Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited A+ Grade by NAAC (Third Cycle-CGPA-3.61)
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

As per National Education Policy - 2020

B. Sc. in Information Technology

(Faculty of Science)

Syllabus for F.Y. B. Sc. (Information Technology)

Semester I and II

(With effect from the academic year 2024-25)

As per National Education Policy - 2020

Sr. No.	Heading	Particulars
1	**Title of program**	Information Technology
2	**Eligibility**	(a) A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates. (b) Candidate who have passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course. (c) However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body. Minimum marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates. OR Candidates with post HSC-Diploma in Information Technology/Computer Technology/ Computer Engineering/ Computer Science/ and Allied branches will be eligible for direct admission to the Second Year of B.Sc. (I.T.). However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body Minimum Marks required 45% aggregate for open category candidates and 40% aggregate for reserved category

		candidates.
3	**Duration of program**	3 Years
4	**Intake Capacity**	120
5	**Scheme of Examination**	60:40
6	**Standards of Passing**	40%
7	**Semesters**	Two
8	**Program Academic Level**	U.G
9	**Pattern**	Semester
10	**Status**	New
11	**To be implemented from Academic Year**	Academic Year 2024-25

Mrs. I. S. Thakare
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Preamble

1) Introduction:

Information Technology encompasses the study, design, development, implementation, support, and management of computer-based information systems. These systems encompass hardware, software, networks, and data storage technologies, all working in concert to process, store, retrieve, and transmit vast amounts of information.

2) Aims and Objectives :

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:
- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

3) Learning Outcomes

- Learners will be able to demonstrate proficiency in the use of hardware, software, and networking technologies commonly used in the field of IT.
- Learners will be able to develop the ability to analyze complex problems in information technology and apply appropriate solutions using critical thinking and problem-solving skills.
- Learners will be able to acquire proficiency in programming languages relevant to the field of IT, such as Java, Python, C++ etc.
- Learners will be able to develop skills in web development, including HTML, CSS, JavaScript, and frameworks such as React or Angular, and demonstrate the ability to create dynamic and interactive web applications.

Abbreviations Used

- POs : Program Outcomes

- PS : Program Structure

- PSOs : Program Specific Outcomes

- COs : Course Outcomes

- TLP : Teaching-Learning Process

- AM : Assessment Method

- DSC : Discipline Specific Core

- DSE : Discipline Specific Elective

- GE : Generic Elective

- OE : Open Elective

- VSC : Vocational Skill Course

- SEC : Skill Enhancement Course

- IKS : Indian Knowledge System

- AEC : Ability Enhancement Course

- VEC : Value Education Course

- OJT : On Job Training (Internship)

- FP : Field project

- CEP : Community engagement and service

- CC : Co-curricular Courses

- RM : Research Methodology

- RP : Research Project

- MJ : Major Course

- MN : Minor Course

Program Outcomes (POs)

PO No.	POs Statement After completing the Bachelor of Science Program, students will be able to-	Knowledge and Skill
PO-1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary Knowledge
PO-2	An ability to develop and conduct experiments, analyse, and interpret data and use scientific judgment to draw conclusions.	Scientific reasoning
PO-3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO-4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO-5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyse and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Program Specific Outcomes (PSOs)

PSO No.	PSOs Statement **After completing the Bachelor of Science Program, students will be able to-**	Knowledge and Skill
PSO-1	Gain proficiency in the field of Networking and Security.	Disciplinary Knowledge
PSO-2	Develop Programming skills that help to meet the needs of the IT industry.	Digital literacy
PSO-3	Build soft skills for employability and personality development in the Industrial environment.	Life-long learning

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. (Information Technology) Semester I and II
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Structure

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
A	*Discipline Specific Course (Major)*		**A**	*Discipline Specific Course (Major)*	
1	Introduction to C++ Programming	03+01	1	Fundamentals of Python Programming	03+01
2	Computer Organization & Design	03+01	2	Database Management System	03+01
3	Statistical Methods	03+1	3	Linear Algebra	03+01
B	*Skill Enhancement Course (SEC)*		**B**	*Skill Enhancement Course (SEC)*	
4	Introduction to Web Designing	02	4	Advanced Web Programming	02
C	*Open Elective (OE)*		**C**	*Open Elective (OE)*	
5	-		5	Introduction to Multimedia	02
D	*Value Education Course VEC (Any One)*		**D**	*Value Education Course VEC (Any One)*	
6	Digital Technology and Solutions	02	6	Digital Technology and Solutions	02
7	Understanding India	02	7	Understanding India	02
8	Environmental Studies	02	8	Environmental Studies	02
E	*Ability Enhancement Course (AEC) (Any One)*		**E**	*Ability Enhancement Course (AEC) (Any One)*	
9	Marathi	02	9	Marathi	02
10	Hindi	02	10	Hindi	02
F	*Indian Knowledge System*		**F**	-	-
11	******************	02	11	-	-
G	*Co-curricular Courses (Any One)*		**G**	*Co-curricular Course (Any One)*	
12	Foundation Course in NSS-I	02	12	Foundation Course in NSS-II	02
13	Foundation Course in NCC-I	02	13	Foundation Course in NCC-II	02
14	Foundation Course in PE-I	02	14	Foundation Course in PE-II	02
15	Foundation Course in PA-I	02	15	Foundation Course in PA-II	02
	Total Credits	22		Total Credits	22

Choice Based Credit System (CBCS)
F.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2024-2025

SEMESTER I

Course Code	Course Type	Course Title	Credit
UIT1TCT	Major Subject I	Introduction to C++ programming	03
UIT1TCP	Major Subject I Practical	Introduction to C++ programming practical	01
UIT1COT	Major Subject II	Computer Organization & Design	03
UIT1COP	Major Subject II Practical	Computer Organization & Design Practical	01
UIT1SMT	Major Subject III	Statistical Method	03
UIT1SMP	Major Subject III Practical	Statistical Method Practical	01
UIT1IWP	SEC	Introduction to Web Designing Practical	02
		Total Credits	**14**

Value Education Courses

Course Code	Course Type	Course Title	Credit
UVEC1DTS	VEC	Digital Technology and Solutions	02

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Syllabus for F.Y.B. Sc. (Information Technology) Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Code: UIT1TCT

Course Title: Introduction to C++ Programming

Course Type: Major-I   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Define basic concepts of C++ programming language.
CO-2	Illustrate different types of operators of C++ language.
CO-3	Explain characteristics of object oriented programming approach with C++.
CO-4	Elaborate Classes and objects in OOPs.

Syllabus for F.Y.B. Sc. (Information Technology) Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT1ICT

Course Title: Introduction to C++ Programming

Unit I: Programming Logic and Techniques: Introduction, Algorithm, Flowchart
Introduction to C++: History of C++, Structure of C++ Program, Variables and Assignments: Variables, variable declarations, Identifiers, local and global variables, Constants, Reference variable, Symbolic constant.
Operators: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Operator Precedence
Input and Output: cin, cout, include directives and Namespaces, Comments, Data types
Flow of Control: Compound statements, Loops: while, for, do while, nested loops, Decision making: if – else, nested if else, switch, break and continue,
Manipulators: endl, setw, sizeof, Increment and decrement operators, Type Cast Operators, Scope resolution operators.

Unit II: Functions: Function Prototypes, built in functions and user defined functions, Function overloading, Call by reference, Call by value, const member functions. Inline Functions and recursive functions, Math Library Functions.
Derived Data types (Arrays , pointers , functions): Introduction to arrays, arrays in functions, 2-D arrays , Multidimensional arrays, Introduction to pointers, void pointers, pointers in function, pointer to constant and constant pointer, generic pointer. **Strings and Vectors:** String functions: strcmp, strcat, strlen, strcpy. Vector Basics.

Unit III: Introduction to OOPs: Need of object oriented programming, Comparison of procedural and object oriented approach, Applications of OOPs, Characteristics of OOPs – Objects, Classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, and Reusability.
Classes and Objects: Classes, Class declaration, Creating Objects, Member function of a class, Objects as function arguments, Dynamic Memory Allocation, Static Data Members, Friend Function.
Operator Overloading: Overloading the assignment operator, This pointer, Overloading arithmetic operators, Overloading the arithmetic assignment operators, Overloading the relational operators, Overloading the stream operators, Conversion operators ,Overloading the increment and decrement operators, Overloading the subscript operator
Constructors: Introduction, Types of Constructors: Default Constructor, Parameterized Constructor, Copy Constructor
Inheritance: Single Inheritance, Multiple Inheritance

Reference Books:

1. "Let us C++" , Y.P.Kanetkar, Seventh edition, BPB publication
2. Object Oriented programming with C++ , E Balagurusamy , Third Edition ,Tata McGraw Hill.
3. Schaum's outlines "Programming with C++", J.R.Hubbard, Second Edition, Tata McGrawHill

Course Code: UIT1ICP

Course Title: Introduction to C++ Programming Practical

Course Type: Major -I   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Demonstrate basic C++ programs.
CO-2	Construct C++ programs using conditional statements and loops.
CO-3	Explain use of functions and arrays in C++ programs.
CO-4	Build programs using classes and objects, constructors and inheritance.

Module/Unit	Course Description	Hrs.
1	**Basic Programs:** a. Write a program to display the message HELLO WORLD. b. Write a program to declare some variables of type int, float and double. Assign some values to these variables & display these values.	**2hrs**
2	**Programs on variables:** a. Write a program to swap two numbers without using a third variable. b. Write a program to find the area of rectangle, square and circle.	**2hrs**
3	**Programs on Decision Making Statements (if-else, nested if-else):** a. Write a program to check whether the number is positive, negative or zero. b. Write a program to find the largest of three numbers.	**2hrs**
4	**Loops (While, do…while, for, Switch)** a. Write a program to enter a number from the user and display the month name. If number>13 then display invalid input using switch case. b. Write a program to check whether the number is even or odd.	**2hrs**
5	**Functions:** a. Program on Functions	**2hrs**
6	**Arrays** a. Write a program to find the largest value that is stored in the array. b. Write a program to compute the sum of all elements stored in an array.	**2hrs**
7	String operations for string length , string concatenation, string reverse, string comparison	**2hrs**
8	Write a C++ program using class and object Student to print name of the student, roll no. Display the same.	**2hrs**

9	Write a friend function for adding the two complex numbers, using a single class	**2hrs**
10	Write a friend function for adding the two different distances and display its Sum, using two classes.	**2hrs**
11	Design a class Complex for adding the two complex numbers and also show the use of constructor.	**2hrs**
12	Overload the + for concatenating the two strings. For e.g. "Py" + "thon" = Python.	**2hrs**
13	Overload the operator + for adding the timings of two clocks, And also pass objects as an argument.	**2hrs**
14	Design a class for single level inheritance.	**2hrs**
15	Design a class for multiple inheritances.	**2hrs**

Reference Books:

1. "Let us C++" , Y.P.Kanetkar, Seventh edition, BPB publication
2. Object Oriented programming with C++ , E Balagurusamy , Third Edition ,Tata McGraw Hill.
3. Schaum's outlines "Programming with C++", J.R.Hubbard, Second Edition, Tata McGrawHill

Course Code: UIT1COT

Course Title: Computer Organization and Design

Course Type: Major II   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain the underlying principles of computers.
CO-2	Analyse how data is transferred between various peripheral devices in the computer.
CO-3	Define the various types of number systems and logic gates.
CO-4	Elaborate the different types of Flip-Flops.

Syllabus for F.Y.B. Sc. (Information Technology) Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT1COT

Course Title: Computer Organization and Design

Unit I : Computer Abstractions and Technology: Basic structure and operation of a computer, Computer Hardware, Software, functional units and their interaction , Types of Operating Systems – Android OS, Linux OS, Windows OS, Memory and its types.

Number System & Binary Arithmetic: 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, ISCII Code, Error detection and correction. Binary Addition, Binary Subtraction, Subtraction Using 1's Complement , Subtraction Using 2's Complement, Binary Multiplication , Binary Division, Octal Addition, Octal Subtraction, Hexadecimal Addition, Hexadecimal Subtraction, BCD Addition, BCD Subtraction , Code Addition , Code Subtraction

Unit II : Boolean Algebra and Logic Gates: Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.

Minterm, Maxterm and Karnaugh Maps:

Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc clusky

Unit III: Arithmetic Circuits: Introduction to Arithmetic Circuits: Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractors.

 Multiplexer, Demultiplexer, ALU, Encoder and Decoder:

Introduction, Multiplexer, Demultiplexer, Encoder, Decoder, ALU.

Sequential Circuits: Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop, Application of flip-flops, Counters, Registers

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Reference Books:

1) Digital Electronics and Logic Design, N. G. Palan, Technova
2) Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011
3) R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd., 4th Edition, 2010.

Course Code: UIT1COP

Course Title: Computer Organization and Design Practical

Course Type: Major II　　　　　　　　　　　　　　　　**No. of Credits:01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Classify logic gates and their ICs and universal gates.
CO-2	Simplify the given Boolean expressions using a minimum number of logic gates and ICs.
CO-3	Build arithmetic circuits.
CO-4	Design Encoder, Decoder, Multiplexer and Demultiplexer.

Module/Unit	Course Description	Hrs.
1	Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, and EX-NOR).	**2hrs**
2	Simplify given Boolean expression and realize it.	**2hrs**
3	Design and implement a circuit based on the problem given and minimizing using K-maps.	**2hrs**
4	.Verifying De Morgan's laws.	**2hrs**
5	Implement other given expressions using minimum number of gates.	**2hrs**
6	Design and implement Binary – to – Gray code converter.	**2hrs**
7	Design and implement Gray – to – Binary code converter.	**2hrs**
8	Design and implement Binary – to – BCD code converter	**2hrs**
9	Design and implement Binary – to – XS-3 code converter	**2hrs**
10	Design and verify a half adder.	**2hrs**
11	Design and verify a full adder	**2hrs**
12	Design and verify full subtractor.	**2hrs**
13	Design and verify full subtractor.	**2hrs**
14	Design and verify the operation of flip-flops using logic gates.	**2hrs**
15	Implementation of digits using seven segment displays.	**2hrs**

Reference Books:
1) Digital Electronics and Logic Design, N. G. Palan, Technova
2) Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011
3) R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd., 4th Edition, 2010.

Course Code: UIT1SMT

Course Title: Statistical Methods

Course Type: Major III   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Recall measure of central tendency and dispersion.
CO-2	Describe sampling theory.
CO-3	Classify discrete and continuous probability distribution to various problems.
CO-4	Explain correlation and regression.

Syllabus for F.Y.B. Sc. (Information Technology) Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT1SMT

Course Title: Statistical Methods

Unit I: Measures of central tendency and dispersion
Introduction to Statistics, Ogive Curve and Histogram, Mean, Median, and Mode, Geometric Mean, Harmonic Mean, Root Mean Square, Quartiles, Deciles, and Percentiles,
Dispersion: Range, Mean Deviation, Quartile Deviation, Standard Deviation, Coefficient of Variation, Variance, Properties of the Standard Deviation.

Unit II: Probability and Sampling Theory
Moments, Skewness and Kurtosis
Elementary Probability Theory: Definitions of Probability, Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, conditional probability and Bayes theorem.
Elementary Sampling Theory: Sampling Theory, Random Samples, Sampling Techniques, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Differences and Sums, Standard Errors, central limit theorem.

Unit III: Correlation and Regression
Correlation: Measures of Correlation, the Karl Pearson's Correlation coefficient (r), Spearman's Rank correlation Coefficient (R).
Regression: The Least-Squares bivariate Regression Lines, Regression Coefficients, Product-Moment Formula for the Linear Correlation Coefficient, Multivariate Regression Lines by least square methods, Application for Time Series, Curve Fitting (Nonlinear regression models) Relationship between Variables, Curve Fitting.

Reference Books:

1. STATISTICS, Murray R Spiegel, Larry J. Stephens, McGRAW –HILL ITERNATIONAL, Fourth edition, 2011, New York : McGraw-Hill.
2. FUNDAMENTAL OF MATHEMATICAL STATISTICS S.C. GUPTA and V.K. KAPOOR, SULTAN CHAND and SONS, ELEVENTH EDITION, 2010.

Course Code: UIT1SMP

Course Title: Statistical Methods Practical

Course Type: Major III Practical   **No. of Credits:01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Make use of basic commands of R programming.
CO-2	Analyse the concepts of various descriptive statistical functions.
CO-3	Analyse the concepts of sampling theory.
CO-4	Explain the probability and regression.

Module/Unit	Course Description	Hrs.
1	Using R execute the basic commands, array, list and frames, sequences and repetition.	2hrs
2	Create a Matrix using R and Perform the operations: addition, multiplication.	2hrs
3	Create a Matrix using R and Perform the operations inverse, transpose.	2hrs
4	Create line charts (scatter plots), multiple line charts, bar plot, pie chart, histograms.	2hrs
5	Using R Execute the statistical function: mean, median, mode.	2hrs
6	Using R Execute the statistical functions: Quartiles, Range	2hrs
7	Using R Execute the statistical function: inter quartile range	2hrs
8	Using R import the data from Excel / .CSV file and perform the above functions	2hrs
9	Using R import the data from Excel / .CSV file and calculate the standard deviation, the variance, co-variance	2hrs
10	Using R import the data from Excel / .CSV file and draw the skewness and kurtosis.	2hrs
11	Using R compute the probability.	2hrs
12	Using R compute the conditional probability.	2hrs
13	Perform the Linear Regression using R.	2hrs
14	Compute the Least squares means using R.	2hrs
15	Compute the Linear Least Square Regression	2hrs

Reference Books:
1. A Practical Approach using R, R.B. Patil, H.J. Dand and R. Bhavsar, SPD publication, First edition, 2017.

Skill Enhancement Course (Credit 02)

Course Code: UIT1IWP

Course Title: Introduction to Web Designing Practical

Course Type: SEC   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain head tag and body tag in the give web page.
CO-2	Creating static web pages using HTML5 and CSS
CO-3	Design a responsive website using HTML5 and CSS.
CO-4	Describe the procedure to organize display as per given screen layout using frames.

Module/Unit	Course Description	Hrs.
1	Write a code of HTML webpage which displays your name, college name, class and semester.	2 hrs
2	Create a basic HTML page to demonstrate use of HTML Text Formatting.	2 hrs
3	Create a basic HTML page to demonstrate use of HTML Hyperlinks with all attributes.	2 hrs
4	Design a home page which displays information about your college department using headings, HTML entities and paragraphs.	2 hrs
5	Implement different types of list tags in the college departmental homepage.	2 hrs
6	Design a HTML page to demonstrate ordered lists.	2 hrs
7	Design a HTML page to demonstrate unordered lists.	2 hrs

8	Create HTML page as given below:
	 List of Subjects :
	   1. FYIT
	       a. C++
	       b. HTML
	       c. Statistics
	   2. SYIT
	      • Java
	      • Python
	      • Embedded system
	   3. TYIT
	      i. Linux
	      ii. IoT
	     iii. Advanced Java
		2 hrs

9	Create a webpage for any clinic using Marquee and HTML formatting tags.	2 hrs
10	Create 3 Hyperlink in home page connecting it to 3 different pages.	2 hrs
11	Create 3 Hyperlink in a page, which jumps to 3 different heading on same page.	2 hrs
12	Create a web page having two links .When link is clicked appropriate content should be displayed in another tab.	2 hrs
13	Create a table with rowspan and colspan attribute of table in HTML. Include cellspacing and cellpadding.	2 hrs
14	Design a timetable and display it in tabular format.	2 hrs

15	Create a simple form that will show all the input methods available in HTML.	2 hrs
16	Create a HTML form with the use of cascading style sheet.	2 hrs
17	Design a web page of your hometown with attractive background color,text color, an image, font face by using CSS.	2 hrs
18	Create a sample code to illustrate inline stylesheet for your web page.	2 hrs
19	Create a sample code to illustrate internal stylesheet for your web page.	2 hrs
20	Create a sample code to illustrate external stylesheet for your web page.	2 hrs
21	Design a web page to demonstrate use of CSS element Selector.	2 hrs
22	Create a webpage to demonstrate use of CSS id selector.	
23	Ceate a web page to Set different margins for all four sides of a paragraph.	2 hrs
24	Design a web page by using different CSS border styles.	2 hrs
25	Write a code for HTML webpage which redirects to Google page.(using <a> tag).	2 hrs
26	Design a web page with imagemaps.	2 hrs
27	Design an admission form for any course in your college with text, password field, drop-down list, check-boxes, radio button, submit and reset button.	2 hrs
28	Design a web of your Home town with a attractive background color, text color, and image, font face by using Internal CSS formatting.	2 hrs
29	Create a basic HTML page to demonstrate use of Audio sin HTML.	2 hrs
30	Create a basic HTML page to demonstrate use of Video in HTML.	2 hrs

Text Books
1 HTML & CSS: The complete Reference, Fifth Edition, Tata McGraw-Hill

Reference Books:
1. Jon Duckett, HTML and CSS : Design And Build Websites , Wiley.
2. Responsive web Design with HTML% and CSS, Ben Frain.
3. https://www.w3schools.com/html/dfault.asp

Value Education Course (Credit 2)

Course Code: UVEC1DTS

Course Title: Digital and Technology Solutions

Course Type: VEC   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Build knowledge about digital paradigm.
CO-2	Elaborate the importance of digital technology, digital financial tools, e-commerce.
CO-3	List the e-governance and Digital India initiatives
CO-4	Explain use & applications of digital technology

Syllabus for F.Y.B. Sc. (Information Technology) Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UVEC1DTS

Course Title: Digital and Technology Solutions

Unit I: Introduction & Evolution of Digital Systems: Introduction, Fundamental components of Digital System, Role & Significance of Digital Technology. Information & Communication Technology & Tools: Advantages & Disadvantages, Importance of ICT in Education.
Major technological trends: Internet of Things, Artificial Intelligence, Blockchain Technologies, Cloud Adoption, and Data Security & Cyber Protection.
Communication Systems: Principles, Model & Transmission Media. Computer Networks.
Internet Concept & Applications: WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking.
Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.

Unit II: Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment.
Application of Digital Financial Services: Savings and its future needs, Bank and banking products, Banking Service Delivery Channels –I, Banking Service Delivery Channels –II.
Digital Financial Tools: OTP, QR Code, Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit/ Debit Cards, e-Wallets.

Reference Books:
1. Digital Systems Engineering William J. Dally, John W. Poulton Cambridge University Press
2. Principles of Digital Communication – Robert G. Gallager
3. E-Governance in India: The Progress Status Sunil K. Muttoo, Rajan Gupta, Saibal K. Pal · 2019

Choice Based Credit System (CBCS)
F.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2024-2025

SEMESTER II

Course Code	Course Type	Course Title	Credit
UIT2PPT	Major Subject I	Fundamentals of Python Programming	03
UIT2PPP	Major Subject I Practical	Fundamentals of Python Programming Practical	01
UIT2DMT	Major Subject II	Database Management System	03
UIT2DMP	Major Subject II Practical	Database Management System Practical	01
UIT2LAT	Major Subject III	Linear Algebra	03
UIT2LAP	Major Subject III Practical	Linear Algebra Practical	01
UIT2AWP	SEC	Advanced Web Programming	02
		Total Credits	**14**

Open Elective Courses

Course Code	Course Type	Course Title	Credit
UOE2MAT	Open Elective	Introduction to Multimedia	02
		Total Credits	**02**

Value Education Courses

Course Code	Course Type	Course Title	Credit
UVEC2DTS	VEC	Digital Technology and Solutions	02

Course Code : UIT2PPT

Course Title : Fundamentals of Python Programming

Course Type: Major I   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain Python syntax and basic programming concepts.
CO-2	Explain and utilize data types, variables, and operators in Python.
CO-3	Learn control flow statements (if-else, loops) for program control and logic.
CO-4	Acquire knowledge of built-in data structures like lists, tuples, and dictionaries.

Syllabus for F.Y.B. Sc. (Information Technology) Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code : UIT2PPT

Course Title : Fundamentals of Python Programming

Unit I : Introduction to Features and Applications of Python: Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program.

Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples.

Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.

Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally.

Unit II: File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.

Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions. Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing.

Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists.

Unit III: Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries.

Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.

Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.

Reference Books:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf, 2015.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall 2012

Course Code: UIT2PPP

Course Title: Fundamentals of Python Programming Practical

Course Type: Major I   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Understanding the Scripting and Automation in python
CO-2	Implement the Handling of User Input
CO-3	Implement Programming Concepts like structure, pattern , etc.
CO-4	Identify the methods to create and manipulate programs.

Module/Unit	Course Description	Hrs.
1	Demonstrate a keyboard input program.	2 hrs
2	Check if a number belongs to the Fibonacci Sequence	2 hrs
3	Solve Quadratic Equations	2 hrs
4	Find the sum of n natural numbers	2 hrs
5	Display Multiplication Tables	2 hrs
6	Check if a given number is a Prime Number or not	2 hrs
7	Create a calculator program	2hrs
8	Explore string functions	2 hrs
9	Implement Selection Sort	2 hrs
10	Read and write into a file	2 hrs
11	Demonstrate usage of basic regular expression	2 hrs
12	Demonstrate use of List	2 hrs
13	Demonstrate use of Dictionaries	2hrs
14	Demonstrate Exceptions in Python	2 hrs
15	Demonstrate use of Tuple & Set	2 hrs

Reference Books:
1. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
2. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall 2012.

Course Code : UIT2DMT

Course Title : Database Management System

Course Type: Major II   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Design E-R model to represent normalized database.
CO-2	Explain the fundamental of RDBMS.
CO-3	Explain the transactions of database.
CO-4	Elaborate the View in DBMS.

Course Code: UIT2DMT

Course Title: Database Management System

Unit I: Introduction: 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.
Database Design, ER-Diagram Database design and ER Model: overview, ER-Model, ER Diagrams, ERD Issues, weak entity sets, Code's rules, Constraints, Relational Schemas, Introduction to Logical view of data, keys, integrity rules, normalization.

Unit II: Constraints, Views and SQL: What is constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views
SQL: SQL Commands, Null Values, Joins (Displaying Data from Multiple Tables)

Unit III: 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.
Introduction to PL/SQL: Introduction, Features of PL/SQL, Advantages of PL/SQL, PL/SQL - Basic Syntax, PL/SQL - Data Types, PL/SQL – Variables.

Reference Books:
1. "Database System Concepts" by Silberschatz, Korth, Sudarshan, 4th Edition, McGraw Hill Publication.
2. Fundamentals of Database System "By Elmasri Ramez and Navathe Shamkant".

Course Code : UIT2DMP

Course Title : Database Management System Practical

Course Type: Major II   **No. of Credits:01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Build Basic Database.
CO-2	Build SQL statement.
CO-3	Modify E-R model to relational table.
CO-4	Construct integrity constraints.

Module/Unit	Course Description	Hrs.
1	Design E-R diagram for college management system and Railway Reservation System.	**2hrs**
2	Design E-R diagram for ATM system and Hospital Management System	**2hrs**
3	Convert college management system E-R diagram into relational database.	**2hrs**
4	Convert Bank management system E-R diagram into relational database.	**2hrs**
5	Design a Database and create required tables. Creating Bank database	**2hrs**
6	Writing Basic SQL SELECT Statements. a) Restricting data b) Sorting Data	**2hrs**
7	Applying the constraints : Table Level.	**2hrs**
8	Applying the constraints : Column Level.	**2hrs**
9	Manipulating Data : a) Using INSERT b) Using UPDATE c) Using DELETE	**2hrs**
10	Write a SQL statement for Creating and Managing Tables. a) Alter b) Drop	**2hrs**
11	Write the query to create the database objects horizontal Views.	**2hrs**
12	Write the query to create the database objects vertical Views.	**2hrs**
13	Write a query to implement the Left outer join.	**2hrs**
14	Write a query to implement the Right outer join.	**2hrs**
15	Write a query to implement the Full outer join.	**2hrs**

Reference Books:

1. "Database System Concepts" by Silberschatz, Korth, Sudarshan, 4th Edition, McGraw Hill   Publication.
2. "Database Management System" by Raghu Ramakrishnan and Johannes Gehrke.

Course Code : UIT2LAT

Course Title : Linear Algebra

Course Type: Major III   **No. of Credits:03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Define vector spaces and subspaces.
CO-2	Relate matrices and linear transformation.
CO-3	Find kernel and image of linear transformation.
CO-4	Evaluate matrix representation.

Syllabus for F.Y.B. Sc. (Information Technology) Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code : UIT2LAT

Course Title : Linear Algebra

Unit I: System of linear equations and Matrices

Review: Matrices, properties of matrices, Transpose of a matrix and its properties, Types of matrices, determinant.
System of linear equations, inverse of a matrix, Row echelon form, Rank of a matrix, Gauss elimination method, Gauss Jordan method, Eigenvalues and eigenvectors of matrix, Diagonalizable of a matrix.

Unit II: Vector Spaces and Subspaces

Definition of a Vector Space, Subspaces and examples, Linear combination of vectors. Linear span of a subset of a vector space. Definition of a finitely generated vector space. Linear dependence and independence of subsets of a vector space, Basis of a vector space, Dimension of a vector space.

Unit III: Linear Transformations

Definition of a linear transformation and Examples, kernel and the image of a linear transformation. Nullity and rank of a linear transformation. Rank-Nullity Theorem (Statement only), linear isomorphism, Matrix representation of a linear transformation.

Reference Books:

1. Serge Lang, Introduction to Linear Algebra, Second Edition, Springer, 1986.
2. S. Kumaresan, Linear Algebra, A Geometric Approach, Prentice Hall of India, Pvt. Ltd, 2000.
3. K. Hoffman and R. Kunze: Linear Algebra, Tata McGraw-Hill, New Delhi, 1971.
4. Vikas Bisht and Vivek Sahai, Linear Algebra, Alpha Science International Limited, 2002.

Course Code: UIT2LAP

Course Title: Linear Algebra Practical

Course Type: Major III Practical   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Make use of basic commands of python programming.
CO-2	Explain properties of vector spaces.
CO-3	Analyse the concept of properties of linear transformation.
CO-4	Evaluate determinant and inverse of matrix.

Module/Unit	Course Description	Hrs.
1	Write a program to do the following: • Enter an r by c matrix M (r and c being positive integers) • Display M in matrix format	2 hrs
2	Write a program to Display the rows and columns of the matrix M	2 hrs
3	Write a program to Find the scalar multiplication of M for a given scalar.	2 hrs
4	Write a program to Find the transpose of the matrix M.	2 hrs
5	Write a program to Find the vector –matrix multiplication of a r by c matrix M with an c-vector u.	2 hrs
6	Write a program to Find the matrix-matrix product of M with a c by p matrix N.	2 hrs
7	Write a program to Enter a vector u as a n-list and Enter another vector v as a n-list	2 hrs
8	Write a program to Enter two distinct functions as vectors u and v.	2 hrs
9	Write a program to Find the vector au+bv for different values of a and b	2 hrs
10	Write a program to Find the dot product of u and v	2 hrs
11	Write a program to find determinant of a matrix	2 hrs
12	Write a program to enter a matrix and check if it is invertible. If the inverse exists, find the inverse.	2 hrs
13	Write a program to convert a matrix into its row echelon form.	2 hrs
14	Write a program to determine linearity	2 hrs
15	Write a program to find matrix representation of a linear transformation.	2 hrs

Reference Books:

1. Linear Algebra with Python by Sean Fitzpatrick, University of Lethbridge (2023); eBook (Creative Commons Licensed)

Open Elective (OE)

Course Code: UOE2MAT

Course Title: Introduction to Multimedia

Course Type: OE   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Summarize the key concepts in current multimedia technology.
CO-2	Find different Image Format and study it.
CO-3	List the different types of audio and video format.
CO-4	Create quality multimedia software titles.

Syllabus for F.Y.B. Sc. (Information Technology) Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code : UOE2MAT

Course Title : Introduction to Multimedia

Unit I: Introduction to Multimedia: What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media.
Audio fundamentals and representations:
Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet, Adding sound to your multimedia project, Audio software and hardware.

Unit II: Image fundamentals and representations:
Colour Science, Colour, Colour Models, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats: GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing [Can Use Photoshop], Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching.
Video and Animation:
Video Basics , How Video Works, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video (Use Adobe Premier for editing), Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: Cell Animation, Computer Animation, Morphing.

Reference Books:
1) Tay Vaughan, "Multimedia making it works", Tata McGraw-Hill, 2008.
2) Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
3) Li & Drew, "Fundamentals of Multimedia", Pearson Education, 2009.

Skill Enhancement Course (Credit 02)

Course Code: UIT2AWP

Course Title: Advanced Web Programming Practical

Course Type: SEC   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Use PHP to create dynamic web pages.
CO-2	Create responsive web pages to interact with databases.
CO-3	Develop attractive web pages using advanced technologies such as JQuery and XML.

Module/Unit	Course Description	Hrs.
1	Write a PHP program to check armstrong number.	2 hrs
2	Write a PHP Program to accept a number from the user and print it factorial.	2 hrs
3	Write a PHP program to print fibonacci series without using recursion and using recursion.	2 hrs
4	Write a PHP program to swap two numbers with and without using third variable.	2 hrs
5	Write a PHP program to print table of a number.	2 hrs
6	Write a PHP program to accept a number from the user and print whether it is prime or not.	2 hrs
7	Write a PHP program to swap two numbers with and without using third variable.	2 hrs
8	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.	2 hrs
9	Write a PHP program to find area of triangle.	2 hrs
10	Write a PHP program to accept a number from the user and display whether it is odd or even.	2 hrs
11	Write a PHP program to accept a number from the user and display the sum of digits of 14597.	2 hrs
12	Write a PHP program to find if the given year is leap year or not.	2 hrs
13	Write a PHP program to display the following Binary Pyramid: 1 0 1 1 0 1 0 1 0 1	2 hrs
14	Write a PHP program to print alphabet triangle.	2 hrs
15	Write a PHP program to demonstrate different string functions.	2 hrs
16	Write a PHP program to create one dimensional array.	2 hrs
17	Write a PHP code to create a database College and create a table Department (Dname, Dno, Number_Of_faculty)	2 hrs
18	Write a PHP code to create a database Bank_DB and create a table Cust_Info (C_name, C_Id, Address)	2 hrs

19	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.	**2 hrs**
20	Write a PHP program to create a database named "Employee". Create a table named "Emp_Info" with following fields (Emp_no, Emp_name, Salary).Insert 3 records of your choice. Display the names of the employee whose salary is between 35000 to 75000 in a tabular format.	**2 hrs**
21	Write a program using JQuery to select all the elements whose class is demo and change the background color of those elements.	**2 hrs**
22	Write a jQuery program to get href and title attributes of an anchor <a> element.	**2 hrs**
23	Write a jQuery program to get author-name and year attributes of a <div> element.	**2 hrs**
24	Write a jQuery program to get student-name and class attributes of a <div> element.	**2 hrs**
25	Write a JQuery Code to get a single element from a selection	**2 hrs**
26	Write a jQuery program to clicks on a button, all <p> elements will be hidden	**2 hrs**
27	Write a jQuery program to hide all the elements with class="test".	**2 hrs**
28	Write an XML program to demonstrate the structure of a simple XML document.	**2 hrs**
29	Create a well formed XML document using DTD.	**2 hrs**
30	Create a web page demonstrating use of AJAX.	**2 hrs**

Reference Books:

1. Steven Holzner,The Complete Reference PHP,McGraw Hill,Indian Edition
2. David Hunter Jeff Rafter,Beginning XML, Wiley India, 4th Edition

Value Education Course (Credit 2)

Course Code : UVEC2DTS

Course Title : Digital and Technology Solutions

Course Type: VEC   **No. of Credits: 2**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Knowledge about digital paradigm.
CO-2	Realization of importance of digital technology, digital financial tools, e-commerce.
CO-3	Familiarity with the e-governance and Digital India initiatives
CO-4	An understanding of use & applications of digital technology.

Syllabus for F.Y.B. Sc. (Information Technology) Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UVEC2DTS

Course Title: Digital and Technology Solutions

Unit I:
Cybersecurity: Fundamental concepts of Cybersecurity including threats, vulnerabilities, encryption, network security.
Ethical and Legal Considerations: Ethical and legal aspects of digital and technology solutions, Privacy, data protection regulations, intellectual property rights, and ethical considerations in technology development and usage.
Data Privacy and Security: Importance of data privacy and security in e-governance initiatives like encryption techniques, the confidentiality, integrity, and availability of data.

Unit II:
Government-to-Citizen (G2C) Services: The digital services provided by the government to citizens like online portals, mobile applications, and other digital platforms to access government services.
Government-to-Business (G2B) Services: The digital services and platforms provided by the government to businesses such as e-filing of taxes, online business registration, and digital procurement systems.
Government-to-Government (G2G) Services: The digital platforms and systems that facilitate interactions between government departments and agencies like e-office, e-procurement, and data sharing frameworks
Digital Identity and Authentication: Digital identity management systems, such as Aadhaar in India, and the use of biometrics or unique identification numbers for secure authentication of citizens accessing government services.

Reference Books:
1. Digital Systems Engineering William J. Dally, John W. Poulton Cambridge University Press
2. Principles of Digital Communication – Robert G. Gallager
3. E-Governance in India: The Progress Status Sunil K. Muttoo, Rajan Gupta, Saibal K. Pal · 2019

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited A+ Grade by NAAC (Third Cycle-CGPA-3.61)
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

As per National Education Policy - 2020

B. Sc. in Information Technology
(Faculty of Science)

Syllabus for S.Y. B. Sc. (Information Technology)
Semester III and IV

(With effect from the academic year 2024-25)

As per National Education Policy - 2020

Sr. No.	Heading	Particulars
1	**Title of program**	Information Technology
2	**Eligibility**	(a) A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates. (b) Candidate who have passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course. (c) However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body. Minimum marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates. OR Candidates with post HSC-Diploma in Information Technology/Computer Technology/ Computer Engineering/ Computer Science/ and Allied branches will be eligible for direct admission to the Second Year of B.Sc. (I.T.). However, the Diploma should be

		recognized by the Board of Technical Education or any other recognized Government Body Minimum Marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates.
3	**Duration of program**	3 Years
4	**Intake Capacity**	120
5	**Scheme of Examination**	**60:40**
6	**Standards of Passing**	40%
7	**Semesters**	Two
8	**Program Academic Level**	U.G
9	**Pattern**	Semester (60:40)
10	**Status**	New
11	**To be implemented from Academic Year**	Academic Year 2024-25

Mrs. I. S. Thakare
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Prof. (Dr.) S.K. Patil
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CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

Preamble

1) Introduction:

Information Technology encompasses the study, design, development, implementation, support, and management of computer-based information systems. These systems encompass hardware, software, networks, and data storage technologies, all working in concert to process, store, retrieve, and transmit vast amounts of information.

2) Aims and Objectives :

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

3) Learning Outcomes

- Learners will be able to demonstrate proficiency in the use of hardware, software, and networking technologies commonly used in the field of IT.
- Learners will be able to develop the ability to analyze complex problems in information technology and apply appropriate solutions using critical thinking and problem-solving skills.
- Learners will be able to acquire proficiency in programming languages relevant to the field of IT, such as Java, Python, C++ etc.
- Learners will be able to develop skills in web development, including HTML, CSS, JavaScript, and frameworks such as React or Angular, and demonstrate the ability to create dynamic and interactive web applications.

Abbreviations Used

- POs : Program Outcomes

- PS : Program Structure

- PSOs : Program Specific Outcomes

- COs : Course Outcomes

- TLP : Teaching-Learning Process

- AM : Assessment Method

- DSC : Discipline Specific Core

- DSE : Discipline Specific Elective

- GE : Generic Elective

- OE : Open Elective

- VSC : Vocational Skill Course

- SEC : Skill Enhancement Course

- IKS : Indian Knowledge System

- AEC : Ability Enhancement Course

- VEC : Value Education Course

- OJT : On Job Training (Internship)

- FP : Field project

- CEP : Community engagement and service

- CC : Co-curricular Courses

- RM : Research Methodology

- RP : Research Project

- MJ : Major Course

- MN : Minor Course

Program Outcomes (POs)

PO No.	POs Statement	Knowledge and Skill
	After completing the Bachelor of Science Program, students will be able to-	
PO-1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary Knowledge
PO-2	An ability to develop and conduct experiments, analyse, and interpret data and use scientific judgment to draw conclusions.	Scientific reasoning
PO-3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO-4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO-5	An ability to achieve high order communication skills.	Communication skills
PO-6	An ability to collect, analyse and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO-7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO-8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO-9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO-10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO-11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Program Specific Outcomes (PSOs)

PSO No.	PSOs Statement	Knowledge and Skill
	After completing the Bachelor of Science Program, students will be able to-	
PSO-1	Gain proficiency in the field of Networking and Security.	Disciplinary Knowledge
PSO-2	Develop Programming skills that help to meet the needs of the IT industry.	Digital literacy
PSO-3	Build soft skills for employability and personality development in the Industrial environment.	Life-long learning

Syllabus for S.Y.B. Sc. (Information Technology) Semester III and IV
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)
Course Structure

No. of Courses	Semester III	Credits	No. of Courses	Semester IV	Credits
A	*Discipline Specific Course (Major)*		**A**	*Discipline Specific Course (Major)*	
1	Advanced Python Programming	03+01	1	Core Java	03+01
2	Advanced Database Management System and Big Data	03+01	2	Operating System	03+01
B	*Minor*		**B**	*Minor*	
3	Computer Network	02+02	3	Data Structure	02+02
C	*Vocational Skill Course (VSC)*		**C**	*Skill Enhancement Course (SEC)*	
4	Software Engineering	02	4	Mobile Application Development	02
D	*Open Elective (OE)*		**D**	*Open Elective (OE)*	
5	Introduction to Mobile App Development	02	5	Introduction to AI tools with MS Office Suite	02
E	*Ability Enhancement Course (AEC)*		**E**	*Ability Enhancement Course (AEC)*	
6	English	02	6	English	02
F	*Co-curricular Courses (Any One)*		**F**	*Co-curricular Course (Any One)*	
7	Foundation Course in NSS-I	02	8	Foundation Course in NSS-II	02
8	Foundation Course in NCC-I	02	9	Foundation Course in NCC-II	02
9	Foundation Course in PE-I	02	10	Foundation Course in PE-II	02
11	Foundation Course in PA-I	02	11	Foundation Course in PA-II	02
G	*OJT/FP/CEP/RP*		**G**	*OJT/FP/CEP/RP*	
12	***Field Project (Major)***	02	12	Community Engagement Project	02
	Total Credits	22		Total Credits	22

Choice Based Credit System (CBCS)
S.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2024-2025
SEMESTER III

Course Code	Course Type	Course Title	Credit
UIT3APT	Major Subject I	Advanced Python Programming	03
UIT3APP	Major Subject I Practical	Advanced Python Programming Practical	01
UIT3ADT	Major Subject II	Advanced Database Management System and Big Data	03
UIT3ADP	Major Subject II Practical	Advanced Database Management System and Big Data Practical	01
UIT3CNT	Minor	Computer Network	02
UIT3CNP	Minor Practical	Computer Network Practical	02
UIT3SEP	VSC2 Practical	Software Engineering	02
UIT3OJT	Major	Field Project	02
		Total Credits	**16**

Open Elective Courses

Course Code	Course Type	Course Title	Credit
UOE3MDT	Open Elective 3	Introduction to Mobile App Development	02
		Total Credits	**02**

CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for S.Y.B. Sc. (Information Technology) Semester III
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Code: UIT3APT

Course Title: Advanced Python Programming

Course Type: Major-I   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain the concepts of Class & Objects & use of Regular Expression in Python Programming.
CO-2	Demonstrate the GUI forms and widgets.
CO-3	Identify the software to create and manipulate connection with DB.
CO-4	Utilize the tools to design reports in charts, bars, etc.

Syllabus for S.Y.B. Sc. (Information Technology) Semester III
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT3APT

Course Title: Advanced Python Programming

Unit I:
Regular Expressions–Concept of regular expression, various types of regular expressions, using match function. **Classes and Objects:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, **multithreaded priority queue Modules:** Importing module, Creating and exploring modules, Math module, Random module, Time module.

Unit II:
Creating the GUI Form and Adding Widgets: Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text,Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox. Handling Standard attributes and Properties of Widgets. **Layout Management**: Designing GUI applications with proper Layout Management features. **Look and Feel Customization:** Enhancing Look and Feel of GUI using different appearances of widgets.

Unit III:
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, UPDATE, DELETE command, Storing and retrieving data from MySQL database. **Introduction to NumPy**: Creation of vectors and matrices, Matrix manipulation. **Introduction to Pandas**: Pandas data structures – Series and Data Frame, Data wrangling using pandas, Loading a dataset into a data frame, Selecting Columns from a data frame, Selecting Rows from a data frame, Adding new data in a data frame Deleting data from a data frame. **Introduction to Matplotlib**: Scatter plot, Line plot, Bar chart, Histogram, Box plot.

Reference Books:
1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python: The Complete Reference, Martin C. Brown, McGraw Hill Edition, 2018.
4. Python Data Analytics: With Pandas, NumPy, and Matplotlib, Fabio Nelli, Apress, 2018

Course Code: UIT3APP

Course Title: Advanced Python Programming Practical

Course Type: Major-I   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Create class, objects, inheritance, overriding functions etc.
CO-2	Identify the methods to create and manipulate programs.
CO-3	Develop graphical user interface & connection with DB.
CO-4	Build reports by using python tools for charts, plots, frames, etc

Module/ Unit	Course Description	Hrs.
1	Design a class that store the information of student and display the same.	2 Hrs.
2	Implement the concept of inheritance using python	2 Hrs.
3	Implement the concept of method overriding using python.	2 Hrs.
4	Write a program for single threaded application.	2 Hrs.
5	Write a program to implement Layout management.	2 Hrs.
6	Write a program to configure the widget with various options like: bg="red", family="times", size=18	2 Hrs.
7	Design a registration page using widgets.	2 Hrs.
8	Design a program to implement Calculator using tkinter.	2 Hrs.
9	Design a simple database application that stores the records and retrieve the same & search the specified record from the database.	2 Hrs.
10	Design a database application to that allows the user to add, delete and modify the records.	2 Hrs.
11	Write a program for creation of vectors and matrices using NumPy.	2 Hrs.
12	Write a program to develop pandas data Structure (Series & Data Frame)	2 Hrs.
13	Write a program for Data wrangling using Pandas	2 Hrs.
14	Write a program to design Scatter, Line & Box Plot using Matplotlib.	2 Hrs.
15	Write a program to design Histogram & Bar chart using Matplotlib.	2 Hrs.

Reference Books:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python: The Complete Reference, Martin C. Brown, McGraw Hill Edition, 2018.
4. Python Data Analytics: With Pandas, NumPy, and Matplotlib, Fabio Nelli, Apress, 2018

Course Code: UIT3ADT

Course Title: Advanced Database Management System and Big Data

Course Type: Major-II   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain advanced database objects required for PL/SQL programs.
CO-2	Elaborate the DDL and DML database statements and associated naming rules.
CO-3	Explain advanced database objects required for PL/SQL programs.
CO-4	Explain the basic concepts of Big Data Analytics.

Course Code: UIT3ADT
Course Title: Advanced Database Management System and Big Data
Unit I :
PL-SQL: Beginning with PL / SQL,
Control Structures: Conditional processing using IF Statements and CASE Statements, Loop Statement, While Loop Statement, For Loop Statement, the Continue Statement
Explicit Cursors: Declare the Cursor, Open the Cursor, Fetch data from the Cursor, Close the Cursor, Cursor FOR loop, The %NOTFOUND and %ROWCOUNT Attributes
Exception Handling: Handle Exceptions with PL/SQL, Propagate Exceptions

Unit II :
Stored Procedures: Create, Call, and Remove Stored Procedures, Implement Procedures Parameters and Parameters Modes.
Stored Functions Create, Call, and Remove a Stored Function, Invoke User-Defined Functions in SQL Statements
Packages: advantages of Packages, components of a Package, Develop a Package, enable visibility of a Package's Components, Create the Package Specification and Body using the SQL CREATE Statement and SQL Developer,
Triggers: Trigger Event Types and Body, Create DML Triggers using the CREATE TRIGGER Statement, Identify the Trigger Event Types, Body, and Firing (Timing), Statement Level Triggers and Row Level Triggers, Manage, Test and Remove Triggers.

Unit III :
Introduction to Big data : Characteristics of data, Definition of Big data, Evolution of Big data, Challenges with Big data, 3 Vs of Big data, Why Big data, Data Warehousing Environment, Hadoop Environment, What is Big Data Analytics, Classification of Big Data Analytics, Data Analytics Life cycle.

Reference Books:
1) Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
2) Oracle database 11g: hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition
3) Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition X- Team, 2011
4) PL/SQL Programming, Ivan Bayross, FirstEdition, BPB 2010
5) Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018

Course Code : UIT3ADP

Course Title : Advanced Database Management System and Big data Practical

Course Type: Major-II Practical   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Apply DDL and DML statements to access database.
CO-2	Create database objects using SET operators.
CO-3	Build basic PL/SQL programs
CO-4	Develop PL/SQL program using Advanced Database objects.

Module/Unit	Course Description	Hrs.
1	**Select queries** a. Select queries on single table using alias, where and	2 hrs

		order by clause. b. Select queries on single table using aggregate	

2	**Implementing DML and DDL**
	    a. Querying single and multiple tables using subqueries.
	    b. Manipulating data (Insert, update and delete)
	      Creating simple tables and tables with constraints.
		2 hrs

3	**Creating database objects and using set operators** a. Creating Views, Sequences, Indexes and synonyms.	2 hrs

4	**Select queries using joins and unions**
	    a. Querying data from multiple tables using all types of joins.
	    b. Querying data from multiple tables using all types of joins.
		2 hrs

5	**Basic PL/SQL Programs** Creating anonymous PL/SQL blocks.	2 hrs

6	**PL/SQL programs using Control Structures**
	    a. Programs using If Then Else
	    b. Programs using Simple LOOP
	    c. Programs using While LOOP
	    d. Programs using For LOOP
	    e. Programs using Switch statement
		2 hrs

7	**Implementing user defined Exceptions.**	2 hrs
8	**Implementing user Cursors.**	2 hrs
9	**Implementing user Composite data type.**	2 hrs
10	**Stored Procedures** Creating and invoking functions from SQL statements.	2 hrs
11	**Stored Functions** Creating and invoking stored procedures.	2 hrs
12	**Working with packages** Create package specifications and package bodies. Invoke the constructs in the packages.	2 hrs
13	**Working with Overloading of packages** Create a package containing an overloaded function.	2 hrs
14	**Working with Large Objects and triggers** Create statement triggers.	2 hrs
15	**Working with Large Objects and triggers** Create row triggers.	2 hrs

Reference Books:
1) Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
2) Oracle database 11g: hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition

3) Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition X- Team, 2011
4) PL/SQL Programming, Ivan Bayross, FirstEdition, BPB 2010
5) Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018

Course Code: UIT3CNT

Course Title: Computer Network

Course Type: Minor   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Learners will be able to explain the functions of each layer in OSI and TCP/IP model.
CO-2	Learners will be able to elaborate functions of data link layer and its protocol
CO-3	Learners will be able to define the concepts of wired and wireless LAN.
CO-4	Learners will be able to elaborate functions of network layer and transport layer.

Syllabus for S.Y.B. Sc. (Information Technology) Semester III
Choice Based Credit System

Course Code: UIT3CNT

Course Title: Computer Network

Unit I:

Introduction: Data communications, networks, network types, Internet history, standards and administration.

Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.

Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.

Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.

Bandwidth Utilization: Multiplexing and Spectrum Spreading: Multiplexing, Spread Spectrum Transmission media: Guided Media, Unguided Media Switching: Introduction, circuit switched networks, packet switching, and structure of a switch.

Unit II:

Introduction to the Data Link Layer: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.

Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol.

Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabitethernet, 10 gigabit Ethernet.

Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks.

Connecting devices and Virtual LANs.

Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP

Unicast Routing: Introduction, routing algorithms, unicast routing protocols.

Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.

Introduction to the Transport Layer.

Standard Client0Server Protocols: Worldwide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.

Reference Books:

1) Data Communication and Networking", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.

2) "TCP/IP protocol suite", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.

3) "Computer Networks", Andrew Tanenbaum, Pearson, Fifth Edition, 2013.

Course Code : UIT3CNP

Course Title : Computer Network Practical

Course Type: Minor   **No. of Credits:02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Learners should be able to determine information about IP address.
CO-2	Learners should be able to apply network commands for network configuration.
CO-3	Learners should be able to configure different client server.
CO-4	Learners should be able to configure different network security tools.

Module/Unit	Course Description	Hrs.
1	**IPv4 Addressing** Given an IP address and network mask, determine other information about the IP address such as: • Network address	2hrs
2	**IPv4 Subnetting:** Given an IP address and network mask, determine other information about the IP address such as: • Network broadcast address	2hrs
3	Given an IP address and network mask, determine other information • Total number of host bits in the network	2hrs
4	Given an IP address and network mask, determine other information • Number of hosts in the network.	2hrs
5	Given an IP address and network mask, determine other information about the IP address such as: • The subnet address of this subnet. • The broadcast address of this Subnet.	2hrs
6	Given an IP address and network mask, determine other information about the IP address such as: The number of hosts for each subnet.	2hrs
7	Given an IP address and network mask, determine other information about the IP address such as: • The range of host addresses for this subnet.	2hrs
8	Given an IP address and network mask, determine other information about the IP address such as: The maximum number of subnets for this subnet mask.	2hrs
9	Given an IP address and network mask, determine other information about the IP address such as: • The number of subnet bits	2hrs
10	Given an IP address and network mask, determine other information about the IP address such as: The number of this subnet in the network.	2hrs
11	Use of ping and tracert / traceroute, ipconfig / ifconfig commands.	2hrs
12	Use of route and arp utilities command	2hrs

13	Configure IP static routing.	2hrs
14	Configure IP routing using RIP.	2hrs
15	Configuring Simple OSPF.	2hrs
16	Configuring DHCP server.	2hrs
17	Configuring DHCP client	2hrs
18	Create virtual PC based network using virtualization software.	2hrs
19	Create virtual PC and install operating system.	2hrs
20	Configuring DNS Server.	2hrs
21	Configuring DNS client.	2hrs
22	Configuring OSPF with multiple areas.	2hrs
23	Use of Wireshark to scan and check the packet information of following protocols : HTTP	2hrs
24	Use of Wireshark to scan and check the packet information of following protocols : ICMP	2hrs
25	Use of Wireshark to scan and check the packet information of following protocols : TCP	2hrs
26	Use of Wireshark to scan and check the packet information of following protocols : SMTP	2hrs
27	Use of Wireshark to scan and check the packet information of following protocols : POP3	2hrs
28	IPV6 address Basics	2hrs
29	Solving Network problems.	2hrs
30	Using Network Security Tools.	2hrs

Reference Books:

1) Data Communication and Networking", Behrouz A. Forouzan , Tata McGraw Hill ,Fifth Edition , 2013.
2) "TCP/IP protocol suite", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
3) "Computer Networks", Andrew Tanenbaum, Pearson, Fifth Edition, 2013.

Vocational Skill Course (Credit 2)

Course Code : UIT3SEP

Course Title : Software Engineering Practical

Course Type: VSC   **No. of Credits:02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Evaluate products-start-ups implementing software process models in software engineering methods.
CO-2	Design the diagram in an open-source tool: Star UML.
CO-3	Construct systems using design principles.
CO-4	Design the existing software using UML diagrams.

Module/Unit	Course Description	Hrs
1	Study and implementation of Waterfall Model.	2hrs
2	Study and implementation of Prototyping Model.	2hrs
3	Study and implementation of Iterative Development Model.	2hrs
4	Study and implementation of Rational Unified Process.	2hrs
5	Study and implementation of The RAD Model.	2hrs
6	Study and implementation of Time boxing Model.	2hrs
7	Study and implementation of class diagrams for College Management System.	2hrs
8	Study and implementation of class diagrams for Hospital Management System.	2hrs
9	Study and implementation of Use Case Diagrams.	2hrs
10	Study and implementation of Entity Relationship Diagrams.	2hrs
11	Study and implementation of Entity Relationship Diagrams in Hospital Management System.	2hrs
12	Study and implementation of Entity Relationship Diagrams in Company Management System.	2hrs
13	Study and implementation of Context Models.	2hrs
14	Study and implementation of Data Models.	2hrs
15	Study and implementation of Sequence Diagrams for Online Ordering System	2hrs
16	Study and implementation of Sequence Diagrams for Doctor Appointment System	2hrs
17	Study and implementation of State Transition Diagrams for Event Management System	2hrs
18	Study and implementation of Data Flow Diagrams.	2hrs
19	Study and implementation of Collaboration Diagrams.	2hrs
20	Study and implementation of Activity Diagrams for Online Food Order System	2hrs
21	Study and implementation of Activity Diagrams for Doctor Appointment System	2hrs
22	Study and implementation of Component Diagrams for Hospital Management System.	2hrs

23	Study and implementation of Component Diagrams for Blood Bank Management System.	2hrs
24	Study and implementation of Deployment Diagrams for Library Management System	2hrs
25	Study and implementation of Deployment Diagrams School Management System	2hrs
26	Study and implementation of State Chart Diagrams for ATM Machine Management System	2hrs
27	Study and implementation of Data Flow Diagram.	2hrs
28	To implement basic COCOMO using C++	2hrs
29	Study and implement Activity scheduling using forward pass	2hrs
30	Study and implement Activity scheduling using backward pass	2hrs

Reference Books:
1) Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
2) Software engineering, a practitioner's approach Roger Pressman Tata Mcgraw-hill Seventh edition
3) Software Project Management, Bob Hughes, Mike Cotterell, Rajib Mall sixth edition.
4) Project Management and Tools & Technologies – An overview,Shailesh Mehta 1st edition

Open Elective Course

Course Code: UOE3MDT

Course Title: Introduction to Mobile Application Development

Course Type: OE   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain the fundamental concepts of mobile app development.
CO-2	Explain Android environment and development tools.
CO-3	Develop rich user interfaces by using layouts and controls.
CO-4	Utilize UI components for android application development.

Syllabus for S.Y.B. Sc. (Information Technology) Semester III
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UOE3MDT
Course Title: Introduction to Mobile Application Development

Unit I: Introduction to mobile application development, importance of designing in mobile app development, what is mobile application, types of mobile applications, cost of developing a mobile app, mobile app development process, introduction to android development, features of android, android versions, advantages and disadvantages of android development

Unit II: Open handset alliance, Android Ecosystem. Need of Android, Features of Androids. Tools and Software required for developing an Android Application. Android Architecture. Operating System, Java JDK, Android SDK, Android Development Tools (ADT), Android Virtual Devices (AVD's), Emulators, JVM & DVM, Steps to install and configure Android Studio and SDK. Control Flow, Directory Structure, Components of a screen, Fundamental UI Design. Layouts, Widgets, tools.

Reference Books:
1. Android, Dixit & Prasanna Kumar, Vikas Publication, New Delhi, 2014.
2. Pro Android 5, Maclean David, Komatineni Satya & Allen Grandt, Apress Publication, 2015
3. Android Programming for Beginners, Hortan & Jhon, Packet Publication, 2015

OJT/FP/CEP/RP

Course Code: UIT3OJT

Course Title: Field Project

Course Type: Major   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Assess interests and abilities in their field of study.
CO-2	Develop work habits and attitudes necessary for job success.
CO-3	Build a record of work experience.
CO-4	Prepare professional work reports

Choice Based Credit System (CBCS)
S.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER IV

Course Code	Course Type	Course Title	Credit
UIT4CJT	Major Subject I	Core Java	03
UIT4CJP	Major Subject I Practical	Core Java Practical	01
UIT4OST	Major Subject II	Operating System	03
UIT4OSP	Major Subject II Practical	Operating System Practical	01
UIT4DST	Minor	Data Structure	02
UIT4DSP	Minor Practical	Data Structure Practical	02
UIT4MAP	SEC Practical	Mobile Application Development Practical	02
UIT4CEP	Major	Community Engagement Project	02
		Total Credits	**16**

Open Elective Courses

Course Code	Course Type	Course Title	Credit
UOE4AIT	Open Elective	Introduction to AI tools with MS Office Suite	02
		Total Credits	**02**

Course Code: UIT4CJT

Course Title: Core Java

Course Type: Major-I   **No. of Credits: 03**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain the basic concepts of java programming.
CO-2	Build java code using control structures, iteration.
CO-3	Explain advance class features.
CO-4	Elaborate multithreading, exception handling.
CO-5	Elaborate AWT application.

Syllabus for S.Y.B. Sc. (Information Technology) Semester IV
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT4CJT

Course Title: Core Java

Unit I :
Introduction: History, Java Runtime Environment, The Java Virtual Machine, Java Development Kit, java platform, Type Annotations, Java Compiler And Interpreter, statements, case sensitivity, identifiers, keywords, comments, variables.
Data types: primitive data types, Strings, Auto boxing and Unboxing.
Operators: Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.

Unit II :
Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects from a Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method Overloading, Constructors, garbage collection.
Inheritance: Inheritance and Access Control, Default Base Class Constructors, this and super keywords.
Abstract Classes And Interfaces: Abstract Classes, Abstract Methods, Interfaces, Implementing Interfaces, Interface V/s Abstract Class, Classes V/s Interfaces.

Unit III :
Arrays and Vectors: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements.
Multithreading: The thread control methods, thread life cycle, the main thread, creating a thread.
Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause.
Event Handling and Abstract Window Toolkit: Events, Event classes, Event listener interfaces, Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars.

Reference Books:
1) "Core Java 8 for Beginners" , Vaishali Shah, Sharnam Shah, First edition, SPD publication
2) "Java: The Complete Reference" , Herbert Schildt, Ninth Edition, McGraw Hill.

Course Code: UIT4CJP

Course Title: Core Java Practical

Course Type: Major-I   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Build basic programs by using operators.
CO-2	Make use of the data types, methods and constructors to write java program.
CO-3	Create a program on inheritance, arrays and vectors.
CO-4	Make use of the multithreading concepts.
CO-5	Design GUI by using Exception handling.

Module/ Unit	Course Description	Hrs.
1	**Java Basics** Write a Java program which takes a number as input from user and prints its multiplication table up to 10.	2hrs
2	**Use of Operators** Write a Java program to convert a decimal number to binary number and vice versa.	2hrs
3	**Java Data Types** Write a Java program to count the letters, spaces, numbers and other characters of an input string.	2hrs
4	**Control Flow Statements and Iterations** Write a Java program to check whether the number is positive, negative or zero.	2hrs
5	**Methods and Constructors** Designed a class that demonstrates the use of constructor and destructor.	2hrs
6	**Abstract class** Write a java program to demonstrate the implementation of abstract class.	2hrs
7	**Method overloading** Write a java program to implement method overloading.	2hrs
8	**Inheritance** Write a java program to implement multilevel inheritance.	2hrs
9	**Arrays** Write a java program to add two matrices and print the resultant matrix.	2hrs
10	**Vectors** Write a java program to implement the vectors.	2hrs
11	**Multithreading** Write a java program to implement multithreading concept.	2hrs
12	**Exception Handling** Write a java program to implement exception handling.	2hrs
13	**Exception Handling** Write a java program to demonstrate the use of finally block.	2hrs
14	**GUI Programming.** Design a AWT program to print the factorial for an input value.	2hrs
15	**GUI Programming.** Design an AWT application that contains the interface to add student information and display the same.	2hrs

Reference Books:

1) "Core Java 8 for Beginners" , Vaishali Shah, Sharnam Shah, First edition, SPD publication
2) "Java: The Complete Reference" , Herbert Schildt, Ninth Edition, McGraw Hill.

Course Code: UIT4OST

Course Title: Operating Systems

Course Type: Major-II   **No. of Credits: 03**

Course Outcomes (Cos)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain the role of operating system with its function and services.
CO-2	Compare Various Algorithm used for CPU Scheduling and Disk Scheduling Algorithm.
CO-3	Apply various concepts related with Deadlock to solve Problems.
CO-4	Describe basic concepts of Linux in terms of operating system.

Syllabus for S.Y.B. Sc. (Information Technology) Semester IV
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT4OST

Course Title: Operating Systems

Unit I : Introduction : Definition of Operating system, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments
Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure
Processes Process states, PCB (Process Control Block), Process Scheduling.
Threads: Thread Concept, Multithreading models, user-level threads Vs Kernel-level threads.

Unit II : CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling
Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Unit III : Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.
Linux Operating system: Linux Distributions, The Unix/Linux architecture, Features of Unix/Linux, Starting the shell, Shell prompt, Command structure, File Systems and Directory Structure, man pages, more documentation pages, General purpose utility Commands, basic commands.

Reference Books:
1. Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill
2. Naresh Chauhan, Principles of Operating Systems, Oxford Press
3. Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016

Course Code: UIT4OSP

Course Title: Operating Systems Practical

Course Type: Major-II   **No. of Credits: 01**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Describe basic installation of Linux / windows operating system.
CO-2	Explain the use of various windows commands.
CO-3	Create a program using expr, if and while loop.
CO-4	Make use of various shell commands with regular expressions.

Module/ Unit	Course Description	Hrs.
1	Installation of virtual machine software.	2 hrs
2	Installation of Linux operating system (Red Hat / Ubuntu) on virtual machine.	2 hrs
3	Installation of Windows operating system on virtual machine.	2 hrs
4	**Windows (DOS) Commands – 1** Date, time, prompt, md, cd, rd, path.	2 hrs
5	Chkdsk, copy, xcopy, format, fidsk, cls, defrag, del, move.	2 hrs
6	**Windows (DOS) Commands – 2** Diskcomp, diskcopy, diskpart, doskey, echo	2 hrs
7	Edit, fc, find, rename, set, type, ver	2 hrs
8	**Linux commands:** date, cal, uptime, w, whoami, finger, uname, man, df, du, free, whereis, which.	2 hrs
9	**Linux commands: Working with Directories:** pwd, cd, absolute and relative paths, ls, mkdir, rmdir,	2 hrs
10	**Linux Commands: Handling Ordinary Files:** file, touch, rm, cp. Mv, rename, cat, tac, more, less.	2 hrs
11	**Simple Filters:** head, tail, cut,paste,sort,tr.	2 hrs
12	**Shell scripting: Reading using input** Write a shell script program to accept name of user and display welcome message.	2 hrs
13	**Shell scripting: using expr** Write a shell script program to accept number from the user and display square.	2 hrs
14	**Shell scripting: using if** Write a shell script program to accept two number from the user and display greatest among them.	2 hrs
15	**Shell scripting: using while** Write a shell script program to display 10 numbers.	2 hrs

Reference Books:

1. Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill
2. Naresh Chauhan, Principles of Operating Systems, Oxford Press
3. Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016

Course Code: UIT4DST

Course Title: Data Structures

Course Type: Minor   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Define the basics of algorithm analysis and array operations.
CO-2	Elaborate Operations on Linked lists, Stack and Queue.
CO-3	Explain Different searching and sorting techniques, tree and AVL tree structures.
CO-4	Solve Problems based on graph and hashing techniques.

Syllabus for S.Y.B. Sc. (Information Technology) Semester IV
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UIT4DST

Course Title: Data Structures

Unit I :
Introduction:
Data Structure, Classification of Data Structures, Types of Data Structure, Operations on Data Structure, Algorithm, Complexity of an Algorithm, Asymptotic Analysis and Notations.
Array:
Introduction to array, Sparse Arrays, Sparse Matrix, Advantages and Limitations of Arrays.
Stack:
Introduction, Operations on the Stack, Evaluation of Arithmetic Expression, infix and postfix operations
Queue:
Introduction, Operations on the Queue, Circular Queue, Deque and Priority Queue.
Linked List:
Linked List, Memory Allocation and De-allocation, Circular Linked List, Two way Linked List, Header Linked List

Unit II :
 Sorting and Searching Techniques
Bubble, Selection, Insertion, Merge sort, Linear Search and Binary Search
Tree: Tree, Binary Tree, Properties of Binary Tree, Heap.
Advanced Tree Structures:
Red Black Tree, AVL Tree,2-3 Tree, B-Tree
Hashing Techniques
Hash function, Address calculation techniques, Common hashing functions
Graph:
Introduction, Graph, Graph Terminology, Graph Traversal, Shortest Path Problems

Reference Books:
1) A Simplified Approach to Data Structures - Lalit Goyal, Vishal Goyal, Pawan Kumar
2) An Introduction to Data Structure with Applications - Jean – Paul Tremblay and Paul Sorenson.
3) Data Structure and Algorithm -Maria RukadikarTata McGraw Hill

Course Code : UIT4DSP

Course Title : Data Structures Practical

Course Type: Minor Practical   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Develop different data structure techniques.
CO-2	Create Linked list, Stack and Queue Operations.
CO-3	Make use of searching and sorting techniques
CO-4	Build a tree and display its elements

Module/ Unit	Course Description	Hrs.
1	Write a program to store the elements in 1-D array & perform the operations like searching, sorting, reversing the elements.	2 hrs
2	Read the two arrays from user & merge them & display the element in sorted order.	2 hrs
3	Write a program to perform the Matrix addition, multiplication, and transpose operations.	2 hrs
4	Write a program to implement the concept of Stack Push, Pop, Display and Exit operations.	2 hrs
5	Write a program to implement the concept of Queue Insert, Delete, Display and Exit operations.	2 hrs
6	Write a program to implement bubble sort.	2 hrs
7	Write a program to implement selection sort.	2 hrs
8	Write a program to implement insertion sort.	2 hrs
9	Write a program to implement the merge sort.	2 hrs
10	Write a program to search the element using sequential search.	2 hrs
11	Write a program to search the element using binary search.	2 hrs
12	Write a program to create a single link list and its node element.	2 hrs
13	Write a program to create a tree and display the element.	2 hrs
14	Write a program to insert the element into a maximum heap.	2 hrs
15	Write a program to insert the element into a minimum heap.	2 hrs
16	Write a program to implement Queue Sort	2 hrs
17	Write a program to concatenate two doubly linked lists.	2 hrs
18	Write a program to implement Circular Queue using arrays that performs following operations. (a) INSERT(b) DELETE(c) DISPLAY	2 hrs
19	Implement a program to convert infix notation to postfix notation using stack.	2 hrs
20	Implement a program for stack that performs following operations using array. (a) PUSH (b) POP (c) PEEP (d) CHANGE (e) DISPLAY	2 hrs
21	Write a program to perform various operation on graph using BFS.	2 hrs

22	Write a program to perform various operation on graph using DFS.	2 hrs
23	Write a program to perform various operation on tree.	2 hrs
24	Write a program to find mean and median of number stored in an array.	2 hrs
25	Write a program to sort an array.	2 hrs
26	Write a program to search a number in an array.	2 hrs
27	Write a program to store mark obtained by 10 students in 5 subjects in 2 dimensional array.	2 hrs
28	Write a program to add two polynomials using linked list.	2 hrs
29	Write a program to implement priority queue using linked list.	2 hrs
30	Write a program to reverse a linked list.	2 hrs

Reference Books:
1) A Simplified Approach to Data Structures - Lalit Goyal, Vishal Goyal, Pawan Kumar
2) An Introduction to Data Structure with Applications - Jean – Paul Tremblay and Paul Sorenson
3) Data Structure and Algorithm -Maria RukadikarTata McGraw Hill

Skill Enhancement Course(SEC)

Course Code: UIT4MAP

Course Title: Mobile Application Development Practical

Course Type: SEC   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain Android environment and development tools.
CO-2	Develop rich user interfaces by using layouts and controls.
CO-3	Utilize UI components for android application development.
CO-4	Create android application.

Module/Unit	Course Description	Hrs.
1	Compare various operating systems with android OS.	2 hrs
2	Install/configure java development kit (JDK), android studio and android SDK.	2 hrs
3	Configure android development tools (ADT) plug-in and create android virtual device.	2 hrs
4	Develop a program to display Helo World on screen.	2 hrs
5	Develop a program to implement linear layout and absolute layout.	2 hrs
6	Develop a program to implement frame layout, table layout and relative layout.	2 hrs
7	Develop program to implement text view and edit text.	2 hrs
8	Develop a program to implement auto complete text view.	2 hrs
9	Develop a program to implement button, image button and toggle button.	2 hrs
10	Develop a program to implement login window using above UI controls.	2 hrs
11	Develop a program to implement checkbox.	2 hrs
12	Develop a program to implement radio button and radio group.	2 hrs
13	Develop program to implement progress bar.	2 hrs
14	Develop program to implement list view, grid view, image view and scroll view.	2 hrs
15	Develop a program to implement custom toast alert.	2 hrs
16	Develop a program to implement date and time picker.	2 hrs
17	Develop a program to create an activity.	2 hrs
18	Develop a program to implement new activity using explicit intent and implicit intent.	2 hrs

19	Develop a program to implement content provider.	2 hrs
20	Develop a program to implement service.	2 hrs
21	Developed app program to implement broadcast receiver.	2 hrs
22	Develop a program to implement sensor.	2 hrs
23	Develop a program to build camera.	2 hrs
24	Develop a program for providing Bluetooth connectivity.	2 hrs
25	Develop a program for animation.	2 hrs
26	Develop a program to send SMS and receive SMS.	2 hrs
27	Develop a program to send and receive email.	2 hrs
28	Develop a program to create login form.	2 hrs
29	Develop a program to create registration form.	2 hrs
30	Developed a program to create calculator.	2 hrs

Reference Books:
1. Android, Dixit & Prasanna Kumar, Vikas Publication, New Delhi, 2014.
2. Pro Android 5, Maclean David, Komatineni Satya & Allen Grandt, Apress Publication, 2015
3. Android Programming for Beginners, Hortan & Jhon, Packet Publication, 2015

Open Elective (OE)

Course Code: UOE4AIT

Course Title: Introduction to AI tools with MS Office Suite

Course Type: OE   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Define basic concepts of Artificial Intelligence.
CO-2	Analyse data with AI integration in Word and Excel.
CO-3	Create enhanced presentations with AI features in PowerPoint.
CO-4	Develop workflow efficiency across Microsoft Office suite.

Syllabus for S.Y.B. Sc. (Information Technology) Semester IV
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: UOE4AIT

Course Title: Introduction to AI tools with MS Office Suite

Unit I : The concept of artificial intelligence related to Microsoft Office tools: Excel
Data analysis, Recommended pivot tables and dynamic charts, Automatic cell filling, Creating
tables from numbers in an image or a PDF file, Forecasting trends in your data
Word: Dictation for quicker document creation, Instant translation of your texts, Smart search

Unit II : PowerPoint: Rapid and impactful presentation design, The coach that analyzes and
provides feedback on your presentations and your way of expressing yourself, Automatic subtitling
of your slideshow
Outlook: Viva Insights for better time management and well-being assurance

Reference Books:
1) Student-Guide-Module-1-Fundamentals-of-AI

OJT/FP/CEP/RP

Course Code: UIT4CEP

Course Title: Community Engagement Project

Course Type: Major   **No. of Credits: 02**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Connects and extends knowledge about facts and theories.
CO-2	Diversity of Communities and Cultures.
CO-3	Establish relationships to further community action.
CO-4	Understand the team members, their backgrounds, strengths and areas of growth.

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Revised Syllabus of T.Y.B.Sc. Information Technology
Choice Based Credit System (60:40)
w.e.f. Academic Year 2023-2024

T.Y.B.Sc Information Technology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Information Technology
2	Eligibility for Admission	(a) A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates. (b) Candidate who have passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course. (c) However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body. Minimum marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates. OR Candidates with post HSC-Diploma in Information Technology/Computer Technology/ Computer Engineering/ Computer Science/ and Allied branches will be eligible for direct admission to the Second Year of B.Sc. (I.T.). However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body Minimum Marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates.
3	Passing marks	40%

4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2023-2024

Preamble of the Syllabus:

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:
- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

Objectives of the Course:

The new syllabus is aimed to achieve the objectives. The syllabus spanning three years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:

- Software Development (Programming)
- Website Development
- Mobile app development
- Embedded Systems Programming
- Embedded Systems Development
- Software Testing
- Networking
- Database Administration
- System Administration
- Cyber Law Consultant
- GIS (Geographic Information Systems)
- IT Service Desk
- Security

Programme Specific Outcome: By the end of the course, a student should develop the
Ability:

- Learners are able to use and apply current technical concepts and practices in the core information technologies.
- Learners are able to apply knowledge of computing and mathematics appropriate to the discipline.
- Learners are able to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- Learners are able to effectively integrate IT based solutions into the user environment.
- Learners are able to design, implement, and evaluate a computer based system, process, component, or program to meet desired needs.

Scheme of Examination

A) Internal Assessment: 40 %   **40 Marks**

Sr. No.	Particular		Marks
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned		15 Marks
	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities		05 Marks

Question Paper Pattern for Class Test

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) **Semester End Examination: 60 %**   **60 Marks**

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be five questions each of 12 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c… and the allocation of marks depends on the weightage of the unit.

➢ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Choice Based Credit System (CBCS)
T.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER V

Course Code	Course Type	Course Title	Credits
UIT5SPM	Skill Enhancement Course	Software Project Management	2
UIT5IOT	Skill Enhancement Course	Internet of Things	2
UIT5AWP	Skill Enhancement Course	Advanced Web Programming	2
UIT5LSA	Discipline Specific Elective	Linux System Administration	2
UIT5ENJ	Discipline Specific Elective	Enterprise Java	2
UIT5PDP	Skill Enhancement Course Practical	Project Dissertation	2
UIT5ITP	Skill Enhancement Course Practical	Internet of Things Practical	2
UIT5WPP	Skill Enhancement Course Practical	Advanced Web Programming Practical	2
UIT5LAP	Discipline Specific Elective Practical	Linux Administration Practical	2
UIT5EJP	Discipline Specific Elective Practical	Enterprise Java Practical	2
Total Credits		**20**	

Choice Based Credit System (CBCS)
T.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER VI

Course Code	Course Type	Course Title	Credits
UIT6SQA	Skill Enhancement Course	Software Quality Assurance	**2**
UIT6SIC	Skill Enhancement Course	Security in Computing	**2**
UIT6BUI	Skill Enhancement Course	Business Intelligence	**2**
UIT6GIS	Discipline Specific Elective	Principles of Geographic Information Systems	**2**
UIT6ISM	Discipline Specific Elective	IT Service Management	**2**
UIT6PIP	Skill Enhancement Course Practical	Project Implementation	**2**
UIT6SCP	Skill Enhancement Course Practical	Security in Computing Practical	**2**
UIT6BIP	Skill Enhancement Course Practical	Business Intelligence Practical	**2**
UIT6GIP	Discipline Specific Elective Practical	Principles of Geographic Information Systems Practical	**2**
UIT6AMP	Skill Enhancement Course Practical	Advanced Mobile Programming	**2**
Total Credits			**20**

Semester V

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Software Project Management
Course Code	UIT5SPM
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	The objective of this course is to understand some problem and concern of software project manager, learners will able to cost estimation of project.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define software project management and project planning
	2) Explain risk management and resource allocation
	3) Determine the cost of project based on project duration
	4) Elaborate the quality of leadership skills and advance project management tools.

Module/ Unit	**Course Description**	**Hrs.**
I	**Introduction to Software Project Management:** Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices. **Project Evaluation and Programme Management:** Introduction, Business Case, Project Portfolio Management,	12hrs

	Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management. **An Overview of Project Planning :** Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyze Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning	
II	**Selection of an Appropriate Project Approach:** Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model. **Software Effort Estimation**: Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom-up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, taffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	12hrs
III	**Activity Planning**: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks. **Risk Management:** Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts. **Resource Allocation:** Introduction, Nature of Resources,	12hrs

	Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.	
IV	**Monitoring and Control:** Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM). **Managing Contracts:** Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. **Managing People in Software Environments:** Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	12hrs
V	**Working in Teams:** Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. **Software Quality :**Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans. **Monitoring and Control:** Introduction, Creating the Framework, Collecting the Data, Review,Visualizing Progress, Cost Monitoring,Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control **Emerging Trends in Software Project Management :** Expansion of Artificial Intelligence &Automation, Inclusion of hybrid project management approaches, Impact of Emotional Intelligence, More focus on Data analytics and numbers, Advanced project management tools and solutions, Increased remote working.	12hrs

References:

1) Software Project Management, Bob Hughes, Mike Cotterell, Rajib Mall sixth edition.
2) Project Management and Tools & Technologies – An overview,Shailesh Mehta 1st edition

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Project Dissertation
Course Code	UIT5PDP
Credit	2 Credit
Hours	2 Hrs per week

Course Objectives	The objective of this course is to understand some problem and concern of software project manager, learners will able to cost estimation of project.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Identify a problem definition.
	2) Estimate system requirement.
	3) Design data flow diagram.
	4) Plan the system design phase in SDLC.

Module/ Unit	Course Description	Hrs
1	**Project Implementation** Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI. **I. OBJECTIVES**	2hrs

- Describe the Systems Development Life Cycle (SDLC).

- Evaluate systems requirements.

- Complete a problem definition.

- Evaluate a problem definition.

- Determine how to collect information to determine requirements.

- Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.

- Work on data collection methods for fact finding.

- Construct and evaluate data flow diagrams.

- Construct and evaluate data dictionaries.

- Evaluate methods of process description to include structured English, decision tables and decision trees.

- Evaluate alternative tools for the analysis process.

- Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.

- Decide the S/W requirement specifications and H/W requirement specifications.

- Plan the systems design phase of the SDLC.

- Distinguish between logical and physical design requirements.

- Design and evaluate system outputs.

- Design and evaluate systems inputs.

- Design and evaluate validity checks for input data.

- Design and evaluate user interfaces for input.

- Design and evaluate file structures to include the use of indexes.

- Estimate storage requirements.

- Explain the various file update processes based on the standard

file organizations.

• Decide various data structures.

• Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.

• Perform normalization for the unnormalized tables for RDBMS related projects

• Decide the various processing systems to include distributed, client/server, online and others.

• Perform project cost estimates using various techniques.

• Schedule projects using both GANTT and PERT charts.

• Perform coding for the project.

• Documentation requirements and prepare and evaluate systems documentation.

• Perform various systems testing techniques/strategies to include the phases of testing.

• Systems implementation and its key problems.

• Generate various reports.

• Be able to prepare and evaluate a final report.

• Brief the maintenance procedures and the role of configuration management in operations.

• To decide the future scope and further enhancement of the system.

• Plan for several appendices to be placed in support with the project report documentation.

• Decide the various processing systems to include distributed, client/server, online and others.

• Perform project cost estimates using various techniques.

• Schedule projects using both GANTT and PERT charts.

• Perform coding for the project.

• Documentation requirements and prepare and evaluate systems documentation.

• Perform various systems testing techniques/strategies to include the phases of testing.

• Systems implementation and its key problems.

• Generate various reports.

• Be able to prepare and evaluate a final report.

• Brief the maintenance procedures and the role of configuration management in operations.

• To decide the future scope and further enhancement of the system.

• Plan for several appendices to be placed in support with the project report documentation.

• Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.

• Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.

• Develop of the ability to assess the implications of work performed.

• Get good exposure and command in one or more application areas and on the software

• Develop quality software using the software engineering principles

• Develop of the ability to communicate effectively.

II. Type of the Project

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

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

III. SOFTWARE AND BROAD AREAS OF APPLICATION FRONT END

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), TcL/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB
UNIX INTERNALS	Device Drivers, RPC, Threads, Socket
NETWORK/WIRELESS TECHNOLOGIES	-

IV. Introduction

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

1.1 PROJECT REPORT:

Title Page

Original Copy of the Approved Proforma of the Project Proposal

Certificate of Authenticated work

Role and Responsibility Form

Abstract

Acknowledgement

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CHAPTER 1: INTRODUCTION

1.1 Background

1.2 Objectives

1.3 Purpose, Scope, and Applicability
1.3.1 Purpose

1.3.2 Scope

1.3.3 Applicability

1.4 Achievements

1.5 Organisation of Report

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

3.1 Problem Definition

3.2 Requirements Specification

3.3 Planning and Scheduling

3.4 Software and Hardware Requirements

3.5 Preliminary Product Description

3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

4.1 Basic Modules

4.2 Data Design

4.2.1 Schema Design	
4.2.2 Data Integrity and Constraints	
4.3 Procedural Design	
4.3.1 Logic Diagrams	
4.3.2 Data Structures	
4.3.3 Algorithms Design	
4.4 User interface design	
4.5 Security Issues	
4.6 Test Cases Design	
The documentation should use tools like star UML, Visuo for windows, Rational Rose for design as part of Software Project Management Practical Course. The documentation should be spiral bound for semester V and the entire documentation should be hard bound during semester VI	

Reference Books:

1) Software Project Management, Bob Hughes, Mike Cotterell, Rajib Mall sixth edition.
2) Project Management and Tools & Technologies – An overview,Shailesh Mehta 1st edition

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Internet of Things
Course Code	UIT5IOT
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	To assess the vision and introduction of IoT. To Understand IoT Market perspective. To provide an understanding of the technologies and the standards relating to the Internet of Things.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain Design Principles for Connected Devices
	2) Elaborate the concepts of Prototyping Embedded Devices,its Physical Design and Online Components
	3) Classify types of designing 3D modules.
	4) Explain the Market perspective and Ethical concept of IOT.

Module/ Unit	Course Description	Hrs.
I	**The Internet of Things:** An Overview : The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances. **Internet Principles**:Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP	12 hrs

	and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.	
II	**Thinking About Prototyping**: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, Climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. **Prototyping Embedded Devices:** Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, Developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness. **Introduction to Raspberry Pi:** Introduction to Raspberry Pi,Raspberry Pi Hardware,Preparing raspberry Pi. **Introduction to Arduino:** Introduction to Arduino, Arduino Hardware.	12 hrs
III	**Prototyping the Physical Design:** Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. **Prototyping Online Components:** Getting Started with an API, Mashing Up APIs, Scraping, Legalities, Writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport	12 hrs
IV	**Techniques for Writing Embedded Code:** Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging, **Business Models:** A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding,	12 hrs

	Crowdfunding, Lean Startups.	
V	**Moving to Manufacture:** What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community. **Ethics:** Characterizing the Internet of Things, Privacy, Control, Disrupting Control crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition	12 hrs

References:

1) Designing the Internet of Things , "Adrian McEwen" First Edition,WILEY
2) Internet of Things – Architecture and Design, "Raj Kamal", First Edition,McGraw Hill

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Internet of Things Practical
Course Code	UIT5ITP
Credit	2
Hours	2Hrs per week

Course Objectives	To make the learners familiar with Raspberry Pi components and interface. To connect different hardware device with Raspberry Pi.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Make use of Raspberry pi to display LED pattern,Time over 4-digit 7-segment and control whatsapp.
	2) Build the interfacing of Raspberry pi with Oscilloscope, Fingerprint sensor,GPS Module.
	3) Create basic Home Automation using Raspberry Pi.
	4) Construct an application to monitor visitor using Raspberry Pi and Pi Camera.

Module/ Unit	**Course Description**	**Hrs**
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface,Connecting to Ethernet , Monitor and USB, Linux Commands: Exploring the Raspbian	2hrs
1	Linux Commands: Exploring the Raspbian	2hrs
2	Light the LED with Python	2hrs
3	Displaying different LED patterns with Raspberry Pi.	2hrs
4	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi	2hrs
5	Raspberry Pi Based Oscilloscope.	2hrs

6	Controlling Raspberry Pi with WhatsApp.	2hrs
7	Setting up a Web Server using Raspberry Pi	2hrs
8	Setting up Wireless Access Point using Raspberry Pi	2hrs
9	Fingerprint Sensor interfacing with Raspberry Pi	2hrs
10	Raspberry Pi GPS Module Interfacing	2hrs
11	IoT based Web Controlled Home Automation using Raspberry Pi	2hrs
12	Visitor Monitoring with Raspberry Pi and Pi Camera	2hrs
13	Interfacing Raspberry Pi with RFID	2hrs
14	Building Google Assistant with Raspberry Pi.	2hrs
15	Installing Windows 10 IoT Core on Raspberry Pi	2hrs

Reference Books:

1) Designing the Internet of Things , "Adrian McEwen" First Edition,WILEY
2) Internet of Things – Architecture and Design, "Raj Kamal", First Edition,McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Advanced Web Programming
Course Code	UIT5AWP
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	To learn to develop web applications that use object-oriented techniques and advanced database interactions. Concepts such as advanced CSS concepts web environment , authentication , and security will also be explored.

Course Outcomes	After completing the course, Student will be able to:
	1) Explain the basic components concept of C# .NET framework language along with .NET framework
	2) Elaborate advanced web concept in ASP.NET
	3) Explain dynamic web page using ADO.NET fundamentals.
	4) Make use of AJAX ,XML and Jquary programming skill in ASP.NET.

Module/ Unit	Course Description	Hrs.
I	**Introducing .NET:** The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	12 hrs

II	**Web Form Fundamentals**: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.	12 hrs
III	**Error Handling, Logging, and Tracing :** Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing State Management : Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options Styles, Themes, and Master Pages : Styles, Themes, Master Page Basics, Advanced Master Pages	12 hrs
IV	**ADO.NET Fundamentals**: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. **Data Binding:** Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls **The Data Controls:** The GridView, Formatting the GridView, Selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView	12 hrs
V	**XML:** XML Explained, The XML Classes, XML Validation, XML Display and Transforms. **Security Fundamentals**: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.	12 hrs

| | **ASP.NET AJAX:** Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.**JQuery:** Introduction to JQuery, JQuery syntax, Jquery Selector, JQuery events function, effects with JQuery | |

References:

1) Beginning ASP.NET 4.5 in C# ,mathevmacDonald,Apress
2) Murach's ASP.NET 4.6 Web Programming in C#2015, SPD,SixthEdition,Mary Delamater and Anne Bohem

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Advanced Web Programming Practical
Course Code	UIT5WPP
Credit	2 Credit
Hours	2 Hrs per week

Course Objectives	To learn to develop web applications that use object-oriented techniques and advanced database interactions. Concepts such as advanced CSS concepts web environment , authentication , and security will also be explored. web pages in asp.net and xml

Course Outcomes	**After completing the course, Student will be able to:**
	1) Build console application in C#.
	2) Develop web applications with strong object – oriented principles.
	3) Develop connection between web pages using ASP.NET AJAX.
	4) Build dynamic web page in ASP.NET , XML and Jquery.

Module/ Unit	**Course Description**	**Hrs**
1	**Working with basic C# and ASP .NET** a. Create an application that obtains four int values from the user and displays the product. b. Create an application to demonstrate string operations. c. Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data is entered. Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of for each loop with arrays v. Reverse a number and find sum of digits of a number.	2hrs

2	**Working with Object Oriented C# and ASP .NET** a. Create simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion b. Create simple application to demonstrate use of following concepts i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces c. Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling	2hrs
3	**Working with Web Forms and Controls** a. Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example :AutoPostBack) b. Demonstrate the use of Calendar control to perform following operations. Display messages in a calendar control i. Display vacation in a calendar control ii. Selected day in a calendar control using style iii. Difference between two calendar dates c. Demonstrate the use of Treeviewcontrol perform following operations. i. Treeview control and datalist ii. Treeview operations	2hrs
4	**Working with Form Controls** a. Create a Registration form to demonstrate use of various Validation controls. b. Create Web Form to demonstrate use of Adrotator Control. c. Create Web Form to demonstrate use User Controls.	2hrs
5	**Working with Navigation, Beautification and Master page.** a. Create Web Form to demonstrate use of Website Navigation controls and Site Map. b. Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification. c. Create a web application to demonstrate various states of ASP.NET Pages.	2hrs
6	**Working with Database** a. Create a web application bind data in a multiline textbox by querying in another textbox. b. Create a web application to display records by using database. c. Demonstrate the use of Datalist link control.	2hrs
7	**Working with Database** a. Create a web application to display Databinding using dropdownlist control.	2hrs

	b. Create a web application for to display the phone no of an author using database. c. Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).	
8	**Working with data controls** a. Create a web application to demonstrate various uses and properties of SqlDataSource. b. Create a web application to demonstrate data binding using DetailsView and FormView Control.	2hrs
9	Create a web application to display Using Disconnected Data Access and Databinding using GridView.	2hrs
10	**Working with GridView control** Create a web application to demonstrate use of GridView control template andGridView hyperlink.	2hrs
11	**Working with GridView control** Create a web application to demonstrate use of GridView button column and GridView events.	2hrs
12	**Working with GridView control** Create a web application to demonstrate GridView paging and Creating own table format using GridView.	2hrs
13	**Working with XML** Create a web application to demonstrate reading and writing operation with XML.	2hrs
14	**Working with Jquery** Create a web application to demonstrate different types of selector.	2hrs
15	**Working with AJAX** Create a web application to demonstrate use of various Ajax controls.	2hrs

Reference Books:
1. Beginning ASP.NET 4.5 in C# ,mathevmacDonald,Apress
2. Murach's ASP.NET 4.6 Web Programming in C#2015, SPD,SixthEdition,Mary Delamater and Anne Bohem

	Course Description: B.Sc. (Information Technology)	
Semester	V	
Course Name	Linux System Administration	
Course Code	UIT5LSA	
Credit	2 credit	
Hours	4Hrs per week	

Course Objectives	To make the learners familiar with linux operating system administration. Learners will be able to install and configure different types of servers such as mail server, Web server etc. They will also be able to create and handle user accounts and maintain its security.

Course Outcomes	After completing the course, Student will be able to:
	1) Explain various commands to manage system level processes and handle software management on linux platforms.
	2) Elaborate storage and user management on linux platforms.
	3) Explain the detailed steps and files for configuration of different types of servers.
	4) Make use of shell level programming in linux.

Module/ Unit	Course Description	Hrs.
I	**Introduction to Red Hat Enterprise Linux:** Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. **Command Line:** Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files **System Administration Tasks:** Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, Using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate	12 hrs

	Booting and shutting down: Boot loaders-GRUB, LILO, Bootstrapping, Init process, rc scripts, Enabling and disabling services. **The File System:** Understanding the File System Structure, Working with Linux-Supported File Systems.	
II	**Managing Software:** Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages **Configuring and Managing Storage:** Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes **Connecting to the Network:** Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access	12 hrs
III	**Working with Users, Groups, and Permissions:** Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes **Securing Server with iptables:** Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules,	12 hrs

	Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT **Setting Up Cryptographic Services:** Introducing SSL, Proof of Authenticity: the Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files	
IV	**Configuring Server for File Sharing:** What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services. **Configuring DNS and DHCP:** Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server **Setting Up a Mail Server:** Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP and IMAP	12 hrs
V	**Configuring Apache on Red Hat Enterprise Linux:** Configuring the Apache Web Server, Creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL **Introducing Bash Shell Scripting:** Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.	12 hrs

| | **High-Availability Clustering:** High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems

Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Creating a Kickstart File, Using a Kickstart File to Perform an Automated Installation | |

Reference Books:

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" ,3rdEdition,Wiley

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Linux System Administration Practical
Course Code	UIT5LAP
Credit	2
Hours	2Hrs per week

Course Objectives	To make the learners familiar with linux operating system administration. Learners will be able to install and configure different types of servers such as mail server, Web server etc. They will also be able to create and handle user accounts and maintain its security.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Make use of administrative level commands for user and storage management and Networking.
	2) Construct the firewall rules for securing server with iptables and setup cryptographic services on linux machine.
	3) Create the configuration for different types of servers.
	4) Develop shell scripting programs on linux platform.

Module/ Unit	**Course Description**	**Hrs**
1	Installation of RHEL 6.X	2hrs

2	Graphical User Interface and Command Line Interface and Processes
	   a. Exploring the Graphical Desktop
	   b. The Command Line Interface
	   c. Managing Processes
		2hrs

3	Storage Devices and Links, Backup and Repository
	   a. Working with Storage Devices and Links
	   b. Making a Backup
	   c. Creating a Repository
		2hrs

4	Working with RPM Storage and Networking
	   a. Using Query Options
	   b. Extracting Files From RPMs
		2hrs

5	Working with RPM Storage and Networking
	   a. Configuring and Managing Storage
	   b. Connecting to the Network
		2hrs

6	Working with Users, Groups, and Permissions	2hrs
7	Securing Server with iptables	2hrs
8	Setting Up Cryptographic Services	2hrs
9	Configuring FTP	2hrs
10	Configuring DNS Server	2hrs
11	Configuring DHCP Server	2hrs
12	Web Server Configuring Apache on Red Hat Enterprise Linux	2hrs
13	a. Writing a Script to Monitor Activity on the Apache Web Server b. Using the select Command	2hrs
14	Shell Scripts and High-Availability Clustering a. Writing Shell Scripts b. Configuring Booting with GRUB c. Configuring High Availability Clustering	2hrs
15	Setting Up an Installation Server Configuring Network Server as an Installation Server.	2hrs

Reference Books:

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" ,3rd Edition,Wiley

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Enterprise Java
Course Code	UIT5ENJ
Credit	2
Hours	4 Hrs per week

Course Objectives	The objective of this course is to acquire the knowledge of advanced java technologies used in developing and deploying enterprise commercial website.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define servlet with java applications and database connectivity.
	2) Elaborate the fundamentals and core concepts of cookies, session, file uploading, file downloading and request dispatcher, EJB applications and JND.
	3) Explain JSP applications using JSTL and deploy EJB application and JSF applications.
	4) Make use of knowledge of application using concept of Persistence, Object/Relational Mapping, JPA and Hibernate.

Module/ Unit	**Course Description**	**Hrs.**
I	**Understanding Java EE:** What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server **Java EE Architecture, Server and Containers:** Types of System Architecture, Java EE Server, Java EE Containers. **Introduction to Java Servlets:** The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do? **Servlet API and Lifecycle:** Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet **Working With Servlets:** Getting Started, Using	12 hrs

	Annotations Instead of Deployment Descriptor. **Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.	
II	**Request Dispatcher:** RequestDispatcher Interface, Methods of RequestDispatcher, RequestDispatcher Application. **COOKIES:** Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing TheColors Of A Page **SESSION:** What Are Sessions? Lifecycle Of Http Session, Session Tracking With Servlet API, A Servlet Session Example **Working With Files:** Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application. **Working With Non-Blocking I/O:** Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp	12 hrs
III	**Introduction To Java Server Pages:** Why use Java Server Pages? Disadvantages Of JSP, JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages **Getting Started With Java Server Pages:** Comments, JSP Document, JSP Elements, JSP GUI Example. **Action Elements:** Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean. **Implicit Objects, Scope And El Expressions:** Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified El], Expression Language. **Java Server Pages Standard Tag Libraries:** What is wrong in using JSP ScriptletTags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages of JSTL, Tag Libraries. **Java Server Faces:** What is JSF? Features of JSF, JSF Architecture, The JSF Lifecycle, Java Server Faces' User-Interface Components, Additional User-Interface	12 hrs

	Component Libraries, JSF Development Tools	
IV	**Introduction To Enterprise Javabeans:** Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans **Working With Session Beans:** When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans. **Working with Message Driven Beans:** Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example. **Interceptors:** Request And Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application. **Java Naming and Directory Interface**: What is Naming Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE.	12 hrs
V	**Persistence, Object/Relational Mapping And JPA:** What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping, **Introduction to Java Persistence API:** The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications. **Writing JPA Application:** Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database And Tables in Mysql, Creating a Web Application, Adding the Required Library Files, Creating a Javabean Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running The JPA Application. **Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?	12 hrs

	Writing Hibernate Application: Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, Creating a Web Application, Adding The Required Library Files, Creating a Javabean Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.	

References:

1) "Java EE 7 For Beginners", Sharanam Shah, Vaishali Shah, First Edition, SPD
2) "Advanced Java Programming",Uttam Kumar Roy, Oxford Press

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Enterprise Java Practical
Course Code	UIT5EJP
Credit	2
Hours	2Hrs per week

Course Objectives	To provide a standard way to implement the server-side business software typically found in enterprise applications.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Create applications using servlet with cookies and session.
	2) Develop the servlet IO, file applications and JSP application.
	3) Construct JSP, JSTL, EL and EJB appplications.
	4) Build the EJB applications with different types of beans and JPA applications.

Module/ Unit	**Course Description**	**Hrs**
1	Create a simple calculator application using servlet.	2hrs
2	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".	2hrs
3	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.	2hrs
4	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.	2hrs

5	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.	2hrs
6	Create a servlet that uses cookies to store the number of times the user has visited servlet.	2hrs
7	Create a Servlet application to upload and download a file.	2hrs
8	Develop a simple servlet question answer application using database.	2hrs
9	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).	2hrs
10	Create a JSP application to demonstrate the use of JSTL.	2hrs
11	Create a Currency Converter application using EJB.	2hrs
12	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.	2hrs
13	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].	2hrs
14	Create a Simple Java Server Faces Application to show message Hello.	2hrs
15	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.	2hrs

Reference Books:

1) "Java EE 7 For Beginners", Sharanam Shah, Vaishali Shah, First Edition, SPD
2) "Advanced Java Programming",Uttam Kumar Roy, Oxford Press

Semester- VI

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Software Quality Assurance
Course Code	UIT6SQA
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	The course is designed to introduce concepts about quality as the driving force behind success of software product, also focuses on life cycle of testing and different testing methodologies used for various test processes.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define quality of software project
	2) Explain testing and different testing method
	3) Elaborate software verification, validation and v test model
	4) Classify level of testing

Module/ Unit	**Course Description**	**Hrs.**
I	**Introduction to Quality:**Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools. **Software Quality:** Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and	12hrs

	Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management	
II	**Fundamentals of testing:** Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing	12hrs
III	**Unit Testing: Boundary Value Testing:** Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, **Equivalence Class Testing:** Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. **Decision Table–Based Testing:** Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, **Path Testing:** Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, **Data Flow Testing:** Define/Use Testing, Slice-Based Testing, Program Slicing Tools.	12hrs

IV	**Software Verification and Validation:** Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis od Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. **V-test Model:** Introduction, V-model for software, Testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities **Automation Testing:** Introduction to Automation Testing, What is Automation testing ,Benefits of Automation Testing.	12hrs
V	**Levels of Testing:** Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages. **Special Tests:** Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusinesseCommerce Testing, Agile Development Testing, Data Warehousing Testing.	12hrs

Reference Books:

1)Software Testing: Principles, Techniques and Tools M. G. Limaye TMH 2017
2) Software Testing and Continuous Quality Improvement William E. Lewis Third Edition 2016
3) Software Testing: A Craftsman's Approach Paul C. Jorgenson 4th Edition 2017

Course Description: B.Sc.(Information Technology)	
Semester	VI
Course Name	Project Implementation
Course Code	UIT6PIP
Credit	2
Hours	2Hrs per week

Course Objectives	To define how exactly all tasks and the entire project will be executed. To create a plan that outlines the steps, timeline, resources and personal required for successful completion.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Design user interface for input
	2) Develop coding for the system
	3) Examine various system testing.
	4) Predict the future scope of project

Module/ Unit	**Course Description**	**Hrs**
1	**Project Implementation** Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI. **I. OBJECTIVES** • Describe the Systems Development Life Cycle (SDLC). • Evaluate systems requirements. • Complete a problem definition.	2hrs

• Evaluate a problem definition.

• Determine how to collect information to determine requirements.

• Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.

• Work on data collection methods for fact finding.

• Construct and evaluate data flow diagrams.

• Construct and evaluate data dictionaries.

• Evaluate methods of process description to include structured English, decision tables and decision trees.

• Evaluate alternative tools for the analysis process.

• Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.

• Decide the S/W requirement specifications and H/W requirement specifications.

• Plan the systems design phase of the SDLC.

• Distinguish between logical and physical design requirements.

• Design and evaluate system outputs.

• Design and evaluate systems inputs.

• Design and evaluate validity checks for input data.

• Design and evaluate user interfaces for input.

• Design and evaluate file structures to include the use of indexes.

• Estimate storage requirements.

• Explain the various file update processes based on the standard file organizations.

• Decide various data structures.

• Construct and evaluate entity-relationship (ER) diagrams for

RDBMS related projects.

• Perform normalization for the unnormalized tables for RDBMS related projects

• Decide the various processing systems to include distributed, client/server, online and others.

• Perform project cost estimates using various techniques.

• Schedule projects using both GANTT and PERT charts.

• Perform coding for the project.

• Documentation requirements and prepare and evaluate systems documentation.

• Perform various systems testing techniques/strategies to include the phases of testing.

• Systems implementation and its key problems.

• Generate various reports.

• Be able to prepare and evaluate a final report.

• Brief the maintenance procedures and the role of configuration management in operations.

• To decide the future scope and further enhancement of the system.

• Plan for several appendices to be placed in support with the project report documentation.

• Decide the various processing systems to include distributed, client/server, online and others.

• Perform project cost estimates using various techniques.

• Schedule projects using both GANTT and PERT charts.

• Perform coding for the project.

• Documentation requirements and prepare and evaluate systems documentation.

• Perform various systems testing techniques/strategies to include the phases of testing.

• Systems implementation and its key problems.

• Generate various reports.

• Be able to prepare and evaluate a final report.

• Brief the maintenance procedures and the role of configuration management in operations.

• To decide the future scope and further enhancement of the system.

• Plan for several appendices to be placed in support with the project report documentation.

• Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.

• Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.

• Develop of the ability to assess the implications of work performed.

• Get good exposure and command in one or more application areas and on the software

• Develop quality software using the software engineering principles

• Develop of the ability to communicate effectively.

II. Type of the Project

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

III. SOFTWARE AND BROAD AREAS OF APPLICATION FRONT END

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), TcL/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB
UNIX INTERNALS	Device Drivers, RPC, Threads, Socket
NETWORK/WIRELESS TECHNOLOGIES	-

IV. Introduction

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

1.1 PROJECT REPORT:

Title Page

Original Copy of the Approved Proforma of the Project Proposal

Certificate of Authenticated work

Role and Responsibility Form

Abstract

Acknowledgement

Table of Contents

Table of Figures

CHAPTER 1: INTRODUCTION

1.1 Background

1.2 Objectives

1.3 Purpose, Scope, and Applicability
1.3.1 Purpose

1.3.2 Scope

1.3.3 Applicability

1.4 Achievements

1.5 Organisation of Report

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

3.1 Problem Definition

3.2 Requirements Specification

3.3 Planning and Scheduling

3.4 Software and Hardware Requirements

3.5 Preliminary Product Description

3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

4.1 Basic Modules

4.2 Data Design

4.2.1 Schema Design

4.2.2 Data Integrity and Constraints

4.3 Procedural Design

4.3.1 Logic Diagrams

4.3.2 Data Structures

4.3.3 Algorithms Design

4.4 User interface design

4.5 Security Issues

4.6 Test Cases Design

The documentation should use tools like star UML, Visuo for windows, Rational Rose for design as part of Software Project Management Practical Course. The documentation should be spiral bound for semester V and the entire documentation should be hard bound during semester VI.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Implementation Approaches

5.2 Coding Details and Code Efficiency 68

5.2.1 Code Efficiency

5.3 Testing Approach

5.3.1 Unit Testing

5.3.2 Integrated Testing

5.3.3 Beta Testing

5.4 Modifications and Improvements

5.5 Test Cases

CHAPTER 6: RESULTS AND DISCUSSION

6.1 Test Reports

6.2 User Documentation

CHAPTER 7: CONCLUSIONS

7.1 Conclusion

7.1.1 Significance of the System

7.2 Limitations of the System

7.3 Future Scope of the Project

REFERENCES

GLOSSARY

APPENDIX A

APPENDIX B

V. EXPLANATION OF CONTENTS

a)Title Page

Sample format of Title page is given in Appendix 1 of this block. Students should follow the given format.

b)Original Copy of the Approved Proforma of the Project Proposal

Sample Proforma of Project Proposal is given in Appendix 2 of this block. Students should follow the given format. 69

c)Certificate of Authenticated work

Sample format of Certificate of Authenticated work is given in Appendix 3 of this block. Students should follow the given format.

d)Role and Responsibility Form

Sample format for Role and Responsibility Form is given in Appendix 4 of this block.

Students should follow the given format.

e)Abstract

This should be one/two short paragraphs (100-150 words total), summarising the project work. It is important that this is not just a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to ascertain if the project is of interest to them and, it should present results of which they may wish to know more details.

f)Acknowledgements

This should express student's gratitude to those who have helped in the preparation of project.

h)Table of Contents

The table of contents gives the readers a view of the detailed structure of the report. The students would need to provide section and subsection headings with associated pages. The formatting details of these sections and subsections are given below.

i)Table of Figures

List of all Figures, Tables, Graphs, Charts etc. along with their page numbers in a table of figures.

Chapter 1: Introduction

The introduction has several parts as given below:

Background: A description of the background and context of the project and its relation to work already done in the area. Summarise existing work in the area concerned with the project work. 70

Objectives: Concise statement of the aims and objectives of the project. Define exactly what is going to be done in the project; the objectives should be about 30 /40 words.

Purpose, Scope and Applicability: The description of Purpose, Scope, and Applicability are given below:

Purpose: Description of the topic of the project that answers questions on why this project is being done. How the project could improve the system its significance and theoretical framework.

Scope: A brief overview of the methodology, assumptions and limitations. The students should answer the question: What are the main issues being covered in the project? What are the main functions of the project?

Applicability: The student should explain the direct and

indirect applications of their work. Briefly discuss how this project will serve the computer world and people.

Achievements: Explain what knowledge the student achieved after the completion of the work. What contributions has the project made to the chosen area? Goals achieved - describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded.

Organisation of Report: Summarising the remaining chapters of the project report, in effect, giving the reader an overview of what is to come in the project report.

Chapter 2: Survey of Technologies

In this chapter Survey of Technologies should demonstrate the students awareness and understanding of Available Technologies related to the topic of the project. The student should give the detail of all the related technologies that are necessary to complete the project. The should describe the technologies available in the chosen area and present a comparative study of all those Available Technologies. Explain why the student selected the one technology for the completion of the objectives of the project.

Chapter 3: Requirements and Analysis

Problem Definition: Define the problem on which the students are working in the project. 71

Provide details of the overall problem and then divide the problem in to sub-problems. Define each sub-problem clearly.

Requirements Specification: In this phase the student should define the requirements of the system, independent of how these requirements will be accomplished. The Requirements Specification describes the things in the system and the actions that can be done on these things. Identify the operation

and problems of the existing system.

Planning and Scheduling: Planning and scheduling is a complicated part of software development. Planning, for our purposes, can be thought of as determining all the small tasks that must be carried out in order to accomplish the goal. Planning also takes into account, rules, known as constraints, which, control when certain tasks can or cannot happen. Scheduling can be thought of as determining whether adequate resources are available to carry out the plan. The student should show the Gantt chart and Program Evaluation Review Technique (PERT).

Software and Hardware Requirements: Define the details of all the software and hardware needed for the development and implementation of the project.

Hardware Requirement: In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the software must be noted.

Software Requirements: In this section, the operating system, the compiler, testing tools, linker, and the libraries etc. necessary to compile, link and install the software must be listed.

Preliminary Product Description: Identify the requirements and objectives of the new system. Define the functions and operation of the application/system the students are developing as project.

Conceptual Models: The student should understand the problem domain and produce a model of the system, which describes operations that can be performed on the system, and the allowable sequences of those operations. Conceptual Models could consist of complete Data Flow Diagrams, ER diagrams, Object-oriented diagrams, System Flowcharts etc.

Chapter 4: System Design

Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudocode and other documentation. 72

Basic Modules: The students should follow the divide and conquer theory, so divide the overall problem into more

manageable parts and develop each part or module separately. When all modules are ready, the student should integrate all the modules into one system. In this phase, the student should briefly describe all the modules and the functionality of these modules.

Data Design: Data design will consist of how data is organised, managed and manipulated.

• Schema Design: Define the structure and explanation of schemas used in the project.

• Data Integrity and Constraints: Define and explain all the validity checks and constraints provided to maintain data integrity.

Procedural Design: Procedural design is a systematic way for developing algorithms or procedurals.

• Logic Diagrams: Define the systematical flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.

• Data Structures: Create and define the data structure used in procedures.

• Algorithms Design: With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.

User Interface Design: Define user, task, environment analysis and how to map those requirements in order to develop a "User Interface". Describe the external and internal components and the architecture of user interface. Show some rough pictorial views of the user interface and its components.

Security Issues: Discuss Real-time considerations and Security issues related to the project and explain how the student intends avoiding those security problems. What are the security policy plans and architecture?

Test Cases Design: Define test cases, which will provide easy detection of errors and mistakes with in a minimum period of time and with the least effort. Explain the different conditions in which the students wish to ensure the correct working of the project.

Chapter 5: Implementation and Testing

Implementation Approaches: Define the plan of implementation, and the standards the students have used in the implementation. 73

Coding Details and Code Efficiency: Students not need include full source code,instead, include only the important codes (algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way.

The student can explain the function of the code with a shot of the output screen of that program code.

• Code Efficiency: The student should explain how the code is efficient and how the students have handled code optimisation.

Testing Approach: Testing should be according to the scheme presented in the system design chapter and should follow some suitable model – e.g., category partition, state machine-based. Both functional testing and user-acceptance testing are appropriate. Explain the approach of testing.

• Unit Testing: Unit testing deals with testing a unit or module as a whole. This would test the interaction of many functions but, do confine the test within one module.

• Integrated Testing: Brings all the modules together into a special testing environment, then checks for errors, bugs and interoperability. It deals with tests for the entire application. Application limits and features are tested here.

Modifications and Improvements: Once the students finish the testing they are bound to be faced with bugs, errors and they will need to modify your source code to improve the system. Define what modification are implemented in the system and how it improved the system.

Chapter 6: Results and Discussion

Test Reports: Explain the test results and reports based on the test cases, which should show that the project is capable of facing any problematic situation and that it works fine in

different conditions. Take the different sample inputs and show the outputs.

User Documentation: Define the working of the software; explain its different functions, components with screen shots. The user document should provide all the details of the product in such a way that any user reading the manual, is able to understand the working and functionality of the document. 74

Chapter 7: Conclusions

Conclusion: The conclusions can be summarised in a fairly short chapter (2 or 3 pages). This chapter brings together many of the points that would have made in the other chapters.

Limitations of the System: Explain the limitations encountered during the testing of the project that the students were not able to modify. List the criticisms accepted during the demonstrations of the project.

Future Scope of the Project describes two things: firstly, new areas of investigation prompted by developments in this project, and secondly, parts of the current work that was not completed due to time constraints and/or problems encountered.

PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be summarily rejected.)

PNR **No.: ……………………** Roll no**: _____**

1. Name of the Student

_____
_____

2. Title of the Project

_____

_____

3. Name of the Guide

_____

_____

4. Teaching experience of the Guide

_____

5. Is this your first submission? Yes   No

Signature of the Student
Signature of the Guide
Date: …………………   Date: …………………….

Signature of the Coordinator

Date: …………………

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Security in Computing
Course Code	UIT6SIC
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	To protect computer systems, networks, and data from unauthorized access, use, or disruption while ensuring confidentiality, integrity, and availability.

Course Outcomes	**After completing the course, learners will be able to:**
	1) Evaluate and contrast computing security issues.
	2) Explain computing security vulnerabilities and threats.
	3) Determine alternative countermeasures and controls.
	4) Classify virtual machines and cloud computing.

Module/ Unit	Course Description	Hrs.
I	**Information Security Overview**: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. **Risk Analysis**: Threat Definition, Types of Attacks, Risk Analysis. **Secure Design Principles**: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	12hrs
II	**Authentication and Authorization**: Authentication, Authorization **Encryption**: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.	12hrs

	Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. **Database Security**: General Database Security Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.	
III	**Network Device Security**: Switch and Router Basics, Network Hardening. **Firewalls**: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. **Wireless Network Security**: Radio Frequency Security Basics, Data-Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.	12hrs
IV	**Intrusion Detection and Prevention Systems**: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). **Voice over IP (VoIP) and PBX Security**: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management. **Operating System Security Models**: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	12hrs
V	**Virtual Machines and Cloud Computing**: Virtual Machines, Cloud Computing. Introduction to Cloud Computing: Introduction, Historical developments, Building Cloud Computing Environments, Working of Cloud Computing, Principles of Parallel and Distributed Computing: Eras of Computing. Parallel v/s Distributed Computing. Elements of Parallel Computing. Elements of Distributed Computing, Technologies of distributed computing. Types of Cloud Computing & usage.	12hrs

Reference Books:

1) The Complete Reference: Information Security ,Mark Rhodes-Ousley, 2nd,McGraw-Hill

2) Essential Cybersecurity Science, Josiah Dykstra , Fifth, O'Reilly

3) Principles of Computer Security: CompTIA Security+ and Beyond ,Wm.ArthurConklin, Greg White, Second,McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Security in Computing Practical
Course Code	UIT6SCP
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	To implement effective measures and controls on computer systems, networks, and dat.

Course Outcomes	After completing the course, Student will be able to:
	1) Design Routers by OSPF, NTP, SSH.
	2) Create AAA authentication.
	3) Apply & verify Extended Numbered ACL.
	4) Test IPV6 by using firewalls & ACL

Module/ Unit	Course Description	Hrs
1	Implement Xen virtualization and Xen Centre.	2hrs
2	Configure AAA Authentication	2hrs
3	Configuring Extended ACLs Configure, Apply and Verify an Extended Numbered ACL	2hrs
4	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs	2hrs
5	Verify connectivity among devices before firewall configuration.	2hrs
6	Configure ACLs on to mitigate attacks.	2hrs
7	Configuring a Zone-Based Policy Firewall	2hrs
8	Configure IOS Intrusion Prevention System (IPS) Using the CLI	2hrs
9	Layer 2 Security Assign the Central switch as the root bridge.	2hrs

	Secure spanning-tree parameters to prevent STP manipulation attacks.	
10	Layer 2 Security Enable port security to prevent CAM table overflow attacks.	2hrs
11	Layer 2 VLAN Security	2hrs
12	Configure and Verify a Site-to-Site IPsec VPN Using CLI	2hrs
13	Configuring ASA Basic Settings and Firewall Using CLI	2hrs
14	Configure basic ASA settings and interface security levels using CLI	2hrs
15	Configure routing, address translation, and inspection policy using CLI Configure DHCP, AAA, and SSH	2hrs

Reference Books:

1) The Complete Reference: Information Security ,Mark Rhodes-Ousley, 2nd,McGraw-Hill

2) Essential Cybersecurity Science, Josiah Dykstra , Fifth, O'Reilly

3) Principles of Computer Security: CompTIA Security+ and Beyond , Wm.ArthurConklin, Greg White, Second,McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Business Intelligence
Course Code	UIT6BUI
Credit	2
Hours	4 Hrs per week

Course Objectives	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems, define mathematical models, data mining and data preparation, describe classification problems and clustering methods, study marketing models, Logistic and production models and Data envelopment analysis, grasp the objectives of knowledge management and artificial intelligence and expert systems.

Course Outcomes	**After completing the course, Learners will be able to:**
	1) Explain the framework of the computerized Business Intelligence System and Decision support system.
	2) Analyse data by choosing relevant model as an algorithm for respective applications.
	3) Explain classification and clustering algorithms.
	4) Elaborate the applications of Business Intelligence.

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

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

References:

1)Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, First Edition , Wiley
2) Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, DursunDelen , Ninth, Pearson

Course Description: B.Sc.(Information Technology)	
Semester	VI
Course Name	Business Intelligence Practical
Course Code	UIT6BIP
Credit	2
Hours	2 Hrs per week

Course Objectives	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems, define mathematical models, data mining and data preparation, describe classification problems and clustering methods, study marketing models, Logistic and production models and Data envelopment analysis, grasp the objectives of knowledge management and artificial intelligence and expert systems.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Import legacy data from sources and apply ETL process on it.
	2) Apply classification and clustering algorithms.
	3) Apply linear and logistic regression algorithms.
	4) Examine what if analysis for data visualization.

Module/ Unit	**Course Description**	**Hrs**
1	Import the legacy data from different sources such as (Excel , SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)	2
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.	2
3	Data visualization from ETL process.	2
4	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	2
5	Perform the data classification using classification algorithm.	2

6	Perform the data clustering using clustering algorithm	2
7	Perform the Linear regression on the given data warehouse data.	2
8	Perform the logistic regression on the given data warehouse data.	2
9	Perform Decision tree using R tool	2
10	Data Analysis using time series Analysis	2
11	Data Modelling and Analytic with pivot table in Excel	2
12	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.	2
13	a.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.	2
14	Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart.	2
15	Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.	2

Reference Books:

1)Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, First Edition , Wiley
2) Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, DursunDelen , Ninth, Pearson

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Principles of Geographical Information system
Course Code	UIT6GIS
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	The course is designed to introduce concepts about geographic information system to explore mapping data, analyze different mapping information and to create meaningful maps using different data.

Course Outcomes	After completing the course, Learners will be able to:
	1) Define importance of GIS and its use in representation of the real world.
	2) Explain data capture, storage, analysis and output in GIS.
	3) Elaborate Map scale, projection and co-ordinate systems in GIS.
	4) Explain Spatial data analysis and Data visualization.

Module/Unit	Course Description	Hrs.
I	**Gentle Introduction to GIS** **The nature of GIS**: Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. **The real world and representations of it:** Models and modelling, Maps, Databases, Spatial databases and spatial analysis **Geographic Information and Spatial Database Models and Representations of the real world** **Geographic Phenomena**: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries **Computer Representations of Geographic Information**: Regular tessellations, irregular tessellations, Vector representations, Topology and	12hrs

	Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects **Organizing and Managing Spatial Data** **The Temporal Dimension**	
II	**Data Management and Processing Systems** **Hardware and Software Trends** **Geographic Information Systems**: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) **Stages of Spatial Data handling**: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. **Database management Systems**: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. **GIS and Spatial Databases**: Linking GIS and DBMS, Spatial database functionality.	12hrs
III	**Spatial Referencing and Positioning** **Spatial Referencing**: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations. **Satellite-based Positioning**: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology **Data Entry and Preparation** **Spatial Data Input**: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere **Data Quality**: Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency **Data Preparation**: Data checks and repairs, Combining data from multiple sources **Point Data Transformation**: Interpolating discrete data, Interpolating continuous data.	12hrs
IV	**Spatial Data Analysis** **Classification of analytical GIS Capabilities** **Retrieval, classification and measurement**: Measurement, Spatial selection queries, Classification **Overlay functions**: Vector overlay operators, Raster overlay operators **Neighbourhood functions**: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis **Analysis**: Network analysis, interpolation, terrain	12hrs

	modeling Concepts and Principles of Web GIS, Significance of Web GIS; Transferred Geo data, Interactive Web Maps, Internet Map Services,Web GIS system Integration, Open Source GIS; Web Based Geo Portal, India Geoportal; State Geoportal and District Geoportal.	
V	**Data Visualization** **GIS and Maps, The Visualization Process** **Visualization Strategies: Present or explore?** **The cartographic toolbox**: What kind of data do I have? How can I map my data? **How to map?** How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series **Map Cosmetics, Map Dissemination**.	12hrs

References:

1) Principles of Geographic Information Systems, Otto Huisman and Rolf A. , The International   Institute of Geoinformation Science and Earth Observation, Fourth edition,2009.

2) Principles of Geographic Information Systems , P.A Burrough and R.A.McDonnell , Oxford University Press , Third edition,1999.

3) Fundamentals of Spatial Information Systems, R.Laurini and D. Thompson, Academic Press,1994.

4) Fundamentals of Geographic Information Systems, Michael N.Demers , Wiley Publications , Fourth edition , 2009 .

5) Introduction to Geographic Information Systems , Chang Kang-tsung (Karl), McGrawHill edition, Any above 3rd Edition.

Course Description: B.Sc.(Information Technology)	
Semester	VI
Course Name	Principles of Geographical Information system Practical
Course Code	UIT6GIP
Credit	2
Hours	2Hrs per week

Course Objectives	Objective of this course is to Analyze various mapping techniques and make use of various mapping tools.

Course Outcomes	After completing the course, Learners will be able to:
	1) Utilize QGIS software for managing vector and raster data.
	2) Build maps with attributes and different data sets.
	3) Design georeferencing for maps.
	4) Make use of advanced operations like Nearest Neighbourhood analysis, automating map creation etc.

Module/ Unit	Course Description	Hrs
1	Creating and manging vector data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics.	2hrs
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping.	2hrs
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files.	2hrs
	Using Plugins, Searching and Downloading OpenStreetMap Data.	2hrs
4	Working with attributes, terrain Data.	2hrs
5	Working with Projections and WMS Data.	2hrs
6	Georeferencing Topo Sheets.	2hrs

7	Georeferencing Scanned Maps.	2hrs
8	Georeferencing Aerial Imagery.	2hrs
9	Digitizing Map Data.	2hrs
10	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis.	2hrs
11	Performing spatial queries.	2hrs
12	Introduction to Bhuvan ISRO software	2hrs
13	Bhuvan 2D.	2hrs
14	Bhuvan 3D.	2hrs
15	Special applications in Bhuvan.	2hrs

Reference Books:

1) Principles of Geographic Information Systems, Otto Huisman and Rolf A. , The International Institute of Geoinformation Science and Earth Observation, Fourth edition,2009.
2) Principles of Geographic Information Systems , P.A Burrough and R.A.McDonnell , Oxford University Press , Third edition,1999.
3) Fundamentals of Spatial Information Systems, R.Laurini and D. Thompson, Academic Press,1994.
4) Fundamentals of Geographic Information Systems, Michael N.Demers , Wiley Publications , Fourth edition , 2009 .
5) Introduction to Geographic Information Systems , Chang Kang-tsung (Karl), McGrawHill edition, Any above 3rd Edition.

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	IT Service Management
Course Code	UIT6ISM
Credit	2 Credit
Hours	4 hrs per week

Course Objectives	The objective of this course is to introduce the concept of the IT Service Management with respect to the services, to improve the end user experience and connecting IT to wider business objectives.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define IT Service management and its framework.
	2) Demonstrate four dimensions of service management.
	3) Explain ITIL service value system, service value chain, and continual improvement model.
	4) Elaborate ITIL management practices.

Module/ Unit	Course Description	Hrs.
I	**Introduction:** **IT Service Management:** Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialization and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle. IT service management in the modern world, The structure and benefits of the ITIL 4 framework, The ITIL SVS, The four dimensions model.	**12hrs**
II	**Service Management:** Fundamentals **Value and value co-creation:** Value co-creation. **Organizations, service providers, service consumers, and other, Stakeholders:** Service providers, Service consumers, Other stakeholders. **Products and services:** Configuring resources for value creation, Service offerings. **Service relationships**: The service relationship model. **Value: outcomes, costs, and risks:** Outcomes, Costs, Risks, Utility and warranty.	**12hrs**

III	**The four dimensions of service management:** Organizations and people**,** Information and technology**,** Partners and suppliers**, Value streams and processes:** Value streams for service management**,** Processes. External factors.	**12hrs**
IV	**The ITIL service value system:** Service value system overview**,** Opportunity, demand, and value. **The ITIL guiding principles:** Focus on value, Start where you are, Progress iteratively with feedback, Collaborate and promote visibility, Think and work holistically, Keep it simple and practical, Optimize and automate, Principle interaction. **Governance:** Governing bodies and governance, Governance in the SVS **Service value chain:** Plan, Improve, Engage, Design and transition, Obtain/build, Deliver and support. **Continual improvement**: Steps of the continual improvement model, Continual improvement and the guiding principles.	**12hrs**
V	**ITIL management practices:** **General management practices:** Architecture management, Continual improvement, Information security management, Knowledge management, Measurement and reporting, Organizational change management, Portfolio management, Project management, Relationship management, Risk management, Service financial management, Strategy management, Supplier management, Workforce and talent management. **Service management practices:** Availability management, Business analysis, Capacity and performance management, Change control, Incident management, IT asset management, Monitoring and event management, Problem management, Release management, Service catalogue management, Service configuration management, Service continuity management, Service design, Service desk, Service level management, Service request management, Service validation and testing.	**12hrs**

Reference Books:
1) ITIL v4 Foundation: ITIL 4 Edition, 2011

Course Description: B.Sc.(Information Technology)	
Semester	VI
Course Name	Advanced Mobile Programming
Course Code	UIT6AMP
Credit	2
Hours	2hrs per week

Course Objectives	The objective of this course is to introduce the concepts of Android Mobile Programming.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Demonstrate basic android app.
	2) Design activity life cycle.
	3) Evaluate different layouts in android app.
	4) Make use of intents, events, listeners and menus, dialog in mobile programming.

Module/ Unit	**Course Description**	**Hrs**
1	Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals: Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple "Hello World" program.	**2 hrs**
2	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image)	**2 hrs**
3	Programming Activities and fragments: Activity Life Cycle	**2 hrs**
4	Programs related to different Layouts: Linear, Relative	**2 hrs**
5	Programs on Table Layout	**2 hrs**
6	Programming with Frame Layout	**2 hrs**
7	Programming with List View and Grid View	**2 hrs**
8	Programming using Events and Event Listener	**2 hrs**

9	Programming with AppBar	**2 hrs**
10	Programming menus, dialog, dialog fragments	**2 hrs**
11	Programs on Services, notification and broadcast receivers	**2 hrs**
12	Programming Media API	**2 hrs**
13	Programming Telephone API	**2 hrs**
14	Programming Security and permissions	**2 hrs**
15	Programming Network Communications and Services (JSON)	**2 hrs**

Reference Books:

1. Android Programming with Kotlin for Beginners by John Horton
2. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition
3. Android Studio Development Essentials - Android 6 Edition