**Rayat Shikshan Sanstha's
KARMAVEER BHAURAO PATIL COLLEGE,
VASHI. NAVI MUMBAI
(AUTONOMOUS COLLEGE)**

Sector-15- A, Vashi, Navi Mumbai - 400 703

Program: B.Sc. Information Technology

Syllabus for S.Y.B.Sc. Information Technology

**(Choice Based Credit, Grading and Semester System
with effect from the academic year 2022-2023)**

Rayat Shikshan Sanstha's

Karmaveer Bhaurao Patil College Vashi, Navi Mumbai

Autonomous College

[University of Mumbai]

Syllabus

Sr. No.	Heading	Particulars
1	**Title of Course**	**S.Y.B.Sc. Information Technology**
2	**Eligibility for Admission**	12th**Maths**
3	**Passing Marks**	**40%**
4	**Ordinances/Regulations (if any)**	
5	**No. of Years/Semesters**	**One year/Two semester**
6	**Level**	**U.G.**
7	**Pattern**	**Semester**
8	**Status**	**Revised**
9	**To be implemented from Academic year**	**2022-2023**

Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil College, Vashi Navi Mumbai (Autonomous)
Department of Information Technology
B.Sc. Information Technology

Program Outcomes (POs)

Learners are able to-

PO-1	**Disciplinary Knowledge and Skills**	Acquire the comprehensive and in-depth knowledge of various subjects in sciences such as Physics, Chemistry, Mathematics, Microbiology, Bio-analytical Science, Computer Science, Data Science, Information Technology and disciplinary skills and ability to apply these skills in the field of science, technology, and its allied branches
PO-2	**Communication and Presentation Skills**	Develop various communication skills including presentation to express ideas evidently to achieve common goals of the organization.
PO-3	**Creativity and Critical Judgment**	Facilitate solutions to current issues based on investigations, evaluation and justification using evidence-based approach.
PO-4	**Analytical Reasoning and Problem Solving**	Build critical and analytical attitude in handling the problems and situations.
PO-5	**Sense of Inquiry**	Curiously raise relevant questions based on highly developed ideas, scientific theories and its applications including research.
PO-6	**Use of Digital Technologies**	Use various digital technologies to explore information/data for business, scientific research, and related purposes.
PO-7	**Research Skills**	Construct, collect, investigate, evaluate, and interpret information/data relevant to science and technology to adapt, evolve and shape the future.
PO-8	**Application of Knowledge**	Develop a scientific outlook to create consciousness against the social myths and blind faith.
PO-9	**Moral and Ethical Reasoning**	Imbibe ethical, moral, and social values to develop virtues such as justice, generosity, and charity as beneficial to individuals and society at large.
PO-10	**Leadership and Teamwork**	Work cooperatively and lead proactively to achieve the goals of the organization by implementing the plans and projects in various field-based situations related to science, technology, and society at large.
PO-11	**Environment and Sustainability**	Create social awareness about the environment and develop sustainability for betterment of the future.
PO-12	**Lifelong Learning**	Realize that pursuit of knowledge is a lifelong activity and in combination with determined efforts, positive attitude and other qualities to lead a successful life.

<table>
<tr><td colspan="2" align="center">Department of Information Technology
Program Specific Outcomes (PSO)</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>PSO-1</td><td>To acquaint students with the fundamental of computer hardware and software in information technology</td></tr>
<tr><td>PSO-2</td><td>To develop analytical skills and critical thinking through application of theory knowledge into practical course</td></tr>
<tr><td>PSO-3</td><td>To construct and apply knowledge of programming, and appreciate the relationship between several programming languages and other disciplines</td></tr>
<tr><td>PSO-4</td><td>To enable students to understand IT and its industrial and social context</td></tr>
</table>

Scheme of examination for Each Semester:

Continuous Internal Evaluation: 40 Marks(Common Test-20 Marks & 20 Marks for- Assignment, Projects, Group discussion, Open book test, online test etc.)
Semester End Examination: 60 Marks will be as follows -

<table>
<tr><td rowspan="10">I.</td><td colspan="2">Theory: The Semester End Examination for theory course work will be conducted as
per the following scheme.</td></tr>
<tr><td colspan="2">Each theory paper shall be of two and half hour duration.</td></tr>
<tr><td colspan="2">All questions are compulsory and will have internal options.</td></tr>
<tr><td>Q – I</td><td>From Unit – I (having internal options.) 10 M</td></tr>
<tr><td>Q – II</td><td>From Unit – II (having internal options.) 10 M</td></tr>
<tr><td>Q – III</td><td>From Unit – III (having internal options.) 10 M</td></tr>
<tr><td>Q – IV</td><td>From Unit – IV (having internal options.) 10 M</td></tr>
<tr><td>Q-V</td><td>From Unit – V (having internal options.)10 M</td></tr>
<tr><td>Q-VI</td><td>From Unit – VI (having internal options.) 10 M</td></tr>
</table>

<table>
<tr><td>II.</td><td>Practical</td><td>The Semester End Examination for practical course work will be conducted as per the following scheme.</td></tr>
</table>

Sr. No.	Particulars of Semester End Practical Examination	Marks%
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	**50**

Course Code	Course Type	Course Title	Credits	Course Code	Course Title	Credits	Total Credits	Total
UGIT301	CORE COURSE	Applied Mathematics	04	UGIT3P1	Applied Mathematics Practical	02	06	26
UGIT302 A	CORE COURSE	Introduction to Digital Electronics	04	UGIT3P2	Introduction to Digital Electronics Practical	02	06	
UGIT303	CORE COURSE	Database Management System	04	UGIT3P3	Database Management System Practical	02	06	
	Elective: Skill Enhancement Course (SEC)			UGIT3P4 A UGIT3P4 B	**Elective (Any one)** Linux System Administration Practical OR Core Java Practical	02 02	02	
UGIT305 A UGIT305.1 B	**Elective: Discipline Specific DSE**	**Elective (Any one)** Web Technology OR Research Methodology	04 04	UGIT3P5 A UGITP305.1 B	**Elective (Any one)** Web Technology Practical OR Research Methodology Practical	02 02	06	

Course Code	Course Type	Course Title	Credits	Course Code	Course Title	Credits	Total Credits	Total
UGIT401	CORE COURSE	Computer Oriented Statistical Techniques	04	UGIT4P1	Computer Oriented Statistical Techniques Practical	02	06	
UGIT402	CORE COURSE	Python Programming.	04	UGIT4P2	Python Programming Practical	02	06	26
UGIT403	CORE COURSE	Data Structure	04	UGIT4P3	Data Structure Practical	02	06	
	Elective: Skill Enhancement Course (SEC)			UGIT4P4 A OR UGIT4P4 B	Elective (Any one) Introduction to Embedded System Practical OR Enterprise Java Practical	02 02	02	
UGIT405 .1A UGIT405 .1B	Elective: Discipline Specific DSE	Elective (Any one) Supply chain Management OR Statistical tools in Research	04 04	UGITP405. 1A OR UGITP405 .1B	Supply chain Management Practical Statistical tools in Research Practical	02 02	06	

Semester -III

B. Sc (Information Technology)		Semester - III	
Course Name: Applied Mathematics		**Course Code: UGIT301**	
Periods per week (1 Period is 60 minutes)		4	
Credits		4	
		Hours	**Marks**
Evaluation System	**Theory Examination**	2	60
	Internal	--	40

UGIT301 Applied Mathematics

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Compute a given integral using the most efficient method.
CO-2: Use integrals to formulate and solve application problems in science and engineering.
CO-3: Construct and plot parametric and polar curves.
CO-4: Identify different types of series and determine whether a particular series converges.
CO-5: Find the interval of convergence of a power series.

ICT Tools Used: Videos, PPT, Pen-Table, Mobile apps, Scilab

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/complexnumbers/
2. https://www.coursera.org/learn/ordinary-differential-equations
3. https://onlinecourses.nptel.ac.in/noc23_ma54/preview

The CO-PO Mapping Matrix

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	-	2	-	-	-	1	-	-	1	-
CO 2	-	-	-	3	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	2	-	-	-	1	-
CO 4	2	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	2	-	-	-	-	-	-	-	2

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.	10

II	**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, 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)	10
III	**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

Differential equation of the first order of a degree higher than the first: Introduction, Solvable for p (or the method of factors), Solve for y, Solve for x, Clairaut's form of the equation, Methods of Substitution, 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 | 10 |
| IV | **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
The 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) | 10 |

V	**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.	10

VI	**Beta and Gamma Functions: Definitions,** Properties and Problems. Duplication formula. **Differentiation Under the Integral Sign :** Introduction , Leibnitz Theorem for DUIS **Error Functions:**Introduction, Definitions of Error Functions, Properties of Error Functions.	10

Books and References:

Sr. No.	Title	Author/s	Publisher
1.	A text book of Applied Mathematics Vol I	P. N. Wartikar and J. N. Wartikar	Pune VidyathiGraha
2.	Applied Mathematics II	P. N. Wartikar and J. N. Wartikar	Pune VidyathiGraha
3.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications

B. Sc (Information Technology)		Semester - III	
Course Name: Applied Mathematics Practical		**Course Code: UGIT3P1**	
Periods per week (1 Period is 60 minutes)		**4**	
Credits			**2**
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	--	--

UGIT3P1 Applied Mathematics Practical

Course Outcomes: After successful completion of this course, students will be able to: **CO-1:** Analyze and solve first-order differential equations of degrees higher than one, employing appropriate techniques.

CO-2: Solve linear differential equations with constant coefficients using methods like the Laplace transform.

CO-3: Apply the Laplace transform and its properties to solve differential equations and initial value problems

CO4: Understand and apply beta and gamma functions in various contexts, such as probability theory and mathematical physics.

ICT Tools Used: Videos, PPT, Pen-Table, Mobile apps, Scilab

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.udemy.com/course/complexnumbers/
2. https://www.coursera.org/learn/ordinary-differential-equations
3. https://onlinecourses.nptel.ac.in/noc23_ma54/preview

The CO-PO Mapping Matrix

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	-	2	-	-	-	-	3	-	-	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	2	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	3	-	-	-	-	-	-	-	-

List of Problem Solving:	
1	Problem Solving based on Matrices
2	Problem Solving based on Complex Numbers
3	Problem Solving based on Equation of the first order and of the first degree

4	Problem Solving based on Differential equation of the first order of a degree higher than the first	

5	Problem Solving based on Linear Differential Equations with Constant Coefficients
6	Problem Solving based on The Laplace Transform
7	Problem Solving based on Inverse Laplace Transform
8	Problem Solving based on Multiple Integrals
9	Problem Solving based on Applications of integration
10	Problem Solving based on Beta and Gamma Functions
11	Problem Solving based on Differentiation Under the Integral Sign
12	Problem Solving based on Error Functions

B. Sc (Information Technology)	Semester - IV	
Course Name: Introduction to Digital Electronics	Course Code: UGIT302A	
Periods per week (1 Period is 60 minutes)	4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT302A INTRODUCTION TODIGITAL ELECTRONICS

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: understand basic understanding of computer hardware and software.**CO-2:** apply the skills that are the focus of this program to businessscenarios.

CO-3:to perform the analysis and design of various digital electroniccircuits..

CO-4: To acquire the basic knowledge of digital logic level**s**

ICT Tools Used: Videos, PPT, Pen-Tablet, MS Office, Internet

Students Centric Methods: Problem Solving and Participative

(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1) https://www.udemy.com/share/107op6/
2)https://www.udemy.com/share/107op6/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	3	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	1
CO3	2	3	-	-	-	2	-	_	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-

Objectives.
To understand the structure and operation of modern processors and their instruction sets

Expected Learning Outcomes:
1. Student can understand about how computer systems work and underlying principles
2. Student will understand the basics of digital electronics needed for computers
3. Student can understand the basics of instruction set architecture for reduced and complexinstruction sets
4. Student can understand the basics of processor structure and operation
5. Student can understand how data is transferred between the processor and I/O devices

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, Hollerith Code, Error detection and correction, Code conversion. **Binary Arithmetic:** Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3arithmetic	10

			10
II	**Boolean Algebra and Logic Gates:** IC Technology, Levels of IC Complexity, Introduction to Logic, 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. **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 usingK-map and obtain K-map from Boolean expression.		

III	**Combinational Logic Circuits:** Introduction, Multi-input, multi-output Combinational circuits, Codeconverters design and implementations **Arithmetic Circuits:** Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractor, BCD Subtractor, Multiplier, Comparator.	10
IV	**Multiplexer, Demultiplexers, ALU, Encoder and Decoder:** Introduction, Multiplexer, Demultiplexers, Decoder, ALU, Encoders.	10
V	**Sequential Circuits: Flip-Flop:** Introduction, Terminologies used, S-R flip-flop, D flip-flop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop,conversion from one type of flip-flop to another.	10
VI	**Counters:** Introduction, Asynchronous counter, Terms related to counters, IC 7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presettable counter, IC 7490, IC 7492, Synchrono us counter ICs.	10

References and Text Book:					
Sr. No	Titl e	Author/s	Publishe r	Editio n	Year
1.	Digital Electronics	Dr. S. B. Kishor, S. Dasarwar, S.Kasarla	Publishe dby DAS GANU Prakashan.	4th Ed.,	2018
2.	Digital Electronics andLogic Design	N. G. Palan	Technova		
3.	Make Electronics	Charles Platt	O'Reilly	1st	2010

4.	Modern Digital Electronics	R. P. Jain	Tata McGraw Hill	3rd	
5.	Digital Principles andApplications	Malvino andLeech	Tata McGraw		

			Hill		
6.	Digital Electronics: Principles, Devices andApplications,	Anil K. Maini	Wiley		2007
7.	Introduction to System Design UGing IntegratedCircuits	B. S. Sonde	New Age International (P) Limited, Publishers	2nd Ed.	

B. Sc (Information Technology)			Semester - IV	
Course Name: Introduction to Digital Electronics Practical			Course Code: UGIT3P2	
Periods per week (1 Period is 60 minutes)			4	
Credits			2	
			Hours	Marks
Evaluation System		Theory Examination	2½	50
		Internal	--	--

	List of Practicals
1.	Study of Logic gates and their ICs.
2.	Study of universal gates and their ICs.
3.	Implement the given Boolean expressions using a minimum number of gates.
4.	Implement combinational circuits.
5.	Implement code converters.
6.	Implement Adder and Subtractor Arithmetic circuits.
7.	Implement Arithmetic circuits.
8.	Implement Encode and Decoder and Multiplexer and Demultiplexers.
9.	Study of flip-flops and counters
10	Study of counter ICs and designing Mod-N counters.

B. Sc (Information Technology)	Semester - III
Course Name: Database Management Systems	**Course Code: UGIT303**

Periods per week (1 Period is 60 minutes)			4	
Credits			**4**	
			Hours	**Marks**
Evaluation System		Theory Examination	2	60
		Internal	--	40

UGIT303 Database Management

System Course Outcomes: After successful completion of this course, students will be able to: **CO-1:** understand and implement database transactions and data models. **CO-2:** understand and implement ER Diagram and Unified Modeling Language.
CO-3: understand the integrity rules.
CO-4: understand and implement Normalization
CO-5: understand and implement Relational Algebra and Calculus Relational Algebra..

ICT Tools Used: Videos, PPT, Pen-Table, Oracle

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/relational-database- management- systemrdbms-complete-pack/
2. https://onlinecourses.swayam2.ac.in/aic20_sp36/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	1	-	-	-	2
CO2	2	-	-	-	-	-	-	1	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	-	-	-	-	-	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	1	-	-	-	2

Unit	Details	Lectures
I	**Introduction to Databases and Transactions :** What is database system, purpose of database system, view of data, Relational databases, database architecture, transaction management **Data Models :** The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.	**10**

II	**Database Design ,ER Diagram and Unified Modeling Language :** Database design and ER Model: overview, ER Model, Constraints, ER Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML **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).	10
III	**Relational Algebra and Calculus Relational algebra:** Introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, and semantics. Operators, grouping and ungrouping, relational comparison **Calculus:** Tuple relational calculus, Domain relational Calculus, calculus vs. algebra, computational capabilities	10
IV	**Constraints, Views and SQL :** Constraints, types of constrains, 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.	10
V	**Transaction management and Concurrency:** Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	10
VI	**PL-SQL:** Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Control Structures, Cursors and Transaction, Collections and composite data types, Procedures Functions, Exceptions Handling, Packages, With Clause and Hierarchical Retrieval, Triggers.	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw-Hill	Fifth Edition	
2.	Database Systems	RobCoronel	Cengage Learning	Twelfth Edition	
3.	Programming with PL/SQL for Beginners	H.Dand, R.Patil and T. Sambare	X –Team	First	2011

4.	Introduction to Database System	C.J.Date	Pearson	First	2003

B. Sc (Information Technology)		Semester - III	
Course Name: Database Management Systems Practical		**Course Code: UGIT3P3**	
Periods per week (1 Period is 60 minutes)		4	
Credts		2	
		Hours	**Marks**
Evaluation System	**Practical Examination**	2½	50
	Internal	--	--

UGIT3P3 Database Management System Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand the fundamentals of SQL and be able to write basic SELECT statements to retrieve data from a single table.

CO-2: Demonstrate the ability to use single-row functions to manipulate data retrieved from a database..

CO-3: Learn to create and manage database tables, including defining constraints to maintain data integrity.

CO-4: Gain a basic understanding of PL/SQL, including declaring variables, writing executable statements, and interacting with the Oracle server.

CO-5: Gain proficiency in using subqueries to perform complex data retrieval operations.

ICT Tools Used: Videos, PPT, Pen-Table, Oracle

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/relational-database- management- systemrdbms-complete-pack/
2. https://onlinecourses.swayam2.ac.in/aic20_sp36/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	2	-	-	-	-	-	2
CO-2	-	-	-	-	-	-	-	-	-	-	-	-
CO-3	2	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-
CO-5	2	-	-	-	2	-	-	-	-	-	-	-

1.	**SQL Statements - 1**
a.	Writing Basic SQL SELECT Statements
b.	Restricting and Sorting Data
c.	Single-Row Functions
2.	**SQL Statements - 2**
a.	Displaying Data from Multiple Tables
b.	Aggregating Data Using Group Functions
c.	Sub queries
3.	**Manipulating Data**
a.	Using INSERT statement
b.	Using DELETE statement

c.	Using UPDATE statement	
4.	**Creating and Managing Tables**	
a.	Creating and Managing Tables	
b.	Including Constraints	

5.	**Creating and Managing other database objects**
a.	Creating Views
b.	Other Database Objects
c.	Controlling User Access
6.	**features) and advanced subqueries**
a.	Using SET Operators
b.	Date time 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

Books and References:

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

B. Sc (Information Technology)		Semester - III	
Course Name: Linux System Administration Practical		**Course Code: UGIT3P4A**	
Periods per week (1 Period is 60 minutes)		**4**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT3P4A Linux System Administration
Practical Course Outcomes: After successful completion of this course, students will be able to: **CO-1:** Learn to manage processes effectively within the RHEL environment.   **CO-2:** Develop skills in working with storage devices, creating backups, and managing repositories. **CO-3:** Understand RPM package management, storage configuration, and networking setup in RHEL. **CO-4:** Acquire skills in configuring file sharing services such as NFS, Samba, and FTP.   **CO-5:** Learn to configure firewall settings and cryptographic services to enhance server security.
ICT Tools Used: Videos, PPT, Pen-Table, ubuntu
Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)
Links: SWAYAM / MOOCS: 1. https://www.coursera.org/learn/fundamentals-of-red-hat-enterprise-linux   2. https://www.udemy.com/course/master-linux-administration/
The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	-	-	-	-	2	-	-	-	-	-	2
CO-2	-	-	-	-	-	-	-	-	-	-	-	2
CO-3	1	-	2	-	-	2	-	-	-	-	-	-
CO-4	-	-	2	-	-	-	-	-	-	-	-	-
CO-5	-	-	-	-	2	2	-	2	-	-	-	-

List of Practical:		
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 RPMs Storage and Networking**	
a.	Using Query Options	
b.	Extracting Files From RPMs	
c.	Configuring and Managing Storage	
d.	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 Samba	
c.	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	
	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	

Books and References:

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

B. Sc (Information Technology)			Semester - III	
Course Name: Core Java Practical			**Course Code: UGIT3P4B**	
Periods per week (1 Period is 60 minutes)			**4**	
Credits			**2**	
			Hours	**Marks**
Evaluation System		**Practical Examination**	**2½**	**50**
		Internal	**--**	**--**

UGIT3P4B Core Java Practical

Course Outcomes: After successful completion of this course, students will be able to:
CO-1: Develop proficiency in using Java operators to perform various arithmetic and logical operations..
CO-2: Understand exception handling mechanisms in Java and learn to implement multithreading for concurrent programming.
CO-3: Understand the concept of methods and constructors and their usage in Java classes.
CO-4: Learn about Java data types and their manipulation, including strings, arrays, and characters.

ICT Tools Used: Videos, PPT, Pen-Table, JDK, Notepad, CMD, Net beans

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.coursera.org/specializations/core-java
2. https://www.udemy.com/course/java-programming- tutorial-for- beginners/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	2	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	2	-	-	-	-	-	-	-	-	-	-	-

List of Practicals:	
1.	**Java Basics**
a.	Write a Java program that takes a number as input and prints its multiplication table up to 10
b.	Write a Java program to display the following pattern.
	*****
	****
	***
	**
	*
c.	Write a Java program to print the area and perimeter of a circle.
2.	**Use of Operators**
a.	Write a Java program to add two binary numbers.
b.	Write a Java program to convert a decimal number to binary number and vice versa.
c.	Write a Java program to reverse a string.
3.	**Java Data Types**
a.	Write a Java program to count the letters, spaces, numbers and other characters of an input string.
b.	Implement a Java function that calculates the sum of digits for a given char array consisting of the digits '0' to '9'. The function should return the digit sum as a long value.
c.	Find the smallest and largest element from the array
4.	**Methods and Constructors**
a.	Designed a class Sort Data that contains the method asec() and desc().
b.	Designed a class that demonstrates the use of constructor and destructor.
c.	Write a java program to demonstrate the implementation of abstract class.
5.	**Inheritance**
a.	Write a java program to implement single level inheritance.
b.	Write a java program to implement method overriding
c.	Write a java program to implement multiple inheritance.
6.	**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.
7.	**Exception Handling and Multithreading**
a.	Write a java program to implement exception handling.
b.	Write a java program to implement thread life cycle.
c.	Write a java program to implement multithreading.
8.	**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.
9.	**Mini Project using Java AWT / Applet and Any Database.**

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. NageswaraRao	DreamTech	1st	2008

B.Sc.(Information Technology)		Semester-II
Course Name: Web Technology		**Course Code: UGIT 305A**
Periods per week(1 periods is 60 minutes)		**4**
Credits		**4**
	Hours	**Marks**
Evaluation System	Theory 2	60
	Internal ---	40

UGIT305A Web Technology

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: design valid, well-formed, scalable, and meaningful pages using emerging technologies.
CO-2: understand the various platforms, devices, display resolutions, viewports, and browsers that render websites.
CO-3: develop and implement server-side scripting language programs.
CO-4: use develop website along with database.
CO-5: understand the different events.

ICT Tools Used: Videos, PPT, Pen-Table, Online parser

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.udemy.com/course/xml-and-xml-schema-definition-in- easy- steps/
2. https://www.coursera.org/learn/web-applications-php
3. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	-	1	-	2	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	1	-	-	1	-
CO4	-	-	-	-	-	2	-	3	-	-	-	2
CO5	3	-	-	-	-	-	-	-	-	-	-	-

Units	Details	Lectures
I	**Introduction to XML :** What is an XML; How XML differs from HTML, Anatomy of an XML documents & Creating XML documents. Types of XML-Valid and Well Form XML. Part of XML Document. XML Document Form a Tree Structure. XML Validation, Creating XML DTD, Types of DTD-Internal and External.	10
II	**XML Schemas :** XML Schemas, Features, Elements in XSD, XSD Attributes, XSD Restrictions **XSL :** What is XSL, Types of XSL-XSL Transform and XML Path(X-path) , CSS vs XSLT, XSLT	10

	Elements	

III	**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, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems.	10
IV	**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.	10
V	**jQuery:** Introduction of jQuery, Install, Syntax, Selectors, Events, jQuery Effects, jQuery HTML, jQuery Traversing.	10
VI	**Bootstrap Framework:** Introduction of Bootstrap Framework, Bootstrap Grids, Bootstrap Theme, Bootstrap CSS Ref, Bootstrap JS Ref., Introduction to Docker Hub	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Web Design The Complete Reference	Thomas Powell	Tata McGrawHill		-
2.	HTML5 Step by Step	Faithe Wempen	Microsoft Press		2011
3.	PHP 5.1 for Beginners	Ivan Bayross Sharanam Shah,	SPD		2013
4.	PHP Project for Beginners	SharanamShah, Vaishali Shah	SPD		2015
5.	PHP 6 and MySQL Bible	Steve Suehring, Tim Converse, Joyce Park	Wiley		2009
7.	Head First HTML 5 programming	Eric Freeman	O'Reilly		2013
8.	Step By Step Bootstrap 3: A Quick Guide to Responsive Web Development Using Bootstrap 3	Riwanto Megosinarso			
9.	Learning Bootstrap 4 by Building Projects: Develop 5 real-world Bootstrap 4.x projects from scratch	Eduonix Learning Solutions			
10.	Learning JQuery	Karl Swedberg and Jonathan Chaffer			

B.Sc.(Information Technology)		Semester-II	
Course Name: Web Technology Practical		**Course Code: UGIT 3P5A**	
Periods per week(1 periods is 60 minutes)		**4**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Theory**	**2½**	**50**
	Internal	---	--

UGIT3P5A Web Technology Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand PHP control structures and develop the ability to create programs for generating patterns and performing arithmetic operations.

CO-2: Understand Document Type Definitions (DTD) and learn to create DTDs for validating XML documents.

CO-3: Develop skills in creating XSL (eXtensible Style sheet Language) files to transform XML documents into XHTML format based on specified criteria.

CO-4: Understand the concepts of event handling and DOM manipulation in jQuery and learn to apply

them effectively in web development projects.

ICT Tools Used: Videos, PPT, Pen-Table, Online parser

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.udemy.com/course/xml-and-xml-schema-definition-in- easy- steps/
2. https://www.coursera.org/learn/web-applications-php
3. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	-	-	-	-	2	-	-	-	-	-	2
CO-2	-	-	-	-	-	2	-	-	-	-	-	-
CO-3	-	-	-	-	-	2	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-

List of Practical

Create XML file to store student information like Roll Number, Name , Age, Mobile Number , Email Id.

Create DTD for above XML File

Create XML Schema for above (Practical No. 18)

Create XSL file to convert above (refer Practical No. 17) XML file into XHTML file and apply xsl based on Age.

Write a PHP Program to accept a number from the user and print it factorial.

Write a PHP program to display the following Binary Pyramid:

1 1 0 1 0 1

1 0 1 0

8. Write program to find out Even numbers form the Table of 3.
9. Write a program to display Fibonacci Series
10. Write a PHP program to create a database named "College". Create a table named "Student" with following fields (sno, sname, percentage). Insert 3 records of your choice. Display the names of the students whose percentage is between 35 to 75 in a tabular format.
11. Design a PHP page for authenticating a user.
12. Write a program to send email with attachment.
13. Write a program to demonstrate use of sessions and cookies.
14. Including jQuery in HTML document
15. Change text color of the elements using jQuery
16. Selecting elements by jQuery custom selector
17. Run code on click event in jQuery
18. Creating animated show hide effect in jQuery
19. Creating simple toggle effect in jQuery
20. Creating animated toggle effect in jQuery
21. Creating fade-in and fade-out effect in jQuery
22. Creating animation effect in jQuery
23. Animate multiple CSS properties only by one in jQuery
24. Animate CSS property using relative values in jQuery

Mini Project : Project consisting of at least 3 pages with database using Boostrap.

B. Sc (Information Technology)	Semester - III
Course Name: Research Methodology	**Course Code: UGIT305.1B**

Periods per week (1 Period is 60 minutes)			4	
Credits			4	
			Hours	**Marks**
Evaluation System		**Theory Examination**	**2**	**60**
		Internal	**--**	**40**

UGIT305.1B Research Methodology

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: solve real world problems with scientific approach. develop analytical skills by applying scientific methods.

CO-2: recognize, understand, and apply the language, theory and models of the field of business analytics. **CO-3:** foster an ability to critically analyze, synthesize and solve complex unstructured business problems. **CO-4:** understand and critically apply the concepts and methods of business analytics.

CO-5: identify, model, and solve decision problems in different settings interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an

opportunity.

ICT Tools Used: Videos, PPT, Pen-Table, Online parser

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/xml-and-xml-schema-definition-in- easy- steps/
2. https://www.coursera.org/learn/web-applications-php
3. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	2	-	-	-	-
CO2	3	-	-	-	-	-	-	2	-	-	1	1
CO3	-	-	3	1	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	2	-	-	-	2
CO5	-	-	-	3	-	-	-	-	-	-	-	-

Unit	Details	Lectures
I	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process Problem Identification & Formulation – Research Question – Investigation Question –Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance	8
II	Research Design: Concept and Importance in Research – Features of a good research design –Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.	8
III	Measurement: Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size.	8
IV	Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size. Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts,percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association..	8
V	Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.	8
VI	Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism	8

Books and References:

Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
Business Research Methods – Alan Bryman& Emma Bell, Oxford University Press.
Research Methodology – C.R.Kothari
Select references from the Internet

B. Sc. (Information Technology)		Semester - III	
Course Name: Research Methodology Practical		**Course Code: UGITP305.1B**	
Periods per week (1 Period is 60 minutes)		**4**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGITP305.1B Research Methodology Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand and apply suitable analysis techniques for analyzing secondary data sets.

CO-2: Learn to use statistical software packages such as R, Python, and Excel for data analysis and hypothesis testing.

CO-3: Understand and critically apply the concepts and methods of business analytics.

CO-4: Understand the importance of hypothesis testing in various fields including business, healthcare, social sciences, and engineering.

ICT Tools Used: Videos, PPT, Pen-Table, Online parser

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

4. https://www.udemy.com/course/xml-and-xml-schema-definition-in- easy- steps/
5. https://www.coursera.org/learn/web-applications-php
6. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	2	-	-	-	-	-
CO-2	-	2	-	-	-	2	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-

	List of Practical
1.	Write a program for obtaining descriptive statistics of data.
2.	Import data from different data sources (from Excel, csv, mysql, sql server, oracle to R/Python/Excel)
3.	Design a survey form for a given case study, collect the primary data and analyze it
4.	Perform suitable analysis of given secondary data.
5.	Perform testing of hypothesis using one sample t-test.

| 6. | Perform testing of hypothesis using two sample t-test. |

7.	Perform testing of hypothesis using paired t-test.
8.	Perform testing of hypothesis using chi-squared goodness-of-fit test.
9.	Perform testing of hypothesis using chi-squared Test of Independence
10.	Perform testing of hypothesis using Z-test.
11.	Perform testing of hypothesis using one-way ANOVA.
12.	Perform testing of hypothesis using two-way ANOVA.

Semester - IV

B. Sc (Information Technology)	Semester - IV
Course Name: Computer Oriented Statistical Techniques	**Course Code: UGIT401**
Periods per week (1 Period is 60 minutes)	4
Credits	4

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

UGIT401Computer Oriented Statistical

Techniques Course Outcomes: After successful completion of this course, students will be able to: **CO-1:** recognize the error in the number generated by the solution

CO-2: apply method of interpolation and extrapolation for prediction

CO-3: recognize elements and variable in statistics and summarize qualitative and quantitative data.

CO-4: calculate mean, median and mode for individual series.

ICT Tools Used: Videos, PPT, Pen-Table, Mobile Apps

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/statistics-computer-oriented- statistical- methods-code/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	2	-	-	-	-	-	-	1	-
CO2	-	-	-	-	-	-	-	2	-	-	-	-
CO3	-	-	-	2	-	-	-	-	-	-	-	2
CO4	-	-	-	3	-	-	-	-	-	-	-	-

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.	10

II	**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, Standardized coefficient of Variation able; 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.	10
III	**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.	10
IV	**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 **Statistical Estimation Theory:** Estimation of Parameters, Unbiased Estimates, coefficient Estimates, coefficient Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error	10

V	**Decision Theory**: Statistical Decisions, Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating Characteristic Curves; the Power of a Test, p-Values for Hypotheses Tests, Control Charts, Tests Involving Sample coefficient Test serences, Involving Binomial Distributions. **Statistics in R**: mean, median, mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R.Perform the Linear Regression ,Least squares means, Linear Least Square Regression using R.	10
VI	**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.	10

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	STATISTICS	Murray R. Spiegel, Larry J. Stephens.	Mc GRAW – HILL ITERNATION A L	FOURTH	
2.	A Practical Approach using R	R.B. Patil, H.J. Dand and R. Bhavsar	SPD	1st	2017
3.	FUNDAMENTAL OF MATHEMATICAL STATISTICS	S.C. GUPTA and V.K. KAPOOR	SULTAN CHAND and SONS	ELEVENTH REVISED	2011
4.	MATHEMATICAL STATISTICS	J.N. KAPUR and H.C. SAXENA	S. CHAND	TWENTIE T H REVISED	2005

B. Sc (Information Technology)		Semester - IV	
Course Name: Computer Oriented Statistical Techniques Practical		Course Code: UGIT4P1	
Periods per week (1 Period is 60 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT4P1Computer Oriented Statistical Techniques Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand and execute the Chi-squared test for assessing the association between categorical variables using R.

CO-2: Develop skills in performing linear regression analysis using R to model relationships between variables.

CO-3: Understand and execute statistical functions in R for calculating measures of central tendency (mean, median, mode), dispersion (range, quartiles, interquartile range), and visualizing data using histograms.

CO-4: Understand and apply linear least square regression analysis techniques using R for modeling
linear relationships between variables.

ICT Tools Used: Videos, PPT, Pen-Table, Mobile Apps

Students Centric Methods: Problem Solving and
Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/statistics-computer-
oriented- statistical- methods-code/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	2	-	-	-	2	-	-	-	-	-	-
CO-2	-	2	-	-	-	2	-	-	-	-	-	-
CO-3	-	-	2	-	-	2	-	-	-	-	-	-
CO-4	-	2	-	2	-	-	-	-	-	-	-	-

List of Practicals:
1. Using R execute the basic commands, array, list and frames.
2. Create a Matrix using R and Perform the operations addition, inverse, transposeand 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. Using R perform the binomial and normal distribution on the data.
10. Perform the Linear Regression using R.
11. Compute the Least squares means using R.
12. Compute the Linear Least Square Regression

B. Sc (Information Technology)	Semester - IV	
Course Name: Python Programming	**Course Code: UGIT402**	
Periods per week (1 Period is 60 minutes)	**4**	
Credits	**4**	
		Hours	Marks

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

UGIT402 Python Programming

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: understand the concepts of programming before actually starting to write new programs.

CO-2: understand what happens in the background when the programs are executed.

CO-3: develop logic for Problem Solving**.**

CO-4: understand basic constructs of programming such as data, operations, conditions, loops, functions etc.

CO-5: apply the problem solving skills using syntactically simple Language.

ICT Tools Used: Videos, PPT, Pen-Table, IDLE, Pycharm

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/specializations/python
2. https://www.udemy.com/course/complete-python-bootcamp/
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	2	-	-	-	2
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	1	-
CO5	-	-	-	-	-	-	-	2	-	-	-	2

Unit	Details	Lectures
I	**Introduction:** The Python Programming Language, History, features, Installing Python, Running Python program, Interactive Mode and Script Mode, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, The Difference Between Brackets, Braces, and Parentheses, **Variables and Expressions**: Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Order of Operations. **Conditional Statements :** if, if-else, nested if –else, Looping: for, while, nested loops **Control statements** : Terminating loops, skipping specific conditions	10
II	**Functions:** Why Functions? Function Calls, Type Conversion Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Fruitful Functions and Void Functions, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Checking Types	10
III	**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. **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	10
IV	**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 **Text Files**: The File Object Attributes, Directories **Built-in Exceptions**: Handling Exceptions, Exception with Arguments, User-defined Exceptions	10
V	**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, Time module	10

	Creating the GUI Form and Adding Widgets: Button, Canvas, Check button, Entry, Frame, Label, Listbox, Menu button, Menu, Message, Radio button, Scale, Scrollbar, text, Toplevel, Spinbox, Paned Window, LabelFrame, tkMessagebox. **Widgets & Layout Management:** Handling Standard attributes and Properties of Widgets , **Look and Feel Customization**: Designing GUI applications with proper Layout Management features. 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.	
VI		**10**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Think Python	Allen Downey	O'Reilly	1st	2012
2.	An Introduction to	JasonMontojo, Jennifer	SPD	1st	2014
	Computer Science using	Campbell, Paul Gries			
	Python 3				
3.	Python GUI	Burkhard A. Meier	Packt		2015
	Programming Cookbook				
4.	Introduction to Problem	E. Balagurusamy	TMH	1st	2016
	Solving with Python				
5.	Murach's Python	Joel Murach, Michael	SPD	1st	2017
	programming	Urban			
6.	Object-oriented	Michael H.	Pearson	1st	2008
	Programming in Python	Goldwasser, David	Prentice		
		Letscher	Hall		
7.	Exploring Python	Budd	TMH	1st	2016

B. Sc (Information Technology)		Semester - IV	
Course Name: Python Programming Practical		Course Code: UGIT4P2	
Periods per week (1 Period is 60 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT4P2 Python Programming Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Develop proficiency in basic Python programming concepts including input/output, conditional statements, and arithmetic operations.

CO-2: Understand object-oriented programming principles and implement classes for storing student information, inheritance, and class attributes with methods.

CO-3: Understand and implement recursive functions for calculating factorial.

CO-4: Develop skills in integrating Python with MySQL databases to create mini projects for data management and manipulation.

ICT Tools Used: Videos, PPT, Pen-Table, IDLE, Pycharm

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/specializations/python
2. https://www.udemy.com/course/complete-python-bootcamp/
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	2	-	-	-	-	-	2
CO-2	-	2	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	2	-	-	-	-	-	2

	List of Practical
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).
	x. Write a method called add which returns the sum of the attributes x and y.
	y. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER.
	z. Write a static method called subtract, which takes two number parameters, b and c, and returns b - c.
	aa. Write a method called value which returns a tuple containing the values of x and
	bb. Make this method into a property, and write a setter and a deleter formanipulating 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:
	Import geometry
	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 square Base is False. x is the length of an edge on a square if square Base is True and the radius of a circle when square Base is False. y is the height of the object. First use square Base to distinguish the cases. Use the circle
	Area and square Area from the geometry module to calculate the base areas.
b.	Write a program to implement exception handling.
9	Mini Project using Python and Mysql

Books and References:

Sr.	Title	Author/s	Publisher	Edition	Year
No.					
1.	Think Python	Allen Downey	O'Reilly	1st	2012
2.	An Introduction to	JasonMontojo, Jennifer	SPD	1st	2014
	Computer Science	Campbell, Paul Gries			
	using Python 3				

B. Sc (Information Technology)			Semester - IV	
Course Name: Data Structures			**Course Code: UGIT403**	
Periods per week (1 Period is 60 minutes)			4	
Credits			4	
			Hous	**Marks**
Evaluation System		**Theory Examination**	2	60
		Internal	--	40

UGIT403 Data Structure

Course Outcomes: After successful completion of this course, students will be able to:
CO-1: Understanding prefix, infix, and postfix expression formats.
CO-2: understand and implement Arrays.
CO-3: understand and implement Linked List**.**
CO-4: understand and implement Doubly-Linked List.
CO-5: understand and implement Stack and Queues.

ICT Tools Used: Videos, PPT, Pen-Table, Turbo C

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.coursera.org/learn/data-structures
2. https://www.udemy.com/course/datastructurescncpp/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	1	-
CO2	3	-	-	-	-	-	-	2	-	-	-	-
CO3	2	-	-	-	-	-	-	2	-	-	-	1
CO4	3	-	-	-	-	1	-	1	-	-	2	-
CO5	2	-	-	-	-	1	-	1	-	-	-	-

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, SparseMatrix, Memory Representation of Special kind of Matrices, Advantages and Limitations of Arrays.	10
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, Circular Linked List, Applications of Circular Linked List,	10
III	**Doubly 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.	10
IV	**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.	10

V	**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, and Operations performed on AVL Tree, 2-3 Tree, and B-Tree.	10
VI	**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, GraphTraversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees.	10

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

B. Sc (Information Technology)	Semester - IV	
Course Name: Data Structures Practical	**Course Code: UGIT4P3**	
Periods per week (1 Period is 60 minutes)	**4**	
Credits	**2**	
	Hours	**Marks**
Evaluation System	Practical Examination	**2½**	**50**
	Internal	**--**	**--**

UGIT4P3 Data Structure Practical

Course Outcomes: After successful completion of this course, students will be able to: **CO-1:** Understanding prefix, infix, and postfix expression formats.
CO-2: Understand and implement linked lists, including creating single and double linked lists, searching for elements, and sorting elements.
CO-3: Develop proficiency in implementing queues, including regular, circular, and deque variations**. CO-4:** Understand and implement tree data structures, including binary trees, and traversal techniques like inorder, postorder, and preorder.
CO-5: Develop proficiency in implementing and manipulating 1-D arrays, including operations such as
searching, sorting, and reversing elements.

ICT Tools Used: Videos, PPT, Pen-Table, Turbo C

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.coursera.org/learn/data-structures
2. https://www.udemy.com/course/datastructurescncpp/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	-	-	-	-	-	-
CO-2	-	2	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-
CO-5	-	-	-	-	2	-	-	-	-	-	-	-

List of Practical :	
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 th−e 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.
b.	Write a program to search the element using sequential search.
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.
b.	Write a program to construct the binary tree.
c.	Write a program for inorder, postorder and preorder traversal of tree
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.

B. Sc (Information Technology)		Semester - IV	
Course Name: Introduction to Embedded Systems Practical		**Course Code: UGIT4P4A**	
Periods per week (1 Period is 60 minutes)		**4**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

UGIT4P4A Introduction to Embedded System

Practical Course Outcomes: After successful completion of this course, students will be able to: **CO-1:** Understand the architecture and functionality of 8051 microcontrollers.

CO-2: Understand and demonstrate the use of general-purpose ports for data transfer between multiple 8051 controllers.

CO-3: Develop proficiency in interfacing various input/output devices such as LEDs, LCD displays, matrix keyboards, and seven-segment LED displays.

CO-4: Understand the concept of embedded hardware and peripherals.

ICT Tools Used: Videos, PPT, Pen-Table

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/learn/introduction-embedded-systems
2. https://www.udemy.com/course/create-your-own-embedded- operating- system/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	-	-	-	-	-	2
CO-2	-	2	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-

List of Practicals:

1)	Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects. a. Programming b. Execution c. Debugging
2.A)	Configure timer control registers of 8051 and develop a program to generate given time delay.
2.B)	To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.
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

3.B)	Interfacing LCD display with AT89S52.
4.A)	Interfacing program for Matrix keyboard.
4.B)	To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.
5.A)	Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.
5.B)	Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
6)	Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction.
7)	Generate traffic signal.
8)	Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.
9)	Implement Elevator control.
10) A)	Using FlashMagic: To demonstrate the procedure for flash programming for reprogrammable embedded system board using FlashMagic
B)	To demonstrate the procedure and connections for multiple controllers programming of same type of controller with same source code in one go, using flash magic.

B. Sc (Information Technology)		Semester - IV	
Course Name: Enterprise Java Practical		**Course Code: UGIT4P4B**	
Periods per week (1 Period is 60 minutes)		**4**	
Credits			**2**
		Hours	**Marks**
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	**--**	**--**

UGIT4P4B Enterprise Java Practical

Course Outcomes: After successful completion of this course, students will be able to:
CO-1: Understand and implement servlet applications with cookies and sessions for managing user sessions, tracking user visits, and validating user credentials.
CO-2: Understand, how to implement the RequestDispatcher, COOKIES, Session in the application. **CO-3**: Develop servlet applications for handling file upload/download operations, creating a question-answer application using database interaction, and demonstrating non-blocking read operations.
CO-4: Understand Enterprise JavaBeans (EJB) and develop applications such as currency converter, room reservation system, and shopping cart application using stateful session beans.

ICT Tools Used: Videos, PPT, Pen-Table, Netbeans, SQL

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://www.udemy.com/course/java-enterprise-edition-8/
2. https://www.coursera.org/learn/introduction-ee

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	2	-	-	-	2	-	-	-	-	-	-
CO-2	-	2	-	-	-	2	-	-	-	-	-	-
CO-3	-	-	2	-	-	2	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-

List of Practicals:	
1.	**Implement the following Simple Servlet applications.**
a.	Create a simple calculator application using servlet.
b.	Create a servlet for a login page. If the username and password are correct then it says message "Hello <username>" else a message "login failed"
c.	Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.
2.	**Implement the following Servlet applications with Cookies and Sessions.**

a.	Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed.
b.	Create a servlet that uses Cookies to store the number of times a user has 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.

3.	**Implement the Servlet IO and File applications.**
a.	Create a Servlet application to upload and download a file.
b.	Develop Simple Servlet Question Answer Application using Database.
c.	Create simple Servlet application to demonstrate Non-Blocking Read Operation.
4.	**Implement the following JSP applications.**
a.	Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
b.	Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
c.	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
5.	**Implement the following JSP JSTL and EL Applications.**
a.	Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
b.	Create a JSP page to demonstrate the use of Expression language.
c.	Create a JSP application to demonstrate the use of JSTL.
6.	**Implement the following EJB Applications.**
a.	Create a Currency Converter application using EJB.
b.	Develop a Simple Room Reservation System Application Using EJB.
c.	Develop simple shopping cart application using EJB [Stateful Session Bean].
7.	**Implement the following EJB applications with different types of Beans.**
a.	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
b.	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].
c.	Develop simple Marks Entry Application to demonstrate accessing Database using EJB.
8.	**Implement the following JPA applications.**
a.	Develop a simple Inventory Application Using JPA.
b.	Develop a Guestbook Application Using JPA.
c.	Create simple JPA application to store and retrieve Book details.
9.	**Implement the following JPA applications with ORM and Hibernate.**
a.	Develop a JPA Application to demonstrate use of ORM associations.
b.	Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
c.	Develop a Hibernate application to store and retrieve employee details in MySQL Database.
10.	**Implement the following Hibernate applications.**
a.	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.
b.	Develop Hibernate application to enter and retrieve course details with ORM Mapping.
c.	Develop a five page web application site using any two or three Java EE Technologies.

B. Sc (Information Technology)	Semester - IV
Course Name: Supply Chain Management	Course Code: USIT405.1A

Periods per week (1 Period is 60 minutes)			4	
Credits			4	
			Hours	Marks
Evaluation System		Practical Examination	2½	60
		Internal	--	40

UGIT405.1A Supply Chain Management

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: understand the goal of a supply chain.

CO-2: explain the impact of supply chain decisions on the success of a firm.

CO-3: identify the supply chain decision phases and explain the significance of each one**. CO-4:** describe the cycle and push/pull views of a supply chain.

CO-5: classify the supply chain macro processes in a firm.

ICT Tools Used: Videos, PPT, Pen-Table, case study based on Amazon, Tata, Flipkart

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/specializations/supply-chain-management

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	2	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	2	-	-	-	-	1	-	-	-	-

Unit	Details	Lectures
I	**Understanding of Supply Chain** Objectives of Supply Chain, Importance, Decision Phase, Process View, Examples, Supply Chain Performance Drivers Evolution and Overview of Supply Chain Management, Traditional and Modern Approach of SCM, Element s in SCM	10
II	**Demand Management in Supply Chain** Demand planning & Forecasting, Types of Demand, Characteristics of forecasts, Components of a Forecast & Forecasting Methods, Basic Approach to Demand Forecasting, The Role of IT in Forecasting, Risk Management in Forecasting, Forecasting in practice, case studies	10

III	**Procurement Management in Supply Chain** Introduction, Traditional Inventory Management, Inventory models, New Paradigms in Inventory, JIT, vendor managed inventory, case studies **Logistics Management** Introduction History & evolution of Logistics, elements of logistics, Distribution management warehousing (types, operations, site selection, layout and design), Packing for logistics (concepts, importance, requirement, important aspects of logistics, packing Repacking & forwarding, Trends in packaging)	10
IV	**Transportation Problem** Role and Functionality in Supply Chain, Participants in transportation, Transportation formats, Modes, Decision and Other Formats and Transport Documentation Private Fleet Management : Process Factors and Drivers **Benchmarking the Supply Chain** Introduction and Concepts, Benchmarking the logistics process, Mapping SC process, Supplier and Distributor benchmarking, Case Study	10
V	**IT for SCM** Concept of IT (need for IT, IT tools for business) IT Application in SCM, Evolution, benefits, role of internet, Issues with SCM system typical Data warehouse concepts, Data Mining, use of Data mining tools in SCM 8. Distribution Networks of Supply Chain : Role of Distribution, influencing factors, design, application to ebusiness, Distribution networks in Practice	10
VI	**Network Design in Supply Chain** : Role of Network Design, influencing factors and Framework, models of facility location and capacity allocation, role of IT in network Design decisions in practice Term work/Practical : Each candidate will submit assignments based on the above syllabus will be submitted with the internal test paper.	10

Books and References:

Supply Chain Management (Concepts & cases) – Rahul V. Altekar – [Prentice Hall of India, 4th Edition]
Supply Chain Management (Strategy, planning and operation) – Sunil Chopra, Peter Meindl, D.V. Kalra – [Pearson, 3rd edition]
Principles of Supply Chain Management : A Balanced Approach, Eisner, Cengage India
Logistics & Supply Chain Management (Strategies for Reducing cost & improving service) – Martin Christopher [FT financial Times/Pitman publishing, 2nd edition]
Logistics & Supply Chain Management (Cases & Concepts) – Raghuram& N. Rangaraj [McMillan India Ltd, 1st edition]

B. Sc (Information Technology)	Semester - IV
Course Name: Supply Chain Management Practical	**Course Code: UGITP405.1A**
Periods per week (1 Period is 60 minutes)	**4**
Credits	**2**

		Hours	Marks
Evaluation System	**Practical Examination**	**2½**	**50**
	Internal	--	--

UGITP405.1A Supply Chain Management Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand the concept of supply chain management and its significance in maximizing quality, delivery, customer experience, and profitability.

CO-2: Understand H&M's low-cost, high-fashion supply chain model, focusing on fast fashion, global sourcing, and supply chain agility..

CO-3: Analyze case studies on companies like Tata Consultancy Services and Infosys to understand their supply chain management strategies, practices, and their impact on business success.

CO-4: Describe the cycle and push/pull views of a supply chain.

ICT Tools Used: Videos, PPT, Pen-Table, case study based on Amazon, Tata, Flipkart

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.coursera.org/specializations/supply-chain-management

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	-	-	-	-	-	-
CO-2	2	-	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-

	List of Practical
1.	Case study on Supply chain management is the handling of the entire production flow of a good or service to maximize quality, delivery, customer experience and profitability
2.	Case study on Tata Consultancy Services, Infosys.
3.	Case study on supply Chain Management Strategy on amazon.
4.	Case study on Dell's Supply Chain Management Strategy.
5.	Case study on H&M's Low-cost, High-fashion Supply Chain.
6.	Case study on D-Mart's Supply Chain Management Practices.
7.	Case study on McDonald's Food Chain
8.	Case study on supply chain management on electric vehicle
9.	Beer game to demonstrate supply chain management.

B. Sc. (Information Technology)		Semester - IV	
Course Name : Statistical tools in Research		Course Code: UGIT405.1B	
Periods per week (1 Period is 60 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT405.1B Statistical tools in Research

Course Outcomes: After successful completion of this course, students will be able to:
CO-1: Demonstrate knowledge of probability and the standard statistical distributions.
CO-2: Demonstrate knowledge of fixed-sample and large-sample statistical properties of point and interval estimators**.**
CO-3: Demonstrate knowledge of the properties of parametric, semi-parametric and nonparametric testing procedures.
CO-4: Demonstrate the ability to perform complex data management and analysis.
CO-5: Demonstrate the ability to apply linear, nonlinear and generalized linear models.

ICT Tools Used: Videos, PPT, Pen-Table

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/statistical-analysis-and-research- using- excel/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	2	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	2	-	-	-	-	-	-	-	2
CO4	2	-	-	-	-	-	-	2	-	-	1	-
CO5	2	-	1	-	-	-	-	-	-	-	-	-

Unit	Details	Lectures
I	**Sampling and Sample Design :** Introduction and Types of Sampling, Sampling Methods, Point Estimation and Interval Estimation, Sampling and Non-Sampling Errors	**8**
II	**Probability and Theoretical Distribution :** Approaches to Probability, Theorems of Probability, Binomial and Poisson Distribution, Exponential, Beta & Normal Distribution	**8**
III	**Hypothesis Testing and Significance Tests in Attributes & Variables** **:** Procedure of Testing a Hypothesis, Significance Test in Attributes, Significance Test in Variables (Large Samples), Significance Test in Variables (Small Samples)	**8**
IV	**Regression, Correlation and Statistical Quality Control :** Partial & Multiple Correlation, Multiple Regression Analysis, Types and Techniques of Statistical Quality Control, Control Charts for Attributes and Variables	**8**
V	**Non Parametric Tests and Analysis of Variance :** Chi-Square Test, Sign Test & Median Test, F Test / Multivariate Analysis Technique, Analysis of Variance (ANNOVA).	**8**

VI	**Research Methodology :** Concepts, Approaches and Methods, Research Design, Measurement and Scaling Techniques, Interpretation, Report Writing & Computer Applications in Research	**8**	

Books and References:
S. P. Gupta, Statistical Methods, Sultan Chand & Sons.
C.R. Kothari, Research Methodology Methods and Techniques, 2/e, VishwaPrakashan.
Bendat and Piersol, Random data: Analysis and Measurement Procedures, Wiley Interscience.
D.C. Sancheti, V.K. Kapoor, Statistics, Theory methods and Application, Sultan Chand & Sons.
S C Agarwal, S C Khurana, Research Methodology and Statistical Analysis(for M. Com), V K Publications.

B. Sc. (Information Technology)	Semester - IV	
Course Name: Statistical tools in Research Practical	**Course Code: UGITP405.1B**	
Periods per week (1 Period is 60 minutes)	**4**	
Credits	**2**	
	Hours	**Marks**
Evaluation System Practical Examination	2½	50
Internal	--	--

UGIT4P5.1B Statistical tools in Research Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Develop skills in random sampling techniques to select a subset of data points from a larger population in a way that each member of the population has an equal chance of being included.

CO-2: Understand and conduct paired t-tests to compare the means of two related samples, such as pre-test and post-test measurements, to assess if there is a significant difference.

CO-3: Demonstrate knowledge of the properties of parametric, semi-parametric and nonparametric testing procedures.

CO-4: Understand and perform one-way analysis of variance (ANOVA) to compare means across multiple groups and determine if there are statistically significant differences between them.

ICT Tools Used: Videos, PPT, Pen-Table

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. https://www.udemy.com/course/statistical-analysis-and-research- using- excel/

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	-	-	-	-	2	-	-	-	-	-
CO-2	-	2	-	-	-	-	-	-	-	-	-	-
CO-3	-	-	2	-	-	-	-	-	-	-	-	-
CO-4	-	-	-	2	-	-	-	-	-	-	-	-

	List of Practical
1.	Perform suitable analysis of given secondary data.
2.	Perform testing of hypothesis using one sample t-test.
3.	Perform testing of hypothesis using two sample t-test.
4.	Perform testing of hypothesis using paired t-test.
5.	Perform testing of hypothesis using chi-squared goodness-of-fit test.
6.	Perform testing of hypothesis using chi-squared Test of Independence
7.	Perform testing of hypothesis using Z-test.
8.	Perform testing of hypothesis using one-way ANOVA.
9.	Perform testing of hypothesis using two-way ANOVA.
10.	Perform testing of hypothesis using multivariate ANOVA (MANOVA).
11.	Perform the Random sampling for the given data and analyse it.
12.	Perform the Stratified sampling for the given data and analyse it.