Department of Computer Science (UG)

Programme Specific Outcomes (PSOs)

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

PSO1 **Disciplinary Knowledge**	acquire domain knowledge in various fields of computer science and prominent computer technologies.
PSO2 **Communication Skills**	effectively communicate information according to the requirements of respective contexts.
PSO 3 **Problem Solving**	solve simple and complex problems in the information technology realm using appropriate algorithms from core and allied streams of computer science.
PSO 4 **Analytical Reasoning**	interpret, create, analyze, design and implement software products.
PSO 5 **Research Skills**	incorporate various methodologies and algorithms which lead to innovations and research.
PSO 6 **Digital Literacy**	apply digital platform and its features in the process of knowledge acquisition and advancement.
PSO 7 **Leadership and Teamwork**	practice required skills for problem solving in a team environment which enhances the qualities of the product altogether.
PSO 8 **Moral and Ethical Awareness/Reasoning**	embrace the moral and ethical standards that enhances harmonious development in the diverse environment.
PSO 9 **Multicultural Competence**	acquire core competencies to enhance work culture in a multicultural environment.
PSO 10 **Self-directed & Lifelong Learning**	advance skill acquisition through periodic knowledge updates for greater levels of proficiency in a lifelong learning process.

Department of Computer Science (UG)

Learning Outcomes-based Curriculum Framework (LOCF)

(w.e.f 2024-2025)

Sem	Part	Course Code	Course Title	Hours/ Wk	Credits	Marks
1	I	24XXXNNNN	TAM/HIN/FRE	3	2	30
1	II	24XXXNNNN	English	3	2	30
1	III CC	24COS1501	C Programming	5	5	75
1	III CC	24COS1401	Practical: C Programming	4	4	60
1	III CC	24COS1403	System Programming	4	4	60
1	III S	24COS1405	Digital Principles and Computer Organization	5	4	60
1	IVNME	24XXXNNNN	*Non Major Elective – I*	3	2	30
1	IVAEC	24HVS/CHR 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	TAM/HIN/FRE	3	2	30
2	II	24XXXNNNN	English	3	2	30
2	III CC	24COS1502	Database Management Systems	5	5	75
2	III CC	24COS1402	Practical: Database Management Systems	4	4	60
2	III CC	24COS1404	Operating Systems	4	4	60
2	III S	24XXXNNNN	*Offered by Mathematics*	5	4	60
2	IVNME	24XXXNNNN	*Non Major Elective – II*	3	2	30
2	IVAEC	24COS1200	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	TAM/HIN/FRE	3	2	30
3	II	24XXXNNNN	English	3	2	30
3	III CC	24COS2401	Java Programming	4	4	60
3	III CC	24COS2301	Practical: Java Programming	3	3	45

Sem	Part	Course Code	Course Title	Hours/ Wk	Credits	Marks
3	III CC	24COS2501	Data Structure and Algorithms (TcL)	5	5	75
3	III CC	24COS2403	Machine Learning	4	4	60
3	III S	24XXXNNNN	*Offered by Mathematics*	5	4	60
3	IV SEC	24XXXNNNN	*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	TAM/HIN/FRE	3	2	30
4	II	24XXXNNNN	English	3	2	30
4	III CC	24COS2402	PHP Programming	4	4	60
4	III CC	24COS2302	Practical: PHP Programming	3	3	45
4	III CC	24COS2404	Computer Networks	4	4	60
4	III CC	24COS2502	Microprocessor and Microcontroller (TcL)	5	5	75
4	III S	24COS2406	Cloud Computing	5	4	60
4	IV SEC	24XXXNNNN	*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	24COS3601	Python Programming (TcL)	6	6	90
5	III CC	24COS3603	Web development using NodeJS and MongoDB (TcL)	6	6	90
5	III CC	24COS3605	Software Engineering	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	III IS	24COS3255	Internship*	-	2	30
5	IV SEC	24XXXNNNN	*Skill Enhancement Course – III*	3	2	30
	Total			**30**	**29**	**435**

Sem	Part	Course Code	Course Title	Hours/ Wk	Credits	Marks
6	III CC	24COS3602	Big Data Using R (TcL)	6	6	90
6	III CC	24COS3604	.NET Programming (TcL)	6	6	90
6	III CC	24COS3608	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	24COS3266	Professional Competency Skill	3	2	30
6	V	24XXXNNNN	*NCC***	-	1**	-
	Total			**30**	**27**	**405**
	Grand Total			**180**	**158 +2**	**2370 +30**

*** Internship - Second Year Vacation (30 Hrs.)**

****Extra Credit – Only for NCC Students**

Part III

Discipline Specific Elective (DSE)

Sem	Part	Course Code	Course Title	Hours / Wk.	Credits	Marks
5	III	24COS3403	Mobile Application Development (TcL)	5	4	60
		24COS3405	Computer Graphics (TcL)			
		24COS3407	Cyber Security			
6	III	24COS3402	Introduction to Data Science	5	4	60
		24COS3404	Essentials of IOT			
		24COS3406	Data Mining and Data Warehousing			

Supportive (offered to Department of Mathematics)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
3	III	24COS2405	Programming in C (TcL)	5	4	60
4	III	24COS2408	Introduction to Python Programming (TcL)	5	4	60

Generic Elective (GE)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
5	III	24COS3301	E-Commerce Technology	4	3	45
		24COS3303	Multimedia and its applications (TcL)			
6	III	24COS3302	Web Services (TcL)	4	3	45
		24COS3304	Fundamentals of Programming			

Part IV

Non-Major Electives (NME)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
1	IV	24COS1201	Desktop Publishing (TcL)	3	2	30
2	IV	24COS1202	Digital Marketing	3	2	30

Skill Enhancement Courses (SEC)

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
3	IV	24COS2201	Data Analytics Using Excel (TcL)	3	2	30
4	IV	24COS2202	Audio & Video Editing (TcL)	3	2	30
5	IV	24COS3203	System Administration & Maintenance	3	2	30

Mapping with POs

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

Mapping of Courses with PSOs

Courses	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
24COS1501	3	2	3	2	2	2	3	2	2	3
24COS1401	3	2	3	2	2	2	3	2	2	3
24COS1403	3	3	2	2	3	3	2	2	3	3
24COS1405	3	2	3	2	2	3	2	2	2	2
24COS1502	3	3	3	3	2	2	2	2	2	2
24COS1402	3	3	3	2	2	3	2	3	2	2
24COS1404	3	2	3	3	3	3	2	2	2	2
24COS1200	3	3	3	2	2	2	2	2	1	3
24COS2401	3	3	3	3	3	2	2	2	2	3
24COS2301	3	3	3	3	3	2	2	2	2	3
24COS2501	3	2	3	3	2	2	2	2	2	2
24COS2403	3	3	3	2	2	3	2	2	2	2
24COS2402	3	3	3	3	2	3	3	2	2	2
24COS2302	3	2	3	3	3	3	3	2	2	2
24COS2404	3	2	3	2	2	3	3	2	2	3
24COS2502	3	2	3	3	2	3	2	2	2	2
24COS2406	3	2	2	2	2	3	3	2	2	2
24COS3601	3	3	3	3	2	2	2	2	2	2
24COS3603	3	2	3	3	2	3	2	2	2	2
24COS3605	3	3	3	3	2	3	3	2	2	2
24COS3403/ 24COS3405/ 24COS3407	3	2	3	3	2	3	2	2	2	2
24COS3255	3	3	3	3	3	3	2	2	2	2
24COS3602	3	3	3	3	2	3	3	2	2	2
24COS3604	3	3	3	3	2	3	3	2	2	2
24COS3608	3	3	3	3	3	3	2	2	2	2
24COS3402/ 24COS3404/ 24COS3406	3	3	3	2	2	2	2	2	2	2
24COS3266	3	2	2	2	2	2	2	2	2	2
Average	**3**	**2.6**	**2.8**	**2.6**	**2.3**	**2.7**	**2.3**	**2**	**2**	**2.3**

Mapping of Courses with POs

Courses	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
24COS1201	3	2	3	2	1	3	2	2	1	2
24COS1202	3	3	3	3	3	3	3	3	3	3
24COS2405	3	3	3	2	2	2	3	2	2	2
24COS2201	3	2	3	3	3	2	2	2	2	3
24COS2408	3	2	2	2	2	2	2	2	2	2
24COS2202	3	3	2	2	1	3	3	1	3	2
24COS3301/ 24COS3303	3	2	3	3	2	3	2	2	3	3
24COS3203	3	2	2	2	1	1	2	2	2	3
24COS3302/ 24COS3304	3	2	3	2	2	2	2	2	2	3
Average	**3**	**2.3**	**2.7**	**2.3**	**1.9**	**2.3**	**2.3**	**2**	**2.2**	**2.6**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS1501	C Programming (T)	Core	5	5

This course helps to provide the fundamental knowledge of a programming language and its features which enhances the students to write general purpose application programs.

Course Outcomes:

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

CO1: describe the program structure of C and its various operators.

CO2: construct decision-making statements and looping statements.

CO3: create and declare types of arrays and functions.

CO4: examine the importance of structures and unions.

CO5: discuss pointers and its importance as well as File concept.

Unit I **15 Hours**

Importance of C - sample C program - C program structure - executing C program. Constants - Variables and Data Types. Character set -C tokens - keywords and identifiers - constants - variables - data types - declaration of variables - Assigning values to variables - Assignment statement - declaring a variable as constant - as volatile. Operators and Expression: Arithmetic - Relational - logical - assignment - increment - decrement - conditional - bitwise and special operators - arithmetic expressions - operator precedence - type conversions - mathematical functions. Managing Input and Output Operators: Reading and writing a character - formatted input - formatted output.

Unit II **15 Hours**

Decision making with If - simple IF - IF ELSE - nested IF ELSE - ELSE IF ladder - switch - GOTO statement. Decision Making and Looping: While - Do-While - For - Jumps in loops.

Unit III **15 Hours**

Declaration and accessing of one & two-dimensional arrays - initializing two-dimensional arrays - multidimensional arrays. Functions: The form of C functions - Return values and types - calling a function - categories of functions - Nested functions - Recursion - functions with arrays - call by value - call by reference-storage classes - character arrays and string functions.

Unit IV **15 Hours**

Defining - giving values to members - initialization and comparison of structure variables - arrays of structure - arrays within structures - structures within structures - structures and functions - unions. Preprocessors: Macro substitution - file inclusion.

Unit V **15 Hours**

Definition - declaring and initializing pointers - accessing a variable through address and through pointer - pointer expressions - pointer increments and scale factor - pointers and arrays - pointers and functions - pointers and structures. File Management in C: Opening - closing and I/O operations on files - random access to files - command line arguments.

Learning Resources:

Text Book

1. E. Balagurusamy, Programming in ANSI C, Eighth Edition, Tata McGraw-Hill, 2019.

References

1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998.
3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021.

Websites/ e-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc23_cs93/preview

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	3	2	2	1	2	2
CO2	3	2	3	2	2	2	2	2	2	3
CO3	3	2	2	3	2	2	3	2	2	3
CO4	3	2	3	2	2	2	3	2	1	3
CO5	3	2	2	2	1	3	3	1	2	2
Total	15	10	13	12	10	11	13	8	9	13
Average	3	2	2.6	2.4	2	2.2	2.6	1.6	1.8	2.6

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS1401	Practical: C Programming (L)	Core	4	4

This course aims at enabling the student to gain knowledge in the basic principles of programming concepts in C and to develop skills for writing programs using 'C' .It also helps the student to build applications using C concepts and thereby improve problem solving ability.

Course Outcomes:

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

CO1: remember and demonstrate how to write programs using the basic syntax and semantics in C.

CO2: apply the concepts of functions, macros, arrays, structures, pointers and files in programs to solve problems.

CO3: analyze and examine the programs written in C language.

CO4: evaluate the program execution flow with test cases.

CO5: apply debugging.

List of Exercises:

1. Evaluation of expression ex: ((x+y) ^2 * (x+z))/w
2. Temperature conversion problem (Fahrenheit to Celsius)
3. Program to convert days to months and months to days (Ex: 364 days = 12 months and 4 days)
4. Solution of quadratic equation
5. Salesman salary (Given: Basic Salary, Bonus for every item sold, commission on the total monthly sales)
6. Maximum of three numbers
7. Calculate Square root of five numbers (using goto statement)
8. Pay-Bill Calculation for different levels of employee (Switch statement)
9. Fibonacci series
10. Floyd's Triangle
11. Pascal's Triangle

12. Prime numbers in an array
13. Sorting data (Ascending and Descending)
14. Matrix Addition and Subtraction
15. Matrix Multiplication
16. Function with no arguments and no return values
17. Function that convert lower case letters to upper case
18. Factorial using recursion.
19. Perform String Operations using Switch Case.
20. Structure that describes a Hotel (name, address, grade,avg room rent, number of rooms) Perform some operations (list of hotels of a given grade etc.)
21. Using Pointers in Structures.
22. Cricket team details using Union.
23. Function to exchange two pointer values
24. Program to read a file and print the data.
25. Program to copy the content of one file to another file.

Learning Resources:

Text Book

1. E. Balagurusamy, Programming in ANSI C, Eighth Edition, Tata McGraw-Hill, 2019.

References

1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2022

Websites/ e-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc23_cs93/preview

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	3	2	2	1	2	2
CO2	3	2	3	2	2	2	2	2	2	3
CO3	3	2	2	3	2	2	3	2	2	3
CO4	3	2	3	2	2	2	3	2	1	3
CO5	3	2	2	2	1	3	3	1	2	2
Total	15	10	13	12	10	11	13	8	9	13
Average	3	2	2.6	2.4	2	2.2	2.6	1.6	1.8	2.6

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS1403	System Programming (T)	Core	4	4

The course aims at giving a detailed understanding of various system software like assembler, loader, linker, compiler, debugging system and text editor. It enables the student to get sufficient knowledge on various system resources.

Course Outcomes:

At the end of the course the student will be able to:

CO1: recall the basic structure of Machine architectures by introducing the organization of SIC and SIC/XE.

CO2: distinguish between various assembler architectures and understand its purposes.

CO3: identify the functioning of loaders and its working.

CO4: illustrate the loading and linking process.

CO5: compose the working of compilers and identify its application in debugging systems.

Unit I **12 Hours**

The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

Unit II **12 Hours**

A simple SIC assembler – Assembler algorithm and data structures – Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers

Unit III **12 Hours**

Design of an Absolute Loader – A Simple Bootstrap Loader – Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Bootstrap Loaders

Unit IV **12 Hours**

Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters- ANSI C Macro language.

Unit V **12 Hours**

Overview of the Editing Process - User Interface – Editor Structure – Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

Learning Resources:

Text Book

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 4thEdition, Pearson Education Asia, 2010. State Integrated Board of Studies – Computer Science UG

References

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2009.
2. John J. Donovan, "Systems Programming", Tata McGraw-Hill Edition, 2009.
3. John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2009.

Websites/ e-Learning Resources

1. www.cs.jhu.edu/~scott/pl/lectures/parsing.html
2. www.en.wikipedia.org/wiki/System_programming
3. https://developer.ibm.com/technologies/systems/tutorials/au-lexyacc/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	3	3	3	2	2	3	3
CO2	3	3	2	2	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	2	3	2	2	3	3
CO5	3	2	2	2	3	3	2	2	2	3
Total	15	13	12	12	13	15	12	12	13	15
Average	3	2.6	2.4	2.4	2.6	3	2.4	2.4	2.6	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS1405	Digital Principles and Computer Organization (T)	Supportive	5	4

The course aims to enable the student to understand the fundamentals of digital principles, the basics of computer organization and gain knowledge on computer architecture and its design.

Course Outcomes:

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

CO1: identify different types of number systems, Logic Gates, Boolean laws & theorems.

CO2: apply different theorems for simplification of basic digital electronics circuits and be able to build arithmetic operations using logic circuits.

CO3: carry out the basics of Flip-flop, shift register, counters and Semiconductor memory for data Processing circuits.

CO4: analyze the basic structure of computer and control unit operations.

CO5: extend the learning of memory organization.

Unit I **15 Hours**

Binary, Octal and Hexadecimal number systems – Conversion between number systems – Binary Arithmetic - Binary codes – BCD - Arithmetic. Logic Gates: AND, OR, NOT, NAND, NOR and XOR. Fundamentals of Boolean Algebra – Laws and theorems of Boolean Algebra – Demorgan's theorem.

Unit II **15 Hours**

Canonical SOP and POS forms – Algebraic Simplification – Karnaugh Maps – Combinational Logic Circuits: Half and Full Adders –Multiplexer & Demultiplexer – Encoder & Decoder.

Unit III **15 Hours**

Sequential Logic Circuit : NAND Latch – Flip Flop-SR Flipflop – JK Flipflop –Shift Register-Universal Shift Register – Counters-Asynchronous Counter- Synchronous Counters – BCD counter.

Unit IV **15 Hours**

Instruction Codes – Computer Register – Computer Instructions – Timing and Control – Instruction Cycle – Memory Reference Instruction – Input Output and Interrupt - CPU: General Register Organization – Instruction Formats – Addressing Modes

Unit V **15 Hours**

Memory Hierarchy – Main memory – Auxiliary memories – Cache memory – Virtual Memory

Learning Resources:

Text Books

1. Moris Mano,"Digital logic and computer design" –Pearson India, 1st edition,2014.
2. Carl Hamacher, "Computer Organization", 5th edition, Tata McGraw Hill, 2014.

References

1. P. Malvino, "Digital Principles and Applications"- McGraw Hill 8th editions, 2015.
2. Morris Mano, "Computer System Architecture", 3rd edition, Prentice Hall, 2014.

Websites/ e-Learning Resources

1. https://www.poriyaan.in/paper/digital-principles-and-computer-organization-7
2. https://www.tutorialspoint.com/digital_circuits/digital_circuits_number_systems.htm

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	1	2	2	1	2	2	1	1	1
CO2	3	2	3	3	2	3	2	2	2	3
CO3	3	2	3	3	2	3	2	2	2	2
CO4	3	2	3	1	1	2	1	1	1	2
CO5	3	1	2	1	2	3	1	2	2	3
Total	15	8	13	10	8	13	8	8	8	11
Average	3	1.6	2.6	2	1.6	2.6	1.6	1.6	1.6	2.2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS1201	Desktop Publishing (TcL)	NME	3	3

This course aims at giving the students to impart the basics of Desktop Publishing and understand the fundamentals & concepts of Adobe Photoshop and enable the students to have hands-on experience on Adobe Photoshop.

Course Outcomes:

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

CO1: underline the features of Corel draw to create artistic characters and shapes.

CO2: discuss the special effects, Exporting drawings, outlining & filling objects.

CO3: apply Image editing techniques, color correction, color management skills.

CO4: apply Designing standards, Print layout Design and creative visualization for intuitive layout.

CO5: create images in Photoshop and manage palettes and layers.

Unit I **9 Hours**

Getting started with Corel Draw : Introduction to CorelDraw - Features of Corel Draw - Corel Draw Interface Tool Box - Moving from Adobe Illustrator to Corel Draw - Common Tasks Drawing and Coloring : Introduction - Selecting Objects - Creating Basic Shapes - Reshaping Objects - Organizing objects - Applying color fills and Outlines

Unit II **9 Hours**

Mastering with Text: Introduction Text Tool - Artistic and paragraph text - Formatting Text - Embedding Objects into text - Wrapping Text around Object Linking - Text to Objects Applying Effects: Introduction - Power of Blends - Distortion Contour Effects - Envelopes - Lens effects -Transparency - Creating Depth Effects - Power Clips.

Unit III **9 Hours**

Working with Bitmap Commands : Introduction - Working with Bitmaps - Editing Bitmaps - Applying effects on Bitmaps Printing - Converting Objects to Bitmap - 3D Effect - Art Effect – Blur Effect - Color Transformation Effect – Contour Effect - Creative Effect - Distort Effect.

Unit IV **9 Hours**

Getting Started with Photoshop- Exploring the Toolbox - The New CS4 Applications -Bar & the Options Bar - Exploring Panels & Menus - Creating & Viewing a New – Document - Customizing the Interface- Setting Preferences – Working with images – Making Selections – Resizing & Cropping Images.

Unit V **9 Hours**

Getting Started with Layers – Layers Palette – Working with Layers – Hiding/Showing Layers – Flattening Images – Working with Adjustment Layers – Layer Effects. Painting in Photoshop – Photo Retouching – Type – Filters.

Learning Resources:

Text Books

1. Smart DTP Course, Soumya Ranjan Behera, 2014, BPB Publications.
2. "Photoshop 6 In Depth", David Xenakis Benjamin Levisay, Dream Tech Press, New Delhi.

References

1. The Ultimate DTP Book ,2012,BillRosoman
2. Peter Bauer, "Adobe Photoshop CC For Dummies", Wiley Publication 2nd Edition, February 2018.

Websites/ e-Learning Resources

1. www.photoshopessentials.com
2. https://www.coreldraw.com/en/learn/tutorials/.

CO – PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	1	2	1	2	1	1
CO2	3	1	3	1	1	3	2	3	1	3
CO3	2	2	3	1	1	3	2	3	2	2
CO4	3	2	3	2	1	3	2	2	1	3
CO5	3	2	3	2	1	3	2	2	1	2
Total	15	9	15	8	5	14	9	12	6	11
Average	3	1.8	3	1.6	1	2.8	1.8	2.4	1.2	2.2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS1502	Database Management Systems (T)	Core	5	5

This course will enable the student to understand database systems, the relational model of data and normal forms and to understand the concepts of database management systems.

Course Outcomes:

At the end of the course the student will be able to:

CO1: discuss basic concepts of Database Systems.

CO2: illustrate Integrity constraints and various Data Models.

CO3: design database schema considering normalization and relationships within the database.

CO4: apply DML operations, functions and joins on database tables.

CO5: construct Database operations on database using PL/SQL programs.

Unit I **15 Hours**

Introduction -Database System-Characteristics of Database Management Systems-Architecture of Database Management Systems-Database Models-System Development Life Cycle-Entity Relationship Model.

Unit II **15 Hours**

Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary - Codd's rules. Entity relationship model - ER diagram

Unit III **15 Hours**

Database tables and Normalization – The Need for Normalization –The Normalization Process Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.

Unit IV **15 Hours**

Rclational SET Opcrators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. Subqueries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function

Unit V **15 Hours**

PL/SQL- Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

Learning Resources:

Text Books

1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
2. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016

References

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, “Database System Concepts”, McGraw Hill International Publication ,VI Edition.

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/dbms/
2. https://www.simplilearn.com/tutorials/sql-tutorial/what-is-normalization-in-sql
3. https://tutorialink.com/dbms/control-structures.dbms

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	2	3	2	2	2	2
CO2	2	3	2	3	2	2	3	2	2	3
CO3	3	3	3	3	2	2	2	3	2	2
CO4	3	3	2	2	1	2	2	3	3	2
CO5	3	3	3	3	1	3	2	2	3	2
Total	14	15	13	13	8	12	11	12	12	11
Average	2.8	3	2.6	2.6	1.6	2.4	2.2	2.4	2.4	2.2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS1402	Practical: Database Management Systems (L)	Core	4	4

This course will enable the students to learn the various DDL and DML commands and also queries in PL/ SQL to retrieve information from the database.

Course Outcomes:

At the end of the course the student will be able to:

CO1: implement the DDL, DML Commands and Constraints

CO2: create, update and query on the database

CO3: classify various functions available in SQL

CO4: construct programming structure using PL/SQL.

CO5: build programs using Cursor.

List of Exercises:

I. SQL

1. DDL Commands
2. DML Commands
3. TCL Commands

II. PL/SQL

4. Fibonacci Series
5. Factorial
6. String Reverse
7. Sum of Series
8. Trigger

III. CURSOR

9. Student Mark Analysis using Cursor

IV. APPLICATION

10. Library Management System
11. Student Mark Analysis

Learning Resources:

Text Books

1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
2. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016

References

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition.
2. Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/dbms/
2.https://onlinecourses.nptel.ac.in/noc22_cs91/preview
3. https://www.simplilearn.com/tutorials/sql-tutorial/what-is-normalization-in-sql

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	1	3	3	3	2	2
CO2	2	3	2	3	2	3	2	3	1	3
CO3	3	3	3	3	2	3	2	3	3	2
CO4	2	3	3	2	2	2	2	2	1	2
CO5	3	3	3	2	1	3	2	2	3	2
Total	13	15	14	12	8	14	11	13	12	11
Average	2.6	3	2.8	2.4	1.6	2.8	2.2	2.6	2.4	2.2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS1404	Operating Systems (T)	Core	4	4

The course aims at enabling the student to have an overview on the components of the operating systems. It will also provide knowledge on the principles of deadlock, designs related to processor scheduling, process management, memory management and file management.

Course Outcomes:

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

CO1: analyze the historical evolution of operating systems and identify the principles of process management.

CO2: describe mutual exclusion primitives and semaphores to ensure concurrent access to shared resources

CO3: evaluate the different deadlock handling mechanisms for efficient operation.

CO4: compare and contrast scheduling algorithms to optimize jobs.

CO5: assess memory management strategies to optimize memory usage and performance.

Unit I **12 Hours**

Introduction: operating system, history (1990s to 2000 and beyond) - distributed computing - parallel computation. Process concepts: definition of process - process states - life cycle of a process - process management - process state transitions - process control block(PCB) - process operations - suspend and resume - context switching. Interrupts: Interrupt processing - interrupt classes. Inter process communication - signals - message passing.

Unit II **12 Hours**

Asynchronous concurrent processes: mutual exclusion - critical section - mutual exclusion primitives - implementing mutual exclusion primitives - Peterson's algorithm. Semaphores - mutual exclusion with semaphores - counting semaphores - implementing semaphores. Concurrent programming: monitors - message passing.

Unit III **12Hours**

Deadlock and indefinite postponement: Resource concepts- four necessary conditions for deadlock - deadlock prevention - deadlock avoidance and Dijkstra's Banker's algorithm - deadlock detection - deadlock recovery.

Unit IV **12 Hours**

Job and processor scheduling: scheduling levels - scheduling objectives - scheduling criteria - preemptive vs non-preemptive scheduling - interval timer or interrupting clock - priorities - scheduling algorithms: FIFO scheduling - RR scheduling - quantum size - SJF scheduling - SRT scheduling - HRN scheduling - multilevel feedback queues - Fair share scheduling.

Unit V **12 Hours**

Real Memory organization and Management: Memory organization - Memory management - Memory hierarchy - Memory management strategies - contiguous vs non- contiguous memory allocation - single user contiguous memory allocation - fixed partition multiprogramming - variable partition multiprogramming - Memory swapping. Virtual Memory organization: virtual memory basic concepts - multilevel storage organization - block mapping - paging basic concepts - segmentation - paging/segmentation systems. Virtual Memory Management: Demand Paging - Page replacement strategies.

Learning Resources:

Text Book

1. H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011

References

1. William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.
2. A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Ninth Edition, John Wiley & Sons(ASIA) Pte Ltd.,2012

Websites/ e-Learning Resources

1. https://www.gecksforgecks.org/last-minutc-notcs-opcrating-systcms/
2. https://www.geektonight.com/operating-systems-pdf-notes/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	3	3	2	2	2	2
CO2	3	2	3	3	3	3	2	1	1	2
CO3	3	3	3	3	3	3	2	2	2	2
CO4	3	3	3	3	3	3	2	2	2	2
CO5	3	2	3	3	3	3	2	1	1	2
Total	15	12	15	15	15	15	10	8	8	10
Average	3	2.4	3	3	3	3	2	1.6	1.6	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS1202	Digital Marketing (T)	NME	3	2

This Course introduces the Fundamental concepts of Digital Marketing, E Commerce, and Analysis of Business for Digital Marketing. The Course also aims to introduce types of Digital Marketing and website, BLOG creation using WordPress.

Course Outcomes:

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

CO1: discuss the core concepts of Digital Marketing and career in Digital Marketing.

CO2: describe an insight on Digital Marketing activities on various Social Media platforms and its emerging significance in Business.

CO3: employ Latest Trends and Practices in Digital Marketing, along with the development of website creation.

CO4: analyze various tools and Analysis of digital marketing and the role of digital marketing in business.

CO5: apply website creation tools to develop websites and Blogs.

Unit I **9 Hours**

Introduction to Digital Marketing: Concepts, Traditional Marketing vs. Digital Marketing, Importance and Benefits of Digital Marketing, Digital Market Evolution, Career in Digital Marketing, Designing Marketing campaigns- Types of Campaigns, Choosing the Campaign.

Unit II **9 Hours**

E-Commerce, Marketing tools and its benefits, Tools used for successful marketing- Website analytic tools, Social media management , Search Engine Optimization, Lead generation, Content Marketing, SWOT Analysis of Business for Digital Marketing, Meaning of Blogs, Websites, Portal and Their Differences.

Unit III **9 Hours**

Facebook Marketing: Facebook for Business, Facebook Insight, Different types of Ad formats, Creating a Facebook Marketing Plan, Selling Products and Services through face book offers, LinkedIn Marketing: Importance of LinkedIn presence, LinkedIn Strategy, Content Strategy, Deploying other Social media – Instagram, twitter, YouTube.

Unit IV 9 **Hours**

Types of Emails - Promotional Emails, Transactional Emails, Newsletters, Welcome Emails, Abandoned Cart Emails, Mailing List- Building an Email List-Opt-in Strategies, Segmentation Techniques, Management Best Practices, Email Marketing tools- Email Service Providers (ESPs),CRM Integrations, Automation Platforms, Analytics and Reporting Tools, Email Deliverability & Email Marketing automation

Unit V **9 Hours**

Introduction to WordPress - History and Evolution of WordPress. Key Features and Benefits of Using WordPress, Understanding the WordPress Dashboard, Building Website using WordPress- CMS - Introduction, Building Methods, Post - Defining Posts in WordPress and Their Purpose, Creating and Publishing Posts in WordPress, and Page- Differentiating Pages from Posts in WordPress, Creating and Managing Pages Using WordPress.

Learning Resources:

Text Books

1. Digital Marketing, Seema Gupta, McGraw Hill Education, 2nd Edition.
2. E-Commerce Strategy, Technologies and Applications, Whitley, David, Tata McGrawHill, 2017

References

1. Fundamentals of Digital Marketing, Punit Singh Bhatia, Pearson, 2nd Edition
2. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Damian Ryan, Calvin Jone. Kogan Page, 4th Edition

Websites/ e-Learning Resources

1. https://mailchimp.com/marketing-glossary/digital-marketing/
2. https://www.investopedia.com/terms/d/digital-marketing.asp
3. https://www.techtarget.com/searchcio/definition/e-commerce
4. https://www.tutorialspoint.com/guide-to-swot-analysis-for-business

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	3	2	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	2	3	3	3	3
CO4	3	2	3	3	3	3	3	2	2	3
CO5	3	3	3	3	2	2	3	3	3	3
Total	15	13	14	14	13	13	14	14	14	15
Average	3	2.6	2.8	2.8	2.6	2.6	2.8	2.8	2.8	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk	Credits
24COS1200	Environmental Studies (T)	AEC	3	2

The course aims at sensitizing students of all disciplines about environmental issues with those aspects of human behaviors which are more directly related to man's interaction with bio-physical environment and his ability to understand this interaction.

Course Outcomes:

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

CO1: identify the structure of the ecosystem.

CO2: categorize different species belonging to the ecosystem.

CO3: assess the importance behind renewable forms of energy and necessity to implement it.

CO4: build the role of various technologies that are useful in sensing environmental impacts.

CO5: carry out the methods involved in disposal and recycling of e-wastes.

Unit I **9 Hours**

Terms and Definitions – Scope and history of Ecology - Ecosystem– Types and functions of structural components – Abiotic – Atmosphere - Lithosphere - Hydrosphere – Light and temperature – Biotic organisms – tropic levels – Interactions among organisms - Food chains – Food web - Ecological pyramids

Unit II **9 Hours**

Definition – Genetics - Species and Ecosystem diversity - Biodiversity at global national and local levels - Conversation methods – Patents - Biosafety protocol.

Unit III **9 Hours**

Renewable and Non-renewable energy sources renewable: Energy from biomass - Gobar glass plant- Solar – Wind – Water - Tidal energy. Non-renewable energy: Fossil fuels – Coal - Crude oil and Natural gas - Oil - Nuclear energy - Geothermal

energy - Ocean thermal energy - Biofuels - Role of technology in environmental protcction.

Unit IV **9 Hours**

Pollution types - Air pollution – Global warming - Ozone hole –Rain - Smog and CFC – Water pollution – BOD – COD – Eutrophication - Thermal pollution -Oil pollution - Noise pollution - Sources and effects - Nuclear pollution - Sources of radiation - Biological effects of radiation – Solid waste pollution - Pollution control - Water treatment and waste management - Computers and environment - Remote sensing - Maps and environmental impact assessment.

Unit V **9 Hours**

Toxic constituents – Pollution problems – Health impact of hazardous waste – Reuse and recycling – Collection process - Separation process - e-waste recycling act – e-waste policy for India.

Learning Resources:

Text Books

1. Rana, SVS, Essentials of ecology and environmental sciences, Prentice Hall of India Pvt.Ltd., Edition 5th 2013.

References

1. Enger, ED and ROSS,F, Concepts in biology, Tata McGraw hill Publishing company limited, 2017.
2. Jogdand.N. Environmental biotechnology- industrial pollution management, Himalaya publishing house, Bombay, 2010.

Websites/ e-Learning Resources

1. https://www.aminotes.com/2018/11/evs-notes.html

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	1	2	2	1	1	3
CO2	3	2	2	2	2	2	2	3	2	3
CO3	3	3	3	3	3	2	2	3	1	3
CO4	3	3	3	3	3	2	2	3	2	3
CO5	3	3	3	3	2	2	3	1	1	3
Total	15	14	14	12	11	10	11	11	7	15
Average	3	2.8	2.8	2.4	2.2	2	2.2	2.2	1.4	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2401	Java Programming (T)	Core	4	4

To provide fundamental knowledge of object-oriented programming. To equip the student with programming knowledge in Core Java from the basics up. To enable the students to use AWT controls, Event Handling and Swing for GUI.

Course Outcomes:

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

CO1: underline the basic object-oriented concepts and the basic constructs of Java.

CO2: construct inheritance, packages and interfaces of Core Java.

CO3: illustrate exception handling, multi-threading and I/O Streams of Core Java.

CO4: practice AWT and Event handling.

CO5: use Swing to create GUI.

Unit I **12 Hours**

Review of Object Oriented concepts – History of Java – Java buzzwords – JVM architecture - Data Types - Variables - Scope and lifetime of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – StaticMethodString and StringBufferClasses.

Unit II **12 Hours**

Basic concepts - Types of inheritance - Member access rules - Usage of this and Super keyword - Method Overloading - Method overriding - Abstract classes - Usage of final keyword.Packages: Definition-Access Protection -Importing Packages. Interfaces: Definition–Implementation–Extending Interfaces.

Unit III **12 Hours**

Try – catch- throw - throws – finally – Built-in Exceptions - Creating own Exception classes, Thread Class - Runnable interface, I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - File Handling.

Unit IV **12 Hours**

The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers.EventHandling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events.

Unit V **12 Hours**

Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton–JtoggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane.

Learning Resources:

Text Books

1. E. Balagurusamy, Programming with Java , A primer, Fifth Edition, McGraw Hill Education India,2014.
2. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.

References

1. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

Websites/ e-Learning Resources

1. https://javabeginnerstutorial.com/core-java-tutorial
2. http://docs.oracle.com/javase/tutorial/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	2	2	1	1	2
CO2	3	3	2	3	3	2	2	1	2	3
CO3	3	3	3	3	2	2	3	2	2	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	2	3	2	2	2	3
Total	15	15	14	15	13	12	11	8	9	14
Average	3	3	2.8	3	2.6	2.4	2.2	1.6	1.8	2.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS2301	Practical: Java Programming (L)	Core	3	3

To provide fundamental knowledge of object-oriented programming. To equip the student with programming knowledge in Core Java from the basics. To enable the students to use AWT controls, Event Handling and Swing for GUI.

Course Outcomes:

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

CO1: practice the basic Object-oriented concepts. Implement the basic constructs of Java.

CO2: create inheritance, packages and interfaces of Core Java.

CO3: construct exception handling, multi-threading and I/O Streams of Core Java.

CO4: practice AWT and Event handling.

CO5: use Swing to create GUI.

Exercises:

1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer
2. Write a Java program to multiply two given matrices.
3. Write a Java program that displays the number of characters, lines and words in a text.
4. Write a program to do String Manipulation using Character Array and perform the following String operations: String length , Finding a character at a particular position, Concatenating two strings
5. Write a program to perform the following string operations using String class: String Concatenation , Search a substring , To extract substring from given string
6. Write a program to perform string operations using String Buffer class: Length of a string, Reverse a string, Delete a substring from the given string
7. Write a java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is

even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

8. Write a threading program which uses the same method asynchronously to print the numbers 1 to10 using Thread1 and to print 90 to100 using Thread2.
9. Write a program to demonstrate the use of following exceptions. Arithmetic Exception, Number Format Exception, ArrayIndexOutofBound Exception, NegativeArraySize Exception.
10. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
11. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
12. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).
13. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
14. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.

Learning Resources:

Text Books

1. E. Balagurusamy, Programming with Java , A primer, Fifth Edition, McGraw Hill Education India,2014.
2. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.

References

1. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

Websites/ e-Learning Resources

1. https://javabcginncrstutorial.com/corc-java-tutorial
2. http://docs.oracle.com/javase/tutorial/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	2	2	1	1	2
CO2	3	3	2	3	3	2	2	1	2	3
CO3	3	3	3	3	2	2	3	2	2	3
CO4	3	3	3	3	3	3	2	2	2	3
CO5	3	3	3	3	2	3	2	2	2	3
Total	15	15	14	15	13	12	11	8	9	14
Average	3	3	2.8	3	2.6	2.4	2.2	1.6	1.8	2.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2501	Data Structure and Algorithms (TcL)	Core	5	5

This course explores the principles and methods in the design and implementation of various data structures. It trains the students to solve the problems using various algorithms by searching through and manipulating data structures such as stack, queue and linked list.

Course Outcomes:

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

CO1: identify the storage mechanisms of data using Array and Stack.

CO2: demonstrate the operation of Queue and Circular Queue using Array and Linked list

CO3: summarize the operations of single Linked list and double Linked list.

CO4: apply traversal of Binary tree and Binary search tree in various applications.

CO5: analyze various sorting and searching algorithms to process data.

Unit I **15 Hours**

Arrays – Strings – Stacks – Operations on Stack –Representation of Stacks using Array and Linked list - Infix - Prefix and Post fix notations - Evaluation of Post fix - Infix- Prefix expression - Applications of Stacks.

Unit II **15 Hours**

Operations on queue -Representation of Queue using array and linked list –Circular Queue – Operation on Circular queue - Representation of Circular Queue using array and linked list.

Unit III **15 Hours**

Operations on linked list- Types of Linked List- Single Linked List- Operation on Single linked list - Double Linked list – Operations on Double Linked List.

Unit IV **15 Hours**

Binary trcc – Travcrsal of a Binary trcc – Applications of Binary Trcc - Binary Scarch Tree Operations on Binary search tree – Applications of Binary search tree Unit.

Unit V **15 Hours**

Bubble sort - Selection sort - Insertion sort - Quick sort - Merge sort –Search – Linear Search – Binary Search.

Learning Resources:

Text Books

1. Yashavant Kanetkar "Data structures using C++", BPB publications 2nd edition,2016

References

1. P. Sudharsan and J. John Manoj Kumar,"Data Structures using C", CBS publishers and distributors pvt ltd; First Edition, 2020.
2. Sahni Sartaj, "Data Structures using C++", TMH 2nd edition 2012

Websites/ e-Learning Resources

1. https://www.w3schools.com/dsa/
2. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
3. https://www.programiz.com/dsa

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	1	2	2	2	1	1	2	1	2
CO2	3	2	3	3	2	2	1	1	1	2
CO3	3	1	2	2	2	2	2	1	2	2
CO4	3	2	3	3	2	2	2	2	2	2
CO5	3	2	3	3	3	2	2	2	2	2
Total	15	8	13	13	11	9	8	8	8	10
Average	3	2.4	2.6	2.6	2.2	1.8	1.6	1.6	1.6	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS2403	Machine Learning (T)	Core	4	4

This Course enables the students to learn about Machine Intelligence and Machine Learning applications and to implement and apply machine learning algorithms to real-world applications.

Course Outcomes:

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

CO1: Appreciate the importance of visualization in the data analytics solution.

CO2: Apply structured thinking to unstructured problems.

CO3: Understand a very broad collection of machine learning algorithms and problems.

CO4: Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.

CO5: Develop an appreciation for what is involved in learning from data.

Unit I **12 Hours**

Introduction Machine Learning: Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbor, support vector machines.

Unit II **12 Hours**

Neural networks and genetic algorithms: Neural Network Representation – Problems – Perceptron – Multilayer Networks and Back Propagation Algorithms –Genetic Algorithms.

Unit III **12 Hours**

Bayesian and computational learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network.

Unit IV **12 Hours**

Instant based learning: K- Nearest Neighbor Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit V **12 Hours**

Advanced learning: Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning.

Learning Resources:

Text Books

1. Tom M. Mitchell, - Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press

References

1. Ethem Alpaydin, - Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, - Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Websites/ e-Learning Resources

1. https://intellipaat.com/blog/tutorial/machine-learning-tutorial/
2. https://www.mygreatlearning.com/blog/machine-learning-tutorial/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	2	2	2	2	1
CO2	3	2	3	2	2	2	2	2	2	2
CO3	3	3	3	2	2	3	2	1	2	2
CO4	3	3	3	3	3	3	2	2	1	2
CO5	3	3	3	3	3	3	2	1	1	2
Total	15	13	14	12	12	13	10	8	8	9
Average	3	2.6	2.8	2.4	2.4	2.6	2	1.6	1.6	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2201	Data Analytics Using Excel (TcL)	SEC	3	2

This course teaches learners to perform Data Analytics using Excel, starting with basic formulas like Sum, Average, and more. It progresses to advanced functions such as Vlookup, Pivot tables, and Data Visualization, enabling efficient analysis of large datasets with time-saving statistical and mathematical tools.

Course Outcomes

At the end of the course the student will be able to:

CO1: explain spreadsheet concepts and explore the Microsoft Office Excel environment.

CO2: identify the different components of the Excel worksheet.

CO3: construct critical thinking skills to design and create spreadsheets.

CO4: compose formulas to manipulate numeric data in an Excel Worksheet.

CO5: apply advanced techniques for Data Analytics visualizations.

Unit I **9 Hours**

Navigate the Excel User Interface - Excel Commands - Create and Save a Basic Workbook - Cell Data - Entering and Editing Worksheet Data: Insert, Delete, and Adjust Cells, Columns, and Rows - Search for and Replace Data – Import and Export data. Uses of Excel, Excel software, Spreadsheet window pane, Title Bar, Menu Bar, Standard Toolbar, Formatting Toolbar, the Ribbon, File Tab and Backstage View, Formula Bar, Workbook Window, Status Bar, Task Pane, Workbook & sheet.

Unit II **9 Hours**

Text Formats - Number Formats - Currency Format - Formatting Dates Cell Contents - Styles and Themes - Basic Conditional Formatting - Create and Use Templates. Functionality Using Ranges. Using Ranges, Selecting Ranges, Entering Information into a Range, Using AutoFill.

Unit III **9 Hours**

Naming and Moving Worksheets - Copying Worksheets - Adding, Deleting and Hiding Worksheets - Grouping Worksheets - Moving, Copying, Deleting and Hiding Grouped Worksheets - Inserting, Deleting Columns and Rows - Modifying Cell Width and Height - Hiding and Unhiding Rows and Columns - Working with multiple workbooks - Printing Worksheets.

Unit IV **9 Hours**

Using Operations - Creating Formulas - Copying formulas – AutoSum - Common Formulas - Date and Time formulas - Data Validations - Sorting and Filtering Data: Sorting tables - Using multiple - level sorting - Using custom sorting - Filtering data for selected view (AutoFilter) - Using advanced filter options. Advance Formulas Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim Spreadsheet.

Unit V **9 Hours**

Creating subtotals- Multiple - level subtotals - Creating Pivot tables - Formatting and customizing - Pivot tables - Using advanced options of Pivot tables - Pivot charts - Instant Chart - Update Chart - Column Chart - Picture Fill - Adjust Chart Size - Line Chart - Scatter Chart - Formatting Charts - Using 3D Graphs. Charts - Creating Charts, Different types of chart, Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table

Learning Resources:

Text Books

1. John Walkenbach, “Excel 2016 Bible”, Wiley Publication, 1st edition, November 2015.
2. Paul McFedries “Excel Data Analysis for Dummies” 4th Edition 2018.

References

1. Greg Harvey, “Microsoft Excel 2016 All-in-One For Dummies” A Wiley Brand 1st Edition, December 2015.

2. William Fischer, “Excel: Quick Start Guide - From Beginner to Expert”, Crcatcspacc Indcpcndcnt Publishing Platform, May 2016

Websites/e-Learning Resources

1. https://www.tutorialspoint.com/excel/index.htm
2. https://edu.gcfglobal.org/en/excel2016/
3. https://www.excel-easy.com/

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	2	3	2	2	2	2	3
CO 2	3	2	3	3	2	2	3	3	1	2
CO 3	3	2	3	3	3	2	2	3	2	2
CO 4	3	2	3	3	3	2	2	2	2	3
CO 5	3	2	3	3	3	2	2	2	3	3
Total	15	11	14	14	14	10	11	12	10	13
Average	3	2.2	3	2.8	2.8	2	2.2	2.4	2	2.6

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

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS2405	Programming in C (TcL)	Supportive	5	4

This course enables the student to perceive the concepts of C programming language and gain knowledge on algorithms and logical thinking. It enhances the programming ability in C Language, and helps to develop software application using C.

Course Outcomes:

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

CO1: recognize the basic data types and control statements in C.

CO2: summarize the concept of arrays and strings in C.

CO3: to create an efficient program using functions to implement reusability.

CO4: apply the structures in making application software

CO5: generate files and use preprocessors for real world applications.

Unit I **15 Hours**

History of C – The C Character Set – Tokens – Identifiers – Keywords – Data Types – Constants - Variables – Operators – Structure of a C program – Formatted input/output functions – Unformatted input/output functions – Data Type Conversions – Control statements – Looping statements.

Unit II **15 Hours**

Declaring Arrays – Accessing array elements – Initializing Arrays – Types of Arrays – Strings – String Library Functions.

Unit III **15 Hours**

Function Prototyping – Return statement – Nested functions – Types of functions – Recursion – Storage classes – Command line arguments – Pointer – Initialization of Pointers – Pointer Arithmetic – Pointers and Arrays – Pointers to Functions – Pointers to Pointers – Passing values to functions – Passing arrays to functions – Memory allocation.

Unit IV **15 Hours**

Structure Declaration – Definition – Initialization – Nested Structures – Array of Structures – Structures and functions – Structures and pointers – Bits field – Unions.

Unit V **15 Hours**

fscanf( ) and fprintf( ) – Character I/O from files –String I/O from files – Error Handling during I/O – Random Access – The Preprocessor.

Learning Resources:

Text Book

1. Balagurusamy.E, " Programming in ANSI C", Eighth Edition, Tata McGraw Hill-2019.

References

1. Kanetkar Y, "Let us 'C' ", 16th edition BPB publications, 2017.
2. Ashok N.Kamthane , "Programming in C" , Pearson Education, 2012.

Websites/ e-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc23_cs93/preview

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	2	2	2	2
CO2	3	2	3	3	2	2	2	1	3	2
CO3	3	3	3	3	2	2	3	3	2	2
CO4	3	2	3	2	2	2	3	2	1	1
CO5	3	3	2	3	1	3	3	3	2	3
Total	15	13	14	14	10	11	13	11	10	10
Average	3	2.6	2.8	1.8	2	2.2	2.6	2.2	2	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS2402	PHP Programming (T)	Core	4	4

This course enables the students to interpret how to use and built dynamic websites by embedding PHP in HTML. It helps the students to gain insight into the components, management aspects of real time, managing sessions and practicing cookies to store some data in the browser and pass it to the next request.

Course Outcomes:

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

CO1: describe the role of PHP in dynamic web pages**.**

CO2: design and develop dynamic, database-driven web applications using HTML.

CO3: explore experience on various web application development techniques.

CO4: determines the various concepts for working with the files using PHP.

CO5: attain ability on managing sessions and cookies with PHP.

Unit I **12 Hours**

Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation

Unit II **12 Hours**

PHP Programming Basics - Syntax of PHP - Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.

Unit III **12 Hours**

Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.

Unit IV **12 Hours**

PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File. Creating forms to display, add, edit and delete data, improving the look of the table with CSS.

Unit V **12Hours**

Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies, Working with images, PHP file uploads

Learning Resources:

Text Books

1. Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison
2. The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes

References

1. PHP: The Complete Reference-Steven Holzner.
2. DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition.

Websites/ e-Learning Resources

1. Open source digital libraries: PHP Programming
2. https://www.w3schools.com/php/default.asp

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	2	2	2	2	2
CO2	3	3	3	2	2	2	2	2	2	2
CO3	2	2	2	3	2	2	3	2	2	2
CO4	3	3	3	3	2	2	3	2	1	2
CO5	3	2	2	3	1	3	3	2	2	1
Total	14	13	13	14	10	11	13	10	9	9
Average	2.8	2.6	2.6	2.8	2	3	3	2	1.8	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS2302	PHP Programming LAB (L)	Core	3	3

This course enables the students in constructing data-driven web applications and various concepts such as arrays, functions, and creating web forms. It also aims to develop Web based applications using session management.

Course Outcomes

At the end of the course the student will be able to:

CO1: understand basic PHP style of programming.

CO2: analyze PHP scripts and determine their behavior.

CO3: evaluate various methods to handle string and array.

CO4: construct PHP scripts to create dynamic web content.

CO5: analyze the file handling techniques.

List of Programs:

1. Write a PHP program using PHP operators.
2. Write a PHP program for if else statement.
3. Write PHP Script for addition of two 2x2 matrices.
4. Write a PHP program to display Fibonacci series.
5. Write a PHP program to check the number is Armstrong.
6. Write a PHP program using switch case.
7. Write a PHP program using Arrays.
8. Write a PHP program to calculate date and time function.
9. Write a PHP program for member function.
10. Write a PHP script to demonstrate File functions.
11. Create student registration form using text box, check box, radio button, select, submit button. And display user inserted values in the new PHP page.
12. Create Website Registration Form using text box, check box, radio button, select, submit button. And display user inserted values in the new PHP page.
13. Write two different PHP scripts to demonstrate passing variables with sessions.
14. Design a PHP page to implement a login screen using sessions.
15. Write a PHP program for sending and receiving plain text messages.

Learning Resources:

Text Books

1. PHP: The Complete Reference-Steven Holzner.
2. "Beginning PHP and MySQL From Novice to Professional" by W Jason Gilmore

References

1. PHP: A Beginner's Guide" by Vikram Vaswani
2. "PHP Object - Oriented Solutions" by David Powers

Websites/ e-Learning Resources

1. https://www.w3schools.com/php/default.asp
2. https://www.tutorialspoint.com/php/index.htm

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	3	3	3	3	1	1	3
CO2	2	3	3	3	2	3	2	2	1	2
CO3	3	2	3	3	3	3	2	1	2	3
CO4	3	2	2	3	2	2	3	1	2	2
CO5	3	2	3	3	3	3	3	3	3	2
Total	14	12	14	15	13	14	13	8	9	12
Average	2.8	2.4	2.8	3	2.6	2.8	2.6	1.6	1.8	2.4

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2404	Computer Networks (T)	Core	4	4

This course enables the student to gain a comprehensive understanding of networking principles. The students familiarize themselves with various protocols and mechanisms used in the physical, data link, network, and transport layers including cryptographic techniques for securing communication.

Course Outcomes:

At the end of the course the student will be able to:

CO1: analyze the basic concepts of networks for data communication.

CO2: discuss the structure of the telephone systems in wireless networks.

CO3: assess different medium access control protocols and their operations.

CO4: compare and analyze various routing and congestion control algorithms.

CO5: evaluate the effectiveness of different cryptographic algorithms.

Unit I **12 Hours**

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet - ATM - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media

Unit II **12 Hours**

Wireless Transmission - Communication Satellites – Telephone System: Structure - Local Loop - Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.

Unit III **12 Hours**

Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – ALOHA - CSMA - Collision free protocols.

Unit IV **12 Hours**

Network Layer - Design Issues - Routing Algorithms – Shortest Path Routing-Flooding-Distance Vector Routing-Link State Routing- Hierarchical routing-Congestion Control Algorithms – General Principles of Congestion Control-Traffic Shaping- IP Protocol – IP Addresses – Internet Control Protocols.

Unit V **12 Hours**

Transport Layer - Services - Addressing - Establishing and Releasing a Connection – Simple Transport Protocol – Network Security - Cryptography - Secret key Algorithms - Public key Algorithms.

Learning Resources:

Text Book

1. S. Tanenbaum, Computer Networks, 4th Edition, Prentice-Hall of India, 2008.

References

1. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2017
2. F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008
3. D. Bertsekas and R. Gallagher, “Data Networks”, 2nd Edition, PHI, 2008.
4. Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002

Websites/e-Learning Resources

1. https://en.wikipedia.org/wiki/Computer_network
2.https://citationsy.com/styles/computer-networks

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	2	2	3	3	1	2	3
CO2	3	2	3	2	2	3	3	1	2	3
CO3	3	2	3	1	2	3	3	2	2	3
CO4	3	2	3	1	2	3	3	2	2	3
CO5	3	2	3	2	1	3	3	2	2	3
Total	15	10	15	8	9	15	15	8	10	15
Average	3	2	3	1.6	1.8	3	3	1.6	2	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2502	Microprocessor and Microcontroller (TcL)	Core	5	5

This course introduces students to the fundamental architecture of 8-bit and 16-bit microprocessors, focusing on the addressing modes and instruction sets of the 8085 and 8051. It covers the interrupt structure of the 8086 and 8051 and the development of simple applications using 8086 programming. Students will also learn about commonly used peripherals and interfacing techniques

Course Outcomes:

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

CO1: recall foundational concepts of digital computers and 8085 microprocessor systems.

CO2: explain 8085 architecture, pinout, functional blocks, and instruction set.

CO3: analyse BCD, binary, ASCII; perform BCD arithmetic operations.

CO4: examine 8085 interrupts, RIM/SIM commands, and explain 8259 PIC and 8257 DMA.

CO5: identify 8051 microcontroller architecture, pin configuration, and interrupt handling.

Unit I **15 Hours**

Digital Computers - Microcomputer Organization-Computer languages – Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations.

Unit II **15 Hours**

8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.

Unit III **15 Hours**

BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multibyte Addition and Subtraction - Multiplication and Division.

Unit IV **15 Hours**

The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.

Unit V **15 Hours**

Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 - Interrupts Control Register – Execution of interrupt.

Learning Resources:

Text Books

1. R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009.
2. Soumitra Kumar Mandal “Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051”, Tata McGraw Hill Education Private Limited.

References

1. Mathur- “Introduction to Microprocessor”- 3rd Edition- Tata McGraw-Hill -1993.
2. Raj Kamal - “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.
3. Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2008

Websites/e-Learning Resources

1. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.html.
2. https://onlinecourses.nptel.ac.in/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	3	1	2	2	2
CO2	3	3	3	3	2	3	2	2	2	3
CO3	3	2	3	3	2	2	2	2	1	2
CO4	3	2	3	2	2	2	2	2	2	2
CO5	3	3	3	3	3	3	3	2	2	3
Total	15	11	14	13	11	13	10	10	9	11
Average	3	2.2	2.8	2.6	2.2	2.6	2	2	1.8	2.2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2406	Cloud Computing (T)	Supportive	5	4

This course aims to provide a comprehensive understanding of Cloud Computing fundamentals and key characteristics. Students will learn Various Cloud services and gain practical experience with deployment, management and application design.

Course Outcomes:

At the end of the course the student will be able to:

CO1: analyze the fundamental concepts and Technologies in Cloud Computing.

CO2: categorize various cloud service types as well as their uses and pitfalls.

CO3: design the Cloud Architecture and Application design.

CO4: explain the various aspects of application design, benchmarking and security in the Cloud.

CO5: discuss the various case studies in Cloud Computing.

Unit I **15 Hours**

Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.

Unit II **15 Hours**

Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure. Virtual Machines. Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. Database Services: Amazon Relational Data Store - Amazon DynamoDB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service. Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services. Content Delivery Services:

Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight. Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation. Open Source Private Cloud Software: CloudStack – Eucalyptus – OpenStack.

Unit III **15 Hours**

Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).

Unit IV **15 Hours**

Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.

Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.

Unit V **15 Hours**

Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

Learning Resources:

Text Book

1.Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018

References

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.
3. David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.
4. Dr. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.

Websites /e-Learning Resources

1. https://en.wikipedia.org/wiki/Cloud_computing
4. https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	2	2	3	3	1	2	2
CO2	3	3	2	2	2	3	3	1	2	2
CO3	3	2	2	2	2	3	3	2	2	2
CO4	3	2	2	2	1	3	3	2	2	2
CO5	3	2	2	1	1	3	3	1	2	2
Total	15	12	10	9	8	15	15	8	10	10
Average	3	2.4	2	1.8	1.6	3	3	1.6	2	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS2202	Audio & Video Editing (TcL)	SEC	3	2

This course aims at providing comprehensive knowledge and hands-on experience in audio and video editing using adobe premiere pro software application. This course covers the essential features and functions to create professional-quality video projects.

Course Outcomes:

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

CO1: identify various file formats and set up projects efficiently

CO2: perform basic video editing tasks using panels.

CO3: apply and adjust different transitions to enhance the visuals.

CO4: utilize the audio workspace to mix audio tracks efficiently.

CO5: create and customize the graphic elements.

Unit I **9 Hours**

Starting the application - Premiere pro interface - Exploring the workspace - Creating a project - Setting up a sequence - Video and audio display formats - Importing media files -Media browser panel - Using the project panel.

Unit II **9 Hours**

Working with bins - Using source monitor controls - Loading a clip - Creating subclips -Navigating the timeline panel - Performing storyboard style editing - Using program monitor controls - Adding markers to the timeline.

Unit III **9 Hours**

Transition - using handles - adding video transition - Transition effects control - Adding audio transition - Adjusting motion effects -Understanding motion settings - working with keyframes.

Unit IV **9 Hours**

Working with audio workspace - Adjusting audio in effects control panel - adjusting audio gain - creating split edit - Improving audio using essential sound panel

Unit V **9 Hours**

Explore essential graphics panel - Adding font and color - Creating new titles - text styles - adding captions.

Learning Resources:

Text Book

1. Maxim Jago, "Adobe Premiere Pro Classroom in a Book (2020 release)", Adobe Press.

References

1. Jha, Niranjan. Teach Yourself Adobe Premiere Pro CS6. India, CreateSpace Independent Publishing Platform, 2014.

Websites/ e-Learning Resources

1. https://helpx.adobe.com/premiere-pro/tutorials.html/1000
2. https://www.udemy.com/course/learn-how-to-use-premiere-pro-cc-for-beginners/

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	1	3	2	1	2	2
CO2	3	3	2	1	1	3	3	1	2	2
CO3	3	3	2	2	1	3	3	1	3	2
CO4	3	2	2	1	1	3	3	1	3	2
CO5	3	3	1	2	1	3	3	1	3	2
Total	15	13	8	8	5	15	14	5	13	10
Average	3	2.6	1.6	1.6	1	3	2.8	1	2.6	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS2408	Introduction to Python Programming (TcL)	Supportive	5	4

The course aims to enable the student to understand the features of python programming, arrays, control statements, function, lists and Exception handling. It helps the student to create real world IOT applications using Python.

Course Outcomes:

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

CO1: learn the basics of python and do simple programs on python.

CO2: create a program using conditional statement, looping and its control statements.

CO3: elaborate the Concept of function, function arguments and implementing the concept of strings in various applications.

CO4: design and develop a program using list, tuples and dictionary.

CO5: develop the application by using File handlings in python

Unit I **15 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 **15 Hours**

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 **15 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. Modulcs: import statcmcnt- Thc Python modulc – dir() function – Modules and Namespace – Defining our own modules.

Unit IV **15 Hours**

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 **15 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. Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.
2. Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers

References

1. Vamsi Kurama, “Python Programming: A Modern Approach”, Pearson Education, 2018.
2. Adam Stewarts, “Python Programming”, Online.2017
3. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, 2019, CENGAGE Publication.
4. Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python”, 6th Edition, 2024, BPB Publications, New Delhi.

Websites/ e-Learning Resources

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://www.geeksforgeeks.org/python-programming-language/
5. https://en.wikipedia.org/wiki/Python_(programming_language)

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	1	1	2	2	1	2	2
CO2	3	1	3	2	1	2	2	2	1	2
CO3	3	2	1	2	3	2	2	2	2	1
CO4	3	2	2	2	3	1	2	2	2	2
CO5	3	3	2	2	1	1	2	2	2	2
Total	15	10	11	9	9	8	10	9	9	9
Average	3	2	2.2	1.8	1.8	1.6	2	1.8	1.8	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3601	Python Programming (TcL)	Core	6	6

The course aims to enable the student to understand the features of python programming, arrays, control statements, function, lists and Exception handling. It helps the student to create real world IOT applications using Python.

Course Outcomes:

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

CO1: learn the basics of python and do simple programs on python.

CO2: construct a program using selection statements, looping and jump statements.

CO3: elaborate the concept of function, function arguments and implementing the concept of strings in various applications.

CO4: design and develop a program using list, tuples and dictionary.

CO5: develop applications by using File handling in python.

Unit I **18 Hours**

Basics of Python Programming: 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**

Control Statements: 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**

Functions: 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 – Modulcs and Namcspacc – Dcfining our own modulcs.

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**

Python File Handling: 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. Reema Thareja, "Python Programming using problem solving approach", First Edition, 2023, Oxford University Press.
2. Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.

References

1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education, 2018.
2. Adam Stewarts, "Python Programming", Online.2017
3. Kenneth A. Lambert, "Fundamentals of Python – First Programs", 2019, CENGAGE Publication.
4. Yashavant Kanetkar, Aditya Kanetkar, "Let Us Python", 6th Edition, 2024, BPB Publications, New Delhi.

Websites/ e-Learning Resources

1. https://www.programiz.com/python-programming
   https://www.guru99.com/python-tutorials.html
2. https://www.w3schools.com/python/python_intro.asp
3. https://www.geeksforgeeks.org/python-programming-language/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	2	2	2	2	2
CO2	3	2	3	2	3	2	2	2	2	2
CO3	3	3	3	3	2	2	2	2	2	2
CO4	3	3	3	3	2	3	2	2	1	1
CO5	3	3	3	3	2	3	2	1	1	2
Total	15	13	14	13	11	12	10	9	8	9
Average	3	2.6	2.8	2.6	2.2	2.4	2	1.8	1.6	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS3603	Web development using NodeJS and MongoDB (TcL)	Core	6	6

This course aims at preparing the students to gain theoretical skills and practical experience required for designing web pages and use various latest technologies to create dynamic websites.

Course Outcomes:

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

CO1: recall the working knowledge of HTML.

CO2: apply DHTML to design eye caching web pages

CO3: create dynamic web page using client side script language javascript

CO4: design and Develop Web Applications using Node.js.

CO5: create interactive and dynamic web applications using MongoDB.

Unit I **18 Hours**

Introduction, Concept of Internet- History of Internet-Protocols of Internet- World Wide Web - URL- Web Server-Web Browser. -Introduction - History of HTML- Structure of HTML Document: Text Basics -Structure of HTML Document: Images and Multimedia - Links and webs - Document Layout - Creating Forms- Frames and Tables.

Unit II **18 Hours**

DHTML – Features – components - Document object model (DOM)- difference between HTML and DHTML – CSS – Properties of CSS – types of CSS- Connecting CSS to a page - CSS examples – Bootstrap- CSS variables – Color modes-Layout – Components - Forms

Unit III **18 Hours**

Adding the JavaScript tag- Adding JavaScript to HTML pages- Using external JavaScript - Building a JavaScript program: JavaScript Programming- Functions-

Objects – Adding jQuery: Introduction- Installing jQuery- Adding jQuery to a page - Working with HTML using jQucry.

Unit IV **18 Hours**

Introduction to Node.js: JavaScript event-driven programming, Node.js event driven programming - JavaScript closures – Node modules: Common JS modules- Node.js core modules - Node modules: Node.js third-party modules-Node.js File modules, Node.js folder modules - Developing Node.js web applications

Unit V **18 Hours**

MongoDB: Introduction to NoSQL, Introducing MongoDB – Key features of MongoDB - MongoDB shell, MongoDB databases-MongoDB collections – MongoDB CRUD operations - Introducing Mongoose: Connecting to MongoDB – Understanding Mongoose schemas– Updating an existing user document- Deleting an existing user document.

Learning Resources:

Text Books

1. Laura Lemay, Rafe Colburn , Jennifer Kyrnin, "Mastering HTML, CSS & Javascript Web Publishing", 2016.
2. Pankaj Sharma, "Web Technology", Sk Kataria& Sons Bangalore 2011.
3. "HTML5 Black Book: Covers CSS3, and PHP ", Kogent Learning Solutions Inc 2016.

References

1. Ecky Putrady, "Practical Web Development with Haskell: Master the essential skills to build fast and scalable web applications", 1st edition, Apress, 2018.
2. Danny Goodman, "Dynamic HTML" 3rd Edition, O'reilly, 2006.
3. Achyut S Godbole &Atul Kahate, "Web Technologies", 2012, 2nd Edition.

Websites/ e-Learning Resources

1. https://www.tutorialspoint.com/html/index.htm
2. https://www.geeksforgeeks.org/dhtml-introduction/
3. https://www.geeksforgeeks.org/nodejs/
4. https://www.w3schools.com/mongodb

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	1	2	2	2	2	1	2	2	1
CO2	3	2	3	3	2	3	2	2	2	1
CO3	3	2	3	3	2	3	2	2	2	2
CO4	3	2	3	3	2	3	2	2	2	2
CO5	3	2	3	3	2	3	2	1	1	2
Total	15	9	14	14	10	14	9	9	9	8
Average	3	1.8	2.8	2.8	2	2.8	1.8	1.8	1.8	1.6

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3605	Software Engineering (T)	Core	6	6

This course enables the students to gain experience on various processes used in the Software industry for the development of a software product. They also learn about testing and maintenance of software products.

Course Outcomes:

At the end of the course the student will be able to:

CO1: discuss the various Software Life Cycle Models.

CO2: apply design principles and techniques.

CO3: model a reliable and cost-effective software system.

CO4: write and implement a test case to build an effective software system.

CO5: illustrate software maintenance at various levels and produce an efficient system.

Unit I **18 Hours**

The software engineering discipline- programs vs. software products- why study software engineering- emergence of software engineering- Notable changes in software development practices- computer systems engineering. Software Life Cycle Models- Why use a life cycle model- Classical waterfall model- iterative waterfall model- prototyping model- evolutionary model- spiral model- comparison of different life cycle models.

Unit II **18 Hours**

Requirements gathering and analysis- Software requirements specification (SRS)- Software Design- Good software design- cohesion and coupling- neat arrangement- software design approaches- object- oriented vs function-oriented design.

Unit III **18 Hours**

Overview of SA/SD methodology- structured analysis- data flow diagrams (DFD's)- structured design- detailed design. User-Interface design- Characteristics of a good

interface; basic concepts; types of user interfaces; component based GUI development- a user interface methodology.

Unit IV **18 Hours**

Coding- code review- testing; testing in the large vs testing in the small- unit testing- black-box testing; white-box testing; debugging; program analysis tools- integration testing- system testing; some general issues associated with testing. Software Reliability and Quality Management- Software reliability-statistical testing; software quality- software quality management system- SEI capability maturity model-personal software process.

Unit V **18 Hours**

CASE and its scope- CASE environment-CASE support in software life cycle-other characteristics of CASE tools- towards second generation CASE tool- architecture of a CASE environment-Software Maintenance- Characteristic of software maintenance-software reverse engineering; software maintenance process models-estimation of maintenance cost.

Learning Resources:

Text Book

1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018

References:

1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.
2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.
3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

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1. https://www.tutorialspoint.com/sdlc/sdlc_overview.htm
2. https://www.scaler.com/topics/software-engineering/srs/
3. https://www.techtarget.com/whatis/definition/software-testing

4. https://www.techopedia.com/definition/3973/computer-aided-software-engineering-case

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	3	2	3	3	1	2	2
CO2	3	3	3	3	2	3	3	2	2	2
CO3	3	2	3	3	3	2	3	2	1	2
CO4	3	3	3	2	2	3	2	2	2	2
CO5	3	3	3	3	2	3	3	1	2	2
Total	15	14	14	14	11	14	14	8	9	10
Average	3	2.8	2.8	2.8	2.2	2.8	2.8	1.6	1.8	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3403	Mobile Application Development (TcL)	DSE	5	4

This course aims to provide a comprehensive understanding of Android development, focusing on both theoretical concepts and practical application. Students will learn designing user interfaces using various layouts and views, managing data persistence with shared preferences and SQLite databases, and implementing SMS messaging and networking features.

Course Outcomes:

At the end of the course the student will be able to:

CO1: analyze the android architecture, features and set up Android development environment.

CO2: design user interfaces using various layouts and views for Android.

CO3: assess data persistence, file handling, and SQLite databases

CO4: apply networking concepts for sending SMS messaging and emails.

CO5: create and evaluate location-based services.

Unit I **15 Hours**

Android Fundamentals: Android overview and Versions – Features of Android – Architecture of Android - Setting up Android Environment (Eclipse/Android Studio, SDK)- Android virtual device - Anatomy of an Android Application - Simple Android Application Development.

Unit II **15 Hours**

Layouts: Linear - Relative - Frame and Scrollview- Managing changes to Screen Orientation. Views: TextView - Button - ImageButton - EditText - CheckBox - RadioButton - RadioGroup - ProgressBar, AutoCompleteTextView - ListViews and WebView.

Unit III **15 Hours**

Data Persistence: Saving and Loading User Preferences. File Handling: File System-Internal and External Storage. -Permissions-File Manipulation-Managing Data using Sqlite: Creation of database-Insertion, Retrieval and Updation of records.

Unit IV **15 Hours**

SMS Messaging: Sending and Receiving messages - Sending E-mail–Networking: Downloading Binary Data – Downloading Text Files.

Unit V **15 Hours**

Location Based Services: Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-coding Publishing Android Applications: Preparing for publishing-Deploying APK Files.

Learning Resources:

Text Books

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley, 2012.
2. Onur Cinar, Android Apps with Eclipse,, Apress, Springer, 2012.

References

1. Ed Burnette, “Hello Android: Introducing Google's Mobile Development Platform”, 3rd edition, 2010, The Pragmatic Publishers.
2. Reto Meier, “Professional Android 4 Application Development”, 2012, Wrox Publications (John Wiley, New York).

Websites /e-Learning Resources

1. 1.www.tutorialspoint.com/android/index.htm
2. www.javatpoint.com/android-tutorial
3. 3.www.vogella.com/articles/Android/article.html
4. 4.https://www.tutorialspoint.com/android/android_location_based_services.htm

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	2	2	3	3	2	2	2
CO2	3	3	2	2	2	3	3	2	2	2
CO3	3	2	2	2	2	3	3	2	2	2
CO4	3	2	2	2	1	3	3	2	2	2
CO5	3	2	2	1	1	3	3	1	2	2
Total	15	12	10	9	8	15	15	9	10	10
Average	3	2.4	2	1.8	1.6	3	3	1.8	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3405	Computer Graphics (TcL)	DSE	5	4

The course covers fundamental topics such as graphics representations and transformations. It aims to introduce the concepts of computer graphics as two dimensional system and mapping, various drawing algorithms, Clipping, two-dimensional transformation and 3-D graphics.

Course Outcomes:

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

CO1: identify the CG applications, understand the working of different input, and output systems

CO2: generate lines, circle, ellipse and fill polygons using different algorithms.

CO3: apply 2 Dimensional transformations to geometric figures.

CO4: state window to view - port coordinate transformation and apply clipping algorithms.

CO5: relate the previously learned concepts of viewing, transformations in 2D with 3D and apply them.

Unit I **15 Hours**

Application areas of Computer Graphics, overview of graphics systems, video - display devices, and raster scan systems, random scan systems, graphics monitors and workstations and input devices.

Unit II **15 Hours**

Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood - fill algorithms

Unit III **15 Hours**

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transformations, transformations between coordinate systems.

Unit IV **15 Hours**

The viewing pipeline, viewing coordinate reference frame, window to view - port coordinate transformation, viewing functions, point clipping - Cohen - Sutherland line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

Unit V **15 Hours**

3D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

Learning Resources:

Text Book

1. Donald D. Hearn, M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", 4th edition, Pearson, 2013

References

1. Rajiv Chopra, "Computer Graphics: With An Introduction To Multimedia" , 4th Edition, S Chand publication, 2015
2. Malay K. Pakhira, "Computer Graphics, Multimedia and Animation" , Prentice Hall Of India Pvt. Ltd. , New Delhi – 2008

Websites/ e-Learning Resources

1. https://www.geeksforgeeks.org/introduction-to-computer-graphics/
2. https://en.wikipedia.org/wiki/Computer_graphics
3. https://www.javatpoint.com/computer-graphics-tutorial

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	2	2	2	2	1	2	2	3
CO2	3	1	3	3	3	2	1	1	1	1
CO3	3	2	3	3	2	2	2	2	2	2
CO4	3	2	3	3	2	2	2	2	1	2
CO5	3	1	3	3	2	1	2	2	2	2
Total	15	8	14	14	11	9	8	9	8	10
Average	3	1.6	2.8	2.8	2.2	1.8	1.6	1.8	1.6	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3407	Cyber Security (T)	DSE	5	4

To understand the basics of Cybercrime and Computer forensics with protecting mechanisms. To gain the ability to understand the importance of cyber investigations with its functioning role and learn the basics of Wi Fi and its security measures. To learn and analyze the concepts of digital forensics with cybercrime prevention techniques.

Course Outcomes:

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

CO1: explain the basics of Cyber security concepts and its implementation in India.

CO2: describe the common cyberattacks and its security.

CO3: recall the basics of Email and Wi Fi and its security measures.

CO4: discuss social media security.

CO5: analyze the security in various online platforms.

Unit I **15 Hours**

Introduction to cybercrime: Classification of cybercrimes - Malware and its type - Kinds of cybercrime – Cyber Security Techniques : Authentication - Encryption - Digital Signatures - Antivirus - Firewall - Steganography - Computer forensics - Cyber security initiatives in India-Importance of cyber security.

Unit II **15 Hours**

Common Cyber attacks: DoS – DDoS – Zombies – Phishing – Spear Phishing – Smishing- Vishing – Whaling – Interception. Digital Devices Security - Tools and Technologies for Cyber Security -Securing computer using free antivirus – Cyber security best practices.

Unit III **15 Hours**

Email Security & Wi Fi Security **:** Guidelines to choose web browsers - Securing web browser - Antivirus - Email security - Guidelines for setting up a secure password - Two-steps authentication- Password – Manager - Wi-Fi Security – strategies to

overcome E-mail threats- techniques of using public Wi-Fi –legal aspects regarding Email.

Unit IV **15Hours**

Social Media Security: Guidelines for social media security - Tips and best practices for safer Social Networking - Basic Security for Windows - User Account Password - Smartphone Security guidelines: Android Security - IOS Security.

Unit V **15 Hours**

Security in Online Platforms: Online Banking, Credit Card and UPI Security Online Banking Security - Mobile Banking Security - Security of Debit and Credit Card – UPI - Micro ATM, e-wallet and POS Security - Security of Micro ATMs - e-wallet Security Guidelines - Security Guidelines for Point of Sales(POS).

Learning Resources:

Text Book

1. Dr.Jcctcndra Pandc, **"**Introduction to Cybcr Sccurity" Publishcd by Uttarakhand Open University, 2017.

References

1. Cyber security For Dummies by Joseph Steinberg.
2. John G.Voller Black and Veatch, "Cyber Security" Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

Websites/ e-Learning Resources

1. https://www.fortinet.com/resources/cyberglossary/types-of-cyber-attacks
2. https://media.techtarget.com/rms/pdf/Securing_the_clicks.pdf

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10
CO1	3	3	3	3	2	2	2	3	3	3
CO2	3	2	3	2	3	3	2	3	3	3
CO3	3	2	3	3	2	3	3	3	3	3
CO4	2	2	2	3	2	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3
Total	14	12	14	14	12	14	12	15	15	15
Average	2.8	2.4	2.8	2.8	2.4	2.8	2.4	3	3	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS3301	E-Commerce Technology (T)	GE	4	3

This course aims to provide students with a comprehensive understanding of the concepts, technologies, and practices associated with E-Commerce . Students will learn the various applications of E-commerce, payment, security and Legal issues in E-Commerce.

Course Outcomes:

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

CO1: explain the basic concept of E-Commerce

CO2: describe the concepts of Internet and the Marketing

CO3: elucidate the importance of E- security

CO4: distinguish different types of electronic payment systems.

CO5: classify the concept of Mobile Commerce.

Unit I **12 Hours**

History of E-commerce and Indian Business Context: E-Commerce –Emergence of the Internet –Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India – Business Models for E-commerce: Business Model – E-business Models Based on the Relationship of Transaction Parties - E-business Models Based on the Relationship of Transaction Types.

Unit II **12 Hours**

Enabling Technologies of the World Wide Web: World Wide Web – Internet Client-Server Applications –Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. E-Marketing :Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-advertising – E-branding.

Unit III **12 Hours**

E-Security: Information system Security – Security on the Internet – E-business Risk Management Issues – Information Security Environment in India. Legal and Ethical

Issues : Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.

Unit IV **12 Hours**

E-Payment Systems: Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-based e-payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and e-Payment Systems – Designing e-payment Systems – Digital Signature – Online Financial Services in India - Online Stock Trading.

Unit V **12 Hours**

Information systems for Mobile Commerce: What is Mobile Commerce? – Wireless Applications –Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies –Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology.

Learning Resources:

Text Books

1. P.T.Joseph, S.J., "E-Commerce - An Indian Perspective", PHI 2012, 4th Edition.
2. E-Commerce Strategy, Technologies and Applications, Whitley, David, Tata McGrawHill, 2017

References

1. David Whiteley , "E-Commerce Strategy, Technologies and Applications", Tata McGraw Hill, 2001.
2. Ravi Kalakota, Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson 2006, 12th Impression.

Websites /e-Learning Resources

1. https://www.tutorialspoint.com/e_commerce/index.htm
2. https://www.geeksforgeeks.org/e-commerce/

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	1	3	2	3	2	2
CO2	2	2	2	3	3	3	2	2	2	3
CO3	2	2	3	2	1	3	1	2	3	3
CO4	3	3	2	3	1	3	2	2	3	3
CO5	3	2	2	3	2	3	2	1	3	3
Total	13	12	12	14	8	15	8	10	13	14
Average	2.6	2.4	2.4	2.8	1.6	3	1.6	2	2.6	2.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3303	Multimedia and its Applications (TcL)	GE	4	3

The aim of the course is to explore how Multimedia components are represented and handled effectively by various technologies and also to help to implement the Multimedia concepts through Photoshop and Flash Techniques.

Course Outcomes:

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

CO1: Infer with various technical aspects of multimedia systems and its elements.

CO2: Describe various file formats for audio, video and text media.

CO3: Apply the tools and perform creative editing on Photoshop.

CO4: Enhance digital images using advanced Photoshop techniques and vector drawing techniques.

CO5: Develop Flash applications with graphic content.

Unit I **12 Hours**

What is Multimedia? –Delivering Multimedia - Content and Copyrights -Resources for Multimedia Developers - Types of products–Evaluation - Computer Architecture - Operating Systems and Software - Multimedia Computers Architecture -Text: Elements of text- Text data files - Using text in Multimedia applications - Hypertext – Graphics: Element of Graphics - Images and Color - Graphics file and Application formats -Obtaining images for Multimedia use - Using Graphics in Multimedia Applications.

Unit II **12 Hours**

Characteristics of Sound and Digital Audio - Digital Audio Systems-MIDI - Audio File Formats -Using Audio in Multimedia Applications.

Unit III **12 Hours**

Exploring the Photoshop Workspace – Performing image basics –Understanding Colors, Histograms, Levels and Curves – Applying History and Actions – Working with Selections, Layers and Channels.

Unit IV **12 Hours**

Optimizing Adjustment workflow – Making Lighting and Color Adjustments – Applying Sharpness, Blur and Noise Adjustments – Cleaning up Digital images with Cloning and Healing Tools – Using Paint, Paths, Shapes and Text Tools: Editing with Paintbrush Tool – Working with Paths and Vector Shapes – Working with Text.

Unit V **12 Hours**

Starting Flash and opening a file - Getting to know the workspace - Understanding the Timeline, Using the Properties Inspector - Using the Tools. Working with Graphics- Flash drawing modes - Creating transparencies - Creating gradients - Creating and editing text - Creating and Editing Symbols: Importing Illustrator files - Creating symbols - Editing and managing symbols - Using rulers, guides, and grids - Adding Animation: Changing the pacing and timing - Changing the path of the motion - Creating nested animations - Using the Motion Editor.

Learning Resources:

Text Books

1. David Hillman, Multimedia Technology and Applications, Galgotia Publishers, 2013.
2. Lisa DaNae Dayley, Brad Dayley, Adobe Photoshop CS6 Bible, John Wiley & sons, 2012.
3. Adobe Flash Professional CS6, Classroom in a Book- The official training workbook from Adobe Systems, Adobe Press, 2012.

References

1. Bhattacharya Siddhartha and Paramartha Dutta, Multimedia Programming: A Practical Approach, Vikas Publishing, 2016.
2. Mark S. Drew, Fundamentals of Multimedia, Second Edition, Springer, 2014.
3. ITL Education Solution Limited, Computer Graphics and Multimedia, Xpress Learning Publications, 2012.
4. VK Jain, Introduction to Multimedia and Its Applications, Khanna Publishers, 2015.
5. D Evangeline, Computer Graphics and Multimedia, PHI Learning, 2014

Websites/ e-Learning Resources

1. https://www.javatpoint.com/photoshop
2. https://www.coursestuff.co.uk/DESI1182/docs/Flash%20tutorials.pdf
3. https://ptgmedia.pearsoncmg.com/imprint_downloads/peachpit/peachpit/academic/FlashCS6CIB_instructor_notes.pdf
4. https://thevirtualinstructor.com/adobeflashlessons.html

CO – PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	3	2	2	2	2
CO2	2	3	3	3	3	3	3	2	2	2
CO3	3	2	2	3	2	3	2	3	2	1
CO4	2	2	3	3	3	3	3	3	2	2
CO5	3	2	3	3	2	3	2	2	1	3
Total	13	12	14	14	11	15	12	12	9	10
Average	2.6	2.4	2.8	2.8	2.2	3	2.4	2.4	1.8	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3255	Internship	IS	-	2

This course will allow a student to observe and participate in professional work environments and explore how his interests relate to possible careers. They are important learning opportunities through industry exposure and practices.

Course Outcomes:

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

CO1: identify how the internship relates to their academic courses and preferred career path.

CO2: integrate existing and new technical knowledge for industrial application.

CO3: design solutions to real time complex engineering problems using the concepts of Computer Science through independent study.

CO4: demonstrate teamwork and leadership skills with professional ethics.

CO5: prepare an internship report in the prescribed format and demonstrate oral communication through presentation of the internship work.

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	2	2	2	2	2	2	2
CO2	3	3	3	2	2	3	2	2	2	2
CO3	3	3	3	3	3	3	2	2	2	2
CO4	3	3	3	3	3	3	2	2	2	2
CO5	3	3	3	3	3	3	2	2	2	2
Total	15	14	15	13	13	14	10	10	10	10
Average	3	2.8	3	2.6	2.6	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3203	System Administration & Maintenance (T)	SEC	3	2

To study the basic concepts of computer systems and operating systems. To configure the system installation, maintenance and troubleshooting.

Course Outcomes:

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

CO1: recall the fundamental concepts and responsibilities of system administration.

CO2: create and manage user accounts, permissions, and security settings.

CO3: discuss firewall and its types.

CO4: analyze the Installation and updation of software on various operating systems.

CO5: apply backup and recovery strategies.

Unit I **9 Hours**

Introduction to Personal Computer: Computer System-Purposes and Characteristics of Cases -Power Supplies-Internal Components -Ports-Cables-Input devices-Output devices. Role and Responsibilities of a System Administrator -Overview of Operating Systems (Windows, Linux, macOS) -Basic Command-Line Interface (CLI) Usage

Unit II **9 Hours**

Creating and Managing User Accounts -Group Management -Setting Permissions and Access Controls -User Authentication and Security.

Unit III **9 Hours**

Types – Limitations – Architecture – Functions – Advantages and Disadvantages of Firewall.

Unit IV **9 Hours**

Installing and Updating Software -Scheduling Tasks and Automating Maintenance -Managing System Services and Daemons -Monitoring System Performance.

Unit V **9 Hours**

Importance of Data Backup -Backup Methods and Tools -Implementing Backup Strategies -Restoring Data from Backups.

Learning Resources:

Text Books

1. David Anfinson & Ken Quamme, "ITEssentials: PC Hardware and Software Companion Guide",3rdEdition,Person Publication,2008.
2. Jan Bergstra and Mark Burgess, Handbook of Network and System Administration,2008.

References

1. Eleen Frisch,Essential System Administration, 3rdEdition, O'Reilly Media, Inc.,2002.
2. Quentin Docter, Emmett Dulaney and Toby Skandier, "CompT1A A+ Complete Review Guide: Exam 220-901, Exam 220-6021', 3rdEdition, Wiley Publications,2015.

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	1	1	1	2	2	2
CO2	2	2	2	2	1	1	2	2	2	3
CO3	3	2	3	3	2	2	2	3	2	3
CO4	3	2	2	3	2	1	3	2	2	3
CO5	2	3	3	2	1	2	2	3	2	3
Total	13	10	11	11	7	7	10	12	10	14
Average	2.6	2	2.2	2.2	1.4	1.4	2	2.4	2	2.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3602	Big Data Using R (T)	Core	6	6

This course enables the students to understand the Big Data Platform, Analytical theory and methods. Also gain knowledge about the introduction of R, Coding and Data analytics using R.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: discuss how to work with big data tools and its analysis techniques.

CO2: analyze data by utilizing clustering and classification algorithms.

CO3: gain knowledge on basics of R.

CO4: elaborate the control structures and coding standards of R programming.

CO5: demonstrate R scripts for performing data handling functions.

Unit I **18 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 **18 Hours**

Advanced Analytical Theory and Methods: 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 **18 Hours**

Benefits of using R-Unique features of R-Exploring R-Install-Packages- Working with code editor-First R session-navigating the workspace R-objects-Atomic Vectors-Attributes Matrices-Arrays-Class-Lists-Data Frames--Loading and Saving data.

Unit IV **18 Hours**

Control Structures- If-else-For Loops-While Loops-Repeat-Next - Break- Functions-Symbol Binding-R Scoping Rules-Optimization-Coding Standards-Dates and Time-Loop-Functions - lapply(), apply(), mapply(), tapply() - split - Debugging - Problem diagnosis - Reading Errors and Warnings-Reading error messages - Caring about warnings-Going Bug Hunting-Calculating the logit()-Knowing where an error comes from-Looking inside a function.

Unit V **18 Hours**

Entering data in the R text editor-Using the Clipboard to copy and paste-Reading data in CSV files, Reading data from Excel-Working with other data types. Manipulating and Processing Data-Deciding on the Most Appropriate Data Structure- Creating Subsets of Data- Adding Calculated Fields to Data- Combining and Merging Data Sets- Sorting and Ordering Data -Traversing Data with the Apply Functions- Getting to Know the Formula Interface- Working with Tables. Basic plotting - Manipulating the plotting window.

Learning Resources:

Text 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. Andrie De Vries, JorisMeys, R Programming for Dummies. ISBN 978-1-119-96284-7. John Wiley & Sons, 2012
3. Grolemund, Forword, Hadley Wickham, Garrett, Hands-On Programming with R,OREILLY Publishers. June 2014.

References

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Robert I. Kabacoff, R in Action, Data Analysis and Graphics with R, ISBN: 9781935182399, August 2011.
3. Viswa Viswanathan, Shanthi Viswanathan, R Data Analysis Cookbook. ISBN 10: 1783989068, 2015.
4. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

Websites/e-Learning Resources

1. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html
2. https://www.simplilearn.com
3. https://www.tutorialspoint.com/r/index.htm
4. https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	2	2	2	2	2	1	2
CO2	3	3	3	3	3	2	2	2	1	2
CO3	3	2	3	2	3	3	3	2	2	2
CO4	3	2	3	3	2	3	3	1	2	2
CO5	3	3	2	3	2	3	3	1	2	2
Total	15	13	13	13	12	13	13	8	8	10
Average	3	2.6	2.6	2.6	2.4	2.6	2.6	1.6	1.6	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3604	.NET Programming (TcL)	Core	6	6

This course enables the students to identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language. Also develop applications to solve real world problems.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: develop working knowledge of C# programming constructs and the .NET Framework.

CO2: develop a software to solve real-world problems using ASP.NET

CO3: implement file handling operations.

CO4: create a web application using MicrosoftADO.NET and SQL Server database.

CO5: develop web applications using XML.

Unit I **18 Hours**

Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String Operations.

Unit II **18 Hours**

Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.

Unit III **18 Hours**

Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting Files – File uploading.

Unit IV **18 Hours**

ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls And its Properties – Data Binding.

Unit V **18 Hours**

Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.

Learning Resources:

Text Book

1. Svetlin Nakov, Veselin Kolev& Co, Fundamentals of Computer Programming with C#, Faber publication,2019.
2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.

References

1. Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech Press,2013.
3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.
4. Danielle Otey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5. Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/introduction-to-net-framework/
2. https://www.javatpoint.com/net-framework

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	3	3	3	3	2	2	2	2	2
CO2	3	3	3	2	2	2	2	2	2	2
CO3	3	2	2	3	2	2	3	2	2	2
CO4	3	3	3	3	2	2	3	2	1	2
CO5	3	2	2	3	1	3	3	2	2	1
Total	14	13	13	14	10	11	13	10	9	9
Average	2.8	2.6	2.6	2.8	2	3	3	2	1.8	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3608	Project (L)	Core	6	6

This course aims to implement the acquired programming skills for solving real-time problems. This implements software engineering techniques to develop software projects in the industry. It enables the student to construct a new software system imparting the learned theory and practical programming skills.

Course Outcomes:

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

CO1: identify and classify the basics of a real-world problem into software solutions.

CO2: compute and illustrate standard design and the necessary environment.

CO3: classify and plan the relationships among project scheduling and planning process.

CO4: assess and measure the software development and implementation process.

CO5: manage with the adoption and revise on the improvement of the developed software.

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	2	2	2	2	2	2	2
CO2	3	3	3	2	2	3	2	2	2	2
CO3	3	3	3	3	3	3	2	2	2	2
CO4	3	3	3	3	3	3	2	2	2	2
CO5	3	3	3	3	3	3	2	2	2	2
Total	15	14	15	13	13	14	10	10	10	10
Average	3	2.8	3	2.6	2.6	2.8	2	2	2	2

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24COS3402	Introduction to Data Science (T)	DSE	5	4

This course aims to introduce the basic concepts of data science, data gathering, analysis and decision making to students. It helps them to analyze big data and make future predictions.

Course Outcomes:

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

CO1: describe the basics in Data Science and Big data.

CO2: elaborate overview and building process in Data Science.

CO3: compare various algorithms in Data Science to find the solution.

CO4: process large amounts of data using Hadoop Framework in Data Science.

CO5: assess the problem and design a solution for a real world subject.

Unit I **15 Hours**

Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science.

Unit II **15 Hours**

Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.

Unit III **15 Hours**

Machine learning algorithms – Modelling process – Types – Supervised – Unsupervised - Semi-supervised.

Unit IV **15 Hours**

Hadoop framework – Spark – replacing Map Reduce– NoSQL – ACID – CAP – BASE types.

Unit V **15 Hours**

Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation.

Learning Resources:

Text Books

1. Dr. M. Davamani Christober , "Concepts of Data Science Using R", Kanthaga Pookal pathipagam, First Edition, 2021.
2. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016.

References

1. Roger Peng, "The Art of Data Science", lulu.com 2016.
2. Murtaza Haider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.
3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.
4. Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017,1st Edition.

Websites/ e-Learning Resources

1. https://www.w3schools.com/datascience/
2. https://en.wikipedia.org/wiki/Data_science
3. http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	2	2	2	2	2	2	2	2	2
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	3	3	2	2	2	3	2	2	2
CO4	3	3	3	3	3	2	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	2
Total	14	13	13	12	12	11	13	10	10	10
Average	2.8	2.6	2.6	2.4	2.4	3	3	2	2	2

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS3404	Essentials of IoT (T)	DSE	5	4

The course aims to instill the knowledge of IoT devices, Tools and Methodology. On completion of this course the student will be able to create smart applications for various fields by using their knowledge on IoT.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Demonstrate the designs and levels of IoT.

CO2: Identify and utilize Domain Specific IoT.

CO3: Discover IoT design methodology, devices and Endpoints.

CO4: Interpret IoT design using case studies.

CO5: Elaborate Data analytics for IoT and tools for IoT.

Unit I **15 Hours**

Introduction – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT Levels & Deployment Templates.

Unit II **15 Hours**

Introduction – Home automation – Cities – Environment – Energy – Retail – Logistics – Agriculture–Industry – Health & Lifestyle –IoT and M2M: Introduction–M2M– Difference between IoT and M2M – SDN and NFV for IoT – Software Defined Networking–Network Function Virtualization.

Unit III **15 Hours**

Introduction – IoT Design Methodology – IoT Physical Devices and Endpoints: – What is an IoT device – Exemplary Device: RaspberryPi – About the Board – Linux on RaspberryPi – RaspberryPi Interfaces–Programming Raspberry Pi with Python – Other IoT devices.

Unit IV **15 Hours**

Introduction – Home Automation – Smart Lighting – Home Intrusion Detection – Cities –Smart Parking – Environment –Weather Monitoring System – Weather Reporting Bot – Air Pollution Monitoring – Forest Fire Detection – Agriculture – Smart Irrigation – Productivity Applications.

Unit V **15 Hours**

Introduction–Apache Hadoop–Using Hadoop Map Reduce for Batch Data Analysis–Apache Oozie – Apache Spark – Apache Storm – Using Apache Storm for Real-time data analysis. Tools for IoT: Introduction–Chef–Chef case studies–Puppet–Puppet case study.

Learning Resources:

Text Book

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things–A Hands-on Approach", Universities Press (India)Private Limited,2016.

References

1. Peter Waher, "Learning Internet of Things", PACKT Publishing,2015.
2. Cuno Pfister, "Getting Started with the Internet of Things", O'Rielly Publication, 2011
3. Francis Da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", A press open publication, 2013 Edition.

Websites/e-Learning Resources

1. https://www.tutorialspoint.com/internet_of_things/index.htm
2. https://www.edureka.co/blog/iot-tutorial/
3. https://www.youtube.com/watch?v=LlhmzVL5bm8&list=PL9ooVrP1hQOGccfBbP5tJWZ1hv5sIUWJl
4. https://www.tutorialspoint.com/internet_of_things/index.html

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	2	1	2	2	2	2	2
CO2	3	2	3	2	2	2	2	2	2	2
CO3	3	3	2	2	3	2	2	1	2	2
CO4	3	3	2	2	2	2	2	2	1	2
CO5	3	3	3	2	2	2	1	2	2	1
Total	15	14	12	10	10	10	9	9	9	9
Average	3	2.8	2.4	2	2	2	1.8	1.8	1.8	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3406	Data Mining and Data Warehousing (T)	DSE	5	4

This course aims to provide knowledge on Data Mining and Warehousing concepts and techniques. Students will learn the concepts of Data Mining, Architecture and Comparison. To equip the student with knowledge in Mining Association Rules, Classification and Prediction, the basic concepts of Cluster analysis and Cluster Methods.

Course Outcomes:

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

CO1: describe the concepts of Data mining and its process.

CO2: explain the Architecture and Characterization of Data mining.

CO3: illustrate Association Rules from Databases.

CO4: identify Classification and Prediction.

CO5: demonstrate Cluster Analysis and Clustering methods.

Unit I **15 Hours**

Data mining Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction.

Unit II **15 Hours**

Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures.

Unit III **15 Hours**

Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multidimensional Association Rules from Relational Database and Data Warehouses.

Unit IV **15 Hours**

Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy.

Unit V **15 Hours**

Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method.

Learning Resources:

Text Book

1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

References

1. K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi
2. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019

Websites/ e-Learning Resources

1. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
2. https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	2	1	2	2	2	3
CO2	3	3	3	2	3	2	3	2	1	3
CO3	3	3	3	3	3	2	2	2	2	3
CO4	3	3	3	2	3	2	2	2	2	3
CO5	3	3	3	2	3	2	1	1	1	3
Total	15	15	15	11	14	9	10	9	8	15
Average	3	3	3	2.2	2.8	1.8	2	1.8	1.6	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3302	Web Services (TcL)	GE	4	3

This course aims to provide students with a comprehensive understanding of tools and technologies related to web services. Students will learn how to design, develop, and deploy web services using standard protocols and tools.

Course Outcomes:

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

CO1: explain the basic principles and concepts of web services.

CO2: distinguish different types of web services proficiently.

CO3: create and design structured XML and JSON documents

CO4: use WSDL to build SOAP based web service.

CO5: apply RESTful web services in various applications.

Unit I **12 Hours**

Definition and generations of web services – Working of web service – Characteristics and users of web service – Advantages of web service.

Unit II **12 Hours**

Architecture of web service – Types of web service – Web service data formats: XML and JSON – Tools for web service.

Unit III **12 Hours**

Introduction to XML – Structure of XML documents – XML schema and validation. Introduction to JSON –Structure of JSON document – JSON schema – Creating and Parsing XML/JSON document.

Unit IV **12 Hours**

Overview of SOAP –SOAP message structure - Communication model – Web Service Description Language.

Unit V **12 Hours**

Overview of RESTful – RESTful key elements – methods – Architecture – Creating and Consuming RESTful web service.

Learning Resources:

Text Books

1. "Web Services: An Introduction" by B.V. Kumar and S.V. Subrahmanya, McGraw Hill Education (9 January 2012).
2. "Web Services: Principles and Technology" by Michael P. Papazoglou, Prentice Hall, 1st edition (January 1, 2007)

References

1. Xml and Web Services , Ron Schmelzer, Pearson Published, 2013.
2. Understanding Web Services XML, WSDL, SOAP, and UDDI By Eric Newcomer 2002

Websites /e-Learning Resources

1. https://www.guru99.com/web-services-tutorial.html
2. https://www.javatpoint.com/web-services-tutorial

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	2	1	2	2	1	3
CO2	3	2	2	2	2	2	2	2	1	3
CO3	3	3	3	2	2	3	2	2	2	3
CO4	3	2	3	2	1	2	1	2	2	3
CO5	3	2	3	2	1	2	1	1	2	3
Total	15	12	13	11	8	10	8	9	8	15
Average	3	2.4	2.6	2.2	1.6	2	1.6	1.8	1.6	3

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24COS3304	Fundamentals of Programming (T)	GE	4	3

This course enables the student to understand the basics of programming languages, operating systems, algorithms, flowcharts, examples, applications of programming languages and number systems. It is also helpful for students to learn the basics of the C programming language and build simple applications.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: To discuss the basics of programming languages and operating systems.

CO2: Explain the algorithms, flow charts and application of programming languages

CO3: Gain knowledge on basics of C Programming

CO4: Learn the control structures and iterative statements

CO5: Describe the concepts of arrays and string library functions

Unit I **12 Hours**

Introduction –Von Neumann concept - storage – programming languages – Translators -Hardware and Software – Operating systems

Unit II **12 Hours**

Problem Analysis – Algorithms- Flow charts-Examples of Algorithms and Flowcharts - Introduction to Programming Languages –Examples and applications of programming Languages

Unit III **12 Hours**

Programming in C: The C Character Set – Tokens – Identifiers – Keywords – Data Types – Constants - Variables – Operators – Structure of a C program – Formatted input/output functions – Unformatted input/output function.

Unit IV **12 Hours**

Conditional statements- simple if – if else – ladder if -Iterative programs using loops- While- do-while- for statements-nested loops- switch-break- Continue- and goto statements.

Unit V **12 Hours**

Declaring Arrays – Accessing array elements – Initializing Arrays – Types of Arrays – Strings – String Library Functions.

Learning Resources:

Text Books

1. Balagurusamy, "Introduction to Computing & Problem Solving Using Python", McGraw Hill Education, 2016.
2. Balagurusamy.E, " Programming in ANSI C", Eighth Edition, Tata McGraw Hill-2019.

References

1. Kanetkar Y, "Let us 'C' ", 16th edition BPB publications, 2017.
2. Ashok N.Kamthane , "Programming in C" , Pearson Education, 2012.

Website/ e-learning resources

1. https://onlinecourses.nptel.ac.in/noc23_cs93/preview

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	2	2	2	2	2
CO2	3	2	2	2	1	1	2	2	2	2
CO3	3	1	1	2	2	2	2	2	2	2
CO4	3	3	3	2	2	2	1	2	2	1
CO5	3	3	2	1	2	1	2	1	1	2
Total	15	12	11	9	9	8	9	9	9	9
Average	3	2.4	2.2	1.8	1.8	1.6	1.8	1.8	1.8	1.8

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS3266	Professional Competency Skill (T)	SEC	3	2

This course is designed to cultivate student awareness about various competitive examinations, providing the necessary guidance to inspire and prepare them for potential careers in both the government and corporate sectors.

Course Outcomes:

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

CO1: develop a thorough understanding of the core subjects relevant to competitive examinations.

CO2: develop the ability to analyze complex situations, identify problems, and propose viable solutions.

CO3: demonstrate effective decision-making skills by considering various perspectives and potential outcomes.

CO4: develop effective networking skills to build and maintain professional relationships.

CO5: embrace the importance of lifelong learning and continuous professional development to stay current in the field.

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	1	2	2	2	3	1	1	1	2
CO2	3	1	3	3	2	2	2	1	1	2
CO3	2	2	3	3	2	2	2	2	2	2
CO4	2	3	2	2	2	2	3	2	2	2
CO5	3	1	2	2	2	2	2	2	2	3
Total	13	8	12	12	10	11	10	8	8	11
Average	2.6	1.6	2.4	2.4	2	2.2	2	1.6	1.6	2.2

Strong – 3 Medium – 2 Low – 1

Department of Computer Science (UG)

VALUE ADDED COURSES

Sem	Course Code	Course Title	Hours/Wk.	Credits
2	24COS122V	Digital Communication Skills	2	2
3	24COS221V	Essentials of E-learning	2	2
5	24COS321V	Network Security	2	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS122V	Digital Communication Skills	VAC	2	2

The course aims at gaining knowledge in the development of information and communication technologies, the required knowledge and skills in view of achieving general digital literacy in student. This course also focuses to equip the student with advanced digital media skills, technical abilities to take on the communication industry challenges.

Course Outcomes:

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

CO1: Outline the importance and identify the types of communication employed in personal and professional environment

CO2: Evaluate the possibilities and problems associated with the use of technology

CO3: Implement computer-based technology in communicating and acquiring information

CO4: Choose employment opportunities in the field of digital media and communication landscape.

CO5: Produce work that contributes knowledge and expresses creativity with competent and effective communication skills in media across written, oral, visual, and interactive forms.

Unit I **6 Hours**

Digital Communication - Modern technologies in digital Communication – Need for Effective Communication - Tools for digital communication: Video Tapes- Video Conferencing- Blogging - Instant Messaging (IM) - Messages through Mobile Phones - CALL (Computer Assisted Language Learning) - Educational Satellites - Internet - Pod casting. Wearable Technology -Virtual Reality.

Unit II **6 Hours**

Generations of Modern Computers – Classification of Digital Computer Systems –

Introduction to Computer Software – Software Development – General Software Features and Trends – Computer in Business and Industry – Computers at Home – Computers in Education and Training – Computers in Entertainment – Science – Medicine and Engineering.

Unit III **6 Hours**

Internet & World Wide Web – How Internet Works – Getting connected – Internet Addressing -Web Browsers and Web Browsing – Searching the Web – Communicating Using E-Mail– Websites and WebPages – Computer Security – Computer Viruses – Bombs and Worms - Virus Protection.

Unit IV **6 Hours**

Social Networking and My Privacy – Pros and Cons in Social media - Cyber bullying – Electronic Publishing –Newsgroups – Mailing Lists and Discussion Forums – Chat – Internet Telephony (VoIP)

Unit V **6 Hours**

Physical barriers - Emotional barriers -Identity barriers - Semantic barriers - Accessibility barriers - Attention barriers - Credibility barrier - Overcoming barriers in digital communication.

Learning Resources:

Text Books

1. Nisha Clement,"Essentials of Communication and Education Technology", Jaypee Brothers Medical Publishers, May 2019.
2. Elizabeth Kuhnke, "Communication Essentials for Dummies", Wiley Publishing Australia Pty. Ltd. (P), 2018.
3. Alexis, Leon & Mathews, Leon, "Internet for Everyone", Vikas Publishing, 15thed, 2012.

References

1. Alexis, Leon & Mathews, Leon, "Fundamentals of Information Technology", Vikas Publishing. (2nd ed.), 2009.
2. https://www.simplilearn.com/introduction-to-digital-transformation-tutorial
3. https://www.govloop.com/community/blog/7-barriers-digital-communication/

Websites/ e-Learning Resources

1. https://online.stanford.edu/courses/ee279-introduction-digital-communication

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	2	3	3	2	2	2
CO2	3	2	3	2	2	3	1	2	1	2
CO3	3	3	2	3	1	1	2	2	2	2
CO4	3	1	1	3	2	3	2	1	2	2
CO5	2	2	3	2	1	2	2	1	1	1
Total	14	10	12	13	8	12	10	8	8	9
Average	2.8	2	2.4	2.6	1.3	2.4	2	1.6	1.6	1.8

Strong – 3 Medium – 2 Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS221V	Essentials of E-learning	VAC	2	2

This course aims to provide a comprehensive understanding of e-learning and practical skills for creating effective e-learning content. The course emphasizes design, create, and implement effective E-Learning solutions using a variety of tools and technologies.

Course Outcomes:

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

CO1: describe history, key terminologies, and different types of e-learning.

CO2: apply instructional design models to create multimedia-rich e-learning content.

CO3:access and utilize E-Learning resources.

CO4: examine the use of standard objects to enhance the interactivity.

CO5:enhance E-Learning experiences in current technologies.

Unit I **6 Hours**

Introduction to E-Learning - history and evolution of E-Learning - definitions and terminologies - types of E-Learning: synchronous, asynchronous and blended - benefits and challenges.

Unit II **6 Hours**

Designing E-Learning - instructional design principles - ADDIE model - dick and carey model - E-Learning content development: text - images - audio - video. Tools for creating E-Learning content development: articulate storyline, adobe captivate.

Unit III **6 Hours**

Introduction to E-Learning resources – types of E-Learning resources: digital print – digital audio – digital video – web based resources. Accessing E-Learning resources: navigating online databases and digital libraries - overview of E-Learning platforms: SWAYAM – NPTEL – Spoken Tutorial – Free and Open Source Software (FOSS) – Cyber Shikshaa – eGyankosh – Shodhganga.

Unit IV **6 Hours**

E-content creation tools: visual content creation tools – image sourcing, creating, editing and uploading tools – interactive content creation tools – infographic and chart maker tools – powerpoint presentation tools – audio creation tools – video creation tools.

Unit V **6 Hours**

Current technologies in E-Learning : virtual reality – augmented reality – artificial intelligence – gamification – microlearning – mobile learning – prescient learning analytics – cloud services - remote virtual laboratories.

Learning Resources:

Text Book(s)

1. Clark, Ruth C., and Richard E. Mayer. E-learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. 4th ed., Wilcy, 2016.

2. Jaisingh, Pooja, and Damien Bruyndonckx. Mastering Adobe Captivate 2019. Packt Publishing, 2019.

References

1. Carliner, Saul, and Patti Shank, editors. The E-learning Handbook: Past Promises, Present Challenges. Pfeiffer, 2008.

2. Siegel, Kevin A. Adobe Captivate 2019: The Essentials. Icon Logic, 2019.

Websites/ e-Learning Resources

1. https://elearning.adobe.com/tutorial/

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	3	2	2	2	2
CO3	3	2	2	2	2	3	2	1	2	2
CO4	3	2	2	1	2	3	2	2	1	3
CO5	3	2	2	1	2	3	2	1	1	3
Total	15	10	10	8	10	15	10	8	8	12
Average	3	2	2	1.6	2	3	2	1.6	1.6	2.4

Strong – 3 **Medium – 2** **Low – 1**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24COS321V	Network Security	VAC	2	2

The course aims at to provide an introduction to firewalls and other network security components that can work together to create an in-depth defensive perimeter around LAN. This course also provides knowledge on other elements like packet filtering, encryption, proxy servers and virtual private networks. In completion of this course the student will be able to secure a network.

Course Outcomes:

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

CO1: Identify various goals of information security, building security policy.

CO2: Build Firewall types and its functions.

CO3: Apply various Packet Filtering rules to control network access.

CO4: Classify encryption and decryption techniques to solve problems based on confidentiality.

CO5: Assess how a secure connection is established between different users using VPN.

Unit I **6 Hours**

Overview - Goals of security policy – Steps to build security policy

Unit II **6 Hours**

Types – Limitations – Architecture – Functions – Advantages and Disadvantages of Firewall

Unit III **6 Hours**

Approaches – Packet filter rules - Proxy server: Overview – Goals – Choosing proxy server - Authenticating users

Unit IV **6 Hours**

Cost of encryption – Preserving data integrity – Maintaining confidentiality - Digital Certificates – Public and Private keys – Encryption schemes

Unit V **6 Hours**

Components – Operations – Advantages and Disadvantages – Types of VPN – VPN setup

Learning Resources:

Text Book

1. William stallings, "Cryptography & Network Security Principles & Practice", 7th Edition, Pearson education, Incorporated, 2016.

References

1. Holden, "Guide to firewalls and Network security", Vijay Nicole publications, 2005 .
2. Christopher M king, Curtis E. Dalton, T.Ertem Osmanoglu, "Security Architecture Design, Deployment & Operations", Osborne/McGraw-Hill, 2001

Websites/ e-Learning Resources

1. https://www.tutorialspoint.com/network_security/index.htm

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	2	2	3	2	1	2
CO2	2	2	2	2	2	2	2	2	2	2
CO3	3	1	2	2	3	1	1	1	2	2
CO4	3	1	2	1	1	1	1	3	2	1
CO5	3	3	2	2	1	2	2	2	2	1
Total	14	9	9	9	9	8	9	10	9	8
Average	2.8	1.8	1.8	1.8	1.8	1.6	1.8	2	1.8	1.6

Strong – 3 Medium – 2 Low – 1