Department of Information Technology (UG)

Programme Specific Outcomes (PSOs)

On the successful completion of the Undergraduate programme, the students will be able to

PSO 1 **Disciplinary Knowledge**	acquire the fundamental domain knowledge for developing effective Information Technology solutions in their respective disciplinary domains and multidisciplinary domains.
PSO 2 **Communication Skills**	convey the technical information effectively and to be proficient in preparing software requirements, creating technical documents and presentations across various context in IT.
PSO 3 **Problem Solving**	enhance problem solving abilities through critical thinking and devise innovative solutions to complex challenges in various IT domains.
PSO 4 **Analytical Reasoning**	improve analytical reasoning skills to apply algorithmic principles across different disciplines and adopt innovative solutions in various academic and professional contexts.
PSO 5 **Research Skills**	identify the problem, collect, and analyse the data, extract insights ethically and provide solutions effectively using appropriate software and tools.
PSO 6 **Digital Literacy**	utilise digital tools productively and make use of ICT tools to assess online information and help them to realize digital responsibility.
PSO 7 **Leadership and Teamwork**	apply creativity, knowledge, and recent trends to provide integrated solutions for real time problems in IT industries through effective leadership and teamwork.
PSO 8 **Moral and Ethical Awareness/Reasoning**	embrace moral and ethical values and apply ethical principles to manage difficult situations in all the technological practices.
PSO 9 **Multicultural Competence**	engage in a multicultural society and put efforts to create inclusive environments within the global society.
PSO 10 **Self-directed & Lifelong Learning**	enhance the employment prospects, acquiring in depth domain knowledge and commitment towards continuous professional development through self-learning.

Department of Information Technology (UG)
Learning Outcome Based Curriculum Framework (LOCF)
(w.e.f 2024-2025)

Sem	Part	Course Code	Course Title	Hours/ wk.	Credits	Marks
1	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
1	II	24XXXNNNN	English	3	2	30
1	III CC	24BIT1501	Programming in C	5	5	75
1	III CC	24BIT1403	C Programming Lab	4	4	60
1	III CC	24BIT1405	Fundamentals of Information Technology	4	4	60
1	III S	24BIT1407	Digital Logic Fundamentals	5	4	60
1	IV NME	24BIT1201	*Non-Major Elective – I*	3	2	30
1	IV AEC	24HVS 1200 / 24CHS 1200	Human Values Development/ Christian Studies	3	2	30
1	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	-	-
	Total			**30**	**25**	**375**
2	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
2	II	24XXXNNNN	English	3	2	30
2	III CC	24BIT1502	Object oriented Programming using C++	5	5	75
2	III CC	24BIT1404	C++ Programming Lab	4	4	60
2	III CC	24BIT1406	Data Structures	4	4	60
2	III S	24MAS14XX	*Offered by Mathematics department*	5	4	60
2	IV NME	24BIT1202	*Non Major Elective – II*	3	2	30
2	IV AEC	24BIT1200	Environmental Studies	3	2	30
2	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	1	15
	Total			**30**	**25+1**	**375+15**
3	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
3	II	24XXXNNNN	English	3	2	30

3	III CC	24BIT2401	Java Programming	4	4	60
3	III CC	24BIT2403	Java Programming & Data Structures Lab	4	4	60
3	III CC	24BIT2405	Software Engineering	4	4	60
3	III CC	24BIT2407	Web designing (TcL)	4	4	60
3	III S	24MAS24XX	*Offered by Mathematics department*	5	4	60
3	IV SEC	24BIT2201	*Skill Enhancement Course – I*	3	2	30
3	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/GNS/LIB/ACH	-	-	-
	Total			**30**	**26**	**390**
4	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
4	II	24XXXNNNN	English	3	2	30
4	III CC	24BIT2402	Relational Database Management System	4	4	60
4	III CC	24BIT2404	Relational Database Management System Lab	4	4	60
4	III CC	24BIT2406	Operating System	4	4	60
4	III CC	24BIT2408	Software Testing	4	4	60
4	III S	24BIT2410	PHP Scripting (TcL)	5	4	60
4	IV SEC	24BIT2202	*Skill Enhancement Course – II*	3	2	30
4	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/GNS/LIB/ACH	-	1	15
	Total			**30**	**26+1**	**390+15**
5	III CC	24BIT3601	.NET Programming (TcL)	6	6	90
5	III CC	24BIT3603	Python Programming (TcL)	6	6	90
5	III CC	24BIT3605	Data Mining and Warehousing	6	6	90
5	III DSE	24XXXNNNN	*Discipline Specific Elective - I*	5	4	60
5	III GE	24XXXNNNN	*Generic Elective – I*	4	3	45
5	IV IS	24BIT3255	Internship*	-	2	30
5	IV SEC	24BIT3201	*Skill Enhancement Course – III*	3	2	30
	Total			**30**	**29**	**435**

6	III CC	24BIT3602	Machine Learning (TcL)	6	6	90
6	III CC	24BIT3604	Data Communication & Networks	6	6	90
6	III CC	24BIT3606	Project	6	6	90
6	III DSE	24XXXNNNN	*Discipline Specific Elective - II*	5	4	60
6	III GE	24XXXNNNN	*Generic Elective – II*	4	3	45
6	IV SEC	24BIT3266	Professional Competency Skill	3	2	30
	Total			**30**	**27**	**405**
Grand Total				**180**	**158+2**	**2370+30**

* Internship - Second Year Vacation (30 Hrs)

Part III

Discipline Specific Elective (DSE)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credit s	Marks
5	III	24BIT3401	Robotics and Its Applications	5	4	60
		24BIT3403	Cyber Forensics			
		24BIT3405	Introduction to Data Science			
6	III	24BIT3402	Big Data Analytics Using R (TcL)	5	4	60
		24BIT3404	Mobile Application Development (TcL)			
		24BIT3406	Linux Programming (TcL)			

Supportive (offered to CIT Department)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
1	III	24BIT1409	Programming in C (TcL)	5	4	60
2	III	24BIT1408	Office Automation (TcL)	5	4	60

Generic Elective (GE)

Sem	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
5	III	24BIT3301	Introduction to HTML (TcL)	4	3	45
		24BIT3303	IT and its applications (TcL)			
6	III	24BIT3302	Multimedia Systems (TcL)	4	3	45
		24BIT3304	Social Media Analytics (TcL)			

Part IV

Non-Major Electives (NME)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
1	IV	24BIT1201	Basics of Internet	3	2	30
2	IV	24BIT1202	Emerging Trends in IT	3	2	30

Skill Enhancement Courses (SEC)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
3	IV	24BIT2201	Ethical Hacking	3	2	30
4	IV	24BIT2202	IoT and its Applications	3	2	30
5	IV	24BIT3201	Trends in Computing	3	2	30

Mapping with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
BIT	3	3	3	3	2	2	2	2	2	3

Mapping of Courses with PSOs

Course Code	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PS10
24BIT1501	3	3	3	2	3	3	2	2	1	3
24BIT1403	3	3	3	3	2	3	2	2	1	3
24BIT1405	3	3	2	2	2	2	1	1	1	2
24BIT1407	3	2	3	2	2	3	2	2	2	3
24BIT1502	3	3	2	2	3	2	2	2	2	3
24BIT1404	3	3	2	2	3	2	2	2	2	3
24BIT1406	3	2	2	2	2	2	2	2	2	2
24BIT1200	2	2	2	2	2	2	1	1	2	2
24BIT2401	3	2	3	3	2	2	2	1	2	2
24BIT2403	3	2	3	3	2	2	2	1	2	2
24BIT2405	3	3	2	3	2	3	2	2	2	2
24BIT2407	3	2	2	3	3	3	2	2	3	3
24BIT2402	3	2	3	2	3	2	2	2	2	3

24BIT2404	3	2	3	2	3	2	2	2	2	3
24BIT2406	3	2	3	3	3	2	2	1	2	2
24BIT2408	3	3	3	3	2	2	2	2	2	2
24BIT2410	3	2	2	2	3	3	2	2	3	3
24BIT3601	3	2	3	3	2	2	2	2	2	2
24BIT3603	3	2	3	3	2	2	3	1	2	2
24BIT3605	3	3	3	3	3	2	2	2	2	3
24BIT3401/ 24BIT3403/ 24BIT3405	3	3	3	3	2	3	2	2	2	3
24BIT3255	3	2	2	2	3	3	2	2	3	3
24BIT3602	3	2	3	3	2	3	2	2	3	3
24BIT3604	3	2	3	3	2	2	2	3	3	2
24BIT3606	3	3	3	3	3	3	3	3	2	3
24BIT3402/ 24BIT3404/ 24BIT3406	3	3	3	3	2	2	2	2	1	2
24BIT3266	3	2	2	2	2	3	2	2	3	3
Average	**2.9**	**2.4**	**2.6**	**2.5**	**2.4**	**2.4**	**2**	**1.8**	**2**	**2.5**

Mapping of Courses with POs

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
24BIT1201	3	2	3	2	2	3	2	2	2	3
24BIT1202	3	3	2	2	2	2	2	2	2	2
24BIT1409	2	3	2	2	2	2	2	2	2	2
24BIT1408	3	2	2	3	2	3	2	2	2	2
24BIT2201	3	3	2	3	2	2	1	2	2	2
24BIT2202	3	3	2	3	3	2	3	2	2	3
24BIT3301/ 24BIT3303	3	3	2	2	2	2	2	2	2	2
24BIT3201	3	3	2	3	2	2	1	1	1	3
24BIT3302/ 24BIT3304	3	2	3	3	2	2	1	2	2	2
Average	**2.9**	**2.7**	**2.2**	**2.6**	**2.1**	**2.2**	**1.8**	**1.9**	**1.9**	**2.3**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT1501	Programming in C	Core	5	5

The objective of the course is to understand algorithms and programs. It also enables the students to solve problems through logical thinking and learn programming using C.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the fundamental concepts of C programming languages, and its features.

CO2: demonstrate the programming methodology.

CO3: identify suitable programming constructs for problem solving.

CO4: select the appropriate data representation, control structures, functions and concepts based on the problem requirement.

CO5: evaluate the program performance by fixing the errors.

Unit I: **15 Hours**

Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations.

Unit II: **15 Hours**

Decision Making and Branching - Decision Making and Looping - Arrays – Types of Array - Character Arrays – Strings – String Operations.

Unit III: **15 Hours**

Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion**.**

Unit IV: **15 Hours**

Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.

Unit V: **15 Hours**

Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions- File Management in C.

Learning Resources:

Text Books:

1. Robert W. Sebesta, (2012), ―Concepts of Programming Languages‖, Fourth Edition, Addison Wesley
2. E. Balaguruswamy, (2010), ―Programming in ANSI C‖, Fifth Edition, Tata McGraw Hill Publications.

References:

1. Ashok Kamthane, (2009), ―Programming with ANSI & Turbo C‖, Pearson Education
2. Byron Gottfried, (2010), ―Programming with C‖, Schaums Outline Series, Tata McGraw Hill Publications.

Websites/ e-Learning Resources

1. http://www.tutorialspoint.com/cprogramming/
2. http://www.cprogramming.com/
3. http://www.programmingsimplified.com/c-program-examples
4. http://www.programiz.com/c-programming
5. http://www.cs.cf.ac.uk/Dave/C/CE.html
6. http://fresh2refresh.com/c-programming/c-function/

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO9**	**PSO10**
CO 1	3	3	2	2	2	2	1	1	1	2
CO 2	3	3	2	2	2	2	2	1	1	2
CO 3	3	2	3	3	3	3	3	2	2	3
CO 4	3	3	3	3	3	3	2	2	1	3
CO 5	3	2	3	2	3	3	2	2	1	3
Average	**3**	**2.6**	**2.6**	**2.4**	**2.6**	**2.6**	**2**	**1.6**	**1.2**	**2.6**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24BIT1403	C Programming Lab	Core	4	4

The objective of the course is to provide exposure to problem-solving through C programming. It aims to train the student to the basic concepts of the C -Programming language. Apply different concepts of C language to solve the problem.

Course Outcomes:

At the end of the course, students will be able to

CO1: demonstrate the understanding of syntax and semantics of C programs.

CO2: identify the problem and solve using C programming techniques.

CO3: identify suitable programming constructs for problem solving.

CO4: analyze various concepts of C language to solve the problem in an efficient way.

CO5: develop a C program for a given problem and test for its correctness.

Contents

1. Programs using Input/ Output functions
2. Programs on conditional structures
3. Programs using loop
4. Command Line Arguments
5. Programs using Arrays
6. String Manipulations
7. Programs using Functions
8. Recursive Functions
9. Programs using Structure
10. Programs using Pointers
11. Programs using Files
12. Programs using Structures & Unions

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5	PSO6	PSO7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	2	1	1	1	3
CO 2	3	3	3	3	2	2	2	1	1	2
CO 3	3	2	3	3	2	3	2	2	2	3
CO 4	3	2	3	3	3	3	2	2	1	3
CO 5	3	3	3	2	2	3	3	2	2	2
Average	**3**	**2.6**	**2.8**	**2.6**	**2.2**	**2.6**	**2**	**1.6**	**1.4**	**2.6**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24BIT1405	Fundamentals of Information Technology	Core	4	4

The objective of the course is to understand basic concepts and terminology of information technology. To have a basic understanding of personal computers and their operation Able to identify data storage and its usage. It helps to understand operating systems and their uses.

Course Outcomes:

At the end of the course, students will be able to

CO1: learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.

CO2: develop organizational structure using the devices present currently under input or output units.

CO3: concept of storing data in a computer using two headers namely RAM and ROM with different types of ROM with advancement in storage basis.

CO4: work with different software, Write programs in the software and applications of software.

CO5: usage of Operating systems in information technology which really acts as an interpreter between software and hardware.

Unit I: **12 Hours**

Introduction, Definition, Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification of Computers, Applications of Computer, Capabilities, and limitations of computer

Unit II: **12 Hours**

Role of I/O devices in a computer system. Input Units: Keyboard, Terminals, and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.

Unit III: **12 Hours**

Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives

Unit IV: **12 Hours**

Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spreadsheet Presentation, Graphics, DBMS s/w

Unit V: **12 Hours**

Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

Learning Resources:

Text Books:

1. Shambhavi Roy, Clinton, Daniel, Manish Agarwal (2023), "Fundamentals of Information Technology", Digital Commons @ University of South Florida.
2. Anoop Mathew, S. Kavitha Murugeshan (2009), "Fundamental of Information Technology", Majestic Books.
3. Alexis Leon, Mathews Leon," Fundamental of Information Technology", 2nd Edition.

4.S. K Bansal, "Fundamental of Information Technology".

References:

1. Bhardwaj Sushil Puneet Kumar, "Fundamental of Information Technology"
2. GG WILKINSON, "Fundamentals of Information Technology", Wiley-Blackwell.
3. A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing

Websites/ e-Learning Resources

1. https://testbook.com/learn/computer-fundamentals.
2. https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html.
3. https://www.javatpoint.com/computer-fundamentals-tutorial
4. https://www.tutorialspoint.com/computer_fundamentals/index.htm
5. https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	2	2	1	1	1	2
CO 2	3	3	2	2	2	3	1	1	1	2
CO 3	3	2	2	2	2	2	1	1	1	3
CO 4	3	3	3	3	2	2	1	1	1	2
CO 5	3	3	3	3	2	2	1	1	1	3
Average	**3**	**2.6**	**2.4**	**2.4**	**2**	**2.2**	**1**	**1**	**1**	**2.4**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24BIT1407	Digital Logic Fundamentals	S	5	4

The objective of the course is to teach various number systems, binary codes, and their applications. To familiarize the students with the importance of error detection and error correction codes. To inculcate concepts of K-MAP to simplify a Boolean expression and facilitate students in designing a logic circuit.

Course Outcomes:

At the end of the course, students will be able to

CO1: use number systems and complements

CO2: minimize functions using any type of minimizing algorithms (Boolean algebra, Karnaugh map or Tabulation method).

CO3: analyze the design procedures of Combinational and Sequential circuits.

CO4: know the working of registers and counters.

CO5: understand the concepts of memory and programmable logic.

Unit I: **15 Hours**

Digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, error detection and error correction codes.

Boolean Algebra and Logic Gates: Basic definitions, axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, digital logic gates.

Unit II: **15 Hours**

The k-map method, four-variable map, five-variable map, product of sums simplification, don't-care conditions, NAND and NOR implementation, determination and selection of Prime Implicants, Essential and Non-essential prime Implicants.

Unit III: **15 Hours**

Design procedure, Binary Adder, Binary Subtractor, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, and Demultiplexers.

Unit IV: **15 Hours**

Sequential circuits, latches, flip-flops, analysis of clocked sequential circuits, State reduction and assignment, design procedure.

Registers And Counters: Registers, shift registers, ripple counters, synchronous counters, counters with unused states, ring counter, Johnson counter.

Unit V: **15 Hours**

Introduction**,** Random access memory, memory decoding, error detection and correction, read only memory, programmable logic array, programmable array logic, sequential programmable devices.

Learning Resources:

Text Books:

1. Donald leach, Albert Paul Malvino, Goutam saha – Digital Principles and Applications, 2014, Mc Graw Hill
2. M. Morris Mano, Michael D. Ciletti (2008), Digital Design, 4th edition, Pearson Education Inc, India.

References:

1. Zvi. Kohavi (2004), Switching and Finite Automata Theory, Tata McGraw Hill, India.
2. C. V. S. Rao (2009), Switching and Logic Design, 3rd Edition, Pearson Education, India.
3. Donald D. Givone (2002), Digital Principles and Design, Tata McGraw Hill, India
4. Roth (2004), Fundamentals of Logic Design, 5th Edition, Thomson, India.

Websites/ e-Learning Resources

1. https://www.javatpoint.com/digital logic fundamentals-tutorial
2. https://www.tutorialspoint.com/ digital logic fundamentals /index.html

CO – PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	2	2	2	2	3	1	1	2	3
CO 2	3	2	2	2	2	2	1	1	1	2
CO 3	3	2	3	2	2	3	2	2	2	2
CO 4	3	3	3	3	2	2	2	2	1	3
CO 5	3	3	3	3	2	3	2	2	2	3
Average	**3**	**2.4**	**2.6**	**2.2**	**2**	**2.6**	**1.6**	**1.6**	**1.6**	**2.6**

Strong – 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24BIT1201	Basics of Internet	NME	3	2

The objective of the course is to provide knowledge of the internet as a mass medium. The course helps to understand the features of Internet Technology, study of internet audiences and about cybercrime. **Course Outcomes:**

At the end of the course, students will be able to

CO1: knows the basic concept of the internet.

CO2: knows the features of the internet and its applications.

CO3: understand the internet as a source of information and entertainment.

CO4: usage of the internet on values and life-styles.

CO5: learn the issues of cyber-crime and future possibilities.

UNIT I **9 Hours**

The emergence of Internet as a mass medium - the world of world wide web. Data communication – categories of networks – Applications of networks, Topology – categories of Topology, modem

UNIT II **9 Hours**

Features of internet as a Technology. Basic terms and concepts-Internet connections-Web surfing Terminologies-Internet Based services-uses and benefits of Internet – Issues with internet

UNIT III **9 Hours**

Internet as a source of infotainment- classification based on content and style: content based classification-Educational content-Entertainment-formal-informal characteristics-Visual heavy and Text based characteristics.

UNIT IV **9 Hours**

Demographic descriptions of internet- Psychographic description of Internet Audiences: Interests and preferences-Behavioral patterns, Effect of the internet on values and lifestyles.

UNIT V **9 Hours**

Present issues such as cyber-crime and future possibilities- Introduction to Information security-general issues related to cyber security, Ethical and professional issues of security.

Learning Resources:

Text Books:

1. Internet Basics: Everything You Need to Know by Frank Sweeney | 31 May 2023
2. "Internet Basics" Diplo foundation, Stefano Bildi, 2020
3. The Internet: The Basics by Jason Whittaker | 13 June 2002

References:

1 ."The Internet Book": Everything You Need to Know about Computer Networking and how the Internet Works, Douglas Comer, Prentice Hall, 2017
2. "Internet for Dummies", John Levine and Margaret Levine Young, BSV Academy Publishers, 2014

Websites/ e-Learning Resources

1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf.
2. https://www.w3schools.com/html/default.asp

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	2	2	2	2	2	1	1	2	2
CO 2	3	2	2	2	2	2	1	2	2	2
CO 3	3	2	3	2	2	3	2	2	2	3
CO 4	3	2	3	3	2	3	2	2	2	3
CO 5	3	2	3	3	2	3	2	3	2	3
Average	**3**	**2**	**2.6**	**2.4**	**2**	**2.6**	**1.6**	**2**	**2**	**2.6**

Strong – 3 Medium-2 Low- 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24BIT1502	Object oriented Programming using C++	Core	5	5

To gain the basic knowledge of object-oriented programming concepts and to understand the detailed idea of C++ streams, templates and error handling concepts of C++ programming.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the C++ programming fundamentals and the concepts of object-oriented programming like object and class, Encapsulation, inheritance, and polymorphism.

CO2: classify the control structures, types of constructors, inheritance, and different type conversion mechanisms.

CO3: analyze the importance of object-oriented programming features like polymorphism, reusability, generic programming, data abstraction and the usage of exception handling.

CO4: determine the use of object-oriented features such as classes, inheritance, and templates to develop C++ programs for complex problems.

CO5: create a program in C++ by implementing the concepts of object-oriented programming.

Unit I **15 Hours**

OOP Paradigm – Concepts of OOP – Benefits of OOP - Object Oriented Languages – Applications of OOP – OOP Design: Using UML as a Design Tool Beginning with C++

Unit II **15 Hours**

Tokens, Expressions and Control Structures - Functions in C++: Function Prototyping – Call by Reference - Return by Reference – Inline Function – Default Arguments – Const Arguments – Recursion – Function Overloading – Classes and Objects

Unit III **15 Hours**

Constructors and Destructors: Constructors – Parameterized Constructors – Multiple Constructors – Constructor with default Arguments – Copy Constructors – Dynamic Constructor – Destructors – Operator Overloading and Type Conversions: Operator Overloading – Overloading Unary Operators – Overloading Binary operators – Rules for Operator Overloading – Type Conversions

Unit IV **15 Hours**

Inheritance: Introduction – Types of Inheritance – Virtual Base Classes – Abstract Classes – Pointers - Virtual Function – Polymorphism

Unit V **15 Hours**

Templates: Class Templates – Function Templates – Overloading of template Function – Exception Handling

Learning Resources:

Text Books:

1. E. Balaguruswamy, (2020), "Object Oriented Programming using C++", 8th Edition, Tata McGraw Hill.

References:

1. Bjarne Stroustrup, "The C++ Programming Language", Fourth Edition, Pearson Education.
2. Hilbert Schildt, (2009), "C++ - The Complete Reference", 4th Edition, Tata McGrawHill

Websites/ e-Learning Resources

1. http:/fahad.cprogramming.blogspot.com/p/c-simple-examples.html
2. http://www.sitesbay.com/cpp/cpp-polymorphism

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	1	2	1	1	1	2	3
CO 2	3	3	2	1	3	2	1	3	2	2
CO 3	3	2	2	2	3	1	3	2	2	3
CO 4	3	3	2	3	2	2	2	3	1	2
CO 5	2	3	2	1	3	3	2	2	2	3
Average	**2.8**	**2.6**	**2**	**1.6**	**2.6**	**2**	**1.8**	**2.2**	**1.8**	**2.6**

Strong – 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT1404	C++ Programming Lab	Core	4	4

To enable the students to understand the concepts of Object-Oriented Programming, the syntax of statements in C++ language and help to acquire the programming skills in C++.

Course Outcomes:

At the end of the course, students will be able to

CO1: understand the fundamentals of C++ programming structure

CO2: identify the basic features of OOPS such as classes, objects, polymorphism, inheritance

CO3: analyze the concept of inheritance with the understanding of early and late binding, usage of exception handling, constructors, destructors, generic programming, and type conversions

CO4: determine the use of various data structures such as stacks, queues and lists to solve various computing problems in C++ by incorporating OOPS concepts.

CO5: develop a program in C++ with the concepts of object-oriented programming to solve real-world problems.

Contents:

1. Basic Programs
2. Arrays
3. Strings
4. Array List, HashSet and Vector collection classes
5. Classes and Objects
6. Interfaces
7. Inheritance
8. Packages
9. Exception Handling
10. Threads
11. Linked List
12. Stacks
13. Queue
14. Sorting
15. Binary Tree Representation
16. Working with Database using JDBC.
17. Web application using Servlet

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	1	2	1	1	1	2	3
CO 2	3	3	2	1	3	2	1	3	2	2
CO 3	3	2	2	2	3	1	3	2	2	3
CO 4	3	3	2	3	2	2	2	3	1	2
CO 5	2	3	2	1	3	3	2	2	2	3
Average	**2.8**	**2.6**	**2**	**1.6**	**2.6**	**2**	**1.8**	**2.2**	**1.8**	**2.6**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/W k.	Cred its
24BIT1406	Data Structures	Core	4	4

The objective of the course is to enable the students to build simple and complex data structures. This helps the students to learn algorithms and write programs for the user defined data types such as Structures, Stacks, Queues, Lists and Trees. Also, this course provides an in-depth knowledge on Sorting & Searching.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the different fundamental concepts of data structures

CO2: compare the uses of different memory representation for data storage and apply various operations

CO3: construct an algorithm for different data structure operations.

CO4: analyze the data structures applications.

CO5: discover suitable techniques to provide solution for solving the problems.

UNIT I **12 Hours**

Basic Terminology – Data Structures – Operations - Algorithms: Complexity – Time Space – Algorithmic Notation – Control Structures – Complexity of Algorithms – Notations Arrays: Representation – Operations - Linear Search – Binary Search

UNIT II **12 Hours**

Stack: Representation – Arithmetic expressions: Polish Notation – Recursion: Towers of Hanoi - Queue: Priority Queue - Linked Lists: Introduction – Representation of Linked Lists – Traversing a Linked Lists – Searching a Linked List

UNIT III **12 Hours**

Insertion into a Linked List – Deletion into Linked List – Header Linked Lists – Two-way Lists – Doubly Linked List - Trees: Binary Trees – Representation – Traversal using Recursion – Binary Search Trees

UNIT IV **12 Hours**

Sorting: Bubble Sort Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Heap Sort

UNIT V **12 Hours**

Graph – Graph Theory Terminology –Sequential Representation – Warshalls Algorithm – Shortest Path – Linked Representation - Traversals – Dynamic Programming – All Pairs Shortest Path - Greedy – Knapsack – Back Tracking – 8 Queens

Learning Resources:

Text Books:

1. Narasimha Karumanchi - "Data Structures and Algorithms Made Easy", 2023.
2. Reema Thareja – "Data Structures Using C", Oxford, 2020
3. "Data Structures Using C", Arron M. Tenebaum, Yedidyah Langsam, Moshe J. Augenstein, 2017
4. Seymour Lipschutz (1986), ―Theory and Problems of Data Structures‖, Tata McGraw- Hill Edition

References:

1. E.Horowitz, S.Sahni, S.Rajasekaran (1998), ―Computer Algorithms‖, Galgotia Publications.
2. Robert Kruse, C.L.Tondo, Bruce Leung, ―Data Structures and Program Design in C‖, Second Edition, Prientice Hall Publications, 2012.

Websites/ e-Learning Resources

1. http://www.cs.sunysb.edu/~skiena/214/lectures/
2. http://datastructures.itgo.com/graphs/dfsbfs.htm
3. http://oopweb.com/Algorithms/Documents/PLDS210/VolumeFrames.html
4. http://discuss.codechef.com/questions/48877/data-structures-and-algorithms
5. http://code.tutsplus.com/tutorials/algorithms-and-data-structures--cms-20437
6. https://www.tutorialspoint.com/data_structures_algorithms/insertion_sort_algorithm.htm (Unit IV : Insertion Sorting)

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	2	3	2	2	2	2	2	2	2
CO 2	2	3	2	3	3	2	2	2	2	2
CO 3	3	2	2	3	2	2	2	1	2	2
CO 4	3	2	2	2	2	3	2	1	2	2
CO 5	2	3	3	2	3	3	2	2	2	3
Average	**2.6**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2**	**1.6**	**2**	**2.2**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/W k.	Cred its
24BIT1202	Emerging Trends in IT	NME	3	2

The aim of this course is to gain insights into emerging computing paradigms and technologies to acquire skills in the IT domain.

Course Outcomes:

On completion of this course, students will

CO1: understand the fundamental concepts of classical computing.

CO2: identify trends in Cloud Computing.

CO3: analyze and synthesize data essentials.

CO4: gain knowledge on the networking essentials.

CO5: to make aware student the changes in futuristic technologies, applications, and Systems around us.

Unit I **9 Hours**

Distributed computing - Parallel Computing - Grid Computing – Utility Computing – Edge Computing - Quantum Computing

Unit II **9 Hours**

What is Cloud computing – Types of Cloud computing – Mobile computing - Big data – Web of Things

Unit III **9 Hours**

Azure Digital Twins – Datafication – Data Analytics – Data Fragmentation

Unit IV **9 Hours**

Types of computer networks - Network layers — Ethernet — WiFi — LiFi – IoT – 5G

Unit V **9 Hours**

Artificial Intelligence – Machine Learning – Virtual & Augmented Reality – Block Chain Technology

Learning Resources:

Text Books:

1. Kai Hwang,Geoffrey C. Fox,Jack J. Dongarra, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things,Elsevier ,2012

References:

1. Selvavinayagam G, Emerging Trends In Information Technology, Notion Press (11 May 2020);
2. Massimo Cafaro, Giovanni Aloisio, Grids, Clouds and Virtualization, Springer verlog, London ,2011.
3. Olivier Terzoismb, Turin, Italylorenzo Mossuccaismb, Turin, Italy,CRC Press, Taylor and Francis Group, 2015

Websites/ e-Learning Resources

1. Emerging Technologies Trends (itu.int)
2. The new Essential Eight technology trends: PwC
3. Emerging Trends in Information Technology - (umangsoftware.com)

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	1	-	1	1	-	1	1	1
CO 2	3	3	2	1	1	2	2	2	1	1
CO 3	3	3	3	3	3	1	2	2	2	2
CO 4	3	3	3	2	2	2	2	1	1	2
CO 5	3	3	3	3	3	3	3	3	3	3
Average	**3**	**2.8**	**2.4**	**1.8**	**2**	**1.8**	**1.8**	**1.8**	**1.6**	**1.8**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/W k.	Cred its

24BIT1200	Environmental Studies	AEC	3	2

The objective of this course is to create awareness about environmental studies and acquire knowledge about various social issues and Environment protection Act.

Course Outcomes:

Upon completion of the course, students will be able to:

CO1: compare different natural resources and their uses

CO2: analyze the structure and function of terrestrial and aquatic ecosystems.

CO3: outline the causes, effects, and control measures of pollution (air, water & soil).

CO4: identify the function of green building concept.

CO5: estimate value education.

Unit I **9 Hours**

Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness. Natural resources and associated problems. Uses and over exploitation of Forest resources, Water resources, Mineral resources, Food resources, Energy resources. Role of an individual in conservation of natural resources.

Unit II **9 Hours**

Ecosystem: Structure components of ecosystem: Biotic and Abiotic components. Functional components of an ecosystem: Food chains, Food webs, Ecological pyramids, Energy flow in the ecosystem (10% law), Ecological succession.

Biodiversity: Definition, Biogeographical classification of India, Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching, man wildlife conflicts. Conservation of biodiversity: In – situ and Ex-situ, Effects and Remedial Measures

Unit III **9 Hours**

Definition Causes, effects, and control measures of: -Air pollution. Water pollution. Soil pollution. Marine pollution. Noise pollution. Nuclear hazards. Solid waste Management: Causes, effects, and control measures. Role of an individual in prevention of pollution. Pollution case studies.

Unit IV **9 Hours**

From Unsustainable to Sustainable development Urban problems related to energy. Water conservation, rainwater harvesting, watershed management. Environmental ethics: Issues and possible solutions. Green building concept. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

Unit V **9 Hours**

Population growth, variation among nations. Environment and human health. HIV/AIDS, Human

rights. Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health. Environment Legislation. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Environmental Protection Act, Issues involved in enforcement of environmental legislation.

Learning Resources:

Text Book(s):

1. Erach Bharucha. Textbook of environmental studies for undergraduate's courses Universities Press, India Private Limited. 2019.
2. Kaushik A and Kaushik C.P. Perspectives in Environmental Studies. New Age International Publishers Edition-VI. 2018.
3. Dave D Katewa S.S. Textbook of Environmental Studies, 2nd Edition. Cengage Learning India. 2012.

Reference Book(s):

1. McKinney M.L., Schoch R.M., Yonavjak L. Mincy G. Environmental Science: Systems and Solutions. Jones and Bartlett Publishers. 6th Edition. 2017.
2. Botkin D.B. Environmental Science: Earth as a Living Planet. John Wiley and Sons. 5th edition. 2005.

Websites/ e-Learning Resources

1. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf From Climate Science to Action | Coursera
2. GyanKosh: Block-1 An Introduction to Environment and Environmental Studies

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	2	2	2	2	2	2	1	2	2	2
CO 2	3	2	2	2	2	2	1	1	2	2
CO 3	2	3	2	3	3	2	1	1	2	2
CO 4	3	2	3	2	2	3	1	2	2	2
CO 5	2	2	3	2	2	3	1	1	2	2
Average	**2.4**	**2.2**	**2.4**	**2.2**	**2.2**	**2.4**	**1**	**1.4**	**2**	**2**

Strong - 3 Medium-2 Low-1

Course code	Name of the course	Category	Hours/Wk.	Credits
24BIT1409	Programming in C	S	5	4

The objective of this course is to introduce students to the field of programming using C language. The students will be able to enhance their analyzing and problem-solving skills and use the same for writing programs in C.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline basics of C language

CO2: interpret about variables, data and operators

CO3: apply the concept of Strings for writing programs

CO4: write programs using concept of user defined and recursive functions.

CO5: apply concept of structures to write programs.

Unit I **15 Hours**

C Language Introduction-Features of C Language-Benefits of C over other languages-Compilation of C Program-First Program in C Pre-processor in C Pre-processor directives

Unit II **15 Hours**

Variables and Keywords in C-Scope rules in C-Data Types in C-Operators & Its Types-Typecasting in C

Unit III **15 Hours**

Decision Making Statements-Switch Statement in C-C Loops & Control Structure Practice Problems-Continue Statement, Break Statement Array & String Handling in C: Arrays in C-Strings in C

Unit IV **15 Hours**

String functions in C- Practice problems. Functions in C: Function Prototype-Parameter Passing Techniques in C-Storage Classes in C-Recursion Concept -Functions in Practice problems

Unit V **15 Hours**

Pointers in C-Structures- Union - Enumeration (or Enum) in C- Pointer vs Array in C – C application programs (Sorting, Matrix manipulations, student's mark list preparation)

Learning Resources:

Textbooks

1E. Bala Guruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN:978- 93-5316-513-0.

2.Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN:

978-01-9949-147-6.

3. Kernighan B.W and Dennis M. Ritchie, “The C Programming Language”,

2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.

Reference Books

1. Yashavant P. Kanetkar, “Let Us C”, 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.

2. Jacqueline A Jones and Keith Harrow, “Problem Solving with C”, Pearson

Education. ISBN: 978-93-325-3800-9.

3Dr. Guruprasad Nagraj, “C Programming for Problem Solving”, Himalaya

Publishing House. ISBN-978-93-5299-361-1.

Web Resources

1http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html

2https://nptel.ac.in/courses/106/105/106105171/

CO-PO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**
CO 1	3	3	2	1	1	2	2	2	2	2
CO 2	2	3	2	2	2	2	2	3	2	3
CO 3	2	2	2	3	3	2	2	2	2	1
CO 4	2	3	3	2	3	2	2	2	3	1
CO 5	3	2	2	3	2	2	2	3	3	3
Average	**2.4**	**2.6**	**2.2**	**2.2**	**2.2**	**2**	**2**	**2.4**	**2.4**	**2**

Strong - 3 Medium-2 Low-1

Course code	Name of the course	Category	Hours/Wk	Credits
24BIT1408	Office Automation	S	5	4

The objective of the course is to familiarize the students in preparation of documents and presentations with office automation tools.

Course Outcomes

At the end of the course, students will be able to

CO1: outline the basics of computer systems and its components.

CO2: interpret the basic concepts of a word processing package.

CO3: apply the basic concepts of electronic spreadsheet software to solve problems.

CO4: work with charts for data analytics process

CO5: create a presentation using PowerPoint tool.

Unit I **15 Hours**

Hardware and Software - Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems - Introduction to Programming Languages.

Unit II **15 Hours**

File menu operations - Editing text – tools, formatting, bullets and numbering - Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, printing – Preview, options, merge.

Unit III **15 Hours**

Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying

Unit IV **15 Hours**

Creating, formatting, and printing, analysis tables, preparation of financial statements, introduction to data analytics.

Unit V **15 Hours**

Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects, audio inclusion, timers.

Learning Resources:

Textbooks

1Peter Norton, "Introduction to Computers" –Tata McGraw-Hill, 2005.

Reference Books

1Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGraw- Hill.

Web Resources

1Web content from NDL / SWAYAM or open source web resources

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	3	2	2	2	2	2	2	2	2	2
CO 3	3	2	3	3	2	3	2	3	2	2
CO 4	3	2	3	3	2	3	3	3	3	2
CO 5	3	3	2	3	2	3	3	2	3	2
Average	**3**	**2.2**	**2.4**	**2.6**	**2**	**2.6**	**2.4**	**2.4**	**2.4**	**2**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2401	Java Programming	Core	4	4

The objective of the course is to impart knowledge on the fundamentals of object-oriented programming and on database connectivity. To train them to create, debug and deploy simple Java applications.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the basic concepts of OOPs and the features of Java.

CO2: implement decision-making statements, arrays, and classes.

CO3: write programs using classes, constructors, and interfaces.

CO4: identify the need of interfaces, packages, and multithreading in Java

CO5: create simple Java programs using database connectivity.

Unit I **12 Hours**

Fundamentals of Object- Oriented Programming: Introduction – Object Oriented Paradigm – Concepts of Object – Oriented Programming – Benefits of OOP – Evolution: Java History- Java Features - Differs from C and C++ - Overview of Java Language: Java Program Structure – Tokens – Java Statements – Java Virtual Machine – Command Line Arguments

Unit II **12Hours**

Constants, Variables and Data Types – Operators and Expressions – Decision making and Branching – Looping – Arrays - Strings – Collection classes and interfaces

Unit III **12 Hours**

Classes objects and methods: Introduction – Defining a class – Method Declaration – Constructors - Method Overloading – Static Keyword – Nesting of methods – Inheritance – Overriding – Final variables and methods – Abstract methods and classes

Unit IV **12 Hours**

Multiple Inheritance: Defining Interfaces – Extending Interfaces – Implementing Interfaces – Packages: Creating Packages – Accessing Packages – Using a Package – Managing Errors and Exceptions - Multithreaded Programming.

Unit V **12 Hours**

Java Servlet: - Servlet Environment Role – Servlet API – Servlet Life Cycle – Servlet Context – HTTP Support – HTML to Servlet Communication-JDBC.

Learning Resources:

Text Books:

1. E Balagurusamy(2010), "Programming with Java", Tata McGraw Hill Edition India Private Ltd, 7th Edition.

2.P.Naughton and H.Schildt (1999), "Java 2 The Complete Reference", TMH, 4th Edition

References:

1. Jaison Hunder & William Crawford (2002)," Java Servlet Programming", O'Reilly,2nd Edition

2. Jim Keogh (2002), "J2EE: The Complete Reference", Tata McGraw Hill Edition.

Websites/ e-Learning Resources

1. http://javabeginnerstutorial.com/core-java/
2. http://www.tutorialspoint.com/java/
3. http://beginnersbook.com/java-tutorial-for-beginners-with-examples/
4. http://www.homeandlearn.co.uk/java/java.html
5. https://www.javatpoint.com/super-keyword
6. http://www.journaldev.com/1877/servlet-tutorial-java (Unit V: Servlet API)

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	3	3	3	1	2	2	1	1	3
CO 2	3	3	3	3	1	2	2	1	1	2
CO 3	3	2	3	3	2	2	2	1	2	2
CO 4	3	2	3	3	2	2	2	1	2	2
CO 5	3	2	3	3	2	2	2	1	2	2
Average	**3**	**2.4**	**3**	**3**	**1.6**	**2**	**2**	**1**	**1.6**	**2**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2403	Java Programming & Data Structures Lab	Core	4	4

The objective of the course is to provide exposure on the concepts of core java and to design and develop applications using different Java programming language techniques. It aims to equip the students to organize and manipulate the data with the help of fundamental data structures and write servlet programs

.

Course Outcomes:

At the end of the course, students will be able to

CO1: identify and explain the ways of solving the simple problems

CO2: use appropriate software development environment to write, compile & execute Java programs

CO3: analyze and identify necessary mechanisms of Java needed to solve real-world problem

CO4: test for defects and validate a Java program with different inputs.

CO5: design, develop and compile Core Java, JDBC and servlet applications.

Contents

1. Basic Programs
2. Arrays
3. Strings
4. ArrayList, HashSet and Vector collection classes
5. Classes and Objects
6. Interfaces
7. Inheritance
8. Packages
9. Exception Handling
10. Threads
11. Linked List
12. Stacks
13. Queue
14. Sorting
15. Binary Tree Representation
16. Working with Database using JDBC
17. Web application using Servlet

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO 8	PSO 9	PSO 10
CO 1	3	3	3	3	2	2	2	1	2	3
CO 2	3	3	3	3	2	2	2	1	2	2
CO 3	3	2	3	3	2	2	2	1	2	2
CO 4	3	2	3	3	2	2	2	1	2	2
CO 5	3	2	3	3	2	2	2	1	2	2
Average	**3**	**2.4**	**3**	**3**	**2**	**2**	**2**	**1**	**2**	**2**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2405	Software Engineering	Core	4	4

The objective of the course is to comprehend software development process from Inception stage to Retirement Stage. This helps to understand the formal specification techniques and its application in real world context to understand how to manage complex projects.

Course Outcomes:

At the end of the course, students will be able to

CO1: define the basic terminologies involved in the entire software development life cycle.

CO2: identify suitable models, techniques, and tools for the development of a software product.

CO3: apply software engineering perspective through requirements analysis, software design and construction, verification, and validation to develop solutions to modern problems.

CO4: compare and contrast different processes, cost, quality models and testing techniques.

CO5: estimate the project cost using suitable cost estimation models, rate the software risks and evaluate management strategies for effective software development.

Unit I **12 Hours**

Definition - The changing nature of software - Software Myths - Terminologies - Role of Management in Software Development - Software Life Cycle Models: The Waterfall Model - Increment Process Model - Evolutionary Process Model - The Unified Process.

Unit II **12 Hours**

Requirements Engineering - Type of Requirements - Feasibility Studies - Requirements Elicitation - Requirements Analysis - Requirements Documentation - Requirements Validation.

Unit III **12 Hours**

Size Estimation - Cost Estimation - The Constructive Cost Model (COCOMO) - COCOMO II - The Putnam Resource Allocation Model - Software Risk Management – Software Design: Definition - Modularity - Strategy of Design - Function Oriented Design.

Unit IV **12 Hours**

Strategic Approach to Software Testing - Terminologies - Functional Testing - Structural Testing - Levels of Testing - Validation Testing - Testing Tools.

Unit V **12 Hours**

Basic Concepts - Software Quality - McCall Software Quality Model - Boehm Software Quality Model - Capability Maturity Model - Software Maintenance: Definition - Process – Models - Configuration Management -Documentation.

Learning Resources:

Text Books:

1. K.K Agarwal, Yogesh Singh (2019), ―Software Engineering, 3 rd Edition, New Age International Publishers

References:

1. Roger S. Pressman, ―Software Engineering – A Practitioner's Approach, 5 th Edition, Tata Mc Graw Hill Publication.
2. Panaj Jalote (2010), ―An Integrated Approach to Software Engineering, 3 rd Edition, Narosa Publication.
3. Thomas T. Baker, ―Writing Software Documentation – A task-oriented approach, Second Edition, Pearson Education, 2014.
4. Rajib Mall ―Fundamentals of Software Engineering, Second Edition, Prentice Hall.

Websites/ e-Learning Resources

1. http://www/tutorialspoint.com/software_engineering
2. http://www.nada.kth.se/lectures/
3. http://www2.latech.edu/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	3	2	2	2	3
CO 2	3	2	2	2	2	3	2	2	2	3
CO 3	3	3	3	3	2	3	2	2	2	2
CO 4	3	3	2	3	3	2	2	2	2	2
CO 5	3	2	3	3	3	2	2	2	2	2
Average	**3**	**2.6**	**2.4**	**2.6**	**2.4**	**2.6**	**2**	**2**	**2**	**2.4**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2407	Web Designing (TcL)	Core	4	4

The objective of the course is to train students to create visually appealing and user-friendly websites using HTML, XML, DHTML and java script..Students gain knowledge on developing web applications and hence validate it.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline basics of HTML and its components.

CO2: acquire the skills to effectively integrate images, multimedia, and forms in HTML.

CO3: apply CSS and gain knowledge in integrating XML for structured data management.

CO4: analyze and apply Dynamic HTML techniques using (DOM) and create client-side scripts in JavaScript.

CO5: develop robust form validations and enhance interactivity within web browser environments.

Unit I **12 Hours**

HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.

Unit II **12 Hours**

Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.

Unit III **12 Hours**

Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).

Unit IV **12 Hours**

Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding.

JavaScript: Client-side scripting, what is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,

Unit V **12 Hours**

Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.

Learning Resources:

Text Books:

1. Achyut S Godbole and AtulKahate, “Web Technologies”, 2019, 3rd Edition.
2. Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore, Reprint 2013 edition.
3. Mike Mcgrath, “Java Script”, Dream Tech Press 2013, 5th Edition.

Reference Books

1. Laura Lemay, RafeColburn , Jennifer Kyrnin, “Mastering HTML, CSS & Javascript Web Publishing”, Reprint 2022.
2. DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition.

Web Resources

1. NPTEL & MOOC courses titled Web Design and Development.
2. https://www.w3schools.com/html/
3. https://www.w3.org/Style/CSS/Overview.en.html
4. https://www.geeksforgeeks.org/javascript/

CO - PSO Mapping Table

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	3	2	2	3	2	2	2	2	2	2
CO 3	3	2	2	2	3	3	2	2	3	3
CO 4	3	2	2	3	3	3	2	2	3	3
CO 5	3	2	3	3	3	3	2	2	3	3
Average	**3**	**2**	**2.2**	**2.6**	**2.6**	**2.6**	**2**	**2**	**2.6**	**2.6**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2201	Ethical Hacking	SEC	3	2

The objective of the course is to learn about the importance of information security. This helps to acquire the knowledge about different scanning, enumeration methodologies and penetration testing tools to understand various hacking techniques.

Course Outcomes:

At the end of the course, students will be able to

CO1: use the various security tools to assess the computing system.

CO2: predict the vulnerabilities across any computing system using penetration testing.

CO3: identify prediction mechanisms to prevent any kind of attacks.

CO4: protect the system from malicious software and worms.

CO5: analyze the risk and support the organization for effective security measures.

Unit I **9 Hours**

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Footprinting Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines.

Unit II **9 Hours**

Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools.

Unit III **9 Hours**

Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing – Password Cracking Tools – Password Cracking Countermeasures – Escalating Privileges –Executing Applications – Keyloggers and Spyware – Web filtering - honeypots.

Unit IV **9 Hours**

Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures.

Unit V **9 Hours**

Introduction – Security Assessments – Types of Penetration Testing- Phases of Penetration Testing – Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools

Learning Resources:

Text Books:

1. Jon Erickson, "Hacking: The Art of Exploitation", No Starch Press, Second Edition, Mar 2020.

Reference Books:

1. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning, 2015.

2. Michael T. Simpson, Kent Backman, James E. Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning, 2014.

3. Patrick Engebretson, "The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013.

Websites/ e-Learning Resources:

1. https://www.geeksforgeeks.org/ethical hacking/

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	2	2	2	2	2	2	2
CO 2	2	3	2	3	2	3	1	2	2	2
CO 3	3	3	3	2	3	2	2	1	2	3
CO 4	3	2	3	3	2	2	1	1	2	2
CO 5	3	3	2	3	3	2	1	2	3	2
Average	**2.8**	**2.8**	**2.4**	**2.6**	**2.4**	**2.2**	**1.4**	**1.6**	**2.2**	**2.2**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2402	Relational Database Management System	Core	4	4

The objective of the course is to acquire basic knowledge on DBMS models and architecture. It also enables the students to learn Relational database models, how to query, design and normalize the database. It helps the students to have a knowledge of Structured query language and PL / SQL.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the fundamental database concepts and its architecture.

CO2: analyze the requirements to implement relational database concepts.

CO3: construct the data model using the ER Model.

CO4: evaluate the database based on various normalization forms.

CO5: design and construct normalized tables and manipulate it effectively using SQL and PL/SQL database objects

Unit I **12 Hours**

Introduction – Characteristics of the Database Approach – Actors on the Scene – Workers behind the scene – Advantages of using DBMS Approach. Overview of database and Architectures: Data Models, Schemas, and Instances – Three-schema Architecture and Data Independence – Database languages & Interfaces – Database System Environment– Centralized & Client Server Architecture for DBMS - Classification of DBMS.

Unit II **12 Hours**

Relational Model Concepts – Relational Model Constraints and Relational Database Schemas – Update Operations, Transactions, Dealing with Constraint Violations – Formal Relational Languages: Unary Relational Operations: SELECT and PROJECT – Relational Algebra Operations from Set Theory – Binary Relational Operations: JOIN and DIVISION – Examples of Queries in Relational Algebra

Unit III **12 Hours**

Conceptual Data Modeling using the ER Model: Using High-Level Conceptual Data Models for Database Design – An example DB application – Entity Types, Entity Sets, Attributes, and Keys – Relationship Types, Relationship sets, Roles, and Structural Constraints – Weak entity types – Example- Mapping a Conceptual Design into Logical Design: Relational Database Design using ER-Relational Mapping – Mapping EER Model Constructs to Relations

Unit IV **12 Hours**

Functional Dependencies and Normalization for Relational Database: Functional Dependencies – Definition of Functional Dependency – Normal Forms based on Primary Keys – Normalization of Relations – First Normal Form – Second Normal Form – Third Normal Form – BCNF- Fourth Normal Form- Fifth Normal Form.

Unit V **12 Hours**

The Relational Database Standard: Data definition, Constraints, and schema changes in SQL – Basic Queries in SQL – More complex SQL Queries – Insert, delete and update statements in SQL – Views in SQL.

PL/SQL: Introduction to PL/SQL – More on PL/SQL – Error Handling in PL/SQL – Oracle Named Exception Handlers – Cursors - Stored Procedures and Functions – Execution of Procedures and Functions – Advantages – Procedures Vs. Functions – Syntax for Creating Procedures and Functions – Deleting a Stored Procedure or Function – Oracle Packages – Database Triggers – Types of Triggers – Deleting a Trigger – Raise-Application Error Procedure

Learning Resources:

Text Books:

1. Ramez Elmasri, Shamkant B. Navathe (2017), ―Database Systems, Seventh edition, Pearson Education, New Delhi.
2. Ivan Bayross (2010 Reprint), SQL, PL/SQL-The Programming Language of Oracle, Fourth Revised Edition, BPB Publications, New Delhi.

References:

1. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, Tata McGraw Hill Publication, 4th Edition.

Websites/ e-Learning Resources

1. http://srikanthtechnologies.com/books/orabook/ch1.pdf
2. http://www.tmv.edu.in/pdf/Distance_education/BCA%20Books/BCA%20IV%20SEM/BC A-428%20Oracle.pdf
3. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.html
4. http://ecomputernotes.com/database-system/rdbms
5. http://www.mithunashok.com/2011/04/basics-of-rdbms.html

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	3	2	2	1	2	3
CO 2	3	2	2	3	3	2	2	2	2	3
CO 3	3	3	3	2	2	2	2	2	2	2
CO 4	3	2	3	2	3	2	2	1	1	3
CO 5	3	3	3	2	2	3	2	2	2	3
Average	**3**	**2.4**	**2.6**	**2.2**	**2.6**	**2.2**	**2**	**1.6**	**1.8**	**2.8**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2404	Relational Database Management System Lab	Core	4	4

The objective of the course is to provide exposure to basic Structured query language commands. It aims to develop simple programs using PL/SQL, to create Procedures and User-defined functions. It also helps the students to handle the exceptions and to invoke the triggers.

Course Outcomes:

At the end of the course, students will be able to

CO1: choose appropriate SQL queries and PL/SQL blocks for the database.

CO2: implement SQL and PL/SQL blocks for the given problem effectively.

CO3: analyze the problem and Exceptions using queries and PL/SQL blocks.

CO4: validate the database for normalization using SQL and PL/SQL blocks.

CO5: design Database tables, create Procedures, user-defined functions and Triggers.

Contents

1. DDL Commands
2. DML Commands
3. DCL Commands
4. SQL Built-in functions
5. Using Sub Queries
6. Set operations
7. Packages
8. Simple programs using PL/SQL
9. Procedures
10. User-defined functions
11. Exception Handling
12. Trigger

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	3	2	2	1	2	3
CO 2	3	2	3	3	3	2	2	2	2	3
CO 3	3	3	3	2	2	2	2	2	2	2
CO 4	3	2	2	2	3	2	2	1	1	3
CO 5	3	3	3	2	2	3	2	2	2	3
Average	**3**	**2.4**	**2.6**	**2.2**	**2.6**	**2.2**	**2**	**1.6**	**1.8**	**2.8**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2406	Operating System	Core	4	4

The objective of this course is to introduce the internal operation of modern operating systems. To focus on the core concepts such as processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the fundamental concepts of OS and their respective functionalities

CO2: interpret the CPU scheduling and synchronization techniques

CO3: acquire knowledge to handle Deadlock situations

CO4: analyze the various storage management supported in operating system

CO5: explain different file system organization

Unit I **12 Hours**

Definition of Operating System - OS Structures: OS Services - System Calls - Virtual Machines - Process Management: Process Concept - Process Scheduling - Operation on Processes - Co-operating Processes - Inter-process Communication

Unit II **12 Hours**

Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Process Synchronization: The Critical Section Problem - Semaphores - Classical Problems of Synchronization - Critical Regions

Unit III **12 Hours**

System Model - Deadlock characterization – Methods for Handling Deadlocks Deadlock Prevention - Deadlock avoidance- Deadlock Detection - Recovery from Deadlock.

Unit IV **12 Hours**

Memory management - Swapping – Contiguous Memory allocation. Paging – Segmentation – Segmentation with Paging –Virtual memory: Demand paging - Page replacement – Thrashing. Mass-Storage Structure: Disk Structure- Disk scheduling.

Unit V **12 Hours**

File Concept-File Attributes-File Operations – Access Methods: Sequential Access – Direct Access – Directory Structure: Single-Level Directory- Two –Level Directory-Tree-Structured Directories-Introducing Shell Programming – Linux General Purpose Commands-Process Oriented Commands – Communication Oriented Commands.

Learning Resources:

Text Books:

1. Silberschatz, Peter Baer Galvin, Greg Gagne (2012), ―Operating System Concepts, 9th edition, Wiley Student Edition.

2. B.Mohamed Ibrahim, (2005), ―Linux Practical Approach,Firewall Media

References:

1. Milan Milenkovic (2003), ―Operating System Concepts and Design, McGraw Hill.

2. Andrew S. Tanenbaum, (2001), ―Modern Operating Systems, 2nd Edition, Prentice Hall of India.

3. Deital and Deital (1990), ―Introduction to Operating System, Pearson Education.

4. William Stallings (1997), ―Operating Systems‖, Prentice Hall of India.

Websites/ e-Learning Resources:

1. http://www.tutorialspoint.com/operating_system/
2. http://www.reallylinux.com/docs/files.shtml
3. http://www.tutorialspoint.com/operating_system/os_linux.htm

CO - PSO Mapping Table

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	3	3	2	2	1	1	2
CO 2	3	2	3	3	2	3	2	1	2	3
CO 3	3	2	2	2	3	2	2	2	2	2
CO 4	3	3	3	2	2	2	2	1	2	2
CO 5	3	2	3	3	3	2	2	2	2	3
Average	**3**	**2.4**	**2.6**	**2.8**	**2.6**	**2.2**	**2**	**1.4**	**1.8**	**2.4**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2408	Software Testing	Core	4	4

The objective of this course is to study fundamental concepts in software testing. It also enables the students to study the basic concept of data flow testing and domain testing. It helps the students to learn about logic-based testing, decision tables and state based testing concepts .

Course Outcomes:

At the end of the course, students will be able to

CO1: familiar with software testing model and bugs

CO2: understand the concept of Flow testing and Path testing.

CO3: understand various testing strategies and domain testing .

CO4: analyze various metrics and understand syntax testing and test cases.

CO5: develop skills in decision tables and various testing .

Unit I **12 Hours**

Introduction: Purpose–Productivity and Quality in Software–Testing Vs Debugging–Model for Testing– Bugs– Types of Bugs – Testing and Design Style.

Unit II **12 Hours**

Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction Flow Testing Techniques.

Unit III **12 Hours**

Data Flow Testing Strategies - Domain Testing: Domains and Paths – Domains and Interface Testing.

Unit IV **12 Hours**

Linguistic –Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing–Formats– Test Cases

Unit V **12 Hours**

Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, State Testing.

Learning Resources:

Text Books:

1. B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.

2. K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005

References:

1. Burnstein,2003,"PracticalSoftwareTesting",SpringerInternationalEdn.

2. E. Kit, 2002, "Software Testing in the Real World: Improving the Process", PearsonEducation,Delhi.

3. R. Rajani,andP.P.Oak,2004,"SoftwareTesting",TataMcgrawHill,New Delhi.

Web Resources:

1. https://www.javatpoint.com/software-testing-tutorial
2. https://www.guru99.com/software-testing.html

CO - PSO Mapping Table

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	1	1	2	1	1	2
CO 2	3	3	2	2	1	1	1	2	1	1
CO 3	3	3	3	3	2	3	2	1	1	1
CO 4	3	3	3	3	3	2	1	1	2	3
CO 5	3	3	3	3	1	1	2	3	3	3
Average	**3**	**3**	**2.6**	**2.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**2**

3-Strong 2-Medium 1-Low

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2410	PHP Scripting (TcL)	S	5	4

The objective of this course is to enable students to understand server-side functionality to create dynamic, interactive web pages and applications. It facilitates students to learn tasks such as database interactions, session management, and content generation tailored to user inputs.

Course Outcome:

On completion of this course, students will be able to

CO1: outline fundamentals of PHP language.

CO2: apply and analyze function definitions, variable scopes, and Arrays.

CO3: acquire knowledge on web techniques and maintaining states.

CO4: interact with MySQL database through data retrieval and manipulation

CO5: analyze the fundamentals of JQuery and Event handling.

Unit I **15 Hours**

Language Basics: Lexical Structure – Data Types – Variables - Expressions and Operators – Flow – Control statements – Embedding PHP in Web Pages

Unit II **15 Hours**

Defining a function – Variable Scope - Function Parameters – Strings: Encoding and Escaping – Comparing Strings – Manipulating and Searching Strings – Arrays: Single and Multidimensional Arrays – Traversing Arrays – Sorting

Unit III **15 Hours**

Classes and Objects – Introspection – Serialization – Web Techniques: Processing Forms – Setting Response Headers – Maintaining State: Cookies and Session-Graphics-File Handling

Unit IV **15 Hours**

Select data from a single table – Select data from multiple tables- Performing DML operations

Unit V **15 Hours**

Requirements of jQuery- JavaScript Premier – jQuery Core – DOM Selection and Manipulation – Event Handling – HTML Forms and Data – jQuery with PHP

Learning Resources:

Text Book

1.Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, “Programming PHP”, O‘Reilly Publications, Third Edition, 2013.

2. Joel Murach, Ray Harris, “PHP and MySQL”, Shroff Publishers & Distributors, 2017

3. Cesar Otero, Rob Lorsen (2012), “Professional jQuery”, John Wiley Sons & Inc

Reference Books

1. W. Jason Gilmore (2010), “Beginning PHP & MySql”, Apress

2. Larry Ullman (2008), “PHP 6 and MySQL 5”, Pearson Education

3. John Coggeshall (2006), “PHP 5”, Pearson Education

4. Michale C. Glass (2004), “Beginning PHP, Apache, MySQL Web Development", Wiley DreamTech Press

5. Robin Nixon (2013), “Learning PHP, MySQL, JavaScript & CSS”, O‘Reilly, 2nd Edition

6. Jack Franlin (2013), “Beginning jQuery”, Apress, Springer Science

Web Resources

1. http://www.w3schools.com/jquery
2. http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jQueryNotes.pdf
3. http://www.w3schools.com/php/
4. http://www.tutorialspoint.com/php/
5. http://www.tutorialspoint.com/mysql/

CO - PSO Mapping Table

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	3	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	2	2	2	3	3	2	2	3	3
CO 4	3	2	3	2	3	3	2	3	3	3
CO 5	3	2	3	2	3	3	3	3	3	3
Average	**3**	**2.4**	**2.4**	**2**	**2.6**	**2.6**	**2.2**	**2.4**	**2.6**	**2.6**

3-Strong 2-Medium 1-Low

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT2202	IoT and its Applications	SEC	3	2

The objective of the course is to enable the students to develop a network of connected devices with data exchange and communication capabilities. It helps the students to develop problem solving skills using IoT technologies.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the fundamentals of IoT

CO2: interpret M2M communication in IoT

CO3: identify the components that forms part of IoT Architecture

CO4: design IoT applications in different domain and analyze their performance

CO5: explain the privacy and Security features in IoT

Unit I **9 Hours**

IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, IoT Related Standardization.

Unit II **9 Hours**

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities.

Unit III **9 Hours**

IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views

Unit IV **9 Hours**

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management

Unit V **9 Hours**

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data- Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Learning Resources:

Text Book

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited, 1st Edition, 2014.

Reference Book

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version, 1st Edition, 2015.

2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications,1st Edition, 2014.

3. WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media 2011

Web references

1. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
2. https://github.com/thingsboard
3. https://dzone.com/articles/type-of-sensors-and-actuators-in-iot

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	1	1	1	2	2	2	2	3
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	3	3	2	3	2	2	3
CO 4	3	3	3	3	3	3	3	2	2	3
CO 5	3	3	3	3	2	3	3	2	2	3
Average	**3**	**2.8**	**2.2**	**3**	**2.6**	**2.4**	**2.6**	**2**	**2**	**2.8**

Strong – 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3601	.Net Programming(TcL)	Core	6	6

The objective of the course is to provide sufficient knowledge in developing web applications using C# and ASP.NET. It also helps the students to manipulate data from SQL Server using Microsoft ADO.NET.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the features of C# programming language and applications

CO2: interpret the salient properties of control statements

CO3: exhibit the features of arrays and strings

CO4: identify Web controls to create web form

CO5: acquire knowledge on validation and data source controls

Unit I **18 Hours**

C# Relates to the .Net Framework - Common Language Runtime - Managed vs unmanaged code - **An** Overview of C#: Object-Oriented Programming - First Simple Program-Handling Syntax errors - Using code blocks-semicolon, positioning and Indentation-The C# Keywords-Identifiers-The .Net Framework Class Library-Data Types, Literals and Variables- Operators.

Unit II **18 Hours**

If Statement- switch Statement-For Loop- While loop do-while loop- foreach loop-using break to exit a loop-using continue- goto- **Introducing Classes and objects**: Class Fundamentals- objects creation-Methods-constructors-Garbage Collection and Destructors-Exception Handling.

Unit III **18 Hours**

Arrays-Multidimensional Arrays-Jagged Arrays- for each loop Strings- Methods and classes: Method overloading- Main Method-Recursion-static Classes Delegates, Events and Lambda Expressions: Delegates -Lambda Expressions-LINQ

Unit IV **18 Hours**

Visual Studio: Creating Websites- The Anatomy of a Web Form – Web Form Fundamentals: Converting HTML Page to an ASP.Net Page – Page Class – Web Controls. State Management**:** View State - Transferring Information between Pages – Cookies – Session State – Application State.

Unit V **18 Hours**

ADO.NET Fundamentals: – Direct Data Access – Disconnected Data Access - Data Binding: Data Binding with ADO.NET –Data Source Controls - The Data Controls: The GridView – Formatting the GridView – Selecting GridView Row – Editing, Sorting and Paging the GridView- Generating Crystal Reports.

Learning Resources:

Textbooks:

1. E.Bala Gurusamy, " Programming In C#", McGraw Hill Education , July 2017
2. Andrew Lock , "ASP.NET Core in Action", Manning Publications, Third Edition, July 2023

Reference Books:

1. Joseph Albahari, "C# 9.0 in a Nutshell The Definitive Reference", O'REILLY" , 2020
2. Kris Hermans, "Mastering ASP.NET: A Comprehensive Guide to Learn ASP.NET", Cybellium Ltd, 2023
3. Adam Freeman , "Pro ASP.NET Core 7", Manning publications, 10th edition,2023
4. Mark J. Price , "C# 8.0 and .NET Core 3.0", Modern Cross-Platform Development,Fourth Edition - 2019

Web Resources:

1. http://ssw.jku.at/Teaching/Lectures/CSharp/Tutorial/
2. http://www.csharpkey.com/csharp/
3. http://www.w3schools.com/aspnet/default.asp

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	2	2	1	1	2	2
CO 2	3	2	3	2	3	2	1	1	2	2
CO 3	3	2	2	3	2	2	2	2	2	2
CO 4	3	2	3	3	2	3	2	2	2	3
CO 5	3	2	3	3	3	3	2	2	2	3
Average	**3**	**2**	**2.6**	**2.6**	**2.4**	**2.4**	**1.6**	**1.6**	**2**	**2.4**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3603	Python Programming (TcL)	Core	6	6

The objective of the course is to apply the OOPs concept in PYTHON programming & to impart knowledge on demand and supply concepts. To teach, the way to partition the data and clustering them and handle files in PYTHON.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the basic concepts of PYTHON programming.

CO2: implement decision making and branching statements.

CO3: identify the need of functions in PYTHON and write user defined functions. **CO4:** analyze and solve problems using basic constructs and techniques of python. **CO5:** write simple programs using file concepts**.**

Unit I **18 Hours**

History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions- Type Conversions-Python Arrays - Defining and Processing Arrays – Array methods.

Unit II **18 Hours**

Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements- Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.

Unit III **18 Hours**

Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.

Unit IV **18 Hours**

Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.

Unit V **18 Hours**

Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.

Learning Resources:

Text Books:

1. E. Balagurusamy, "Introduction to computing and Problem solving using Python", 7th reprint 2022.
2. Reema Thareja, "Python Programming using problem solving approach", 3nd Edition, 2019, Oxford University Press.
3. Dr. R. Nageswara Rao, "Core Python Programming", 2nd Edition, 2018, Dream tech Publishers

References:

1. VamsiKurama, "Python Programming: A Modern Approach", Pearson Education,2018
2. Mark Lutz, "Learning Python", O'reilly Media, 5th Edition.

Websites/ e-Learning Resources

1.https://www.javatpoint.com/python-tutorial
2.https://docs.python.org/3/tutorial/index.html
3.https://www.javatpoint.com/python-tutorial
4.https://docs.python.org/3/tutorial/index.html

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	1	2	2	1	1	1
CO 2	3	2	3	2	1	2	2	1	1	1
CO 3	3	2	3	3	2	2	3	1	2	2
CO 4	3	2	3	3	2	2	3	1	2	2
CO 5	3	1	3	3	3	2	3	1	2	2
Average	**3**	**1.8**	**2.8**	**2.6**	**1.5**	**2**	**2.6**	**1**	**1.6**	**1.6**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3605	Data Mining and Warehousing	Core	6	6

The objective of the course is to enable the students to understand the basic concepts of data mining and warehousing. It helps the students to learn Data mining techniques and algorithms. It also helps the students to understand the various clustering and outlier detection techniques.

Course Outcomes:

At the end of the course, students will be able to

CO1: acquire the fundamentals of Data Mining along with preprocessing techniques.

CO2: evaluate the patterns based on the Association Rules Mining concepts and its algorithm.

CO3: identify the usages of Decision tree Algorithm, Bayesian Classification, Back Propagation techniques in classification analysis.

CO4: outline the cluster and partitioning algorithms such as K – means along with evaluation of Clustering.

CO5: identify the outliers and a suitable visualization technique to display the data.

Unit I **18 Hours**

Introduction: Data Mining – Kinds of Data and Patterns to be Mined – Technologies used –Kinds of Applications are Targeted - Major Issues –Data objects and Attribute types – Basic statistical Descriptions of Data- Data warehouse – Data warehouse architecture - Data Preprocessing: Data Cleaning – Data Integration - Data Reduction - Data Transformation.

Unit II **18 Hours**

Introduction – Frequent Itemset Mining Methods: Apriori Algorithm-Generating Association Rules from Frequent Itemset - Improving the efficiency of Apriori - A Pattern – Growth Approach for mining Frequent Itemset - Pattern Evaluation Methods.

Unit III **18 Hours**

Introduction –Basic concepts – Logistic regression - Decision tree induction–Bayesian classification, Rule–based classification-Model Evaluation and selection.

Unit IV **18 Hours**

Cluster Analysis: Introduction-Requirements for Cluster Analysis - Partitioning Methods: The K-Means method - Hierarchical Method: Agglomerative method - Density based methods: DBSCAN-Evaluation of Clustering: Determining the Number of Clusters – Measuring Clustering Quality.

Unit V **18 Hours**

Outlier Detection: Outliers and Outlier Analysis – Outlier Detection Methods - Data Visualization: Pixel - oriented visualization – Geometric Projection visualization technique-Icon-based - Hierarchical Visualization - Visualizing complex data and relations.

Learning Resources:

Text Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining concepts and techniques", 3rd Edition, Elsevier publication, 2012.

References:

1. Ian H. Witten and Eibe Frank, (2016), "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann.
2. Arun K Pujari, "Data Mining Techniques", 10 impressions, University Press, 2013.
3. Daniel T. Larose , Chantal D. Larose, "Data mining and Predictive analytics," Second Ed., Wiley Publication, 2015.
4. G.K. Gupta, "Introduction to Data mining with case studies", 2nd Edition, PHI Private limited, New Delhi, 2011.

Websites/ e-Learning Resources

1. https://www.geeksforgeeks.org/data-mining/
2. https://www.scaler.com/topics/data-mining-tutorial/
3. http://csed.sggs.ac.in/csed/sites/default/files/WEKA%20Explorer%20Tutorial.pdf
4. https://www.cs.auckland.ac.nz/courses/compsci367s1c/tutorials/IntroductionToWeka.pdf

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	3	3	2	2	3	2	1	2	1	3
CO 2	3	2	2	2	3	3	2	2	2	3
CO 3	3	2	3	3	3	2	2	2	2	3
CO 4	3	3	3	3	3	3	2	2	2	3
CO 5	3	3	3	3	2	2	2	2	2	3
Average	**3**	**2.6**	**2.6**	**2.6**	**2.8**	**2.4**	**1.8**	**2**	**1.8**	**3**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3401	Robotics and Its Applications	DSE	5	4

The objective of the course is to understand the fundamentals of robotics, the sensors and matrix methods. It helps the students to learn the concept of Path Planning, Vision system, and artificial intelligence in robots.

Course Outcomes:

On completion of the course, students will be able to

CO1: acquire knowledge on the different physical forms of robot architectures.

CO2: interpret the kinematics of robots and sensors.

CO3: determining where a mobile robot is located with respect to its environment

CO4: identify a set of waypoints which a robot is expected to travel

CO5: acquire knowledge on a wide range of robotics applications across various fields.

Unit I **15 Hours**

Introduction, brief history, components of robotics, classification, workspace, work-envelope, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.

Unit II **15 Hours**

Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge-based force torque sensor-proximity and distance measuring sensors

Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot

Unit III **15 Hours**

Self-localization and mapping - Challenges in localizations – IR based localizations – vision-based localizations – Ultrasonic based localizations - GPS localization systems.

Unit IV **15 Hours**

Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies

Vision system: Robotic vision systems-image representation-object recognition-and categorization-

depth measurement- image data compression-visual inspection-software considerations

Unit V **15 Hours**

Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.

Learning Resources:

Textbooks:

1. Dr. Jisu Elsa Jacob, Manjunath N , "Robotics Simplified: An Illustrative Guide to Learn Fundamentals of Robotics, Including Kinematics, Motion Control, and Trajectory Planning",2022

2. Lanny Hansen, "Robotics: Discover the Robotic Innovations of the Future (A Beginners and Advanced Guide in Understanding Robotics)" , 2022

Reference Books:

1. Peter McKinnon , "Robotics: Everything You Need to Know About Robotics from Beginner to Expert", 2016

2. Kris Hermans , "Mastering Robotics: A Comprehensive Guide to Learn Robotics", Cybellium Ltd, 2023

Web Resources:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm
2. https://www.geeksforgeeks.org/robotics-introduction/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	3	2	3	2	3	2
CO 2	3	3	2	2	3	3	3	2	3	2
CO 3	3	3	3	3	3	3	2	2	2	3
CO 4	3	3	3	3	3	2	3	2	2	3
CO 5	3	2	3	3	2	3	3	2	2	3
Average	**3**	**2.6**	**2.6**	**2.6**	**2.8**	**2.6**	**2.8**	**2**	**2.4**	**2.6**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3403	Cyber Forensics	DSE	5	4

The objective of this course is to gain basic knowledge in Forensic Technology. It provides insights on data recovery, evidence handling, and legal compliance. The goal is to provide reliable, admissible evidence that can be used in legal proceedings.

Course Outcomes:

On completion of the course, students will be able to

CO1: outline computer forensics fundamentals.

CO2: compare types of Computer Forensics Evidence

CO3: acquire the concepts of Duplication and Preservation of Digital Evidence

CO4: explain Computer forensics analysis.

CO5: analyze reconstruction of past events.

Unit I **15 Hours**

Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computers. Forensics Technology: Types of Business Computer Forensic, Technology–Types of Military Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.

Unit II **15 Hours**

Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artifacts, Collection Steps, Controlling Contamination: The chain of custody.

Unit III **15 Hours**

Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.

Unit IV **15 Hours**

Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool.

Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.

Unit V **15 Hours**

How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction of E–Mail, Damaging Computer Evidence, Documenting The Intrusion on Destruction of Data, System Testing.

Learning Resources:

Text Book

1. John R. Vacca, "Computer Forensics: Computer Crime Investigation", Laxmi Publications; First Edition (1 January 2015)

Reference Books

1. Nelson, Phillips Enfinger, Steuart,"Computer Forensics and Investigations" Enfinger, Steuart, CENGAGE Learning, 2004.

2. Anthony Sammes and Brian Jenkinson,"Forensic Computing: A Practitioner Guide", Second Edition, Springer–Verlag London Limited, 2007.

3. Robert M.Slade," Software Forensics Collecting Evidence from the Scene of a Digital Crime", TMH 2005.

Web Resources

1. https://www.vskills.in
2. https://www.hackingarticles.in/best-of-computer-forensics-tutorials/
3. https://www.isc2.org/

CO - PSO Mapping Table

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	2	2	2	2	2
CO 2	3	2	2	2	2	2	2	2	2	2
CO 3	3	2	3	3	2	3	2	2	2	3
CO 4	3	2	3	3	3	3	3	2	3	3
CO 5	3	2	3	3	3	3	3	2	3	3
Average	**3**	**2.2**	**2.6**	**2.6**	**2.4**	**2.6**	**2.4**	**2**	**2.4**	**2.6**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3405	Introduction to Data Science	DSE	5	4

The objective of this course is to understand the basics of Data Science. It also enables the student to solve problems through logical thinking and learn programming concepts in Data Science.

Course Outcomes:

At the end of the course, students will be able to

CO1: attain the basic knowledge of Data Science and its concepts.

CO2: acquire in-depth knowledge in the Data Science Process.

CO3: outline Data exploration using Data Visualization.

CO4: compare classification and clustering algorithms.

CO5: develop simple applications using Excel and data analysis using KNIME.

Unit I **15 Hours**

Introduction – Life Cycle of Data Science – AI, Machine Learning and Data Science – What is Data Science – Case of Data Science – Data Science Classification – Data Science Algorithms – Data Security issues.

Unit II **15 Hours**

Introduction – CRISP data mining framework – Data Science Process – Prior Knowledge – Data Preparation- Missing Values- Outliers- Sampling – Training and Testing Data Modeling – Applications – Knowledge.

Unit III **15 Hours**

Introduction - Objective of Data Exploration – Datasets – Type of Data – Data Visualization: Histogram – Scatter Plot – Quartile – TreeMap charts – Regression – Linear and Non-Linear regression.

Unit IV **15 Hours**

Introduction - Classification – Decision Trees – Rule Induction – Support Vector Machines – Prediction – Clustering – KNN – Random Forest and Decision Making.

Unit V **15 Hours**

Data Analysis using Excel - quick retrieval of data - reformat and summarize data using pivot table - automating Excel task using Macros - KNIME for advanced data analysis - KNIME workbench - Data analysis using KNIME - time series analysis and auto regressive modeling.

Learning Resources:

Textbook:

1. Dr. M. Davamani Christober, “Concepts of Data Science using R”, Kanthaga Pookal Pathipagam, First Edition 2021, ISBN: 978-93-80368-41-

2. Lillian Pierson, “Data science for Dummies”, John wiley & sons, Inc., 2015.

References:

1. Vijay Kotu, Bala Deshpande, “Data Science Concepts and Practice” Second Edition, Morgan Kaufmann Publishers, 2019

2. John D. Kelleher and Brendan Tierney, “Data Science”, First Edition, The MIT Press, London, 2018.

Web Resources:

1.https://www.tutorialspoint.com/data science/

2.https://www.geeksforgeeks.org/data science-introduction/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	2	2	2	2	2
CO 2	3	2	2	3	2	2	2	2	2	2
CO 3	3	2	3	3	3	3	2	2	2	3
CO 4	2	3	3	3	2	3	2	2	3	3
CO 5	3	3	3	2	3	3	2	2	3	3
Average	**2.8**	**2.6**	**2.6**	**2.6**	**2.4**	**2.6**	**2**	**2**	**2.4**	**2.6**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3301	Introduction to HTML (TcL)	GE	4	3

The objective of this course is to understand the basics of HTML. It also enables the student to study the concept of css, tags and lists. It helps the students to be familiar in forms, tables, canvas and frames.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the basic concept in Internet and HTML

CO2: acquire knowledge in CSS, tags and fonts.

CO3: familiar in Lists, Images and Hyperlinks.

CO4: creating tables, cell padding and applying canvas and SVG.

CO5: apply frames and various form input tags.

Unit I **12 Hours**

Introduction: Web Basics: What is Internet – Web browsers – What is Web page – HTML Basics: Understanding tags.

Unit II **12 Hours**

Css Introduction - Css Colors - Types of CSS - Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph(<p> tag) – Font style elements: (bold, italic, font, small, strong, strike, big tags)

Unit III **12 Hours**

Types of lists: Ordered, Unordered – Nesting Lists – Other tags: Marquee, HR, BR- Using Images – Creating Hyperlinks.

Unit IV **12 Hours**

Creating basic Table, Table elements, Caption – Table and cell alignment – Rowspan, Colspan – Cell padding - HTML Canvas - SVG.

Unit V **12 Hours**

Frameset – Targeted Links – No frame – Forms: Input, Textarea, Select, Option.

Learning Resources:

Text Books:

1. "Mastering HTML5 and CSS3 Made Easy", TeachUComp Inc., 2014.
2. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"

References:

1. HTML 5 Blackbook, DT Editorial services, 2nd edition, Kindle Edition, Dreamtech Press, 2016

Web Resources:

1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2. https://www.w3schools.com/html/default.asp

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	1	1	1	2	1	1	1	1
CO 2	3	3	2	2	1	1	2	2	1	1
CO 3	3	3	2	2	2	2	1	1	1	2
CO 4	3	3	3	2	2	2	2	2	2	3
CO 5	3	3	3	2	3	3	2	2	3	2
Average	**3**	**3**	**2.2**	**1.8**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.8**

S-Strong-3 **M-Medium-2** **L-Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3303	IT and its applications (TcL)	GE	4	3

The objective of this course is to understand the basics of computer and its applications. It also enables the student to have an insight on data communications and its related security issues.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the basic concept in information technology

CO2: interpret about internet and its applications

CO3: explain about data communication and computer network

CO4: compare various security issues and its impact

CO5: analyze the applications of IT in various sectors

Unit I **12 Hours**

Concepts of data, information, and computer-based information system. impact of information technology -Types of Information System - Transaction Processing System (TPS), Management Information System (MIS), Decision Support System (DSS), Knowledge Management System (KMS) - Recent trends in information technology -Enterprise computing, mobile communication, smart card.

Unit II **12 Hours**

Meaning of Internet. Concepts of Internet Intranet and Extranet, IP Address (IPv4, IPv6), URL, Domain name System. Internet services – Email, chatting, Internet conferencing, Electronic new paper, www, online shopping.

Unit III **12 Hours**

Concept of Data communications, Transmission Modes-Communication Media. Wireless and satellite communication, Wireless Broadband, WAP, Network components – Bridge, Switch, Router, Gateway- Network Concept, Types: LAN, WAN, MAN, VAN, SAN. Various Topologies: Bus, Star, Ring, Mesh, Tree.

Unit IV **12 Hours**

Security threats - Virus, Trojan, Hacking, Spam. Security Measures - Firewall, Antivirus software, Digital Signature. Concept of data Encryption & Decryption. Symmetric and asymmetric encryption. Digital envelope

Unit V **12 Hours**

Applications of IT in healthcare – Communication – Education – Employment – Governance – Human resource – Transportation – Banking – Finance.

Learning Resources:

Text Books:

1. Reema Thareja, Information Technology and its Applications in 2017 second edition, Oxford university press.

References:

1. Dr. Anant Kumar Srivastav, Information Technology and Its Application in Business

Web Resources:

1. https://www.geeksforgeeks.org/applications-of-information-technology/
2. https://www.analyticssteps.com/blogs/information-technology-its-functions-and-why-it-important

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	1	1	1	2	1	1	1	1
CO 2	3	3	2	2	1	1	2	2	1	1
CO 3	3	3	2	2	2	2	1	1	1	2
CO 4	3	3	3	2	2	2	2	2	2	3
CO 5	3	3	3	2	3	3	2	2	3	2
Average	**3**	**3**	**2.2**	**1.8**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.8**

S-Strong-3 **M-Medium-2** **L-Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3255	Internship	IS	-	2

Students gain practical experience in applying IT concepts and skills within a professional environment. They develop problem-solving abilities by working on real-world projects, thereby enhancing their readiness for career opportunities in the field of Information Technology.

Course Outcomes:

At the end of the course, students will be able to

CO1: apply IT concepts in a real-world setting

CO2: design and develop IT solutions based on project requirements

CO3: investigate and research new technologies and methods

CO4: use modern IT tools and software effectively

CO5: collaborate effectively within a team environment

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	2	2	2	2	3	2	2	2	2
CO 2	3	2	2	3	3	3	2	2	3	3
CO 3	2	2	2	2	3	3	2	3	3	3
CO 4	3	3	3	3	3	2	2	2	3	3
CO 5	2	3	3	2	2	2	3	2	3	3
Average	**2.6**	**2.4**	**2.4**	**2.4**	**2.6**	**2.6**	**2.2**	**2.2**	**2.8**	**2.8**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3201	Trends in Computing	SEC	3	2

The objective of this course is to teach current trends in various computer science and information technology. To explain about Architecture and Application design of Cloud, Edge & fog computing and to improve security services of computing technologies.

Course Outcomes:

At the end of the course, students will be able to

CO1: identify the concepts, applications, benefits and limitations of various computing paradigms.

CO2: interpret various cloud services, Security threat exposure within a cloud computing infrastructure.

CO3: explain the concepts of Edge computing

CO4: familiarize the fundamental concepts of green computing

CO5: identify the importance of Fog technology and implement innovative ideas and practices for regulating green IT.

Unit I **9 Hours**

Introduction – Components of Cloud Computing – Cloud Types: Private, Public and Hybrid clouds – Limitations of the Cloud - Virtualization: Structure and Mechanisms.

Unit II **9 Hours**

Software as a Service (SaaS) – Platform as a Service(PaaS)- Infrastructure as a Service(IaaS)-Database as a Service (DBaaS)- Recent Trends in cloud computing and Standards-Data Security in Cloud – Risks and Challenges with Cloud Data- Security as a Service.

Unit III **9 Hours**

Edge Computing and Its Essentials: Introduction- Edge Computing Architecture- Advantages and Limitations of Edge Computing Systems- Edge Computing Interfaces and Devices - Edge Analytics: Edge Data Analytics – Potential of Edge Analytics – Architecture of Edge Analytics – Case study

Unit IV **9 Hours**

Edge-Based Attack Detection and Prevention-Edge Computing Use Cases and Case Studies: Edge Computing High- Potential Use Cases. Introduction to green computing–Calculating carbon footprint-Choosing Green PC path: A green makeover – Buying green computer- Choosing Earth Friendly peripherals

Unit V **9 Hours**

Introduction to Fog computing – Architecture - Characteristics - Fog Computing Services – Fog Resource Estimation and Its Challenges-Fog computing on 5G networks – Fog computing Use cases and Case studies. **Learning Resources:**

Text Books:

1. Kailas Jayaswal,Jagannath Kallakurchi,Donald J.Houde,Dr.Devan Shah " Cloud Computing – Black Book" Edition :2020

2. K. Anitha Kumari G. Sudha Sadasivam D. Dharani M. Niranjanamurthy, "EDGE COMPUTING Fundamentals, Advances and Applications", First Edition 2022, CRC Press.

3. Woody Leonhard and Katherine Murray (2009), Green Home Computing for Dummies,Willey Publishing Inc.

4. Evangelos Markakis, George Mastorakis, Constandinos X.Mavromoutakis and Evangelos pallis "Cloud and Fog computing in 5G mobile Networks" ,First edition 2017.

References:

1. RajKumar Buyya, ChristianVecchiola, S.ThamaraiSelvi, (2013), Mastering Cloud Computing, McGraw Hill Education.

2. Michael Miller, (2009), Cloud Computing, Pearson Education.

3. Shijun Liu Bedir Tekinerdogan Mikio Aoyama Liang-Jie Zhang" Edge Computing – EDGE " 2018.

4. FlavioBonomi, Rodolfo Milito, Jiang Zhu, SateeshAddepalli, ―Fog Computing and Its Role in the Internet of Things‖, MCC'12, August 17, 2012, Helsinki, Finland. Copyright 2012.

5. Amir M. Rahmani · Pasi Liljeberg Jürgo-Sören Preden "Fog Computing in the Internet of Things"Springer,2018.

Websites/ e-Learning Resources:

1. https://static.googleusercontent.com/media/www.google.com/en//green/pdfs/google-green-computing.pdf (Case Study)
2. http://whatiscloud.com/basic_concepts_and_terminology/cloud
3. http://www.computerweekly.com/guides/Using-green-computing-for-improving-energy- efficiency

CO - PO Mapping Table

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	3	3	2	2	2	2	1	2

CO 2	3	3	2	2	2	3	1	1	2	3
CO 3	3	3	2	2	2	2	2	1	1	3
CO 4	3	3	2	3	3	2	2	2	2	2
CO 5	3	2	3	3	3	2	1	1	1	3
Average	**3**	**2.8**	**2.4**	**2.6**	**2.4**	**2.2**	**1.3**	**1.4**	**1.4**	**2.6**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3602	Machine Learning(TcL)	Core	6	6

The objective of the course is to make students familiar with the fundamental concepts, techniques, and tools of machine learning. It aims to enable them to design, implement and evaluate predictive models and algorithms for analyzing and interpreting complex data.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the algorithms and models of Machine learning.

CO2: compare parametric & nonparametric Methods in ML.

CO3: apply geometric concepts to linear discriminants and design multilayer perceptrons.

CO4: optimize ensemble learning techniques and reinforcement learning for decision making.

CO5: interpret data science process with machine learning algorithms.

Unit I **18 Hours**

Machine Learning – Examples of Machine Learning Applications. Supervised Learning: Learning a Class from Examples – Vapnik- Chervonenkis (VC) Dimension – Probably Approximately Correct (PAC) Learning – Noise – Learning Multiple Classes – Regression – Model Selection and Generalization – Dimensions of a Supervised Machine Learning Algorithm. Bayesian Decision Theory: Introduction – Classification – Losses and Risks – Discriminant Functions – Association Rules.

Unit II **18 Hours**

Parametric Methods: Maximum Likelihood Estimation – Evaluating an Estimator: Bias and Variance – The Bayes' Estimator – Parametric Classification – Regression – Tuning Model Complexity: Bias/Variance Dilemma – Model Selection Procedures. Nonparametric Methods: Nonparametric Density Estimation – Generalization to Multivariate Data – Nonparametric Classification – Condensed Nearest Neighbor – Distance-Based Classification – Outlier Detection – Nonparametric Regression: Smoothing Models

Unit III **18 Hours**

Generalizing the Linear Model – Geometry of the Linear Discriminant – Pairwise Separation – Gradient Descent – Logistic Discrimination – Discrimination by Regression – Learning to Rank. Multilayer

Perceptrons: The Perceptron – Training a Perceptron – Learning Boolean Functions – Multilayer Perceptrons – MLP as a Universal Approximator – Backpropagation Algorithm

Unit IV **18 Hours**

Generating Diverse Learners – Model Combination Schemes – Voting – Bagging – Boosting – Stacked Generalization – Fine-Tuning an Ensemble – Cascading Reinforcement Learning: Elements of Reinforcement Learning – Model-Based Learning – Temporal Difference Learning – Generalization – Partially Observable States

Unit V **18 Hours**

Data Pre-processing, Analysis & Visualization - Training Data and Test Data – Techniques – Algorithms: List of Common Machine Learning Algorithms- Decision Tree Algorithm- Naïve Bayes Algorithm - K- Means-Random Forest- Dimensionality Reduction Algorithm- Boosting Algorithms.

Learning Resources:

Text Book :

1. Ethem Alpaydın, “Introduction to Machine Learning” Third Edition, MIT, 2015. (Unit I – Unit IV)

Reference Book :

1. Brett Lantz, "Machine Learning with R," Packt Publishing, 2013
2. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals," Wiley Publication, 2012.

Web References:

1. https://www.ibm.com/topics/machine-learning
2. https://www.geeksforgeeks.org/machine-learning/
3. https://www.javatpoint.com/backward-elimination-in-machine-learning

CO - PO Mapping Table

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	3	2	2	2	3
CO 2	3	2	2	2	3	3	2	2	2	3
CO 3	3	2	3	3	2	2	2	2	3	3
CO 4	3	2	3	3	3	3	2	2	3	2
CO 5	3	2	3	3	2	3	2	2	3	3
Average	**3**	**2**	**2.6**	**2.6**	**2.4**	**2.8**	**2**	**2**	**2.6**	**2.8**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3604	Data Communication & Networks	Core	6	6

The objective of the course is to give students an overview of the concepts and fundamentals of data communication and computer networks. To familiarize the student with the basic taxonomy and terminology of the computer networks.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the fundamental concepts of computer networks and its application areas

CO2: identify various networking techniques and components to establish networking connection and transmission

CO3: analyze the services performed by different network layers and recent advancements in networking

CO4: compare various networking models, layers, protocols, and technologies.

CO5: evaluate an appropriate networking mechanism to build a reliable network

Unit I **18 Hours**

Data Communication-Networks: Distributed Processing-Network Criteria Physical Structures –Network Models-Categories of Network-Internetwork - The Internet Protocols and Standards – Network Models: Layers in the OSI Model - TCP/IP Protocol Suite.

Unit II **18 Hours**

Analog and Digital Data - Analog and Digital Signals – Performance - Digital Transmission: Transmission Modes – Multiplexing: FDM – WDM - Synchronous TDM -Statistical TDM - Transmission Media: Guided media - Unguided Media.

Unit III **18 Hours**

Circuit Switched Networks - Datagram Networks-Virtual Circuit Network - Error Detection and Correction: Introduction - Block Coding - Linear Block Codes - Cyclic Codes: Cyclic Redundancy Check

- Checksum. Data Link Control: Framing - Flow Control and Error Control - Noiseless Channel: Stop-and- wait Protocol.

Unit IV **18 Hours**

Wired LANs: Standard Ethernet-GIGABIT Ethernet-Wireless LAN: Bluetooth Connecting LANs: Connecting Devices**:** Passive Hubs-Repeaters-Active Hubs-Bridges-Two Layer Switches-Routers-

Three- layer Switches-Gateway-Network Layer: Internet Protocol: IPv4 –Ipv6-Transition from IPv4 to IPv6.

Unit V **18 Hours**

Delivery, Forwarding and Routing- Unicast Routing Protocols: Distance Vector Routing-Link state routing- Future & Current Trends in Computer Networks: 5G Network: Salient Features-Technology-Applications-Advanced Features-Advantages & Disadvantages-Internet of Things: key Features - Advantages & Disadvantages-IOT Hardware- IOT Technology and Protocols-IOT Common Uses-Applications-WiFi-WiMax Lifi- Lifi vs Wifi.

Learning Resources:

Textbooks:

1. Behrouz A. Forouzan, "Data Communications and Networking with TCPIP Protocol Suite" 6th Edition 2022
2. Vijay T. Patil, Mrs. Manisha A. Pokharkar, Dr. Kishor S. Wagh, "Data Communication and Computer Network" publisher - Nirali Prakashan, First Edition 2018

Reference Books:

1.Stallings William, "Data and Computer Communications, 10/e", Publisher Pearson Education, 2017

Web Resources:

1. http://www.tutorialspoint.com/data_communication_computer_network/
2. http://www.slideshare.net/zafar_ayub/data-communication-and-network-11903853

CO-PSO Mapping

	PSO 1	**PSO 2**	**PSO 3**	**PSO4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
CO 1	2	2	3	2	2	2	2	3	2	2
CO 2	3	2	2	2	3	3	2	3	3	2
CO 3	3	2	3	3	2	2	2	3	3	2
CO 4	3	2	2	3	2	2	2	2	2	3
CO 5	3	2	3	3	3	2	2	3	3	3
Average	**2.8**	**2**	**2.6**	**2.6**	**2.4**	**2.2**	**2**	**2.8**	**2.6**	**2.4**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3606	Project	Core	6	6

The objective of the course is to enable the students to gain domain knowledge, and technical skills to solve potential business or research problems. To learn how to gather requirements and design suitable software solutions and evaluate alternatives. It also helps the students to work in small teams, implement, test and deploy solutions for target platforms.

Course Outcomes:

At the end of the course, students will be able to

CO1: gain Domain knowledge and technical skill set required for solving industry / research problems

CO2: provide solution architecture, module level designs, algorithms

CO3: implement, test and deploy the solution for the target platform

CO4: develop analytical skills

CO5: prepare detailed technical report, demonstrate, and present the work

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	3	2	2	2	2
CO 2	3	3	3	3	3	3	3	2	2	3
CO 3	2	2	3	3	3	3	3	3	2	3
CO 4	3	3	3	3	3	2	3	2	3	3
CO 5	2	3	3	2	2	2	3	2	3	3
Average	**2.6**	**2.8**	**2.8**	**2.6**	**2.6**	**2.6**	**2.8**	**2.2**	**2.4**	**2.8**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3402	Big Data Analytics Using R(TcL)	DSE	5	4

The objective of this course is to develop skills in managing and analyzing large datasets effectively. Students acquire knowledge on how to apply statistical methods and machine learning techniques to derive actionable insights.

Course Outcome:

On completion of this course, students will be able to

CO1: outline big data tools and its analysis techniques.

CO2: acquire knowledge on clustering and classification algorithms.

CO3: apply different mining algorithms and recommendation systems for large volumes of data.

CO4: recall analytics on data streams.

CO5: create NoSQL database to store massive data.

Unit I **15 Hours**

Evolution of Big data - Best Practices for Big data Analytics -Big data characteristics - Validating - The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model

Unit II **15 Hours**

Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions. - Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier.

Unit III **15 Hours**

Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association & finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Unit IV **15 Hours**

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating

moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform (RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

Unit V **15 Hours**

NoSQL Databases: Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Learning Resources:

Text Book

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2016.

Reference Books

1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann, Elsevier Publishers, 2013
2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

Web Resources

1. https://rviews.rstudio.com/2019/07/17/3-big-data-strategies-for-r/
2. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html
3. https://fastercapital.com/content/Big-Data-Analytics-with-R--Harnessing-the-Power-of--R--in-Large-Datasets.html

CO - PSO Mapping Table

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	3	2	2	2	2
CO 2	3	3	2	3	2	3	2	2	2	3
CO 3	2	2	3	3	3	3	2	2	2	3
CO 4	3	2	3	3	3	2	2	2	3	3
CO 5	2	2	3	2	2	2	2	3	3	3
Average	**2.6**	**2.4**	**2.6**	**2.6**	**2.4**	**2.6**	**2**	**2.2**	**2.4**	**2.8**

3-Strong **2-Medium** **1-Low**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3404	Mobile Application Development (TcL)	DSE	5	4

The objective of this course is to provide the students with the basics of Android Software Development tools. It helps the students to build various mobile applications.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the Android OS environment and designing interface

CO2: create android applications and explore them.

CO3: apply media related features in android.

CO4: work with maps and various sensors.

CO5: analyze various storage platforms with android.

Unit I **15 Hours**

Introduction to Android Operating System – Configuration of Android Environment- Create the First Android Application. Layout: Vertical, Vertical Scroll, horizontal, horizontal Scroll, Table Layout arrangement. Designing User Interface: Label Text - TextView – Password Text Box - Button – ImageButton – CheckBox – Image - RadioButton – Slider – Autocomplete text View.

Unit II **15 Hours**

Spinner – Switch – Side Bar- ListView - List Picker - Image Picker - Notifier - Time and Date Picker - Web Viewer

Unit III **15 Hours**

Camcorder - Camera – Player – Speech Recognizer – Text to Speech – Video Player - Canvas

Unit IV **15 Hours**

Maps - Sensor: Location Sensor – Barcode Scanner Social components: Contact Picker – Email Picker – Phone Number Picker – Phone Call - Social: Texting

Unit V **15 Hours**

Cloud DB – Types of Cloud DB– Tiny DB – TinyDB Environmental Setup - Querying – Experimental – Fire DB – Fire DB Security – Fire DB Deploying

Learning Resources:

Text Books:

1. Karen Lang and Selim Tezel, “Become an App Inventor The official guide from MIT App Inventor”,

Miteen Press, Walker Books Limited 2022.

References:

1. Wei – Meng Lee, "Beginning Android 4 Application Development", Wiley India Edition 2012.
2. Deital, Android for Programmers-An App-Driven Approach, Third Edition, 2015

Web Resources:

1. https://aws.amazon.com/mobile/mobile-application development/#:~:text=Mobile%20application%20development%20is%20the,work%20with%20remote%20computing%20resources.
2. https://buildfire.com/understanding-mobile-app-development-lifecycle/

CO-PSO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	2	2	1	1	1	1	1
CO 2	3	3	2	3	2	2	1	1	1	1
CO 3	3	3	2	3	1	2	1	1	1	2
CO 4	3	3	3	3	3	2	1	2	1	1
CO 5	3	3	3	2	1	2	2	3	2	3
Average	**3**	**3**	**2.4**	**2.6**	**1.8**	**1.8**	**1.2**	**1.6**	**1.2**	**1.6**

3-Strong 2-Medium 1-Low

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3406	Linux Programming(TcL)	DSE	5	4

The objective of this course is to teach principles of LINUX including basic Linux commands, Scripts and filters. To familiarize fundamentals shell programming, pipes, fundamentals of file concepts, Inter process communication, semaphore shared memory and Sockets.

Course Outcomes:

At the end of the course, students will be able to

CO1: interpret various Linux commands that are used to manipulate system operations at admin level.

CO2: develop Shell Programming using Linux commands.

CO3: create applications to manipulate internal kernel level Linux File System.

CO4: compose IPC-API's that can be used to control various processes for Synchronization.

CO5: develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

Unit I **15 Hours**

A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- File related commands, Directory related commands, networking related commands, and Text Processing related Commands.

Unit II **15 Hours**

Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command- Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

Unit III **15 Hours**

Grep: Operation, grep Family, Searching for File Content. Sed : Scripts, Operation, Addresses, commands, Applications- grep and sed.

File Management: File Structures, System Calls for File Management – Directory API – Directory related system calls

Unit IV **15 Hours**

Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, Process related system call – signal related system call

Unit V **15 Hours**

Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semaphore related system call, message queues: message queue related system call, shared memory: shared memory related system call, ipc status commands.

Introduction to sockets**:** Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

Learning Resources:

Text Books:

1. Sander van Vugt, "Linux Fundamentals", 2nd Edition, Pearson Education, New Delhi, India 2022

References:

1. William shots, The Linux command line 2nd Edition, no starch press, 2019
2. Robert Love, Linux System Programming, O'Reilly, SPD, 2013
3. W.R.Stevens , Advanced Programming in the UNIX environment, 3rd Edition, , Pearson Education 2013
4. Graham Glass, King Ables, UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, , Pearson Education 2003

Websites/ e-Learning Resources:

1. https://www.simplilearn.com/linux-programming-for-beginners-article#basic_concepts_to_linux_programming
2. https://www.oreilly.com/library/view/linux-syste programming/9781449341527/ch01.html
3. https://www.geeksforgeeks.org/linux-tutorial/

CO - PSO Mapping Table

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
CO 1	3	3	2	3	2	2	2	1	1	3
CO 2	3	3	3	2	2	3	2	1	2	2
CO 3	3	2	2	3	2	2	2	1	1	2
CO 4	3	3	3	3	2	2	3	2	2	1
CO 5	3	2	3	2	2	2	2	1	1	2
Average	**3**	**2.6**	**2.6**	**2.6**	**2**	**2.2**	**2.2**	**1.1**	**1.4**	**2**

3-Strong 2-Medium 1-Low

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3302	Multimedia Systems(TcL)	GE	4	3

The objective of the course is to acquire the basic knowledge about fundamentals of Multimedia, Image, and Audio File Formats. This helps to understand the concepts of Animation & Digital Video Containers, Stages of Multimedia Project, concept of Ownership of Content Created for Project Acquiring Talent.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the concepts, importance, application and process of developing multimedia**.**

CO2: acquire basic knowledge on image and sound plotting

CO3: analyze the framework of frames and bit images to animations

CO4: build various multimedia projects

CO5: interpret the concept of cost involved in multimedia planning, designing, and producing.

Unit I **12 Hours**

Multimedia Definition - Use of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text Font Editing and Design Tools – Hypermedia and Hypertext.

Unit II **12 Hours**

Images: Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. Sound: The Power of Sound - Digital Audio – Midi Audio - Midi Vs. Digital Audio – Multimedia System Sounds Audio File Formats - Vaughan's Law of Multimedia.

Unit III **12 Hours**

Animation: Power of Motion - Principles of Animation - Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays - Digital Video Containers – Obtaining Video Clips - Shooting and Editing Video.

Unit IV **12 Hours**

Building Multimedia: The Stages of Multimedia Project - Hardware Prerequisites - Software Prerequisites

Authoring Systems Prerequisites - Multimedia Production & Deployment.

Unit V **12 Hours**

Planning and Costing: Process of making Multimedia – Scheduling - Estimating - RFPs and Bid Proposals Designing and Producing - Content and Talent: Acquiring Content – Ownership of Content Created for Project – Acquiring Talent.

Learning Resources:

Text Books:

1. Tay Vaughan," Multimedia: Making It Work", 8thEdition, Osborne/McGraw Hill, 2017.

Reference Books:

1. Ralf Steinmetz & Klara Nahrstedt "Multimedia Computing, Communication & Applications", Pearson Education, 2014.

Websites/ e-Learning Resources:

1. https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	2	2	2	1	2	2	2
CO 2	3	2	2	2	2	2	1	2	2	2
CO 3	3	3	3	3	3	3	2	1	2	2
CO 4	2	2	2	2	2	2	1	2	2	2
CO 5	2	2	3	3	2	2	2	1	2	2
Average	**2.6**	**2.4**	**2.4**	**2.4**	**2.2**	**2.2**	**1.4**	**1.6**	**2**	**2**

Strong - 3 **Medium-2** **Low-1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3304	Social Media Analytics (TcL)	GE	4	3

The course objectives for social media analytics course typically focus on equipping students with the knowledge and skills to effectively analyze and utilize social media data for various purposes.

Course Outcomes:

At the end of the course, students will be able to

CO1: outline the basics of Social Media Analytics

CO2: explain the significance of Data mining in social media

CO3: interpret the algorithms used for text mining.

CO4: apply network measures for social media data.

CO5: explain behavior Analytics techniques used for social media data.

Unit I **12 Hours**

The foundation for analytics, social media data sources, defining social media data, data sources in social media channels, Estimated Data sources and Factual Data Sources, Public and Private data, data gathering in social media analytics.

Unit II **12 Hours**

A Taxonomy of Visualization, The convergence of Visualization, Interaction and Analytics. Data mining in social media: Introduction, Motivations for Data mining in social media, Data mining methods for social media, Related Efforts.

Unit III **12 Hours**

Introduction, Keyword search, Classification Algorithms, Clustering Algorithms-Greedy Clustering, Hierarchical clustering, k-means clustering, Transfer Learning in heterogeneous Networks, Sampling of online social networks, Comparison of different algorithms used for mining, tools for text mining.

Unit IV **12 Hours**

Centrality: Degree Centrality, Eigenvector Centrality, Katz Centrality, PageRank, Betweenness Centrality, Closeness Centrality, Group Centrality, Transitivity and Reciprocity, Balance and Status, Similarity: Structural Equivalence, Regular Equivalence

Unit V **12 Hours**

Individual Behaviour: Individual Behaviour Analysis, Individual Behaviour Modelling, Individual Behaviour Prediction Collective Behaviour: Collective Behaviour Analysis, Collective Behaviour Modelling, Collective Behaviour Prediction

Learning Resources:

Text Books:

1. Reza Zafarani Mohammad Ali Abbasi Huan Liu, "Social Media Mining", Cambridge University Press, 2014
2. Charu C. Aggarwal, Social Network Data Analytics, Springer, 2011

Reference Books:

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, McGraw Hill Education 2011.
2. Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition 2013
3. Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Edition, 2012
4. Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents and Usage Data, Springer, 2nd Edition

Websites/ e-Learning Resources:

1. https://www.ibm.com/topics/social-media-analytics
2. https://sproutsocial.com/insights/social-media-analytics/

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	2	2	2	1	2	2	2
CO 2	3	2	2	2	2	2	1	2	2	2
CO 3	3	3	3	3	3	3	2	1	2	2
CO 4	2	2	2	2	2	2	1	2	2	2
CO 5	2	2	3	3	2	2	2	1	2	2
Average	**2.6**	**2.4**	**2.4**	**2.4**	**2.2**	**2.2**	**1.4**	**1.6**	**2**	**2**

Strong - 3 Medium-2 Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT3266	Professional Competency Skill	SEC	3	2

The objective of the course is to equip students with essential professional competencies necessary for career advancement and success in the modern workplace. This course will develop skills in effective communication, critical thinking, teamwork, and problem-solving, while also enhancing adaptability and leadership qualities.

Course Outcomes:

At the end of the course, students will be able to

CO1: develop a specialized knowledge and expertise required in an IT field.

CO2: ability to analyze complex problems, evaluate evidence, and develop well-reasoned solutions and strategies.

CO3: integrate their domain knowledge with the core skills of communication, problem-solving, and leadership

CO4: develop a strong decision-making skill that can significantly enhance professional effectiveness and
career growth.

CO5: interpret continuous acquiring of new knowledge and skills to adapt to evolving job requirements, industry trends, and personal growth goals.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	3
CO 2	3	2	2	3	2	3	2	2	3	3
CO 3	3	2	2	2	3	3	2	2	3	3
CO 4	3	3	2	3	3	3	2	2	3	3
CO 5	3	3	3	2	2	3	2	2	3	2
Average	**3**	**2.2**	**2.2**	**2.4**	**2.4**	**2.8**	**2**	**2**	**2.8**	**2.8**

Strong - 3 Medium-2 Low-1

VALUE ADDED COURSES

Sem	Course Code	Course Title	Hours/Wk.	Credits
2	24BIT122V	Graphics design using Illustrator	2	2
3	24BIT221V	Automated Testing using Selenium	2	2
5	24BIT321V	Animation Using Open- Source Tool	2	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT122V	Graphics design using Illustrator	VAC	2	2

This course enables the students to apply skills in the combination of creation, modification and formatting of raster and vector objects and type of elements to create design work.

Course Outcomes:
At the end of the course, students will be able to

CO1: identify the capabilities and functions of drawing, transformation and shape tools in Adobe Illustrator

CO2: demonstrate skills in the use of vector specific capabilities for typesetting

CO3: show efficient planning and file organization techniques

CO4: apply conceptual planning techniques in the development of graphic design pieces

CO5: demonstrate working with color shapes and objects.

Unit I **6 Hours**

Getting Started with Illustrator- CMYK vs RGB -Art Boards-Creating Your First Document- Exploring the Interface / Navigation - Overview of the Tools – Panels – Menus
- Working with Layers
- Working with Objects.

Unit II **6 Hours**

Selection Tools - Shape Tools - Pen Tool - Using Brushes and Custom Brushes - Pencil Tool -Shaper Tool - Creating Paths - Line Tools - Eraser Tools.

Unit III **6 Hours**

Color artwork - Swatches - Gradients - Recolor artwork- Drawing - Trace drawing - Creating shape vectors- Compounding vectors - Create and edit shapes - Colouring - Adding type.

Unit IV **6 Hours**

Isometric in Illustrator- Masking in Illustrator -Transform and edit artwork - Edit paths - guide to Pathfinder Shape mode - Organise content with layers - Creating a Biohazard Symbol.

Unit V **6 Hours**

Creating realistic shadows - Creating repeating patterns for fills and borders, drawing 3-D artwork— isometric, dimetric, and trimetric views - Creating line effects for maps -

LiveTrace to LivePaint to LiveColor explorations.

Text Book:

1. Brian Wood, "Adobe Illustrator Classroom in a Book (2020 release)", 1st Edition

References:

1. Robert Shuffle Botham**,** Illustrator: Structured Learning a Beginner's Guide, 2017.
2. Adobe Illustrator CS6 Tutorial

Websites/ e-Learning Resources

1.https://www.pgsd.org/cms/lib07/PA01916597/Centricity/Domain/202/illustrator_for_ beginners_tastytuts.pdf

2.https://www.youtube.com/playlist?list=PLAKKrTj_Vtb2Qe57J9_Ls0DmYwvZad4lG

CO – PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO 1	3	2	1	2	2	2	2	1	2	2
CO 2	3	2	1	2	2	2	2	1	2	2
CO 3	3	2	2	2	3	2	2	2	3	3
CO 4	3	2	2	3	3	3	3	2	3	3
CO 5	3	3	2	3	3	3	3	2	3	3
Average	**3**	**2.2**	**1.6**	**2.4**	**2.6**	**2.4**	**2.4**	**1.6**	**2.6**	**2.6**

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT221V	Automated Testing using Selenium	VAC	**2**	**2**

The course aims at developing skill and knowledge in Selenium testing tool and its components. train the students to validate the various kinds of software across different platforms.

Course Outcomes:
At the end of the course, students will be able to

CO1: Understand selenium fundamentals.

CO2: Work with selenium IDE to create an automated test case for web applications.

CO3: Enhance the test cases by adding the JavaScript commands.

CO4: Understand both the language bindings and the implementations of the individual browser controlling code.

CO5: Perform parallel execution of test cases and to create a selenium test case.

Unit I **6 Hours**

Introduction to Selenium - Features of Selenium - Selenium Version History - Advantages of Selenium - Drawbacks of Selenium – Introduction on Selenium Suite: Selenium IDE , Selenium RC, WebDriver, Selenium Grid.

Unit II **6 Hours**

Selenium IDE add-on – Advancement with new selenium IDE – Working principle of IDE – Components of IDE interface – Selenium commands – Key features of Selenium IDE – Selenium side runner.

Unit III: **6 Hours**

Introduction - Usage of variables – operators - control structures – looping structures - arrays and functions - mathematical functions - string functions –Window - Confirmation, alert message

Unit IV: **6 Hours**

Introduction to Selenium WebDriver – Features of WebDriver – Selenium WebDriver Environment Setup - Web Elements and Operations - Web Element Locators – Selenium WebDriver API Commands – understanding WebDriver events – Chrome driver: installing driver, test script for chrome browser, using

chrome options.

Unit V: 6 Hours

Introduction to Hub and Node – Configuring Selenium Grid – Hub configuration parameters– Different ways to specify the Configuration – Create Selenium Test Cases - Execute Test Batches and analyze Test Results.

Text Books:

1. SatyaAva sarala, Selenium WebDriver Practical Guide, Packt Publishing, 2014.

2. DT Editorial Service, HTML 5, Black Book, Dreamtech Press, 2nd edition,2016

3. David Burns, Selenium 2 Testing Tools_ Beginner's Guide, Packt Publishing, 2012.

References:

1. Unmesh Gundecha, Selenium Testing Tools Cookbook, 2nd Edition, PacktPublishing, 2015.

2. David Burns, Selenium 1.0 Testing Tools_ Beginners Guide, Packt Publishing, 2010.

Websites/ e-Learning Resources

1. https://www.javatpoint.com/selenium-tutorial
2. https://www.selenium.dev/documentation/webdriver/getting_started/

CO – PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	3	3	2	2	2	3
CO 4	3	2	3	2	3	3	2	2	3	3
CO 5	3	2	3	2	3	3	3	2	3	3
Average	**3**	**2.6**	**2.4**	**2**	**2.6**	**2.6**	**2.2**	**2**	**2.4**	**2.6**

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BIT321V	Animation Using Open-Source Tool	VAC	**2**	**2**

The course aims at developing the skill and knowledge in 3D modeling and animation and equip the students to create simple games and animated movies.

Course Outcomes:

At the end of the course, students will be able to

CO1: obtain basic knowledge on Multimedia concepts and applications,3D concepts and animation.

CO2: understand the fundamental concepts in Blender and create objects.

CO3: design their own models using sculpting tools

CO4: create skeleton models for animation.

CO5: develop simple games and perform video editing.

Unit 1 **6 Hours**

Multimedia basics − Multimedia applications − Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia databases −Three-Dimensional object representations – Color models – Virtual reality – Animation.

Unit 2 **6 Hours**

Introduction to Blender, The Blender Interface, importing objects − working with viewports , Modelling: creating and editing objects, Mesh Modeling Fundamentals: Creating and manipulating mesh objects, fundamental modeling tools and mesh selection tools – join or separating meshes − curves –text−modifiers.

Unit 3 **6 Hours**

Sculpting tools – Adaptive sculpting – Hiding and Masking – Texture paint – vertex paint – weight paint – Grease pencil – Modes: Draw mode – Sculpt mode –Edit paint mode – Weight paint mode.

Unit 4 **6 Hours**

Key frames –Armatures: Bones, Properties, Structure, Skinning, Posing – Actions − Drivers –

Markers –Shape keys – Motion path

Unit 5 **6 Hours**

Cycles – Cameras – Lights – Materials –Free style – Render outputs. Tracking and Masking: Motion Tracking – Masking – Movie clip Editor, Create scenes: Create an environment for our scene – Adding motion to our scene.

Learning Resources:

Textbook:

1. Modeling and Animation Using Blender Blender 2.80: The Rise of Eevee Authors: Guevarra, Ezra Thess, Apress publications, 2019.

Reference:

1. James Chronister, Blender Basics, Creative Commons Attribution-Non Commercial-Share Alike 4.0 International License,2017 fifth edition by James C.

Websites/ e-Learning Resources

1. https://www.tutorialspoint.com/multimedia/multimedia_systems.html
2. https://docs.blender.org/manual/en/latest/addons/materials/material_utils.html
3. https://docs.blender.org/manual/en/2.81/sculpt_paint/sculpting/tools.html

CO – PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	3	2	2	2	2	3	2	2	2	2
CO 3	3	2	3	2	3	3	2	2	3	3
CO 4	3	2	3	3	3	3	2	2	3	3
CO 5	3	2	3	3	3	3	2	2	3	3
Average	**3**	**2**	**2.6**	**2.4**	**2.6**	**2.8**	**2**	**2**	**2.6**	**2.6**

Strong – 3 **Medium – 2** **Low – 1**