of algorithms** ● Asymptotic complexity ● Sorting and Search ● Algorithms and Graph ● Design Techniques – Shortest Path, Divide and conquer ● Dijkstra's algorithm ● Data Structures ● Search Trees Balancing ● Dynamic Programming
Elective 2: (8 Weeks)	**Object Oriented Analysis and Design** ● Software Complexity: Understanding the challenges OOAD can address ● Object Model: Defining the primitives of the OO paradigm ● Classes and Objects: Identification approaches using OOAD ● UML ● OOAD Case Studies: Applying OOAD in different contexts

Elective 3: (8 Weeks)	**Introduction to Machine Learning** ● Types of learning, hypothesis space and inductive bias, evaluation, cross validation ● Linear regression, Decision trees, overfitting ● Instance based learning, Feature reduction, Collaborative filtering-based recommendation, Probability and Bayes learning ● Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM ● Neural network: Perceptron, multilayer network, backpropagation, introduction to deep neural network ● Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning ● Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

S.Y. B.Sc. I.T	**Semester III Theory**
RJSUDSE301	Course Outcomes 1 : Students will be able to 1. Learn basic concepts for writing effective algorithm. 2. Getting a clear idea about implementation of search, sort algorithms. 3. Use UML for object-oriented approach of software engineering Learning outcomes: ➢ Students will be able to apply the concepts of data structures in different algorithms ➢ Students will be able to write small independent programs based on data structures
	Course Outcomes 2 : Students will be able to 1. Understand basic challenges in Object Oriented Analysis and Design. 2. Apply Object Oriented paradigms to a software project. 3. Learn basic idea of dynamic programming. Learning outcomes: ➢ Students can prepare a case study based on Object Oriented principles applied to software projects. ➢ Learners will have a UML based approach to create an independent design solution

	Course Outcomes 3 : Students will be able to 1. Understand basic concepts of machine learning including linear regression and decision trees. 2. Understand concepts of neural networks 3. Use different learning models and theories Learning outcomes: ➢ Learners will be able to apply basic Machine learning concepts to real life examples. ➢ Learners will be able to relate the core concepts of neural network to their applications in real life. ➢ Learners will have better insight to clustering techniques

B.Sc. (Information Technology)		**Semester–IV**	
Course Name: Advanced Java		**Course Code: RJSUIT401**	
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 GUI:** **Applet:** Lifecycle of java applet, creating an applet, applet tag attributes, passing parameters to applet **AWT:** Window Fundamentals, basic UI components, Layouts **Event Handling:** event driven programs, delegating the event, java event type, event classes **Reference: 1**	**12**
II	**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. **Reference: 2**	**12**
III	**Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example. **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 **Request Dispatcher:** Request dispatcher Interface, Methods of Request Dispatcher, Request Dispatcher Application. **Reference: 2**	**12**

IV	**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. **Reference : 2**	**12**
V	**Networking in Java:** socket and networking, socket overview, proxy server, internet addressing, DNS, using UDP connection, using TCP connection, working with URL **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. **Reference : 1, 2**	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Core Java 8 for Beginners	Vaishali Shah, Sharnam Shah	SPD	1st	2015
2.	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9th	2014
3.	Murach's beginning Java with Net Beans	Joel Murach , Michael Urban	SPD	1st	2016
4.	Core Java, Volume I: Fundamentals	Hortsman	Pearson	9th	2013
5.	Core Java, Volume II: Advanced Features	Gary Cornell and Hortsman	Pearson	8th	2008
6.	Core Java: An Integrated Approach	R. Nageswara Rao	Dream Tech	1st	2008

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Advanced Java Practical		**Course Code: RJSUITP401**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	Details
1.	**Applet Programming**
a.	Write a Java program to demonstrate lifecycle of an applet
2.	**GUI Programming**
a.	Design a AWT program to print the factorial for an input value.
b.	Design an AWT program to perform various string operations like reverse string, string concatenation etc.
3.	**Layouts and Event Handling**
a.	Design an AWT application to demonstrate different layouts
b.	Write a java program to implement – Text Events Mouse Events Windows Event
4.	**Introduction to Servlet Programming**
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"
5.	**Servlet Programming with Cookies and Session**
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 visited servlet.
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.
6.	**Java Database Connectivity**
a.	Write a servlet program to demonstrate simple database connectivity
b.	Develop Simple Servlet Question Answer Application using Database.
7.	**JSP**
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).
8.	**JSP with Database Connectivity**
a.	Write a java program to generate a JSP application to demonstrate database connectivity.
b.	Generate a Guestbook application using taglib
9.	**Networking in Java**
a.	Create a socket program to implement TCP protocol
b.	Write a java program to implement UDP protocol
10.	**Implement the following Hibernate applications.**
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Core Java 8 for Beginners	Vaishali Shah, Sharnam Shah	SPD	1st	2015
2.	Java EE 6 For Beginners	Vaishali Shah, Sharnam Shah	SPD		2012
3.	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9th	2014

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT401 **Core Java**	**Course Outcomes 4.1:** Students will be able to 1. Understand basics of GUI programming using AWT in JAVA, 2. Understand different event handling techniques in JAVA. 3. Understand JDBC, Cookies and Session objects 4. Understand Servlet, Servlet lifecycle , SP 5. Understand implementation of network protocols using JAVA 6. Understand and implement Hibernate **Learning outcomes:** ➢ Students will understand how to design GUI applications using AWT. ➢ Students will be able to implement Java application using Servlet and JSP ➢ Students will be able to implement network protocols – UDP and TCP using Java ➢ Students will be able to understand Hibernate framework mapping
RJSUITP401 **Core Java Practical**	Course Outcomes : Students will be able to 1. Design GUI applications using different AWT layouts and classes. 2. Able to implement servlet, JSP to build applications 3. Able to implement Network protocols using

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Introduction to Embedded Systems		**Course Code: RJSUIT402**	
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:** Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems **Core of embedded systems:** microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components. **Characteristics and quality attributes of embedded systems:** Characteristics, operational and non-operational quality attributes.	**12**
II	**Embedded Systems – Application and Domain Specific:** Application specific – washing machine, domain specific - automotive. **Peripherals:** Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers. **Programming embedded systems:** structure of embedded program, infinite loop, compiling, linking and debugging.	**12**
III	**The 8051 Microcontrollers:** Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory. **Designing Embedded System with 8051 Microcontroller:** Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051. **8051 Programming in C:** Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.	**12**
IV	**Introduction to Arduino**: Arduinouno, Arduino Mega and Arduino Nano, Arduino and display devices, Arduino and digital input output devices (push button), Arduino and motors **Arduino Programming:** Arduino IDE, Installing and launching the IDE, program structure, Data types, variables, constants, control structure and loops, Functions **Arduino and wireless communication:** RF modem, global system for mobile modem	**12**
V	**Real Time Operating System (RTOS):** Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS. **Design and Development:** Embedded system development Environment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry	**12**

Books and References:

Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	Introduction to embedded systems	Shibu K V	Tata Mcgraw-Hill	1st	2012
2.	The 8051 Microcontroller and Embedded Systems	Muhammad Ali Mazidi	Pearson	2nd	2011
3.	Embedded Systems	Rajkamal	Tata Mcgraw-Hill		
4.	Arduino-Based Embedded Systems: Interfacing, Simulation, and LabVIEW GUI	Rajesh Singh, Anita Gehlot, Bhupendra Singh, Sushabhan Choudhury	CRC		2018

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Introduction to Embedded Systems Practical		**Course Code: RJSUITP402**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No		**Details**
1.		Demonstrate the use of reprogrammable computer to perform Programming, Execution and debugging of embedded program using - a. 8051 microcontroller b. Arduino Uno
2.	a)	To demonstrate use of general purpose port i.e. Input/ output port of two 8051 controllers for data transfer between them.
	b)	Demonstrate use of arduino ports using push button and LED
3.	a)	Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's
	b)	To interface 8 LEDs at Input-output port of 8051 microcontroller and create different patterns.
4.	a)	Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return.
	b)	To demonstrate interfacing of a seven-segment LED display with 8051 microcontroller and generate counting from 0 to 99 with fixed time delay.
5.	a)	Interface 8051 with D/A converter and generate a square wave of given frequency on the oscilloscope.
	b)	Interface 8051 with D/A converter and generate a triangular wave of given frequency on the oscilloscope.
	c)	Using a D/A converter generates sine waves on an oscilloscope with the help of a lookup table stored in a data area of 8051.
6.		Interface stepper motor with 8051 and write a program to move the motor through a given angle in clockwise or counterclockwise direction.
7.		Generate traffic signal using 8051 microcontroller
8.		Implement temperature controller using 8051

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT402 **Introduction to Embedded Systems**	Course Outcomes 4.2: Students will be able to Understand basic ideas behind embedded systems and to study various circuit elements which can act as core of embedded systems. Study different types of Embedded systems, embedded hardware and peripheral devices. Design and program embedded system using 8051 microcontroller Understand the real time operating system. Understand life cycle of an embedded product Learning outcomes: Student will understand the concepts – Embedded Systems, Real Time operating systems and their applications Students will understand the process of development of Embedded project development.
RJSUITP402 **Introduction to Embedded Systems Practical**	Course Outcomes: Students will be able to User programmable embedded computer using 8051 microcontroller, and arduino uno. Burn an executable program image into the relevant microcontroller. Implement a delay routine Use serial and parallel communication ports of 8051 microcontroller and arduino uno Use Digital to analog converter to generate waveforms using microcontroller

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Computer Oriented Statistical Techniques		**Course Code: RJSUIT403**	
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 Mean, Median, Mode, and Other Measures of Central Tendency**: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean,The Arithmetic Mean Computed from Grouped Data ,The Median,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles, Software and Measures of Central Tendency. **The Standard Deviation and Other Measures of Dispersion**: Dispersion, or Variation, The Range, The Mean Deviation, The Semi- Interquartile Range, The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Charlie's Check, Sheppard's Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion;Coefficient of variation, Standardized Variable, Standard Scores, Software and Measures of Dispersion. **Introduction to R:** Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays.	**12**

II	**Moments, Skewness, and Kurtosis**: Moments, Moments for Grouped Data, Relations Between Moments, Computation of Moments for Grouped Data, Charlie's Check and Sheppard's Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis. **Elementary Probability Theory**: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling's Approximation to n!, Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability. **Elementary Sampling Theory**: Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Di and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory	**12**
III	**Statistical Estimation Theory**: Estimation of Parameters, UnbiasedEstimates, Efficient estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error. **Statistical Decision Theory:** Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p- Values for Hypothesis Tests, Control Charts, Tests Involving SampleDifferences, Tests involving Binomial Distributions. **Statistics in R:** mean, median, mode, Normal Distribution, Binomial Distribution, Frequency Distribution in R.	**12**
IV	**Small Sampling Theory**: Small Samples, Student's t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi- Square Distribution, Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution. **The Chi-Square Test**: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Simple Formulas for Computing chi-square, Coe Contingency, Correlation of Attributes, Additive Property of chi- square.	**12**

V	**Curve Fitting and the Method of Least Squares:** Relationship Between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares, The LeastSquares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables. **Correlation Theory:** Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of correlation, Remarks concerning the Correlation coefficient, Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression.	**12**

Books and References:

Sr.No.	Title	Author/s	Publisher	Edition	Year
1.	Statistics	Murray R. Spiegel, Larry J. Stephens.	McGRAW – HILL INTERNATIONAL	4th	
2.	A Practical Approach using R	R.B. Patil, H.J. Dand and R. Bhavsar	SPD	1st	2017
3.	Fundamentals of Mathematical Statistics	S.C. GUPTA and V.K. KAPOOR	SULTAN CHAND and SONS	11th	2011
4.	Mathematical Statistics	J.N. KAPUR and H.C. SAXENA	S. CHAND	20th	2005

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Computer Oriented Statistical Techniques Practical		**Course Code: RJSUITP403**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	**Details**
1.	Using R execute the basic commands, array, list and frames.
2.	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
3.	Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram
4.	Using R import the data from Excel / .CSV file and Perform the above functions.
5.	Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance.
6.	Using R import the data from Excel / .CSV file and draw the skewness.
7.	Import the data from Excel / .CSV and perform the hypothetical testing.
8.	Import the data from Excel / .CSV and perform the Chi-squared Test.
9.	Perform the Linear Regression using R.
10.	Compute the Least squares means using R

Books and References:

Sr.No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	A Practical Approach to R Tool	R.B. Patil,H.J. Dand, R. Dahake	SPD	1st	2011
2.	STATISTICS	Murray R. Spiegel, Larry J. Stephens	McGRAW –HILL	4th	2006

S.Y. BSc I.T.	Semester IV Theory
RJSUIT403 **Computer Oriented Statistical Techniques**	Course Outcomes 4.3: Students will be able to 1. Gain knowledge in techniques to calculate the measures of central tendency and different measures of dispersion 2. Gain insight into consequences of plan by probability techniques and processing samples using sampling techniques 3. Draw valid conclusion using estimation theory and proper decision using decision theory 4. Measure experimental result based on hypothesis using chi square techniques 5. Learn techniques to correlate the relationship between various variables Learning outcomes: ➢ The objective of this course is to provide an understanding on statistical concepts to include measurements of location and dispersion, probability, probability distributions, sampling, estimation, hypothesis testing, regression, and correlation analysis, multiple regression and business/economic forecasting
RJSUITP403 **Computer Oriented Statistical Techniques Practical**	Course Outcomes: Students will be able to 1. Learn the basic programming concepts and implement various statistical techniques using R software 2. Calculate and apply measures of central tendency and measures of dispersion -- grouped and ungrouped data cases. 3. Perform Test of Hypothesis, non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit. 4. Compute and interpret the results of Regression and Correlation Analysis, for forecasting.

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Software Engineering		**Course Code: RJSUIT404**	
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:** What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc. **Software Development Process Models.** ● Waterfall Model. ● Prototyping. ● Iterative Development. ● Rational Unified Process. **Agile software development**: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. **Requirements Engineering Processes:** Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management.	**12**
II	**System Models:** Models and its types, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods. **Architectural Design:** Architectural Design Decisions, System Organization, Modular Decomposition Styles, Control Styles, Reference Architectures. **User Interface Design:** Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.	**12**
III	**Project Management** Software Project Management, Management activities, Project Planning, Project Scheduling, Risk Management. **Quality Management:** Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics. **Process Improvement:** Process and product quality, Process Classification, Process Measurement, Process Analysis and Modeling, Process Change, The CMMI Process Improvement Framework.	**12**
IV	**Verification and Validation:** Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. **Software Testing:** System Testing, Component Testing, Test Case Design, Test Automation. **Software Cost Estimation:** Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing	**12**

V	**Service Oriented Software Engineering:** Services as reusable components, Service Engineering, Software Development with Services. **Software reuse:** The reuse landscape, Application frameworks, Software product lines, COTS product reuse. **Distributed software engineering**: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Software Engineering, edition,	Ian Somerville	Pearson Education.	9th	
2.	Software Engineering	PankajJalote	Narosa Publication		
3.	Software engineering, a practitioner's approach	Roger Pressman	Tata Mcgraw-hill	7th	
4.	Software Engineering principles and practice	WS Jawadekar	Tata Mcgraw-hill		
5.	Software Engineering- A Concise Study	S.A Kelkar	PHI India.		
6.	Software Engineering Concept and Applications	Subhajit Dutta	Oxford Higher Education		
7.	Software Design	D. Budgen	Pearson Education	2nd	
8.	Software Engineering	KL James	PHI	EEE	2009

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Software Engineering Practical		**Course Code: RJSUITP404**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

List of Practical (To be executed using StarUML or any similar software)	
1.	Study and implementation of class diagrams.
2.	Study and implementation of Use Case Diagrams.
3.	Study and implementation of Entity Relationship Diagrams.
4.	Study and implementation of Sequence Diagrams.
5.	Study and implementation of State Transition Diagrams.
6.	Study and implementation of Data Flow Diagrams.
7.	Study and implementation of Collaboration Diagrams.
8.	Study and implementation of Activity Diagrams.
9.	Study and implementation of Component Diagrams.
10.	Study and implementation of Deployment Diagrams.

Books and References:

Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**
1.	Object - Oriented Modeling and Design	Michael Blaha, James Rumbaugh	Pearson		2011
2.	Learning UML 2. 0	Kim Hamilton, Russ Miles	O'Reilly Media		2006
3.	The unified modeling language user guide	Grady Booch, James Rumbaugh, Ivar Jacobson	Addison-Wesley		2005
4.	UML A Beginners Guide	Jason T. Roff	McGraw Hill Professional		2003

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT404 **Software Engineering**	Course Outcomes 4.4: Students will be able to 1. Gain a broad understanding of software engineering and its application in the development and management of software systems using System Modeling tool UML. Learning outcomes: ➢ Students will understand different approaches taken to develop different type of software systems during development life cycle. ➢ Students will understand the importance of Requirement Engineering, Project Management and Software Quality Assurance.
RJSUITP404 **Software Engineering Practical**	Course Outcomes: Students will be able to 1. Use StarUML - a complete solution to system modeling using several types of diagrams - Use Case Diagrams, Class Diagrams, Component Diagram, Sequence Diagram, Activity Diagram etc.

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Computer Graphics and Animation		**Course Code: RJSUIT405**	
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 Computer Graphics:** Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Video Display Devices, Cathode Ray Tube Basics, Raster Refresh (RasterScan) Displays, Random-Scan Display, Color CRT Monitors, Graphics Monitors and Workstations. **Scan conversion:** Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm. Bresenham's method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Boundary-Fill algorithm, Flood-Fill algorithm	**12**
II	**Two-Dimensional Transformations:** Basic Transformations: Translation, Rotation, Scaling. Transformations and Matrices, Transformation Conventions, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composite Transformation: Translations, Rotation, Reflection, Scaling, Shearing , Transformation of Points, Transformation of The Unit Square, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations, Clipping Operations: Line Clipping algorithms–Cohen-Sutherland and LiangBarsky, Polygon Clipping Algorithms- Sutherland Hodgeman and Weiler Atherton, Curve Clipping, Text Clipping. **Three-Dimensional Transformations:** Three-Dimensional Translation, Three-Dimensional Scaling, ThreeDimensional Shearing, Three-Dimensional Rotations, Three-Dimensional Reflection, Matrix Representation of 3D Transformations, Composite 3D Transformations.	

III	**Viewing in 3D** Viewing Pipeline, Viewing Coordinates, Examples of 3D Viewing, Projections: Parallel Projections, Perspective Projections, Orthographic Projections, Oblique Projections, View Volumes and General Projection Transformations, Viewport Clipping, Clipping in Homogeneous Coordinates. **Light:** Basic Light Sources, Basic Illumination Models: Ambient Light, Diffuse Reflection, Intensity Attenuation, Transparency, Shadows. **Color Models and Color Applications:** Chromaticity Diagram, Color Models.	**12**
IV	**Visible-Surface Determination:** Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, Painter's algorithms, BSP tree Method, Curved Surfaces, Wireframe Methods **Plane Curves and Surfaces:** Curve Representation, Spline Representation, Cubic Splines, Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, and Quadric Surfaces. Bezier Surfaces.	**12**
V	**Computer Animation:** Principles of Animation, General Computer Animation Functions, Key frame Systems, Morphing, Character Animation, Physics-Based Animation, Procedural Techniques. **Image Manipulation and Storage:** What is an Image? Digital image file formats, Image compression standard– JPEG, Image Processing-Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Computer Graphics	Donald Hearn, M. Pauline Baker	Pearson	2nd	
2.	Computer Graphics - Principles and Practice	J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes	Pearson	2nd	
3.	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	CRC press	4th	2016

B.Sc.(Information Technology)		**Semester–IV**	
Course Name: Computer Graphics and Animation Practical		**Course Code: RJSUITP405**	
Periods per week(1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½ 2**	**50**
	External	**--**	**--**

Practical No	Details
1.	**Solve the following:**
a.	Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them.
b.	Draw a coordinate axis at the center of the screen.
2.	**Solve the following:**
a.	Divide your screen into four regions, draw a circle, rectangle, ellipse and half ellipse in each region with appropriate message.
b.	Draw a simple hut on the screen.
3.	**Draw the following basic shapes in the center of the screen :**
	i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line
4.	**Solve the following:**
a.	Develop the program for DDA Line drawing algorithm.
b.	Develop the program for Bresenham's Line drawing algorithm.
5.	**Solve the following:**
a.	Develop the program for the mid-point ellipse drawing algorithm.
6.	**Solve the following:**
a.	Write a program to implement 2D scaling.
b.	Write a program to perform 2D translation
7.	**Solve the following:**
a.	Perform 2D Rotation on a given object.
b.	Program to create a house like figure and perform the following operations. i. Scaling about the origin followed by translation. ii. Scaling with reference to an arbitrary point. iii. Reflect about the line y = mx + c.
8.	**Solve the following:**
a.	Write a program to implement Cohen-Sutherland clipping.
b.	Write a program to implement Liang - Barsky Line Clipping Algorithm
9.	**Solve the following:**
a.	Write a program to fill a circle using the Flood Fill Algorithm.

b.	Write a program to fill a circle using the Boundary Fill Algorithm.
10.	**Solve the following:**
a.	Develop a simple text screen saver using graphics functions.
b.	Perform smiling face animation using graphic functions.

S.Y. B.Sc. I.T.	Semester IV Theory
RJSUIT405 **Computer Graphics and Animation**	Course Outcomes 4.5: Students will be able to 1. Understand core concepts of computer graphics and computer animation. 2. Learn different graphics algorithms. 3. Apply graphics programming techniques to design, and create computer graphics applications Learning outcomes: ➢ Students will demonstrate their ability to use computer graphics techniques, models, and algorithms to solve graphics problems.
RJSUITP405 **Computer Graphics and Animation Practical**	Course Outcomes: Students will be able to 1. Draw line, circle, rectangle, ellipse and half ellipse in C, C++ or python 2. Develop programs for different algorithms like DDA, Bresenham's, midpoint circle drawing, midpoint ellipse drawing, Clipping and Fill algorithms. 3. Implement 2D scaling and translation 4. Implement animation programs.

B.Sc. (Information Technology)		**Semester–II**	
Course Name: Mini Project Implementation		**Course Code: RJSUDSE401**	
Periods per week (1 Period is 50 minutes)		**4**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Project Implementation**	**1½**	**50**
	Documentation	**--**	**50**

Project and Viva Voce	
1.	A project should be done based on one of the technologies learned in the duration of Semester I to Semester III; or using any other suitable software technology. Sample problem definitions are given below. Student can choose the topic of their interest and develop a mini project after getting the topic approved by respective project guide. **Problem Statement 1** **Web Application** Create a website for ticket booking of a "RJ Cinema". There will be two types of users for the web site – • Employees of theatre who will add details regarding the movie shows and show timings. • Users who will book the tickets online. Details regarding the show timings, Name of the film playing and production house will be maintained. Report of total tickets sold for the show and total income of a movie per day will be generated **Problem Statement 2 Desktop application** Design a desktop course management system for RJ College. There will be three modules in the project - Administrator, Student and Instructor • Admin module - Create, Delete or update student and instructor user logins. Create, Delete or update course details. Course details can be - Course Code, Title, Level. Administrator will attach instructor and students to courses. • Instructor module - Create materials, Assignments for allotted courses. Review student assignment and grade Student module - View materials, submit assignments, view grades **Problem Statement 3** **Mobile application** Voting App - Online voting mobile App can be designed for conducting Elections Standing in long queues and waiting for your turn for voting is no less than a challenge. Voting app would be a great help for voters to vote in a hassle-free manner. This app will have two modules- admin and user. • Admin Module- The admin will create new election add candidates list with their symbols to the new election, schedule the voting duration and assign users to vote. There will be OTP generation, verification of voters, and voting

	• User Module-Voters can verify themselves (Mobile no,Aadhar no) with the already existing data. And once the identity is confirmed, OTP (One Time Password) will be sent to their phone numbers. Subsequently, the voters can vote by selecting their candidate **Problem Statement 4** **Game Application** Game apps can be designed for different target audiences, such as arcade games, brain training puzzles Designing a maze game with different levels of twists and turns, decisions and dead ends. Player will choose the level 1 maze right from the start of the game. Player must finish the path quickly following the timer set If the player gets lost in maze for more than 30 sec, the hint path should be indicated with negative score Score of Player can maintained at summing up score at each level Complex levels can be incorporated by putting obstacles or beasts coming from anywhere in the maze. Player can kill them to continue to move along. Beasts can also kill the player leading to end the game.
2.	The project can be done individually or a group of two students.
3.	The students will have to present the project during the examination. They must create a presentation including following details – 1. Technology used 2. About the project – Objective and features 3. Actual working
4.	Students will prepare minor project documentation. Format of documentation Chapter 1: Introduction - About the project, who will use the project, feasibility of the project, software and hardware requirements, technology used Chapter 2: Design - Use case, Activity diagram, ER diagram, Database Schema Chapter 3: Implementation - UI design Screen shots, code Chapter 4: Conclusion - Report / conclusion of project with limitations and future scope
5.	Soft copy of the presentation and executable of the implementation / video or screen recording of working project should be uploaded in the examination portal provided. (Google classroom or any other)

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 the Theory and Practical Exam is 40 %.
5. Students must appear for at least one of the two Internal Tests to be eligible for the Semester End Examination.
6. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of S.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 S.Y. B.Sc. Information Technology as per the minimum requirements.
7. In case of loss of a journal, a candidate must produce a certificate from the Head of the department /Institute that the practical 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.

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 2021-22)

Refer to page no: 06

highlighting component

of Research Project

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

Course Structure (Information Technology)

Details of courses under B.Sc. Program

	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

Eligibility Criteria

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

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

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		Object Oriented Programming	
	Computer Networks			
	Database Management Systems			
	Applied Mathematics			
IV	Introduction to Embedded Systems		Advanced 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	

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

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	Object Oriented 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	Object Oriented 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	Advanced 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	Advanced Java Practical	2
	Core Subject I Practical	Introduction to Embedded Systems Practical	2

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

	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 Practical	2
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	Software Quality Assurance Practical	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	Project Implementation	2
Total Credits			**120**

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

Course Structure

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	2	1. Introduction to Enterprise Linux, Managing software 2. Network in Linux, users, groups and permissions 3. Cryptographic services 4. Server configuration 5. Shell Scripting
RJSUIT505	Next Generation Technologies	2	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	Next Generation Technologies Practical	2	
Total		20	

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

RJSUIT604	Principles of Geographic Information Systems (Elective-I)	2	1. Introduction to GIS, Models and representations 2. Data Management and processing systems 3. Spatial Referencing and Positioning, Data Entry and Preparation 4. Spatial data analysis 5. Data Visualization
RJSUIT604	Enterprise Networking (Elective-II)		1. Network Design and design models 2. Design – LAN, Data center, Wireless LAN 3. WAN Technologies 4. Network protocols 5. Managing Security
RJSUIT605	IT Service Management (Elective-I)	2	1. IT service management, Service Strategy Principles and risks 2. Service design principle and processes 3. Service Transition principles and processes 4. Service operation 5. Continual Service Improvement
RJSUIT605	Cyber Laws (Elective-II)		1. IT Act 2000 – Arrest without warrant, Crime and criminal justice 2. Contracts in Infotech 3. Jurisdiction in cyber world 4. Copyright protection 5. E commerce taxation, Digital signature and E Governance 6. Protection of cyber-Consumers in India
RJSUITP601	Software Quality Assurance Practical using tools – Selenium, AutoIT	2	
RJSUITP602	Security in Computing Practical	2	
RJSUITP603	Business Intelligence Practical	2	
RJSUITP604	Principles of Geographic Information Systems Practical (Elective-I)	2	

RJSUITP604	Enterprise Networking Practical (Elective-II)		
RJSUITP605	Project Implementation (for both electives)	2	
Total		20	

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

Mapping of the courses to employability / entrepreneurship / skill development
SEMESTER V

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

		Unit III :Securing Server with ip tables, Setting Up Cryptographic Services, Configuring Server for File Sharing Unit IV :Configuring DNS and DHCP, Setting Up a Mail Server, Configuring Apache on Red Hat Enterprise Linux Unit V :Introducing Bash Shell Scripting, High-Availability Clustering, Setting Up an Installation Server
RJSUIT505	Next Generation Technologies	**Skill Enhancement** Unit I :Big data, NoSQL, Introduction to MongoDB Unit II:The MongoDB Data model, Using MongoDB Shell, MongoDB Architecture Unit III :MongoDB Storage Engine, MongoDB Use Cases, MongoDB Limitations, MongoDB Best Practices Unit IV :The End of Disk? SSD and In-Memory Databases, jQuery Unit V :JSON
RJSUITP501	Project Dissertation	**Skill Enhancement**
RJSUITP502	Internet of Things Practical	**Skill Enhancement**
RJSUITP503	Advanced Web Programming Practical	**Skill Enhancement, Employability**
RJSUITP504	Linux Administration Practical	**Skill Enhancement, Employability**
RJSUITP505	Next Generation Technologies Practical	**Skill Enhancement**

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

SEMESTER VI

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

		Unit IV: Spatial Data Analysis, Classification of analytical GIS Capabilities, GIS and Application models, Error Propagation in spatial data processing Unit V: Data Visualization, GIS and Maps, The Visualization Process Visualization, Strategies: Present or explore? Map Cosmetics, Map Dissemination, The cartographic toolbox
RJSUIT604	Enterprise Networking	**Skill Enhancement** Unit I: General Network Design, Network Design Models Unit II: Enterprise LAN Design, Data Center Design Unit III: Wireless LAN Design, WAN Technologies and the Enterprise Edge, WAN Design Unit IV: Internet Protocol Version 4, case Study, Internet Protocol Version 6 Unit V: Managing Security
RJSUIT605	IT Service Management	**Skill Enhancement** Unit I: IT Service Management, Service Strategy Principles, Service Strategy, Challenges, Critical Success factors and risks Unit II: Service Design, Service Design Principles, Service Design Processes, Challenges, Critical Success factors and risks Unit III: Service Transition, Service Transition Principles, Service Transition Processes, Challenges, Critical Success factors and risks Unit IV: Service Operation, Service Operation Principles, Service Operation Processes, Challenges, Critical Success factors and risks Unit V: Continual Service Improvement (CSI) Principles, CSI Process, CSI Methods and Techniques, organising for CSI, Technology considerations, Implementing CSI
RJSUIT605	Cyber Laws	**Skill Enhancement** Unit I: Power of Arrest Without Warrant Under the IT Act, 2000, Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000 Unit II: Contracts in the Infotech World, Jurisdiction in the Cyber World Unit III: Battling Cyber Squatters and Copyright Protection in the Cyber World Unit IV: E-Commerce Taxation: Real Problems in the Virtual World, Digital Signature, Certifying Authorities and E-Governance

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

		Unit V: The Indian Evidence Act of 1872 v. Information Technology Act, 2000, Protection of Cyber Consumers in India
RJSUITP601	Software Quality Assurance Practical using tools – Selenium, AutoIT	**Skill Enhancement:** 1. Manual Testing 2. Automation Testing using Selenium- IDE, WebDriver, AutoIT and WAPT
RJSUITP602	Security in Computing Practical	**Skill Enhancement**
RJSUITP603	Business Intelligence Practical	**Skill Enhancement**
RJSUITP604	Principles of Geographic Information Systems Practical	**Skill Enhancement**
RJSUITP604	Enterprise Networking Practical	**Skill Enhancement**
RJSUITP605	Project Viva Voca	**Skill Enhancement, Employability**

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

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	Lectures
I	**Introduction to Software Project Management**: Introduction, why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Projects, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. **Project Evaluation and Programme Management**: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programme, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. **An Overview of Project Planning**: Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step7: Allocate Resources, Step8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning	**12**
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, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	**12**
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.	**12**

	Project Closeout: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report.	

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

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

Guidelines

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

approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

SOFTWARE AND BROAD AREAS OF APPLICATION

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

The project report should be documented with 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
1.2 Objectives
1.3 Purpose, Scope, and Applicability
  1.3.1 Purpose
  1.3.2 Scope
  1.3.3 Applicability

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

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

CHAPTER 4: SYSTEM DESIGN

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

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

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. **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.	**12**

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 on the Raspberry Pi, Some Notes on the Hardware, Openness. **Limitations and Challenges :** IOT for the sake of IOT – lack of practical usefulness, compelling but limited features, lack of control, Basic challenges of security and privacy, security is given but it can be a myth, privacy is not given	**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, Government Funding, Crowdfunding, Lean Startups.	**12**
V	**Moving to Manufacture:** What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community. **Ethics:** Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	WILEY	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

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

Practical No.	**Details**
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
1	Displaying different LED patterns with Raspberry Pi.
2	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi
3	Raspberry Pi Based Oscilloscope
4	Controlling Raspberry Pi with Terminal.

5	Setting up Wireless Access Point using Raspberry Pi
6	Fingerprint Sensor interfacing with Raspberry Pi
7	Raspberry Pi GPS Module Interfacing
8	Visitor Monitoring with Raspberry Pi and Pi Camera
9	Interfacing Raspberry Pi with RFID.
10	Building Google Assistant with Raspberry Pi.

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**

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

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

	ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.	

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

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

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

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

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 the 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 of 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 Data Binding using dropdown list control.
b.	Create a web application to display the phone no of an author using a database.
c.	Create a web application for inserting and deleting records from a database. (Using Execute-Non Query).
8.	**Working with data controls**
a.	Create a web application to demonstrate various uses and properties of SqlDataSource.
b.	Create a web application to demonstrate data binding using DetailsView and FormView Control.
c.	Create a web application to display Using Disconnected Data Access and Data binding using GridView.
9.	**Working with GridView control**
a.	Create a web application to demonstrate use of GridView control template and GridView hyperlink.
b.	Create a web application to demonstrate use of GridView button column and GridView events.
c.	Create a web application to demonstrate GridView paging and Create own table format using GridView.
10.	**Working with AJAX and XML**
a.	Create a web application to demonstrate reading and writing operations with XML.

b.	Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties.
c.	Create a web application to demonstrate use of various Ajax controls.
11.	**Programs to create and use DLL**

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 **Working with Users, Groups, and Permissions**: Managing Users and Groups, Commands for User Management, Managing Passwords,Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management,Using External Authentication Sources, the Authentication Process,sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership,	**12**

	Basic Permissions: Read, Write,and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes	
III	**Securing Server with ip tables:** Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with ip tables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced ip tables Configuration, Configuring Logging, The Limit Module, Configuring NAT **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, 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.	**12**
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. **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	**12**

Books and References:

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

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

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

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

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

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

T.Y.B.Sc. I.T.	Semester V Theory
RJSUIT504 **Linux System Administration**	Course Outcomes : 5.4.2 1. Getting introduced to the Linux operating system, starting up and shutting down a Linux system. 2. Understanding the role and duties of a system administrator 3. Use of system configuration files in Linux and TCP/IP network configuration files. 4. Use of windows configuration server, time server and caching proxy server 5. Use of secured and unsecured internet services – FTP, SSH etc. 6. Understanding the concept of domain name server, types of DNS. 7. Configuring mail services in Linux system 8. Configuring and using a web server. 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 administration 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.

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

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

Unit	Details	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**
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	**12**

	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	
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 **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	**12**
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 **jQuery:** Introduction, Traversing the DOM, DOM Manipulation with jQuery, Events, Ajax with jQuery, jQuery Plug-ins, jQuery Image Slider	**12**
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**

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

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		

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

Practical No	**Details**
1	**MongoDB Basics**
a	Write a MongoDB query to create and drop databases.
b	Write a MongoDB query to create, display and drop collection
c	Write a MongoDB query to insert, query, update and delete a document.
2	**Simple Queries with MongoDB**

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

T.Y.B.Sc. I.T.	Semester V Theory
RJSUIT505 **Next Generation Technologies**	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:

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

	➢ 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

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

SEMESTER- VI

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

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, Organization Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.	**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), Test Methodologies /Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing	**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, **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.	**12**
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, Testing Stages. **Special Tests:** Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusinesse Commerce Testing, AgileDevelopment Testing, Data Warehousing Testing.	**12**

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: Software Quality Assurance Practical		**Course Code: RJSUITP601**	
Periods per week (1 Period is 50 minutes)		**3**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

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

		Implementation of Our First WebDriver Script
7.		Check Visibility Of Web Elements (buttons, drop boxes, checkboxes, radio buttons, labels etc) Using WebDriver Commands-isDisplayed(), isSelected(), isEnabled()
Testing Tool: AutoIT		
8.		Implement Iterative and decision-making structures
9.		Handling different windows application (Calculator, MS Excel, MS Word, Notepad) using AutoIt
Testing Tool: WAPT		
10.		To perform Load and performance testing

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

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 **Software Quality Assurance Practical**	Course Outcomes : After successful completion of project, student will be able to 1. Perform manual testing. 2. Download, install and write scripts using Selenium IDE and AutoIT 3. Perform Load and Performance Testing using WAPT

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

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

Unit	Details	Lectures
I	**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**
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	**12**

	Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	
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**

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.

d	Configuring IPv6 ACLs
5	**Configuring a Zone-Based Policy Firewall**
6	**Configure IOS Intrusion Prevention System (IPS) Using the CLI**
a	Enable IOS IPS.
b	Modify an IPS signature.
7	Layer 2 Security
a	Assign the Central switch as the root bridge
b	Secure spanning-tree parameters to prevent STP manipulation attacks
c	Enable port security to prevent CAM table overflow attacks
8	**Layer 2 VLAN Security**
9	**Configure and Verify a Site-to-Site IPsec VPN Using CLI**
10	**Configuring ASA Basic Settings and Firewall Using CLI**
a	Configure basic ASA settings and interface security levels using CLI
b	Configure routing, address translation, and inspection policy using CLI
c	Configure DHCP, AAA, and SSH
d	Configure a DMZ, Static NAT, and ACLs

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT602 **Security in Computing**	Course Outcomes : 6.2 1. At the end of the course, the students will have firm understanding on basic terminology and concepts related to network and system level security, basics of computers and networking including Internet Protocol, routing, Domain Name Service, and network devices. 2. They are also exposed to basic cryptography, security management, and network security techniques. 3. They also look at policies as a tool to effectively change an organization's culture towards a better secure environment Learning outcomes: After studying this course, you should be able to: ➢ Define what information is

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

	➢ Appreciate the value of information to the modern organization ➢ 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

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**	**Lectures**
I	**Business intelligence:** Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence **Decision support systems:** Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	**12**

II	**Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models **Data mining:** Definition of data mining, Representation of input data , Data mining process, Analysis methodologies **Data preparation**: Data validation, Data transformation, Data reduction	**12**
III	**Classification**: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines **Clustering:** Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	**12**
IV	**Business intelligence applications:** **Marketing models**: Relational marketing, Sales force management, **Logistic and production models**: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. **Data envelopment analysis**: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	**12**
V	**Knowledge Management:** Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management **Artificial Intelligence and Expert Systems:** Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	**12**

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

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

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 selected database.
	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 Chart to perform data analysis.
6.		Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
7.		Perform the data classification using classification algorithm.
8.		Perform the data clustering using clustering algorithm.

9.		Perform the Linear regression on the given data warehouse data.
10.		Perform the logistic regression on the given data warehouse data.

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT603 **Business Intelligence**	Course Outcomes : 6.3 After this course student will be able to understand 1. The process of analyzing data and presenting information used to make decision. 2. Understand and represent decision making systems 3. Data mining process and analysis methodologies 4. Classification of problems and clustering 5. Supply chain optimization and optimization models 6. Knowledge management and expert systems 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 data warehouse 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

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**

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

		Hours	Marks
Evaluation System	**Theory Examination**	**2 2**	**60**
	Internal	**--**	**40**

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

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

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 continuous data	**12**
IV	**Spatial Data Analysis** **Classification of analytical GIS Capabilities** **Retrieval, classification and measurement:** Measurement, Spatial selection queries, Classification **Overlay functions:** Vector overlay operators, Raster overlay operators **Neighborhood functions:** Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis **Analysis:** Network analysis, interpolation, terrain modeling **GIS and Application models:** GPS, Open GIS Standards, GIS Applications and Advances **Error Propagation in spatial data processing:** How Errors propagate, Quantifying error propagation	**12**
V	**Data Visualization** **GIS and Maps, The Visualization Process Visualization Strategies: Present or explore?** **The cartographic toolbox:** What kind of data do I have?, How can I map my data? **How to map?:** How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series **Map Cosmetics, Map Dissemination**	**12**

B.Sc.(Information Technology)	**Semester–VI**
Course Name: Principles of Geographical Information System Practical	**Course Code: RJSUITP604 (Elective I)**

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

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

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

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

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 Universit y Press	3rd	1999
3.	Fundamentals of Spatial Information Systems,	R. Laurini and D. Thompson,	Academi c Press		1994
4.	Fundamentals of Geographic Information Systems	Michael N. Demers	Wiley Publicatio ns	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	

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

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

Unit	**Details**	**Lectures**
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 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	**12**
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 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,	**12**

	Application Load Balancing, Network Load Balancing.	
III	**Wireless LAN Design:** Wireless LAN Technologies, WLAN Standards, ISM and UNIIF frequencies, Summary of WLAN Standards, Service Set Identifier, WLAN Layer 2 Access Method, WLAN Security, Unauthorized Access, WLAN Security Design Approach, IEEE 802.1X-2001 Port-Based Authentication, Dynamic WEP Keys and LEAP, Controlling WLAN Access to Servers, WLAN Authentication, Authentication Options, WLAN Controller Components, WLC Interface Types, AP Controller Equipment Scaling, Roaming and Mobility Groups, Intra controller Roaming, Layer 2 Intercontroller Roaming, Layer 3 Intercontroller Roaming, Mobility Groups, WLAN Design, Controller Redundancy Design: Deterministic vs. Dynamic, N+1 WLC Redundancy, N+N WLC Redundancy, N+N+1 WLC Redundancy, Radio Management and Radio Groups, RF Groups, RF Site Survey, Using EoIP Tunnels for Guest Services, Wireless Mesh for Outdoor Wireless, Mesh 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 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	**12**

	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 Aggregable IPv6 Address , IPv4-Compatible IPv6 Address IPv6 Anycast Addresses , IPv6 Multicast Addresses IPv6 Mechanisms ICMPv6 , IPv6 Neighbor Discovery Protocol IPv6 Name Resolution , Path MTU Discovery IPv6 Address-Assignment Strategies , Manual Configuration SLAAC of Link-Local Address , SLAAC of Globally Unique IPv6 Address DHCPv6 , DHCPv6 Lite IPv6 Security IPv6 Routing Protocols RIPng OSPFv3 , BGP4 Multiprotocol Extensions (MP-BGP) forIPv6, IPv6 Addressing Design , Planning for Addressing with IPv6 , Route Summarization with IPv6 IPv6 Private Addressing 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	**12**

	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 Network Management Protocols, Simple Network Management ProtocolSNMPComponents,MIBSNMPMessageVersionsSNMPv1 SNMPv2 SNMPv3 , Other Network Management Technologies RMON , RMON2 NetFlow Compared to RMON and SNMP , CDP LLDPSyslog	**12**

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

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

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

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

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**
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. INFORMATION TECHNOLOGY Syllabus Semester V & VI

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 4. Configure Firewalls

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

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

Unit	Details	Lectures
I	**IT Service Management:** Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialization and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the lifecycle. **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, Service and Deployment Management, Service Validation and Testing, 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,	**12**

	Operational activities of processes covered in other lifecycle phases. **Challenges, Critical Success factors and risks:** Challenges, Critical Success factors, Risks	
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.	
	CSI Methods and Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes, **Organizing for CSI:** Organizational 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

Course Name: Cyber Laws		**Course Code: RJSUIT605 (Elective II)**	
Periods per week (1 Period is 50 minutes)		**5**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**2 2**	**60**
	Internal	**--**	**40**

Unit	Details	Lectures
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, Criminal Justice 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 State of 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-Residents under the Income Tax Act,1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance. **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.	**12**

	Protection of Cyber Consumers in India: Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Forums, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000	

Books and References:

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

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

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

T.Y.B.Sc. I.T.	Semester VI Theory
RJSUIT605 **IT Service Management**	After completion of the 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.
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.
RJSUITP605 **Project Viva Voce 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

Scheme of Examinations

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