Academic Council Date – June 13, 2024
Item No. – 04

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

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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
UIT1ICT	Major Subject I	Introduction to C++ programming	03
UIT1ICP	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
USEC1IWP	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

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

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 a basic HTML page to demonstrate use of HTML Description Lists.	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	2 hrs

	Selector.	
22	Create a webpage to demonstrate use of CSS id selector.	
23	Create 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
USEC2AWP	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.

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

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.

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

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 element.	**2 hrs**
24	Write a jQuery program to get student-name and class attributes of a 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

Academic Council Date – April 28, 2025
Item No – 02

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

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

Accredited A++ Grade by NAAC (Fourth Cycle-CGPA-3.52)
'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 2025-26)

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 2025-26

Mrs. I. S. Thakare
Head, Department of Information Technology
Changu Kana Thakur
A.C.S. College, New Panvel
(Autonomous)

Prof. (Dr.) S.K. Patil
Principal
Changu Kana Thakur
A.C.S. 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 **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 S.Y.B. Sc. (Information Technology) Semester III and IV

Choice Based Credit System

Under National Education Policy (NEP) 2020

(To be implemented from the academic year 2025-2026)

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	02	1	Core Java	02
2	Advanced SQL	02	2	Operating System	02
3	**IKS (**Indian Knowledge System **)**	02	3	Software Engineering	02
	Practical based on A1 and A2	02		**Practical based on A1 and A2**	02
B	***Discipline Specific Course (Minor)*** ***(Select one, in continuation of Sem 2 minor)***		***B***	***Discipline Specific Course (Minor)*** ***(Select one, in continuation of Sem 2 minor)***	
4	Computer Network	02	4	Data Structure	02
	Practical based on Computer Network	02		Practical based on Data Structure	02
C	***Open Elective*** ***(Any one from the OE List)***		***C***	***Open Elective*** ***(Any one from the OE List)***	
4	Introduction to Mobile App Development	04	4	Introduction to AI tools with MS Office Suite	04
D	***Skill Enhancement Course***		***D***	***Skill Enhancement Course***	
5	Mobile App Development	02		xxxxxxxxxxxxxxxxxxxxxx	x
E	***Ability Enhancement Courses***		**F**	***Ability Enhancement Courses***	
6	**Communication Skill-English**	02	6	**Communication Skill – English**	02
F	**Foundation Course in NSS/ NCC/ PE / PA**		**G**	**Foundation Course in NSS/ NCC/ PE / PA**	
7	Give your preference of choice to subjects from Basket of Co-curricular Course	02	7	Give your preference of choice to subjects from Basket of Co-curricular Course	02
G	**OJT/FP/CEP/RP**			**OJT/FP/CEP/RP**	
8	xxxxxxxxxxxxxxxxxxxx	x	8	Community Engagement Project	
Total Credits		**22**	**Total Credits**		**22**

Course Structure

Choice Based Credit System (CBCS)

S.Y.B. Sc. Information Technology Syllabus

To be implemented from the Academic year 2025-2026

SEMESTER III

Course Code	Course Type	Course Title	Credit
UIT3APT	Major I	Advanced Python Programming	02
UIT3ASQL	Major II	Advanced SQL	02
UIT3MAP	Major Practical	Advanced Python Programming + Advanced SQL Practical	02
UIT3CNT	Minor	Computer Network	02
UIT3CNP	Minor Practical	Computer Network Practical	02
UIT3HET	IKS	Indian Knowledge System (History and Evolution of Growth of IT in India)	02
USEC3MAD	SEC	Mobile App Development (Practical)	02
		Total Credits	**14**

Open Elective Course

Course Code	Course Type	Course Title	Credit
UOE3MAD	Open Elective	Introduction to Mobile App Development	04

Janardan Bhagat Shikshan Prasarak Sanstha's

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 National Education Policy (NEP) 2020

(To be implemented from the academic year 2025-2026)

Course Code: UIT3APT

Course Title: Advanced python Programming

Course Type: Major-I **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 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 National Education Policy (NEP) 2020

Course Code: UIT3APT

Course Title: Advanced python Programming

Unit I: **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, **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 II : **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: UIT3ASQL
Course Title: Advanced SQL

Course Type: Major II **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 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.

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

Choice Based Credit System

Under National Education Policy (NEP) 2020

Course Code:UIT3ASQL

Course Title: Advanced SQL

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, **Explicit Cursors**: Declare the Cursor, Open the Cursor, Fetch data from the Cursor, Close the Cursor, Attributes of cursor **Exception Handling**: Handle Exceptions with PL/SQL ,Predefined Exceptions, Non Predefined Exception
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, Create the Package Specification and Body using the SQL CREATE Statement **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.

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

Course Code:UIT3MAP

Course Title: Advanced Python Programming + Advanced SQL Practical

Course Type: Major 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	Create class, objects, inheritance, overriding functions etc.
CO-2	Develop graphical user interface & connection with DB.
CO-3	Build reports by using python tools for charts, plots, frames, etc
CO-4	Apply DDL and DML statements to access database.
CO-5	Create database objects using SET operators.

Module/Unit	Course Description	Hrs.
1	Design a class that store the information of student and display the same.	**2hrs**
2	Implement the concept of constructors using python.	**2hrs**
3	Implement the concept of inheritance using python	**2hrs**
4	Implement the concept of method overriding using python.	**2hrs**
5	Write a program to implement Layout management.	**2hrs**
6	Write a program to configure the widget with various options like: bg=”red”, family=”times”, size=18	**2hrs**
7	Design a registration page using widgets.	**2hrs**
8	Design a program to implement Calculator using tkinter.	**2hrs**
9	Design a simple database application that stores the records and retrieve the same & search the specified record from the database.	**2hrs**
10	Design a database application to that allows the user to add, delete and modify the records.	**2hrs**
11	Write a program for creation of vectors and matrices using NumPy.	**2hrs**
12	Write a program to develop pandas data Structure (Series & Data Frame)	**2hrs**
13	Write a program for Data wrangling using Pandas	**2hrs**
14	Write a program to design Scatter, Line & Box Plot using Matplotlib.	**2hrs**
15	Write a program to design Histogram & Bar chart using Matplotlib.	**2hrs**
16	**Select queries** a. Select queries on single table using alias, where and Order by clause. b. Select queries on single table using aggregate functions.	**2hrs**
17	**Implementing DML and DDL** a. Manipulating data (Insert, update and delete) b. Creating simple tables and tables with constraints.	**2hrs**
18	**Creating database objects** Creating Views, Sequences, Indexes and synonyms.	**2hrs**
19	**Select queries using joins** Querying data from multiple tables using all types of Joins.	**2hrs**
20	**Basic PL/SQL Programs** Creating anonymous PL/SQL blocks.	**2hrs**

21	**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	**2hrs**
22	**Implementing User Defined Exceptions.**	**2hrs**
23	**Implementing Cursors.**	**2hrs**
24	**Implementing Composite data type.**	**2hrs**
25	**Stored Procedures** Creating and invoking functions from SQL statements.	**2hrs**
26	**Stored Functions** Creating and invoking stored procedures.	**2hrs**
27	**Working with packages** Create package specifications and package bodies. Invoke the constructs in the packages.	**2hrs**
28	**Working with Overloading of packages** Create a package containing an overloaded function.	**2hrs**
29	**Working with Large Objects and triggers** Create statement triggers.	**2hrs**
30	**Working with Large Objects and triggers** Create row triggers.	**2hrs**

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
5. Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
6. Oracle database 11g: hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition
7. Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition X- Team, 2011
8. PL/SQL Programming, Ivan Bayross, FirstEdition, BPB 2010

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

Under National Education Policy (NEP) 2020

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 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	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.

Indian Knowledge System

Course Code: UIT3HET

Course Title: History and Evolution of Growth of IT in India

Course Type: IKS **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 Indian Knowledge System.
CO-2	Demonstrate Role of Sanskrit in NLP.
CO-3	Determine growth of IT education in India.
CO-4	Elaborate challenges and future aspects of Indian IT industry.

Course Code: UIT3HET

Course Title: IKS (History and Evolution of growth of IT in India)

Unit I: **Overview:** Importance of Ancient Knowledge, Defining IKS, Role of IKS in shaping modern society, How ancient Indian knowledge complements modern IT practices? **Linguistics Concepts:** Components of Language, Computational Concepts in ASTADHYAYI: Mahesvara sutras, Use of mathematics, Rules based grammatical operations, Algorithm for compound works, Role of Sanskrit in Natural Language Processing, **Digital Preservation of Indian Knowledge Systems:** The importance of preserving Indian manuscripts and texts (e.g., Vedas, Upanishads, Sutras) in the digital age, Artificial Intelligence for Text Analysis: Using AI and NLP (Natural Language Processing) to understand, translate, and analyze ancient Indian languages (Sanskrit, Prakrit), Creating databases for traditional Indian knowledge in modern IT environments Blockchain for Knowledge Preservation: Blockchain as a tool for preserving the authenticity of ancient knowledge and intellectual property
Unit II : **Growth of IT Education in India,** **Applications of Indian Knowledge in Contemporary IT:** Yoga and Mindfulness in IT Systems: The role of mental health, mindfulness, and yoga in improving productivity and creativity in the IT sector, Practical techniques for stress management for IT professionals **Key player companies in Growth of IT Sector, Contribution of Pioneers in Indian Computing, Challenges and Future Prospects:** Challenges faced by the Indian IT industry, Future trends and prospects of IT in India

Reference Books:

1. Introduction to Indian Knowledge System, Concepts and Applications, B. Mahadevan, Vinayak Bhat, Nagendra Pavana R.N.
2. Digitizing the Vedas: A Handbook for the Indian Knowledge Systems" by R. S. Raghavan

Skill Enhancement Course

Course Code: UIT3MAD

Course Title: Mobile App 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	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image)	**2 hrs**
6	Develop a program to implement linear layout and absolute layout.	**2 hrs**
7	Develop a program to implement frame layout, table layout and relative layout.	**2 hrs**
8	Develop program to implement text view and edit text.	**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.	
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 Course (Credit 2)

Course Code: UOE3MAD

Course Title: Introduction to Mobile App Development

Course Type: OE **No. of Credits: 04**

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 National Education Policy (NEP) 2020

Course Code: UOE3MAD

Course Title: Introduction to Mobile App Development

Unit I: Operating System, types of operating system, operating system framework, fundamentals of operating systems: process management, memory management, file systems, security.
Unit II: Introduction to mobile application development, importance of designing in mobile app development, what is mobile application, advantages and disadvantages of mobile application, types of mobile applications, cost of developing a mobile app, need of mobile application, mobile app development process, mobile application development framework, mobile app development platforms.
Unit III: Android Libraries**,** Android Ecosystem, Need of Android, Features of Androids. Tools and Software required for developing an Android Application. Objectives of UI Design, Principles of Mobile UI Design, Key Components of Mobile UI, UI Navigation Patterns, Tools for UI Design **No-Code App Development**: overview of No-Code PlatformsImportance of Thunkable, Features and Benefits of Using Thunkable..Comparing Thunkable with Other Platforms.
Unit IV: Introduction to Thunkable: Thunkable User Interface, Designing Mobile App UI **Case Study:**Mobile application development for a fitness tracking App **Project**

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

Choice Based Credit System (CBCS)
S.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2025-2026

SEMESTER IV

Course Code	Course Type	Course Title	Credit
UIT4CJT	Major Subject I	Core Java	02
UIT4OST	Major Subject II	Operating System	02
UIT4MAP	Major Subject II Practical	Core Java + Operating System Practical	02
UIT4SET	Major Subject III	Software Engineering	02
UIT4DST	Minor	Data Structure	02
UIT4DSP	Minor Practical	Data Structure Practical	02
		Total Credits	**12**

Open Elective Courses

Course Code	Course Type	Course Title	Credit
UOE4IAI	Open Elective	Introduction to AI Tools with MS Office Suite	04
		Total Credits	**04**

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

Choice Based Credit System

Under National Education Policy (NEP) 2020

(To be implemented from the academic year 2025-2026)

Course Code: UIT4CJT

Course Title: Core Java

Course Type: Major-I **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 basic concepts of java programming.
CO-2	Build java code using advance class features.
CO-3	Elaborate multithreading, exception handling.
CO-4	Elaborate AWT application.

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

Choice Based Credit System

Under National 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 and Operators:** primitive data types, Strings, Auto boxing and Unboxing, Conditional operator. **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, Abstract Classes And Interfaces:** Inheritance and Access Control, Abstract Classes, Abstract Methods, Interfaces, Implementing Interfaces.
Unit II: **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. **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:UIT4OST

Course Title: Operating System

Course Type: Major II **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 role of operating system with its function and services.
CO-2	Make use of various CPU scheduling algorithms .
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 National Education Policy (NEP) 2020

Course Code: UIT4OST

Course Title: Operating System

Unit I: **Introduction :** Definition of Operating system, Operating System's role, Functions of Operating System, Computing Environments, Operating-System Services, System Calls, Types of System Calls, Operating-System Structure **Processes** Process states, PCB (Process Control Block), Process Scheduling. **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling)
Unit II : **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock **Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging,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
4. Sumitabha Das, Unix Concepts and Applications,Fourth Edition, Tata McGraw Hill

Course Code: UIT4MAP

Course Title: Core Java + Operating System Practical

Course Type: Major 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	Create a program on constructors, inheritance, arrays and vectors.
CO-2	Make use of the multithreading and Exception handling concepts.
CO-3	Describe basic installation of Linux / windows operating system.
CO-4	Explain the use of various windows & DOS commands.
CO-5	Create programs using expr, if and while loop.

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**
16	Installation of virtual machine software.	**2hrs**
17	Installation of Linux operating system (Red Hat / Ubuntu) on virtual machine.	**2hrs**

18	Installation of Windows operating system on virtual machine.	**2hrs**
19	**Windows (DOS) Commands – 1** Date, time, prompt, md, cd, rd, path.	**2hrs**
20	**Windows (DOS) Commands – 1I** Date, time, prompt, md, cd, rd, path.Edit, fc, find, rename, set, type	**2hrs**
21	**Windows (DOS) Administrative Commands – 1** Chkdsk, copy, xcopy, fidsk, cls, del, move.	**2hrs**
22	**Windows (DOS) Administrative Commands – 2** Diskcomp, diskcopy, diskpart, doskey, echo	**2hrs**
23	**Linux commands:** date, cal, uptime, w, whoami, finger, uname, man, df, du, free,whereis, which.	**2hrs**
24	**Linux commands: Working with Directories:** pwd, cd, absolute and relative paths, ls, mkdir, rmdir,	**2hrs**
25	**Linux Commands: Handling Ordinary Files:** file, touch, rm, cp. Mv, rename, cat, tac, more, less.	**2hrs**
26	**Simple Filters:** head, tail, cut,paste,sort,tr.	**2hrs**
27	**Shell scripting: Reading using input** Write a shell script program to accept name of user and display welcome message.	**2hrs**
28	**Shell scripting: using expr** Write a shell script program to accept number from the user and display square.	**2hrs**
29	**Shell scripting: using if** Write a shell script program to accept two number from the user and display greatest among them.	**2hrs**
30	**Shell scripting: using while** Write a shell script program to display 10 numbers.	**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.

3. Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill

4. Naresh Chauhan, Principles of Operating Systems, Oxford Press

5. Sumitabha Das, Unix Concepts and Applications,Fourth Edition, Tata McGraw Hill

Course Code: UIT4SET

Course Title: Software Engineering

Course Type: Major III **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	Explain software life cycle model and knowledge about different phases of software life cycle.
CO-2	Make use of different methodologies in software engineering.
CO-3	Explain current theories, models and techniques that provide a basis for the software life cycle.
CO-4	Elaborate techniques and tools necessary for engineering practice.

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

Choice Based Credit System

Under National Education Policy (NEP) 2020

Course Code:UIT4SET

Course Title: Software Engineering

Unit I: What is software engineering? Software Development Life Cycle Software Development Process Models.
• Waterfall Model.
• Prototyping.
• Iterative Development.
• Rational Unified Process.
• The RAD Model
• Time boxing Model
Agile methods: Agile methods, Plan-driven and agile development, Extreme programming **Socio-technical system:** Essential characteristics of socio technical systems, Emergent System Properties **Critical system:** Types of critical system, simple safety critical system **System Models:** Models and its types, Context Models, Behavioural Models, Data Models, Object Models
Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modelling, Process Change, The CMMI Process Improvement Framework.

Reference Books:

1. Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
2. Software Engineering Pankaj JaloteNarosa Publication
3. Software engineering, a practitioner's approach Roger Pressman Tata Mcgraw-hill Seventh edition
4. Software Engineering principles and practice WS Jawadekar Tata Mcgraw-hill

Course Code: UIT4SEP

Course Title: Software Engineering Practical

Course Type: Minor 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	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 class diagrams for College Management System.	**2hrs**
2	Study and implementation of class diagrams for Hospital Management System.	**2hrs**
3	Study and implementation of Use Case Diagrams.	**2hrs**
4	Study and implementation of Entity Relationship Diagrams.	**2hrs**
5	Study and implementation of Entity Relationship Diagrams in Hospital Management System.	**2hrs**
6	Study and implementation of Entity Relationship Diagrams in Company Management System.	**2hrs**
7	Study and implementation of Sequence Diagrams for ATM	**2hrs**
8	Study and implementation of Sequence Diagrams for Online Ordering System	**2hrs**
9	Study and implementation of State Transition Diagrams for Event Management System	**2hrs**
10	Study and implementation of Data Flow Diagrams.	**2hrs**
11	Study and implementation of Collaboration Diagrams.	**2hrs**
12	Study and implementation of Activity Diagrams for Online Food Order System	**2hrs**
13	Study and implementation of Activity Diagrams for Doctor Appointment System	**2hrs**
14	Study and implementation of Deployment Diagrams for Library Management System	**2hrs**
15	Study and implementation of State Chart Diagrams for ATM Machine Management System	**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

Course Code: UIT4DST

Course Title: Data Structure

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 National Education Policy (NEP) 2020

Course Code: UIT4DST

Course Title: Data Structure

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 Structure 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.	**2hrs**
2	Read the two arrays from user & merge them & display the element in sorted order.	**2hrs**
3	Write a program to perform the Matrix addition, multiplication, and transpose operations.	**2hrs**
4	Write a program to find mean and median of number stored in an array.	**2hrs**
5	Write a program to sort an array.	**2hrs**
6	Write a program to search a number in an array.	**2hrs**
7	Write a program to store mark obtained by 10 students in 5 subjects in 2 dimensional array.	**2hrs**
8	Write a program to implement the concept of Stack Push, Pop, Display and Exit operations.	**2hrs**
9	Implement a program to convert infix notation to postfix notation using stack.	**2hrs**
10	Implement a program for stack that performs following operations using array. (a) PUSH (b) POP (c) PEEP (d) CHANGE (e) DISPLAY	**2hrs**
11	Write a program to perform various operation on graph using BFS.	**2hrs**
12	Write a program to perform various operation on graph using DFS.	**2hrs**
13	Write a program to implement the concept of Queue Insert, Delete, Display and Exit operations.	**2hrs**
14	Write a program to implement Queue Sort	**2hrs**
15	Write a program to implement Circular Queue using arrays that performs following operations. (a) INSERT(b) DELETE(c) DISPLAY	**2hrs**
16	Write a program to create a single link list and its node element.	**2hrs**
17	Write a program to concatenate two doubly linked lists.	**2hrs**
18	Write a program to add two polynomials using linked list.	**2hrs**
19	Write a program to implement priority queue using linked list.	**2hrs**
20	Write a program to reverse a linked list.	**2hrs**
21	Write a program to implement bubble sort.	**2hrs**
22	Write a program to implement selection sort.	**2hrs**
23	Write a program to implement insertion sort.	**2hrs**
24	Write a program to implement the merge sort.	**2hrs**
25	Write a program to search the element using sequential search.	**2hrs**
26	Write a program to search the element using binary search.	**2hrs**
27	Write a program to insert the element into a maximum heap.	**2hrs**
28	Write a program to insert the element into a minimum heap.	**2hrs**

29	Write a program to perform various operation on tree.	**2hrs**
30	Write a program to create a tree and display the element.	**2hrs**

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

Open Elective Course (Credit 4)

Course Code: UOE4IAI

Course Title: Introduction to AI Tools with MS Office Suite

Course Type: OE **No. of Credits: 04**

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 National Education Policy (NEP)

2020

Course Code: UOE4IAI

Course Title: Introduction to AI Tools with MS Office Suite

Unit I:

Introduction to AI in Tools:

Overview of AI in Office Applications, Benefits of AI-powered automation, Understanding Microsoft Copilot and AI Assistants, Ethical Considerations and Data Security

Unit II :

AI in Microsoft Word

- Smart Editing and Proofreading with AI (Microsoft Editor, Grammarly)
- AI-Powered Summarization and Content Generation
- Speech-to-Text and Dictation Features
- Language Translation and Read Aloud

Hands-on Exercise:

- Create a report using AI-powered suggestions
- Use AI to summarize a long document

AI in Microsoft Excel

- Data Analysis with AI (Ideas & Insights Tool)
- AI-Powered Formulas and Predictive Analytics
- Automating Repetitive Tasks with AI
- Data Cleaning and Visualization with AI Charts

Hands-on Exercise:

- Use AI to generate reports and trends
- Automate data cleanup using AI tools

Unit III

AI in Microsoft PowerPoint

- AI-Powered Design Suggestions (Designer & Layout Ideas)
- Automatic Slide Generation using AI
- AI for Presentations (Rehearse with Coach)
- Converting Text into Visuals and Infographics

Hands-on Exercise:

- Create a presentation with AI-generated designs
- Use "Rehearse with Coach" to improve presentation delivery

AI in Microsoft Outlook & Teams

- Smart Email Management with AI (Focused Inbox, Suggested Replies)
- Scheduling & Meeting Optimization with AI
- AI-Driven Insights and Meeting Transcriptions

- Automating Workflows with AI-Powered Bots

Hands-on Exercise:

- Use AI to schedule meetings and draft emails
- Implement AI-driven auto-replies and templates

Unit IV

AI Automation & Integration in MS Office

- Introduction to Power Automate & AI Bots
- Automating Repetitive Tasks Across MS Office
- AI Integration with External Apps & Cloud Services
- Future of AI in Office Productivity

Hands-on Exercise:

- Create an automated workflow using AI in Power Automate

Final Project & Assessment

- **Case Study:** Implement AI-driven solutions in a real-world scenario
- **Presentation:** Showcase findings and improvements using AI in MS Office
- **Assessment:** Quiz and practical exercises

Reference Books:

1. Student-Guide-Module-1-Fundamentals-of-AI

Academic Council Date – April 28, 2025
Item No - 03

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

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

Accredited A++ Grade by NAAC (Fourth Cycle-CGPA-3.52)
'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 T.Y. B. Sc. (Information Technology)

Semester V and VI

(With effect from the academic year 2025-26)

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 2025-26

Mrs. I. S. Thakare
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Changu Kana Thakur
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Principal
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A.C.S. College, New Panvel
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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 T.Y.B. Sc. (Information Technology) Semester V and VI

Choice Based Credit System

Under National Education Policy (NEP) 2020

(To be implemented from the academic year 2025-2026)

Course Structure

No. of Courses	Semester V	Credits	No. of Courses	Semester VI	Credits
A	***Discipline Specific Course (Major)***		**A**	***Discipline Specific Course (Major)***	
1	Ethical Hacking	04	1	Security in Computing	04
2	Advanced Big Data & Business Intelligence	04	2	AI & ML (Artificial Intelligence and Machine Learning)	04
3	Ethical Hacking Practical 1+ Advanced Big Data Analytics& BI Practical 2	02	3	Security in Computing practical 1 + AI & ML Practical 2	02
B	***Discipline Specific Course (Elective) (Students will select any 1 out of 2)***		***B***	***Discipline Specific Course (Elective) (Students will select any 1 out of 2)***	
4	Enterprise Java	04	4	Principles of Geographic Information Systems	04
	Internet of Things			Next Generation Technology- Mongo DB	
C	***Discipline Specific Course(Minor)***		***C***	***Discipline Specific Course(Minor)***	
5	.Net Core	04		Software Project Management & Project Implementation	04
D	***VSC***		***D***	***VSC***	
6	React	04		-	-
E	***OJT/FP/CEP/RP***		***E***	***OJT/FP/CEP/RP***	
	-	-		On Job Training	04
	Total Credits	22		Total Credits	22

Choice Based Credit System (CBCS)
T.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2025-2026

SEMESTER V

Course Code	Course Type	Course Title	Credit
UIT5EHT	Major I	Ethical Hacking	04
UIT5ABD	Major II	Advanced Big Data & Business Intelligence	04
UIT5MAP	Major I+ Major II Practical	Ethical Hacking Practical + Advanced Big Data & Business Intelligence Practical	01+01
UIT5EJT	Elective	Enterprise Java Internet of Things	03
UIT5EJP	Elective Practical	Enterprise Java Practical Internet of Things Practical	01
UIT5NETM	Minor	.Net Core	02
UIT5NETP	Minor Practical	Practical based on .Net Core	02
UVSC5RET	VSC	React	04
		Total Credits	**22**

Syllabus for T.Y.B. Sc. (Information Technology) Semester V

Choice Based Credit System

Under National Education Policy (NEP) 2020

(To be implemented from the academic year 2025-2026)

Course Code: UIT5EHT

Course Title: Ethical Hacking

Course Type: Major-I **No. of Credits: 04**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Define Ethical Hacking concepts.
CO-2	Apply various hacking tools to find solution for problem.
CO-3	Identify vulnerabilities from network scanning.
CO-4	Describe cryptography and its applications.

Syllabus for T.Y.B. Sc. (Information Technology) Semester V

Choice Based Credit System

Under National Education Policy(NEP) 2020

Course Code: UIT5EHT

Course Title: Ethical Hacking

Unit I: **Introduction to ethical Hacking:** What is ethical hacking? Types of hacking, advantages, disadvantages and purpose of hacking, Types of hackers, Phases of hacking. **Footprinting and Reconnaissance:** What is footprinting? Active and passive footprinting, purpose of footprinting, objectives of footprinting, footprinting threats, Types of footprinting, footprinting countermeasures. **Scanning networks:** Network scanning and its types, objectives of network scanning, scanning live systems, scanning techniques-TCP Connect / Full Open Scan, Types of Stealth scans, port scanning countermeasures, IDS evasion techniques, Banner grabbing and its tools, vulnerability scanning, proxy servers, anonymizers, IP spoofing and its countermeasures.
Unit II : **Enumeration and Sniffing:** What is Enumeration? Enumeration techniques, Enumeration types, Enumeration countermeasures, what is sniffing? Wiretrapping and its types, packet sniffing, sniffing threats, how sniffers work?, sniffing methods-ARP spoofing and MAC flooding, active and passive sniffing, types of sniffing attacks, sniffing countermeasures, sniffing detection techniques **System Hacking:** Goals, Password Cracking, Stealing Password using Key Loggers, Privilege Escalation, Spywares, Rootkits, Classification of Steganography, Covering tracks **Trojans and other Attacks:** Worms, viruses, Trojans, Types of worms, viruses and worms, Preventing malware attacks, types of attacks: (DoS / DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs, Steganography - text, image and audio and video
Unit III: **Virus and Worms:** Introduction to Viruses, Stages of Virus Life, Types of Viruses, Computer worms, Virus and Worm Countermeasures. **Social Engineering:** What is Social Engineering?, Phases of Social Engineering Attack, Types of Social Engineering Identity Theft, Countermeasures. **Denial Of Service:** Denial of Service Attack, DDoS, DoS Attack Techniques, Botnets, Dos Attack Tools, Countermeasures **Hacking Webservers:** Webservers, Webserver Attacks, Attack Methodology, Attack Tools, Countermeasures
Unit IV: **Hacking Web Applications:** Web Apps, Components, Architecture, Web Applications Threats, Hacking Methodology, and Countermeasures. **SQL Injection:** SQL Injection, Types of SQL Injections, Blind SQL Injection, Methodology, Tools, Evasion Techniques, Countermeasures. **Cryptography:** Cryptography, Encryption Algorithms, Cryptography Tools, Cryptography Attacks, Cryptoanalysis Tools.

Reference Books:

1. Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

Course Code: UIT5ABD

Course Title: Advanced Big Data & Business Intelligence

Course Type: Major II **No. of Credits: 04**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain concept of Big Data and Big Data analytics
CO-2	Different mathematical models for decision making
CO-3	Explain Hadoop Environment using Spark.
CO-4	Elaborate Data Products and Patterns with Hadoop

Syllabus for T.Y.B. Sc. (Information Technology) Semester V

Choice Based Credit System

Under National Education Policy(NEP) 2020

Course Code: UIT5ABD

Course Title: Advanced Big Data & Business Intelligence

Unit I: Introduction to Big Data : Introduction to Big Data, 5 V's of Big Data, Drivers of Big Data , Big Data and Business Intelligence, Big Data Types, Industry examples of Big Data **Introduction to Hadoop**: Introduction, Hadoop architecture, Hadoop Ecosystem (components), Advantages of Hadoop, Hadoop Distributed File System (HDFS), Architecture of HDFS, Examples of Big Data Analytics, Key Roles for a Successful Analytics Project, Map Reduce, Introduction of Map reduce, Working of Map reduce, MAP operations, YARN
Unit II : NO SQL Data Management and MongoDB NO SQL data Management, Types of NO SQL Databases **MongoDB** Database, Collection, Document, Data as Documents, Advantages of MongoDB over RDBMS, SQL vs Document Databases, Mongodb Query API, Mongo DB Create Databases, Mongo DB Create Collection, MongoDB Insert, MongoDB Find , MongoDB Update, MongoDB Delete, MongoDB Query Operators, MongoDB Aggregations Hbase and Cassandra
Unit III: 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
Unit IV: Mathematical models for decision making Structure of mathematical models, Development of a model, Classes of models **Data mining** : Definition of data mining, Representation of input data, Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction

Reference Books:

1. Big Data and Analytics: Subhashini Chellappan Seema Acharya, Wiley, First
2. Data Analytics with Hadoop An Introduction for Data Scientists: Benjamin Bengfort and Jenny Kim, O'Reilly, 2016
3. Big Data and Hadoop V.K Jain Khanna Publishing First 2018

Course Code: UIT5MAP

Course Title: Ethical Hacking Practical + Big Data Practical

Course Type: Major III(Practical) **No. of Credits:01+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 tools to perform foot printing and reconnaissance
CO-2	Determine use of Enumeration and network scanning tools, cryptography tools.
CO-3	Implement Simple Queries with MongoDB.
CO-4	Build and install hadoop and HDF

Module/Unit	Course Description	Hrs.
1	Use the following tools to perform footprinting and reconnaissance i. Recon-ng (Using Kali Linux) ii. FOCA Tool iii. Windows Command Line Utilities • Ping • Tracert using Ping • Tracert • NSLookup iv. Website Copier Tool – HTTrack v. Metasploit (for information gathering) vi. Whois Lookup Tools for Mobile – DNS Tools, Whois, Ultra Tools Mobile vii. Smart Whois viii. eMailTracker Pro ix. Tools for Mobile – Network Scanner, Fing – Network Tool, Network Discovery Tool, Port Droid Tool	**2hrs**
2	Scan the network using the following tools: i. Hping2 / Hping3 ii. Advanced IP Scanner iii. Angry IP Scanner iv. Masscan v. NEET vi. CurrPorts vii. Colasoft Packet Builder viii. The Dude	**2hrs**
3	Scan the network using the following tools: i. Hping2 / Hping3 ii. Advanced IP Scanner iii. Angry IP Scanner iv. Masscan v. NEET vi. CurrPorts vii. Colasoft Packet Builder	**2hrs**
4	Use Proxy Workbench to see the data passing through it and save the data to file. Perform Network Discovery using the following tools: i. Solar Wind Network Topology Mapper ii. OpManager iii. Network View iv. LANState Pro Use the following censorship circumvention tools: i. Alkasir ii. Tails OS Use Scanning Tools for Mobile – Network Scanner, Fing – Network Tool, Network Discovery Tool, Port Droid Tool	**2hrs**

5	Use the following censorship circumvention tools: i. Alkasir ii. Tails OS Use Scanning Tools for Mobile – Network Scanner, Fing – Network Tool, Network Discovery Tool, Port Droid Tool.	**2hrs**
6	Perform Enumeration using the following tools: i. Nmap ii. NetBIOS Enumeration Tool iii. SuperScan Software iv. Hyena v. SoftPerfect Network Scanner Tool vi. OpUtils vii. SolarWinds Engineer's Toolset viii. Wireshark Perform the vulnerability analysis using the following tools: i. Nessus ii. OpenVas	**2hrs**
7	Perform mobile network scanning using NESSUS.	**2hrs**
8	Perform the System Hacking using the following tools: i. Winrtgen ii. PWDump iii. Ophcrack iv. Flexispy v. NTFS Stream Manipulation vi. ADS Spy vii. Snow viii. Quickstego ix. Clearing Audit Policies x. Clearing Logs	**2hrs**
9	a. Use wireshark to sniff the network. b. Use SMAC for MAC Spoofing. c. Use Caspa Network Analyser. d. Use Omnipeek Network Analyzer	**2hrs**
10	a. Use Social Engineering Toolkit on Kali Linux to perform Social Engineering using Kali Linux. b. Perform the DDOS attack using the following tools: i. HOIC ii. LOIC iii. HULK iv. Metasploit c. Using Burp Suite to inspect and modify traffic between the browser and target application.	**2hrs**
11	a. Perform Web App Scanning using OWASP Zed Proxy. b. Use droid sheep on mobile for session hijacking c. Demonstrate the use of the following firewalls: i. Zonealarm and analyse using Firewall Analyzer. ii. Comodo Firewall	**2hrs**

	d. Use HoneyBOT to capture malicious network traffic.	
12	Use the following tools to protect attacks on the web servers: i. ID Server ii. Microsoft Baseline Security Analyzer iii. Syhunt Hybrid	**2hrs**
13	a. Protect the Web Application using dotDefender. b. Demonstrate the following tools to perform SQL Injection: i. Tyrant SQL ii. Havij iii. BBQSQL	**2hrs**
14	Use Aircrack-ng suite for wireless hacking and countermeasures.	**2hrs**
15	Use the following tools for cryptography i. HashCalc **ii.** Advanced Encryption Package **iii.** MD5 Calculator **iv.** TrueCrypt CrypTool	**2hrs**
16	Implement SVM classification techniques	**2hrs**
17	Regression Model : Single Linear Regression	**2hrs**
18	Regression Model : Multiple Linear Regression	**2hrs**
19	Regression Model: Logistic Regression	**2hrs**
20	Write a MongoDB query to create and drop database.	
21	Write a MongoDB query to create, display and drop collection	**2hrs**
22	Write a MongoDB query to insert, query, update and delete a document.	**2hrs**
23	Write a MongoDB query to use sum, avg, min and max expression.	**2hrs**
24	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.)	**2hrs**
25	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.	**2hrs**
26	Data visualization from ETL process.	**2hrs**
27	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	**2hrs**
28	Perform the data classification using classification algorithm.	**2hrs**
29	Perform Decision tree using R tool	**2hrs**
30	Data Analysis using time series Analysis	**2hrs**

Reference Books:

1. CEHv10, Certified Ethical Hacker Study Guide Ric Messier Sybex - Wiley - 2019
2. All in One, Certified Ethical Hacker Matt Walker Tata McGraw Hill – 2012
3. Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018
4. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud William Stallings AddisonWesley

Course Code: UIT5EJT
Course Title: Enterprise Java

Course Type: Elective 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 servlet with java applications and database connectivity.
CO-2	Elaborate the fundamentals and core concepts of cookies, session, request dispatcher and EJB applications.
CO-3	Explain JSP applications and deploy EJB application.
CO-4	Make use of knowledge of application using concept of Persistence, Object/Relational Mapping, JPA and Hibernate.

Syllabus for T.Y.B. Sc. (Information Technology) Semester V

Choice Based Credit System

Under National Education Policy(NEP) 2020

Course Code: UIT5EJT

Course Title: Enterprise Java

Unit 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. **Java Servlets:** Java Servlet Types, Why Servlets? The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet, Using Annotations Instead of Deployment Descriptor. **Working with Databases:** What is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example. **Request Dispatcher:** RequestDispatcher Interface, Methods of RequestDispatcher, RequestDispatcher Application.
Unit II : **COOKIES and SESSION:** Introduction of Cookies, Kinds Of Cookies, Creating Cookies Using Servlet, What Are Sessions? Lifecycle Of Http Session, Session Tracking With Servlet API, A Servlet Session Example. **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.
Unit III : **Introduction To Enterprise Javabeans:** Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans. **Working With Session Beans and Message Driven Beans:** When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Bean, Example of Message Driven Bean. **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 Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?

Reference Books:

1. "Java EE 7 For Beginners", Sharanam Shah, Vaishali Shah, First Edition, SPD

2. "Advanced Java Programming",Uttam Kumar Roy, Oxford Press

Course Code: UIT5EJP

Course Title: Enterprise Java Practical

Course Type: Elective I 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	Create the simple servlet and JDBC application.
CO-2	Construct applications using servlet with cookies and session.
CO-3	Develop the servlet IO and JSP application and EJB application with different types of beans.
CO-4	Build an application to demonstrate Hibernate.

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 that uses cookies to store the number of times the user has visited servlet.	2hrs
6	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
7	Develop a simple servlet question answer application using database.	2hrs
8	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
9	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.	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 a simple room reservation system application using EJB.	2hrs
14	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].	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

Course Code: UIT5IOT

Course Title: Internet of Things

Course Type: Elective 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 Design Principles for Connected Devices
CO-2	Elaborate the concepts of Prototyping Embedded Devices,its Physical Design and Online Components
CO-3	Classify types of designing 3D modules.
CO-4	Explain the Market perspective and Ethical concept of IOT.

Syllabus for T.Y.B. Sc. (Information Technology) Semester V
Choice Based Credit System
Under National Education Policy(NEP) 2020

Course Code: UIT5IOT

Course Title: Internet of Things

Unit 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? **Internet Principles:** Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.
Unit 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, Hardware's on Arduino Board, Openness, Raspberry Pi, , Developing on the Raspberry Pi, Hardware on Raspberry Pi, Openness. **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
Unit III : 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.

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 Code: UIT5IOP

Course Title: Internet of Things Practical

Course Type: Elective 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	Make use of Raspberry pi to display LED pattern,Time over 4-digit 7-segment and control whatsapp.
CO-2	Build the interfacing of Raspberry pi with Oscilloscope, Fingerprint sensor,GPS Module.
CO-3	Create basic Home Automation using Raspberry Pi.
CO-4	Construct an application to monitor visitor using Raspberry Pi and Pi Camera.

Module/Unit	Course Description	Hrs.
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	Controlling Raspberry Pi with WhatsApp.	**2hrs**
6	Setting up a Web Server using Raspberry Pi	**2hrs**
7	Fingerprint Sensor interfacing with Raspberry Pi	**2hrs**
8	Raspberry Pi GPS Module Interfacing	**2hrs**
9	IoT based Web Controlled Home Automation using Raspberry Pi	**2hrs**
10	Visitor Monitoring with Raspberry Pi and Pi Camera	**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 Code: UIT5NETM

Course Title: .Net Core

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	Explain the basic components concept of C# .NET framework language along with .NET framework
CO-2	Elaborate advanced web concept in ASP.NET
CO-3	Explain dynamic web page using ADO.NET fundamentals.
CO-4	Make use of AJAX ,XML and Jquery programming skill in ASP.NET.

Course Code: UIT5NETM

Course Title: .NET Core

Unit I: **Introducing .NET:** The .NET Core Characteristics, C#, 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 .NET Core -MSBuild, Value Types and Reference Types, Understanding Namespaces and Assemblies **Web Form Fundamentals:** Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Stepping Up to Web Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, User Controls and Graphics,Website Navigation
Unit II : **Error Handling, Logging, and Tracing :** Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing, Using View State Using Cookies,Configuring Session State, Using Application State, Comparing State Management Options **Styles, Themes, and Master Pages** : Styles, Themes, Master Page Basics, **ADO.NET Fundamentals**: Understanding Databases 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**The Data Controls:** The GridView, Formatting the GridView, Selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, **XML:** XML Explained, The XML Classes, XML Validation **Security Fundamentals**: Understanding Security Requirements, Authentication and Authorization **ASP.NET AJAX:** Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, **JQuery:** Introduction to JQuery, JQuery syntax, Jquery Selector, JQuery events function, effects with JQuery.

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 Code: UIT5NETP

Course Title: Practical based on .Net Core

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	Build console application in C#.
CO-2	Develop web applications with strong object – oriented principles.
CO-3	Develop connection between web pages using ASP.NET AJAX.
CO-4	Build dynamic web page in ASP.NET , XML and Jquery.

Module/Unit	Course Description	Hrs.
1	**Working with basic C# and ASP .NET** Create an application that obtains four int values from the user and displays the product.	**2hrs**
2	**Working with basic C# and ASP .NET** Create an application to demonstrate string operations.	**2hrs**
3	**Working with basic C# and ASP .NET** 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.	**2hrs**
4	**Working with basic C# and ASP .NET** Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers.	**2hrs**
5	**Working with basic C# and ASP .NET** Create an application to demonstrate following operations iTest for vowels. ii. Use of for each loop with arrays	**2hrs**
6	**Working with basic C# and ASP .NET** Create an application to demonstrate Reverse a number and find sum of digits of a number.	**2hrs**
7	**Working with Object Oriented C# and ASP .NET** Create simple application to perform following operations i. Finding factorial Value ii. Quadratic Equation	**2hrs**

8	**Working with Object Oriented C# and ASP .NET** Create simple application to demonstrate use of following concepts i. Function Overloading	**2hrs**
	ii. Inheritance (all types)	
9	**Working with Object Oriented C# and ASP .NET** Create simple application to demonstrate use of following concepts i. Constructor overloading ii. Interfaces	**2hrs**
10	**Working with Object Oriented C# and ASP .NET** Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling	**2hrs**
11	**Working with Web Forms and Controls** Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example :AutoPostBack)	**2hrs**
12	**Working with Web Forms and Controls** 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	**2hrs**
13	**Working with Form Controls** Create a Registration form to demonstrate use of various Validation controls.	**2hrs**
14	**Working with Form Controls** Create Web Form to demonstrate use of Adrotator Control.	**2hrs**
15	**Working with Navigation, Beautification and Master page.** a. Create Web Form to demonstrate use of Website Navigation controls and Site Map.	**2hrs**
16	**Working with Navigation, Beautification and Master page.** Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.	**2hrs**
17	**Working with Navigation, Beautification and Master page.** Create a web application to demonstrate various states of ASP.NET Pages.	**2hrs**
18	**Working with Database** Create a web application bind data in a multiline textbox by querying in another textbox.	**2hrs**

19	**Working with Database** Create a web application to display records by using database.	**2hrs**
20	**Working with Database** Create a web application to display Databinding using dropdownlist control.	**2hrs**
21	**Working with Database** Create a web application for to display the phone no of an author using database.	**2hrs**
22	**Working with data controls** a. Create a web application to demonstrate various uses and properties of SqlDataSource.	**2hrs**
23	**Working with data controls** Create a web application to demonstrate data binding using DetailsView and FormView Control.	**2hrs**
24	Create a web application to display Using Disconnected Data Access and Databinding using GridView.	**2hrs**
25	**Working with GridView control** Create a web application to demonstrate use of GridView control template andGridView hyperlink.	**2hrs**
26	**Working with GridView control** Create a web application to demonstrate use of GridView button column and GridView events.	**2hrs**
27	**Working with GridView control** Create a web application to demonstrate GridView paging and Creating own table format using GridView.	**2hrs**
28	**Working with XML** Create a web application to demonstrate reading and writing operation with XML.	**2hrs**
29	**Working with Jquery** Create a web application to demonstrate different types of selector.	**2hrs**
30	**Working with AJAX** Create a web application to demonstrate use of various Ajax controls.	**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

Course Code: UIT5RET

Course Title: React

Course Type: VSC **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 basics of React Applications.
CO-2	Implement JSX, Redux & hooks to design a React application.
CO-3	Apply & verify React DOM Events.
CO-4	Utilize React routing for hooks, navigation, link etc.

Course Code: UIT5RET

Course Title: React

Unit I:

Introduction to React: What is React?, Why React?, React version history, React 16 vs React 15, React Installation, React – Hello World, Using create-react-app, Anatomy of react project, Running the app, Debugging first react app

Import& Exports, JSX Introduction, Components, Conditional Rendering, PropTypes, Prop Drilling, React Lists, Context API, React Redux, React Hooks: Introduction, useState Hook, useEffect Hook, useRef Hook, useMemo Hook, useContext Hook

React DOM Events: Introduction, onclickcapture, onmousedown, ondoubleclick, onsubmit, onscroll, onblur **Lifecycle of Components:** Introduction, constructor, render, componentdidmount, componentwillunmount, componentdidcatch, componentdidupdate, shouldcomponentupdate,

Routing in React: React JS Router, React router DOM, React JS types of Routers, React-Router Hooks, Navigation and routing in react, link and navlink components in react & react DOM

Reference Books:

1. React and React Native - Fifth Edition, Mikhail Sakhniuk and Adam Boduch, PACKT
2. React JS: A Step-by-Step Guide, Tim Simon, Kindle Edition
3. Beginning React, Greg Lim (Author), 2020
4. Introduction to React,Cory Gackenheimer,Apress,2015

Course Code: UIT5RET

Course Title: React (Practical)

Course Type: VSC **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 basics of React Applications.
CO-2	Apply hooks to design a React application.
CO-3	Implement JSX, Redux a React application.
CO-4	Apply Lifecycle Models of React

Module/ Unit	Course Description	Hrs.
1	Create a basic React app that renders "Hello World" on the screen.	2 Hrs.
2	Build a simple React component that renders a static message.	2 Hrs.
3	Pass data to a component using props and render the data dynamically (e.g., passing a name and greeting a user).	**2 Hrs.**
4	Build a counter app that increments and decrements using React state (useState).	**2 Hrs.**
5	Create a button that triggers an event (e.g., showing an alert) when clicked.	**2 Hrs.**
6	Render content conditionally based on a state variable (e.g., display "Logged In" or "Logged Out" depending on user authentication).	**2 Hrs.**
7	Create a form that allows users to input their name and email, and display the values after submission.	**2 Hrs.**
8	Build a form with multiple fields (name, age, and email) and handle their inputs using React state.	**2 Hrs.**
9	Create a component that displays a list of items dynamically from an array using the map() function.	**2 Hrs.**
10	Fetch data from an API and render it using useEffect when the component mounts.	**2 Hrs.**
11	Bind an event handler to a class component method using .bind() and update state.	**2 Hrs.**
12	Create both controlled and uncontrolled components for input fields and observe their behavior.	**2 Hrs.**
13	Style a component using inline CSS and external CSS stylesheets.	**2 Hrs.**
14	Pass a function as a prop to a child component and call it within the child.	**2 Hrs.**
15	Implement componentDidMount, componentDidUpdate, and componentWillUnmount in a class-based component.	**2 Hrs.**
16	Create a custom hook that manages the state of a counter and returns it along with increment and decrement functions.	**2 Hrs.**
17	Set up a basic routing system using react-router-dom to navigate between pages.	**2 Hrs.**
18	Create links to navigate between multiple pages using Link from react-router-dom.	**2 Hrs.**
19	Implement nested routing using react-router-dom to display different components based on URL.	**2 Hrs.**
20	Use React.lazy and Suspense to load routes lazily.	**2 Hrs.**
21	Implement a "404 - Page Not Found" component and handle non-existent routes with React Router.	**2 Hrs.**
22	Fetch data from a public API (e.g., JSONPlaceholder) and display it in your component.	**2 Hrs.**
23	Handle errors that might occur during an API call and display error messages to the user.	**2 Hrs.**
24	Create a search input field that debounces user input and fetches results after the user stops typing for a short period.	**2 Hrs.**

25	Use PropTypes to validate the props passed to a component and display a warning if the prop types are incorrect.	**2 Hrs.**
26	Use multiple useState hooks to manage different state variables in a component (e.g., for user input, loading, and data).	**2 Hrs.**
27	Lift state up from a child component to a parent component and update the parent's state when the child component changes.	**2 Hrs.**
28	Use useState to manage an array and allow users to add and remove items dynamically.	**2 Hrs.**
29	Use the useRef hook to store a reference to an input field and programmatically focus on it.	**2 Hrs.**
30	Set up the Context API to share state across multiple components without passing props manually.	**2 Hrs.**
31	Use the useReducer hook to manage complex state logic, such as handling a counter with multiple actions.	**2 Hrs.**
32	Build a to-do list where users can add, delete, and mark tasks as completed.	**2 Hrs.**
33	Use React DevTools to inspect the component tree and check the state and props of your components.	**2 Hrs.**
34	Implement form validation to ensure the user enters valid data (e.g., valid email format).	**2 Hrs.**
35	Implement a dark mode toggle using React state and conditional CSS classes.	**2 Hrs.**
36	Create a modal component that can be opened and closed by clicking a button.	**2 Hrs.**
37	Implement a basic drag-and-drop feature using a library like react-dnd or react-beautiful-dnd.	**2 Hrs.**
38	Create a pagination component that allows users to navigate through paginated data.	**2 Hrs.**
39	Implement an infinite scroll feature that loads more items as the user scrolls to the bottom of the page.	**2 Hrs.**
40	Create a simple audio or video player using HTML5 elements and React.	**2 Hrs.**
41	Create a toast notification component that shows brief messages to the user after actions are performed.	**2 Hrs.**
42	Use a form library like Formik or React Hook Form to handle form state and validation more efficiently.	**2 Hrs.**
43	Use styled-components to style your React components with JavaScript.	**2 Hrs.**
44	Use useMemo to optimize expensive calculations and useCallback to memoize functions in your components.	**2 Hrs.**
45	Set up a React project with TypeScript, type your components, props, and states to ensure type safety.	**2 Hrs.**

Reference Books:

1. React and React Native - Fifth Edition, Mikhail Sakhniuk and Adam Boduch, PACKT
2. React JS: A Step-by-Step Guide, Tim Simon, Kindle Edition
3. Beginning React, Greg Lim (Author), 2020
4. Introduction to React,Cory Gackenheimer,Apress,2015

Choice Based Credit System (CBCS)
T.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2025-2026

SEMESTER VI

Course Code	Course Type	Course Title	Credit
UIT6SIC	Major I	Security in Computing	04
UIT6AIML	Major II	AI and ML (Artificial Intelligence and Machine Learning)	04
UIT6MAP	Major I+ Major II Practical	Security in Computing Practical + AI and ML Practical	01+01
UIT6PGIS	Elective	Principles of Geographic Information Systems	03
UIT6NGT		Next Generation Technology	
UIT6PGP	Elective Practical	Principles of Geographic Information Systems Practical	01
UIT6NGP		Next Generation Technology Practical	
UIT6SPM	Minor	Software Project Management	02
UIT6PIM	Minor Practical	Project Implementation	02
UIT6OJT	OJT	On Job Training	04
		Total Credits	**22**

Syllabus for T.Y.B. Sc. (Information Technology) Semester VI

Choice Based Credit System
Under National Education Policy(NEP)
2020
(To be implemented from the academic year 2025-2026)

Course Code: UIT6SIC

Course Title: Security in Computing

Course Type: Major-I **No. of Credits: 04**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	1) Evaluate and contrast computing security issues.
CO-2	2) Explain computing security vulnerabilities and threats.
CO-3	3) Determine alternative countermeasures and controls.
CO-4	4) Classify virtual machines and cloud computing.

Syllabus for T.Y.B. Sc. (Information Technology) Semester V

Choice Based Credit System

Under National Education Policy(NEP)

2020

Course Code: UIT6SIC

Course Title: Security in Computing

Unit 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. **Authentication and Authorization**: Authentication, Authorization **Encryption**: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure
Unit II : **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. **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,
Unit III: **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.
Unit IV: **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.

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, Conklin &Greg White, Second, McGraw Hill

Course Code: UIT6AIML

Course Title: AI and ML

Course Type: Major II **No. of Credits: 04**

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Solve the searching problems using AI.
CO-2	Explain first order logic.
CO-3	Understand the key issues in Machine learning and its associated applications.
CO-4	Apply the algorithms to real world problem, optimize the models learned.

Syllabus for T.Y.B. Sc. (Information Technology) Semester VI

Choice Based Credit System

Under National Education Policy(NEP) 2020

Course Code: UIT6AIML

Course Title: AI and ML

Unit I: Introduction to AI, Intelligent Agents: agents and environment, nature of environment, the structure of agents. Solving Problems by Searching: Problem solving agents, examples problems, searching for solutions, uninformed search, informed search strategies, heuristic functions,. Beyond Classical Search: local search algorithms, searching with non-deterministic action, searching with partial observations, online search agents and unknown environments.
Unit II : First Order Logic: Syntax and semantics, using First Order Logic, Knowledge engineering in First Order Logic. Inference in First Order Logic: propositional vs. First Order, unification and lifting, forward and backward chaining, resolution.
Unit III : Machine learning, Examples of Machine Learning Problems, Structure of Learning, learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, and Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.
Unit IV :**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. **Fuzzy Logic**: Introduction to Fuzzy logic , Operations of Fuzzy Logic **Trends In Machine Learning:** Model and Symbols-Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.

Reference Books:

1. Artificial Intelligence, R.B. Mishra, PHI Publication, 2nd Edition

2. Introduction to Machine Learning, Ethem Alpaydin, PHI Publication, 2nd Edition,2013

Course Code: UIT6MAP

Course Title: Security in Computing Practical1 + AI and ML Practical2

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

Course Outcomes (COs)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Design Routers by OSPF, NTP, SSH,AAA, etc
CO-2	Apply & verify IPV6 by Firewalls, ACL, IPS, etc.
CO-3	Identify and apply suitable Intelligent agents for various AI applications
CO-4	Apply conceptual knowledge on how BI is used in decision support systems

Module / Unit	Course Description	Hrs.
1	Configure SSH with password and without Password	**2hrs**
2	Configure Routers by NTP and Syslog Servers	
3	Configure AAA Authentication	**2hrs**
4	Configuring Extended ACLs Configure, Apply and Verify an Extended Numbered ACL	**2hrs**
5	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs	**2 hrs**
6	Verify connectivity among devices before firewall configuration.	**2 hrs**
7	Configure Standard ACLs on to mitigate attacks.	**2 hrs**
8	Configure Extended ACLs on to mitigate attacks.	**2 hrs**
9	Configure Named ACLs on to mitigate attacks.	**2 hrs**
10	Configuring a Zone-Based Policy Firewall	**2hrs**
11	Configure IOS Intrusion Prevention System (IPS) Using the CLI	**2hrs**
12	Layer 2 Security Assign the Central switch as the root bridge. Secure spanning-tree parameters to prevent STP manipulation attacks.	**2hrs**
13	Layer 2 Security Enable port security to prevent CAM table overflow attacks.	**2hrs**
14	Layer 2 VLAN Security	**2hrs**
15	Configure and Verify a Site-to-Site IPsec VPN Using CLI	**2hrs**
16	Configuring ASA Basic Settings and Firewall Using CLI	**2hrs**
17	Configure basic ASA settings and interface security levels using CLI	**2hrs**
18	Configure routing, address translation, and inspection policy using CLI Configure DHCP, AAA, and SSH	**2hrs**
19	Write a program to implement depth first search algorithm.	**2hrs**
20	Write a program to implement breadth first search algorithm.	**2hrs**
21	Write a program to implement alpha beta search	**2hrs**
22	Write a program to implement A* algorithm	**2hrs**
23	Design a simple Machine Learning Model to train the training instances and test the same.	**2hrs**
24	For a given set of training data example stored in a .csv file implement LEAST SQUARE algorithm	**2hrs**
25	For a given set of training data example stored in a .csv file implement Logistic Regression algorithm	**2hrs**
26	Write program to construct a Bayesian network considering medical data use this model to demonstrate the diagnosis of heart patients using standard heart disease dataset.	**2hrs**
27	Implementation of Confusion Matrix	**2hrs**
28	Perform the operations of Fuzzy Logic.	**2hrs**
29	Evaluating feed forward deep network for regression using KFold cross validation.	**2hrs**
30	Implementing regularization to avoid overfitting in binary classification.	**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, Conklin & Greg White, Second, McGraw Hill

Course Code: UIT6PGIS

Course Title: Principles of Geographic Information Systems

Course Type: Elective 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 importance of GIS and its use in representation of the real world.
CO-2	Explain data capture, storage, analysis and output in GIS.
CO-3	Elaborate Map scale, projection and co-ordinate systems in GIS.
CO-4	Explain Spatial data analysis and Data visualization.

Syllabus for T.Y.B. Sc. (Information Technology) Semester V

Choice Based Credit System

Under National Education Policy(NEP)

2020

Course Code: UIT6PGIS

Course Title: Principles of Geographic Information Systems

Unit I : A 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 Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects

Organizing and Managing Spatial Data The Temporal Dimension.

Unit 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.

Unit III : Spatial Referencing and Positioning

Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations 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 captiure, 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.

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.

Reference Books:

1. Principles of Geographic Information Systems- An Introductory Text Book Editors: Otto Huisman and Rolf A. The International Institute of Geoinformation Science and Earth Observation.

2. Principles of Geographic Information Systems P.A Burrough and R.A.McDonnell Oxford University Press.

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

Course Code: UIT6PGP

Course Title: Principles of Geographic Information Systems Practical

Course Type: Elective I 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	Utilize QGIS software for managing vector and raster data.
CO-2	Build maps with attributes and different data sets.
CO-3	Design georeferencing for maps.
CO-4	Make use of advanced operations like Nearest Neighbourhood analysis, automating map creation etc.

Module/Unit	Course Description	Hrs.
1	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting.	**2hrs**
2	Calculating line lengths and statistics.	**2hrs**
3	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis.	**2hrs**
4	Exploring and Managing Raster data raster mosaicking	**2hrs**
5	Making a Map.	**2hrs**
6	Working with Attributes.	**2hrs**
7	Working with terrain Data and hill shade analysis.	**2hrs**
8	Working with Projections and WMS Data.	**2hrs**
9	Georeferencing Topo Sheets and Scanned Maps.	**2hrs**
10	Georeferencing Aerial Imagery.	**2hrs**
11	Digitizing Map Data.	**2hrs**
12	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis.	**2hrs**
13	Performing spatial queries.	**2hrs**
14	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data.	**2hrs**
15	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas.	**2hrs**

Reference Books:

1. Principles of Geographic Information Systems- An Introductory Text Book Editors: Otto Huisman and Rolf A. The International Institute of Geoinformation Science and Earth Observation.
2. Principles of Geographic Information Systems P.A Burrough and R.A.McDonnell Oxford University Press.
3. Fundamentals of Spatial Information Systems R.Laurini and D. Thompson. Academic Press.

Course Code: UIT6NGT

Course Title: Next Generation Technology- Mongo DB

Course Type: Elective 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	Define Big Data and NoSQL,Big Data Challenges, Policies and Procedures,.
CO-2	Explain MongoDB, MongoDB Data Model.
CO-3	Elaborate using of MongoDB Shell & MongoDB Architecture.
CO-4	Describe MongoDB Storage Engine , MongoDB Use Cases and MongoDB Limitations.

Syllabus for T.Y.B. Sc. (Information Technology) Semester VI

Choice Based Credit System

Under National Education Policy(NEP)

2020

Course Code: UIT6NGT

Course Title: Next Generation Technology- Mongo DB

Unit I :

Big Data: Getting Started, Big Data, Facts About Big Data, Big Data Sources, Three Vs of Big Data, Volume, Variety, Velocity, Usage of Big Data, Visibility, Discover and Analyze Information, Segmentation and Customizations, Aiding Decision Making, Innovation, Big Data Challenges, Policies and Procedures, Access to Data, Technology and Techniques, Legacy Systems and Big Data, Structure of Big Data, Data Storage, Data Processing, Big Data Technologies

NoSQL: SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer's Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases

Unit II :

The MongoDB Data Model: The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, Object- Oriented Programming, Schema Evolution

Using MongoDB Shell: Basic Querying, Create and Insert, Explicitly Creating Collections, Inserting Documents Using Loop, Inserting by Explicitly Specifying _id, Update, Delete, Read, Using Indexes, Stepping Beyond the Basics, Using Conditional Operators, Regular Expressions, MapReduce, aggregate(), Designing an Application's Data Model, Relational Data Modeling and Normalization, MongoDB Document Data Model Approach

MongoDB Architecture: Core Processes, mongod, mongo, mongos, MongoDB Tools, Standalone Deployment, Replication, Master/Slave Replication, Replica Set, Implementing Advanced Clustering with Replica Sets, Sharding, Sharding Components, Data Distribution Process, Data Balancing Process, Operations, Implementing Sharding, Controlling Collection Distribution (Tag-Based Sharding), Points to Remember When Importing Data in a ShardedEnvironment, Monitoring for Sharding, Monitoring the Config Servers, Production Cluster Architecture, Scenario 1, Scenario 2, Scenario 3, Scenario 4

Unit III :

MongoDB Storage Engine: Data Storage Engine, Data File (Relevant for MMAPv1), Namespace (.ns File), Data File (Relevant for WiredTiger), Reads and Writes, How Data Is Written Using Journaling, GridFS – The MongoDB File System, The Rationale of GridFS,

GridFSunder the Hood, Using GridFS, Indexing, Types of Indexes, Behaviors and Limitations

MongoDB Use Cases: Use Case 1 -Performance Monitoring, Schema Design, Operations, Sharding, Managing the Data, Use Case 2 – Social Networking, Schema Design, Operations, Sharding
MongoDB Limitations: MongoDB Space Is Too Large (Applicable for MMAPv1), Memory Issues (Applicable for Storage Engine MMAPv1), 32-bit vs. 64-bit, BSON Documents, Namespaces Limits, Indexes Limit, Capped Collections Limit - Maximum Number of Documents in a Capped Collection, Sharding Limitations, Shard Early to Avoid Any Issues, Shard Key Can't Be Updated, Shard Collection Limit, Select the Correct Shard Key, Security Limitations, No Authentication by Default, Traffi c to and from MongoDB Isn't Encrypted, Write and Read Limitations, Case-Sensitive Queries, Type-Sensitive Fields, No JOIN, Transactions, MongoDB Not Applicable Range
MongoDB Best Practices: Deployment, Hardware Suggestions from the MongoDB Site, Few Points to be Noted, Coding, Application Response Time Optimization, Data Safety, Administration, Replication Lag, Sharding, Monitoring

Reference Books:

1. Practical MongoDB Shakuntala Gupta Edward Navin Sabharwal Apress
2. Beginning jQuery Jack Franklin Russ Ferguson Apress Second
3. Next Generation Databases Guy Harrison Apress

Course Code:UIT6NGP

Course Title: Next Generation Technology- Mongo DB Practical

Course Type: Elective 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	Utilize MongoDB software for MongoDB Basics.
CO-2	Implement Simple Queries with MongoDB.
CO-3	Design Replication, Backup and Restore.
CO-4	Make connectivity between JAVAand MongoDB, Python and MongoDB, PHP and MongoDB.

Module/Unit	Course Description	Hrs.
1	Write a MongoDB query to create and drop database.	**2hrs**
2	Write a MongoDB query to create, display and drop collection	**2hrs**
3	Write a MongoDB query to insert, query, update and delete a document.	**2hrs**
4	Write a MongoDB query to use sum, avg, min and max expression.	**2hrs**
5	Write a MongoDB query to use push and addToSet expression.	**2hrs**
6	Write a MongoDB query to use first and last expression.	**2hrs**
7	Write a MongoDB query to create Replica of existing database.	**2hrs**
8	Write a MongoDB query to create a backup of existing database.	**2hrs**
9	Write a MongoDB query to restore database from the backup.	**2hrs**
10	Connecting Java with MongoDB and inserting, retrieving.	**2hrs**
11	Connecting Java with MongoDB and updating and deleting	**2hrs**
12	Connecting PHP with MongoDB and inserting, retrieving.	**2hrs**
13	Connecting PHP with MongoDB and updating and deleting.	**2hrs**
14	Connecting Python with MongoDB and inserting, retrieving.	**2hrs**
15	Connecting Python with MongoDB and updating and deleting	**2hrs**

Reference Books:

1. Practical MongoDB Shakuntala Gupta Edward Navin Sabharwal Apress
2. Next Generation Databases Guy Harrison Apress

Course Code: UIT6SPM

Course Title: Software Project Management

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 software project management and project planning
CO-2	Explain risk management and resource allocation
CO-3	Determine the cost of project based on project duration
CO-4	Elaborate the quality of leadership skills and advance project management tools.

Unit 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.

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

Unit 2

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.

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.

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 Code: UIT6PIM

Course Title: Project

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	Design user interface for input
CO-2	Develop coding for the system
CO-3	Examine various system testing.
CO-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. • Evaluate a problem definition. • Determine how to collect information to determine requirements.	2hrs

	• 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: ·····	