Department of BCA

Programme Specific Outcomes (PSOs)

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

PSO1 **Disciplinary Knowledge**	demonstrate basic knowledge of computer applications and apply standard practices in developing software applications.
PSO2 **Communication Skills**	communicate effectively on computing activities in visual, verbal, and written forms using techniques appropriate in various contexts.
PSO3 **Problem Solving**	apply theoretical foundations of computer applications with emphasis on strong practical training to find solutions for problems in societal and environmental contexts.
PSO4 **Analytical Reasoning**	analyze complex computing problems through design of algorithms and interpretation of data to arrive at valid conclusions.
PSO5 **Research Skills**	carry out research in the advanced areas of computer applications to address the demands of the social development.
PSO6 **Digital Literacy**	utilize modern computing tools, skills and techniques to find the optimum software solutions for the betterment of society.
PSO7 **Leadership and Teamwork**	contribute and collaborate effectively as a member or a leader on multidisciplinary teams to accomplish a common objective in implementation of professional applications.
PSO8 **Moral and Ethical Awareness/Reasoning**	provide ethical solutions within the boundaries and responsibilities of professional computing practices and cyber regulations.
PSO9 **Multicultural Competence**	participate effectively in technical, cultural events with social and ethical responsibility as an individual or as a team member with positive attitude.
PSO10 **Self-directed & Lifelong Learning**	recognize the need for self-motivation to engage in lifelong learning to be in par with changing technology.

Department of BCA
Learning Outcomes-based Curriculum Framework (LOCF)
(w.e.f 2024-2025)

Sem	Part	Course Code	Course Title	Hours /Wk.	Credits	Marks
1	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
1	II	24XXXNNNN	English	3	2	30
1	III CC	24BCA1401	C Programming	4	4	60
1	III CC	24BCA1501	Computer Fundamentals	5	5	75
1	III CC	24BCA1403	C Programming Lab	4	4	60
1	III S	24XXXNNNN	*Offered by Commerce*	5	4	60
1	IV NME	24XXXNNNN	*Non Major Elective–I*	3	2	30
1	IV AEC	24BCA1200	Environmental Studies	3	2	30
1	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/GNS/LIB/ACH	-	-	-
			Total	**30**	**25**	**375**
2	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
2	II	24XXXNNNN	English	3	2	30
2	III CC	24BCA1402	Object Oriented Programming Concepts using C++	4	4	60
2	III CC	24BCA1502	Data Structures and Algorithms(TcL)	5	5	75
2	III CC	24BCA1404	Object Oriented Programming Concepts using C++ Lab	4	4	60
2	III S	24XXXNNNN	*Offered by Commerce*	5	4	60
2	IV NME	24XXXNNNN	*Non Major Elective–II*	3	2	30
2	IV AEC	24HVS/ CHR1200	Human Values Development/ Christian Studies	3	2	30
2	V	24XXXNNNN	NSS/NCC/PED/SLP/GMP/ GNS/LIB/ACH	-	1	15
			Total	**30**	**25+1**	**375+15**
3	I	24XXXNNNN	Tamil / Hindi / French	3	2	30
3	II	24XXXNNNN	English	3	2	30
3	III CC	24BCA2401	RDBMS with PL/SQL	4	4	60
3	III CC	24BCA2403	Web Programming	4	4	60
3	III CC	24BCA2405	Operating Systems	4	4	60
3	III CC	24BCA2407	RDBMS with PL/SQL Lab	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	Tamil / Hindi / French	3	2	30
4	II	24XXXNNNN	English	3	2	30
4	III CC	24BCA2402	Programming in Java	4	4	60
4	III CC	24BCA2404	Computer Networks	4	4	60
4	III CC	24BCA2406	Dot Net Programming (TcL)	4	4	60
4	III CC	24BCA2408	Programming in Java Lab	4	4	60
4	III S	24XXXNNNN	*Offered by Mathematics*	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**

Sem	Part	Course Code	Course Title	Hours/ Wk.	Credits	Marks
5	III CC	24BCA3601	Software Engineering	6	6	90
5	III CC	24BCA3603	Python Programming (TcL)	6	6	90
5	III CC	24BCA3605	Mobile Application Development (TcL)	6	6	90
5	III DSE	24XXXXXNN	*Discipline Specific Elective - I*	5	4	60
5	III GE	24XXXXXNN	*Generic Elective – I*	4	3	45
5	IV IS	24BCA3255	Internship*	-	2	30
5	IV SEC	24XXXNNNN	*Skill Enhancement Course - III*	3	2	30
			Total	**30**	**29**	**435**
6	III CC	24BCA3602	Machine Learning (TcL)	6	6	90
6	III CC	24BCA3604	Data Science Using R Programming (TcL)	6	6	90
6	III CC	24BCA3606	Project	6	6	90
6	III DSE	24XXXXXNN	*Discipline Specific Elective – II*	5	4	60
6	III GE	24XXXNNNN	*Generic Elective - II*	4	3	45
6	IV SEC	24BCA3266	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	24BCA3401/ 24BCA3403/ 24BCA3405	Cloud Computing/ Software Project Management/ Artificial Intelligence	5	4	60
6	III	24BCA3402/ 24BCA3404/ 24BCA3406	IOT and its Applications / Information Security/ Human Computer Interaction	5	4	60

Supportive (offered to Commerce)

Sem	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
1	III	24BCA1405	Programming in C (TcL)	5	4	60
2	III	24BCA1406	Programming in C++ (TcL)	5	4	60

Generic Elective (GE)

Sem	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
5	III	24BCA3301/ 24BCA3303	Introduction to HTML / Digital Marketing	4	3	45
6	III	24BCA3302 / 24BCA3304	Advanced Excel/ Introduction to Data Science	4	3	45

Part IV

Non-Major Electives (NME)

Sem	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
1	IV	24BCA1201	Office Automation (TcL)	3	2	30
2	IV	24BCA1202	Multimedia Systems	3	2	30

Skill Enhancement Courses (SEC)

Sem	Part	Course Code	Course Title	Hours/Wk.	Credits	Marks
3	IV	24BCA2201	Open Source Technologies	3	2	30
4	IV	24BCA2202	Enterprise Resource Planning	3	2	30
5	IV	24BCA3201	Cyber Security	3	2	30

Mapping with POs

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

Mapping of Courses with PSOs

Courses	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
24BCA1401	3	3	3	3	2	3	3	2	3	3
24BCA1501	3	3	3	3	1	3	3	2	2	2
24BCA1403	3	3	3	3	3	3	3	2	2	2
24BCA1402	3	3	3	3	2	3	2	2	2	3
24BCA1502	3	3	3	3	3	3	3	3	3	3
24BCA1404	3	3	3	3	3	3	3	3	3	3
24BCA1200	3	3	2	2	3	3	3	3	2	2
24BCA2401	3	3	3	3	3	3	2	1	2	2
24BCA2403	3	3	3	2	2	2	2	1	2	3
24BCA2405	3	3	3	3	1	3	2	1	2	2
24BCA2407	3	3	3	3	3	3	3	2	2	2
24BCA2402	3	3	3	2	2	3	2	2	2	2
24BCA2404	3	3	2	2	2	2	2	1	2	2
24BCA2406	3	3	3	3	2	2	2	2	2	2
24BCA2408	3	2	3	2	2	2	2	2	2	2
24BCA3601	3	3	3	2	1	2	2	2	2	2
24BCA3603	3	3	3	2	3	2	2	1	1	1
24BCA3605	3	3	2	3	2	3	2	2	1	1
24BCA3602	3	3	3	3	3	3	2	2	2	3
24BCA3604	3	3	3	3	3	3	3	2	3	3
24BCA3606	3	3	3	3	3	3	3	3	3	3
24BCA3401/ 24BCA3403/ 24BCA3405	3	3	3	3	3	3	3	2	2	2
24BCA3402/ 24BCA3404/ 24BCA3406	3	3	3	2	2	2	2	2	2	2
24BCA3255	3	3	3	3	3	3	3	3	3	3
24BCA3266	3	3	3	3	3	3	3	3	3	3
Average	**3.0**	**3.0**	**2.9**	**2.7**	**2.4**	**2.7**	**2.5**	**2.0**	**2.2**	**2.3**

Mapping of Courses with POs

Courses	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
24BCA1405	3	3	3	2	2	2	2	2	2	2
24BCA1406	3	3	3	3	3	2	2	2	2	2
24BCA3301/ 24BCA3303	3	3	3	2	2	2	2	2	2	2
24BCA3302/ 24BCA3304	3	3	3	2	2	2	2	1	2	2
24BCA1201	3	3	3	2	2	2	2	2	3	2
24BCA1202	3	3	3	2	3	2	2	2	2	2
24BCA2201	3	3	3	3	3	2	2	2	2	2
24BCA2202	3	2	3	3	3	2	2	2	2	2
24BCA3201	3	3	2	2	3	2	2	1	1	2
Average	**3.0**	**2.9**	**2.9**	**2.3**	**2.6**	**2.0**	**2.0**	**1.8**	**2.0**	**2.0**

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA1401	C Programming	Core	4	4

The objective of this course is to enable the students to understand code organization, functional hierarchical decomposition and enhance problem-solving skills through C programming.

Course Outcomes:

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

CO1: explain the fundamentals and the basic concepts of C programming language.

CO2: use knowledge gained about operators and control statements to write programs.

CO3: apply concepts of arrays and work with strings for solving problems.

CO4: create programs using functions, structures, and unions

CO5: write programs using pointers, and preprocessors.

Unit I 12 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.

Unit II 12 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 12 Hours

Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.

Unit IV 12 Hours

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 V: **12 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.

Learning Resources:

Text Book(s)

1. E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.

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

4. Aileen Chris.P, Computing Techniques in C, Himalaya Publishing House, 2019

Websites/e-Learning Resources/e-Learning Resources

1. https://www.geeksforgeeks.org/c-programming-language/

2. http://learn-c.org/

3. https://www.cprogramming.com/

CO - PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	1	2	2	2	3	2
CO 2	3	3	3	3	2	3	3	2	3	3
CO 3	3	3	3	3	2	3	3	2	3	3
CO 4	3	3	3	3	2	3	3	2	3	3
CO 5	3	3	3	3	2	3	3	2	3	3
Average	3	3	2.8	2.8	1.8	2.8	2.8	2	3	2.8

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA1501	Computer Fundamentals	Core	5	5

The objective of this course is to enable the students to understand the fundamentals of computer components, operating system and its working, functions of Networking, concept of DBMS and the various problem-solving methods.

Course Outcomes:

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

   CO1: summarize the fundamentals of computer and hardware.

   CO2: explain the concept of computer memory and I/O devices

   CO3: describe software and its types and perform number conversions

   CO4: analyze functions of OS and DBMS

   CO5: discuss the basics of networks and steps involved in problem solving

Unit I: **15 Hours**

Basics of Computer : Analog and Digital Computers - Characteristics of Computers – History of Computer – Classification of Computer – The Input-Process-Output Concept – Components of Computer hardware – Application of Computers – The Computer System Hardware : Central Processing Unit –Memory Unit Instruction Format – Instruction Set- Instruction Cycle – Interconnecting the Units of computer

Unit II: **15 Hours**

Memory representation – Memory Hierarchy – CPU Registers – Cache Memory – Primary Memory – Secondary Memory – Magnetic Tape- Magnetic Disc- Optical Disc – I/O Devices: Input Devices – output devices

Unit III: **15 Hours**

Number System: Decimal Number System – conversion from decimal to binary, octal , hexadecimal - conversion from binary to decimal, octal , hexadecimal – Binary Arithmetic – Types of Software – System software – application Software

Unit IV: **15 Hours**

Objective of OS – Functions of OS – Types of OS – Examples of OS – DBMS: data independence- data dictionaries- DBA- Components of DBMS – Architecture of DBMS- Database Languages- Database system architecture- Database Applications

Unit V: **15 Hours**

Network Types- Communication Protocols – Network Devices- application of Computer Networks - Program development lifecycle – Algorithm - Control Structures – Flow chart – Pseudo code- Programming paradigms

Learning Resources:

Text Book (s)

1. Computer Fundamentals, Anita Goel, Pearson Education India 2010.
2. Introduction to Computers, Peter Norton, McGraw-Hill Education, 7th edition, 2013.

References

1. Brian Williams, Stacey Sawyer,Using Information Technology : A Practical Introduction to Computers & Communication ,2005
2. E Balagurusamy, Fundamentals of Computers, , McGrawHill Education India 2014.
3. Thomas C.Bartee , Digital Computer Fundamentals, 6th Edition, Tata McGraw Hill Publishers. 2014.
4. Gary Shelly, Discovering Computers, Fundamentals, Misty Vermaat, 2011, Cengage Learning.

Websites/e-Learning Resources/e-Learning Resources

1. www.tutorialspoint.com/computer_fundamentals.
2. https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html

CO - PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	1	2	2	2	2	2
CO 2	3	3	3	3	1	3	3	2	2	2
CO 3	3	3	3	3	1	3	3	2	2	2
CO 4	3	3	3	3	1	3	3	2	2	2
CO 5	3	3	3	3	1	3	3	2	2	2
Average	3	3	2.8	2.8	1	2.8	2.8	2	2	2

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24BCA1403	C Programming Lab	Core	4	4

The objective of the course aims to introduce the students about the basic knowledge of programming fundamentals in C language and to impart writing skills in C Programming to solve problems.

Course Outcomes:

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

CO1: explain the fundamentals and the basic concepts of C programming language.

CO2: describe about operators and control statements to write programs.

CO3: apply the concepts of arrays and work with strings for solving problems.

CO4: create programs using functions, structures, and unions

CO5: write programs using pointers, preprocessors.

Total – 60 Hours

LIST OF EXERCISES

1. Write a C Program using various data types.
2. Write a C Program using local, global, and static variables.
3. Write a C Program using various operators.
4. Write a C Program using formatted I/O.
5. Write a C Program using if statement.
6. Write a C Program using if … else statement.
7. Write a C Program using switch statement.
8. Write a C Program using for statement.
9. Write a C Program using while statement.
10. Write a C Program using do … while statement.
11. Write a C Program using 1-D numeric array.
12. Write a C Program using 2-D numeric array.
13. Write a C Program using built-in functions.
14. Write a C Program using call by value.
15. Write a C Program using pass by reference.
16. Write a C Program using user-defined function and 1-D array.
17. Write a C Program using mathematical functions.
18. Write a C Program using 1-D character array.

19. Write a C Program using 2-D character array.

20. Write a C Program for string handling functions.

21. Write a C Program using structure.

22. Write a C Program using pointers.

23. Write a C Program using command line arguments.

24. Write a C Program using recursive function.

Learning Resources:

Text Book(s)

1. E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.

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. YashavantKanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021

4. Aileen Chris. P, Computing Techniques in C, Himalaya Publishing House, 1st Edition 2019

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/c-programming-language/

2. http://learn-c.org/

3. https://www.cprogramming.com/

CO - PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	2	2	1
CO 2	3	3	2	3	3	3	2	1	2	2
CO 3	2	3	3	2	3	3	3	1	2	3
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	3	3	3	3	2	3	2	2	2
Average	2.8	3	2.8	2.8	3	2.8	2.8	1.6	2	2

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24BCA1201	Office Automation (TcL)	NME	3	2

The objective of this course is to enable the students to understand the various components of Computer System, various skills, knowledge and competency in using Microsoft Office applications and tools for improved office productivity.

Course Outcomes:

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

    CO1: explain the fundamentals of computer components.

    CO2: describe the concepts of word processing package.

    CO3: apply the various functions in excel spreadsheets

    CO4: write Queries to access the Database effectively.

    CO5: develop presentations using Power point.

Unit I: **9 Hours**

Memory Unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS– UNIX–Windows. Introduction to Programming Languages.

Unit II: **9 Hours**

Open, Save and close word document; Editing text – tools, formatting, bullets; Spell checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.

Unit III: **9 Hours**

Excel–opening, entering text and data, formatting, navigating; Formulas–entering, handling and copying; Charts–creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.

UNIT IV: **9 Hours**

The concept of data base management system; Data field, records, and files, Sorting and

indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language(MS–Access).

Unit V: **9 Hours**

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

Learning Resources:

Text Book(s)

1.   Peter Norton,"Introduction to Computers"–Tata McGraw –Hill, 6th edition, 2008
2.   Misty E. Vermaat. "Microsoft Office 365 & Office: Introductory"2019**.**
3.   Peter Weverka "OfficeAll-in-One for Dummies" 2019.

References

1.   Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", TataMcGrawHill.The complete Reference – Office 2000, Stephen L.Nelson, Tata McGraw Hill publishing Company Limited.

2.   Window   and   MS   Office   2000   with   Database   Concepts,   N.Krishnan, SciTechpublications(India) Pvt Ltd., Chennai.

Websites/e-Learning Resources

1.   https://www.udemy.com/course/office-automation-certificate-course/
2.   https://www.javatpoint.com/automation-tools

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	3	1	2	1	3	2	2	1
CO 2	3	3	3	2	3	2	1	2	3	1
CO 3	3	3	3	3	1	3	1	2	3	1
CO 4	3	3	2	3	1	3	3	2	2	2
CO 5	3	3	2	2	1	2	1	2	3	3
Average	3	3	2.6	2.2	1.6	2.2	1.8	2	2.6	1.6

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA1200	Environmental Studies	AEC	3	2

The objective of this course is to create awareness among the students about the importance of environment, the effect of technology on the environment and its ecological balance.

Course Outcomes:

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

CO 1: explain the environmental system and the tropic levels

CO 2: describe the ecosystem, biodiversity and the safety protocols

CO 3: classify the energy sources and its necessities

CO 4: compare and contrast the types of pollution and its effects

CO 5: illustrate about the e-waste management and recycling act

Unit I: **9 Hours**

Introduction – Terms and Definitions – Scope and history of Ecology - Ecosystem – Types and functions of structural components (i) A-biotic-atmosphere-lithosphere-hydrosphere – light and temperature (ii) Biotic- Organisms –tropic levels – and interactions among organisms -food chains – food-web-ecological pyramids and energy flow.

Unit II: **9 Hours**

Bio diversity: definition –genetics-species and ecosystem diversity-biodiversity at global national and local levels- conversation methods (in situ and ex situ)-patents-bio safety protocol- Role of technology in environmental protection.

Unit III: **9 Hours**

Energy sources: renewable and non-renewable energy sources. Renewable: energy from biomass-gobar glass plant-solar-wind-water-tidal energy. On-renewable energy: fossil fuels-coal-crude oil and natural gas-oil (shale –tar –sands)-nuclear energy-geothermal energy ocean thermal energy-bio fuels.

Unit IV: **9 Hours**

Environmental surveillance: pollution types -air pollution: global warming-ozone hole – smog and CFC – water pollution: BOD-COD-eutrophication-thermal pollution -noise pollution-nuclear pollution- sources of radiation- solid waste pollution- pollution control- water treatment and waste management - remote sensing.

Unit V: **9 Hours**

e-waste – 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 – Computer usesand impact on Health.

Learning Resources:

Text book(s)

1. Dr. Erach Bharucha, Environmental studies, 2021, Erach Bharucha for University GrantsCommission, New Delhi. 2004.

References

1. Enger, ED and ROSS, Environmental bio technology- industrial pollution management, TataMcGraw hill Publishing, 2000.
2. Jogdand.N, Himalaya, Essentials of ecology and environmental sciences, publishing house,Bombay, Rana, SVS Prentice Hall of India Pvt.Ltd, 2003.
3. Enger, ED and ROSS, concepts in biology, Tata McGraw hill Publishing, 2000.

Websites/e-Learning Resources

1. https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf
2. https://mrcet.com/downloads/digital_notes/EEE/ES%20DIGITAL%20NOTES.pdf

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	3	2	3	2	3
CO 2	2	2	2	2	3	3	2	3	3	2
CO 3	2	2	2	2	3	2	3	3	2	3
CO 4	3	3	2	3	3	3	3	3	2	2
CO 5	3	3	3	3	3	2	3	3	2	2
Average	2.6	2.6	2.2	2.4	2.8	2.6	2.6	3	2.2	2.4

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

Course Code	Name of the Course	Category	Hours/wk	Credits
24BCA1402	Object Oriented Programming Concepts using C++	Core	4	4

The objective of this course is to enable the students to acquire a fundamental understanding of the OOPs concepts, arrays, functions, classes, objects, pointers, file handling and exception handling using C++.

Course Outcomes:

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

CO1: explain the object oriented programming features and program structure of C++.

CO2: describe the concept of Class and objects

CO3: apply the programming principles inheritance and overloading

CO4: analyze the various methods of solving a problem using Arrays and Pointers

CO5: code, debug and test the File handling and Exception handling programs

Unit I   12 Hours

Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures: - Decision Making and Statements : If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading.

Unit II   12 Hours

Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.

Unit III   12 Hours

Operator Overloading: Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchical, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.

Unit IV: **12 Hours**

Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.

Unit V: **12 Hours**

Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions .

Learning Resources:

Text Book(s)

1. E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.

References

1. Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", PearsonEducation 2003.
2. Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.

Websites/e-Learning Resources

1. https://alison.com/course/introduction-to-c-plus-plus-programming

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	3	2	2	2	2	2	3
CO 2	3	3	2	3	2	3	3	2	2	3
CO 3	2	3	3	3	2	2	2	2	2	3
CO 4	3	3	3	3	2	3	2	2	1	3
CO 5	3	2	3	2	2	3	3	2	2	3
Average	2.8	2.6	2.8	2.8	2	2.6	2.4	2	1.8	3

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA1502	Data Structures and Algorithms (TcL)	Core	5	5

The objective of the course is to enable the students to understand the concepts of Abstract Data Types, Linear Data Structures, Non-linear Data Structures, Hash Functions, and various Searching and Sorting Algorithms.

Course Outcomes:

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

CO1: Demonstrate basic knowledge on stacks and queues.

CO2: Communicate effectively the operations and applications of linked lists.

CO3: Analyze the efficiency of various types of trees.

CO4: Apply graph algorithms for solving real-world problems.

CO5: Evaluate hash functions and sorting techniques.

Unit I: **15 Hours**

Abstract Data Types (ADTs) – Data Structure and its Classification - Stack ADT – Definition, Properties, Representation, and Operations – Applications - Conversion of Infix Expression to Postfix Expression - Evaluating Arithmetic Expressions – Queue ADT – Definition, Properties, Representation, and Operations – Applications of Queue - Circular Queue – Double Ended Queue.

Unit II: **15 Hours**

List ADT – Types of Linked Lists - Singly Linked Lists- Doubly Linked Lists- Circular Linked Lists – Operations on Singly Linked Lists – Insertion – Deletion – Merge – Traversal - Applications of Lists - Polynomial Manipulation.

Unit III: **15 Hours**

Tree ADT - Binary Tree ADT - Definition, Properties, Array Representation and Linked Representation, and Operations – Types of Binary Trees - Applications of Binary Trees - Binary Tree Traversals – Expression Trees - Binary Search Tree ADT - Definition, Properties and Operations.

Unit IV: **15 Hours**

Graph – Definition, Properties, Representation of Graphs, and Operations - Types of Graphs -Applications of Graphs.- Breadth First Traversal – Depth First Traversal – Prim's Minimum Cost Spanning Tree Algorithm - Kruskal's Minimum Cost Spanning Tree Algorithm – Dijkstra's Single Source Shortest Path Algorithm.

Unit V: **15 Hours**

Searching - Linear Search - Binary Search – Sorting - Bubble Sort - Selection Sort - Insertion Sort – Quick Sort – Merge Sort – Hashing - Hash Functions - Separate Chaining - Open Addressing – Rehashing - Extendible Hashing.

Learning Resources:
Text Book(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, 2014, 4th Edition.
2. Reema Thareja, Data Structures Using C, Oxford Universities Press, 2014, 2nd Edition.

References

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, McGraw Hill, 2009, 3rd Edition.
2. Aho, Hopcroft, Ullman, Data Structures and Algorithms, Pearson Education, 2003.

Websites/e-Learning Resources

1. NPTEL & MOOC courses titled Data Structures
2. https://nptel.ac.in/courses/106106127/

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	2	2	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24BCA1404	Object Oriented Programming Concepts using C++ Lab	Core	4	4

The objective of this course is to train the student to learn OOP Concept, to apply problem solving techniques in developing real-time applications using C++.

Course Outcomes:

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

CO1: discuss the program structure of C++ with its syntax and semantics.

CO2: understand the programming principles in C++ (data types, operators, branching and looping,arrays, functions, structures, pointers and files),

CO3: apply the programming principles learnt in real-time problems.

CO4: analyze the various methods of solving a problem and choose the best method.

CO5: code, debug and test the programs with appropriate test cases.

Total – 60 Hours

LIST OF EXERCISES

1. Write a C++ program to demonstrate function overloading, Default Arguments and Inlinefunction.

2. Write a C++ program to demonstrate Class and Objects

3. Write a C++ program to demonstrate the concept of Passing Objects to Functions

4. Write a C++ program to demonstrate the Friend Functions.

5. Write a C++ program to demonstrate the concept of Passing Objects to Functions

6. Write a C++ program to demonstrate Constructor and Destructor

7. Write a C++ program to demonstrate Unary Operator Overloading

8. Write a C++ program to demonstrate Binary Operator Overloading

9. Write a C++ program to demonstrate:

   a) Single Inheritance

   b) Multilevel Inheritance

   c) Multiple Inheritance

   d) Hierarchical Inheritance

   e) Hybrid Inheritance

10. Write a C++ program to demonstrate Virtual Functions.

11. Write a C++ program to manipulate a Text File.

12. Write a C++ program to perform Sequential I/O Operations on a file.

13. Write a C++ program to find the Biggest Number using Command Line Arguments

14. Write a C++ program to demonstrate Class Template

15. Write a C++ program to demonstrate Function Template.

16. Write a C++ program to demonstrate Exception Handling.

Learning Resources:

Text Book(s)

1. E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.

References

1. Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo
   C++", PearsonEducation 2003.

2. Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.

Websites/e-Learning Resources

1.   https://alison.com/

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	2	2	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24BCA1202	Multimedia Systems	NME	3	2

The objective of this course is to enable the students to understand the fundamentals of Multimedia and its components, concepts of Animation, Digital Video Containers and the stages of Multimedia Project.

Course Outcomes:

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

  CO1: describe the fundamentals of multimedia

  CO2: have basic knowledge and understand about image related processing

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

  CO4: discuss the various phases of Multimedia project.

  CO5: estimate the cost involved in multimedia planning, designing, and producing.

Unit I: **9 Hours**

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

Unit II: **9 Hours**

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

Unit III: **9 Hours**

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

Unit IV: **9 Hours**

Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-Multimedia Production Team.

Unit V: **9 Hours**

Planning and Costing: The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing – Content

Learning Resources:

Text Book(s)

1. Tay Vaughan, "Multimedia: Making It Work", 9th Edition, Osborne/McGraw- Hill, 2014.

Reference Books

1. Ralf Steinmetz & KlaraNahrstedt" Multimedia Computing, Communication & Applications", Pearson Education, 2012.
2. Multimedia Systems, S Ashifa Begum, 2020.
3. Multimedia Systems and Techniques (Hb 1996) By Furht B.

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/
2. https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm
3. https://www.tutorialspoint.com/multimedia/multimedia_images_graphics.htm

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	2	2	2	2	2	2	2	1
CO 2	3	3	3	1	2	3	2	2	2	2
CO 3	3	3	3	2	3	3	2	3	3	2
CO 4	3	3	3	2	3	2	2	3	1	2
CO 5	3	3	3	2	3	2	2	2	2	2
Average	3	3	2.8	1.8	2.6	2.4	2	2.4	2	1.8

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

Course Code	Name of the Course	Category	Hours/Wk	Credits
24BCA2401	RDBMS with PL\SQL	Core	4	4

The objective of this course is to enable the students, to understand the concept of data base management and to handle relational aspects. It introduces fundamental concepts, terminology and application of databases and teaches design concepts and creation of relational databases.

Course Outcomes:

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

CO1: summarize the basic concepts of database system

CO2: design a Data model and Schemas in RDBMS

CO3: explain the concepts of Normalization

CO4: analyze functional dependencies for designing robust Database

CO5: infer the concepts of Triggers and Cursors

Unit I: **12 Hours**

Introduction to DBMS– Data and Information - Database – Database Management System – Objectives - Advantages – Components - Architecture. ER Model: Building blocks of ER Diagram – Relationship Degree – Classification – ER diagram to Tables – ISA relationship – Constraints – Aggregation and Composition – Advantages.

Unit II: **12 Hours**

Relational Model: CODD's Rule- Relational Data Model - Key - Integrity – Relational Algebra Operations – Advantages and limitations – Relational Calculus – Domain Relational Calculus - QBE.

Unit III: **12 Hours**

Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools – Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF – BCNF. Transaction Processing – Database Security.

Unit IV: **12 Hours**

SQL: Commands – Data types – DDL - Selection, Projection, Join and Set Operations – Aggregate Functions – DML – Modification - Truncation - Constraints – Subquery.

Unit V: **12 Hours**

PL/SQL: Structure - Elements – Operators Precedence – Control Structure – Iterative Control - Cursors - Procedure - Function - Packages – Exceptional Handling - Triggers.

Learning Resources:

Text Book(s)

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill 2019, 7th Edition.

2. M. Moses Antony Rajendran, V. Jothi Francina, "Relational Database Management Systems: Database System", LAMBERT Academic Publishing, 2023.

References

1. Elmasri Ramez , Navathe Shamkant , "Fundamentals of Database Systems", Pearson Publications 2017, 7th Edition.

2. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management System",Springer International Edition 2008.

3. Dr.A.Indrapandi, "Oracle Mastery" Kripa Drishti Publication 2024, First Edition.

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/dbms/

2. https://www.javatpoint.com/dbms-tutorial

3. https://www.w3schools.com/sql/

4. NPTEL & MOOC courses titled Relational Database Management Systems

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	3	3	2	2	1	2	2
CO 2	3	3	2	3	2	3	3	1	2	2
CO 3	2	3	3	3	3	2	2	2	2	3
CO 4	3	3	3	3	3	3	2	1	1	2
CO 5	3	2	3	2	3	3	3	2	2	1
Average	2.8	2.6	2.8	2.8	2.8	2.6	2.4	1.4	1.8	2

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

Course Code	Name of the Course	Category	Hours/ Wk	Credits
24BCA2403	Web Programming	Core	4	4

The objective of this course is to enable the students to understand the basics of Internet, web development techniques, PHP for Web Development, AJAX and XML and to develop web applications using advanced techniques and modern web programming.

Course Outcomes:

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

CO1: explain static and dynamic web pages

CO2: discuss the capabilities of web browsers for client side applications

CO3: illustrate the core concepts of PHP in developing web Applications

CO4: describe the Database Connectivity using PHP.

CO5: design well-formed and valid XML document

Unit I   **12 Hours**

Web 2.0–RIA–Internet technologies Overview – Introduction to HTML-Basic Tags-Images-Lists- Forms – frames – tables - CSS - The Presentation Semantics- CSS Properties-Types of Style Sheets

Unit II   **12 Hours**

JavaScript with HTML- Variables, Operators, Expressions, Arrays - Handling Loops & Decision structures - Understanding jQuery-Selectors- Event Manipulation Methods- Sliding, Fading - jQuery and AJAX calls.

Unit III   **12 Hours**

Introduction to JSON- Overview of PHP –Data types –Variables –Expressions –control and Structure – functions –classes and objects –arrays –simple and multiple Dimensional arrays.

Unit IV   **12 Hours**

Using Mysql in PHP- Connection to a Data base – Listing DB –Displaying DB Tables – inserting a row of data using forms in PHP – Using Images –Mail management – File management.

UNIT V   **12 Hours**

Introduction to XML – How to use XML –XML syntax –XML elements- XML attributes –Displaying XML Files – Working with XSL –Web Application Development using WordPress

Learning Resources:

Textbook(s)

1.   Paul Deitel and Harvey Deitel and Abbey Deital, "Internet and World Wide Web " Fifth Edition, Pearson, 2018.

2.   Jeffrey C. Jackson , Web Technologies--A Computer Science Perspective, Pearson Education, 2011.

References

1.   Randy Connolly and Richardo Hoar, "Fundamentals of Web Development" 1/e Pearson Education, 2016.

2.   Robert W. Sebesta, "Programming the World Wide Web", Third Edition, Pearson,2013

3.   Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2014.

Websites/e-Learning Resources

1.   https://www.geeksforgeeks.org/web-development/

2.   https://www.w3schools.com/php/

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	2	2	2	2	1	2	3
CO 2	3	3	3	2	2	2	2	1	2	3
CO 3	3	3	3	3	2	2	2	1	2	3
CO 4	3	3	3	3	2	2	2	1	2	3
CO 5	3	3	3	2	2	2	2	1	2	3
Average	3	3	3	2.4	2	2	2	1	2	3

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2405	Operating Systems	Core	4	4

The objective of this course is to provide students with the fundamental knowledge and skills required to comprehend operating systems, as well as the ability to recognize ideas related to processes, the life cycle of processes, scheduling algorithms, deadlock, and memory management.

Course Outcomes:

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

CO1: define the fundamentals of OS and explain the concepts relevant to process life cycle and Inter process communication.

CO2: describe the critical analysis of process involving various algorithms, an exposure to threads and semaphores

CO3: have a complete study about Deadlock and its impact over OS, Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock.

CO4: discuss various Job and Processor Scheduling Algorithms and its types.

CO5: explain the concept of memory organization and management.

Unit I: **12 Hours**

Introduction: Operating System - History (1990s to 2000 and beyond) - Distributed Computing - Parallel Computing. **Process Concepts:** Definition of Process - Process States - Life cycle of a Process - Process State Transitions - Process Management - Process Control Block (PCB) - Process Operations: suspend and resume Operations - Context Switching – Inter process Communication - Signals, Message Passing.

Unit II: **12 Hours**

Asynchronous Concurrent Processes: Classic Problems of Synchronization – The Bounded Buffer Problem – The Dining Philosophers Problem - The Critical Section Problem - Requirements for Solution to the Critical Section Problem - Software Solutions to the Critical Section Problem- Peterson's Algorithm. Semaphores – Counting Semaphores, Implementing Semaphores - Mutual Exclusion with Semaphores – Monitors.

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Unit III: **12 Hours**

Deadlock and Indefinite Postponement: Resource Concepts - Necessary Conditions for Deadlock - Deadlock Prevention - Deadlock Avoidance –- Resource Allocation Graph Algorithm - Dijkstra's Banker's algorithm, Deadlock Detection - Wait-for Graph - Deadlock Recovery.

Unit IV: **12 Hours**

Job and Processor Scheduling: Scheduling , Scheduling Criteria, Preemptive vs Non-Preemptive Scheduling - Scheduling Algorithms - FIFO Scheduling, SJF scheduling, RR scheduling, Quantum Size, SRT Scheduling - Multilevel Feedback Queue Scheduling, 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 – Swapping.

Virtual Memory organization and management: paging, segmentation, virtual memory basic concepts - Demand Paging, Page replacement strategies.

Learning Resources:
Text Book(s)
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. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Ninth Edition, John Wiley &Sons (ASIA) Pte Ltd.,2012

Websites/e-Learning Resources
1. https://archive.nptel.ac.in/courses/106/105/106105214/
2. https://www.guru99.com/os-tutorial.html

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	1	2	1	1	2	2
CO 2	3	3	3	3	2	3	2	1	2	2
CO 3	3	3	3	3	1	3	2	1	2	2
CO 4	3	3	3	3	2	3	2	1	2	2
CO 5	3	3	2	2	1	3	2	1	2	2
Average	3	3	2.6	2.6	1.4	2.8	1.8	1	2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2407	RDBMS with PL\SQL Lab	Core	4	4

The objective of this course is to enable the students, to attain a good practical knowledge to understand the concept of data base management and to handle relational aspects.

Course Outcomes:

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

CO1: explain the designing of database system

CO2: design a simple Database model

CO3: write queries using SQL.

CO4: attain knowledge to retrieve data using Data Manipulation Language (DML)

CO5: enhance the knowledge of handling multiple Database tables.

Total Hours: 60 Hours

LIST OF EXERCISES

SQL

    1.DDL Commands

    2.DM L Commands

PL/SQL

    1.Fibonacci series

    2.Factorial

    3.String reverse

    4.Sum of series

    5.Trigger

CURSOR

    1.Student Mark Analysis Using Cursor

APPLICATION

    1.Library management System

    2.Student mark analysis

Learning Resources:

Text Book(s)

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill 2019, 7th Edition.

2. M. Moses Antony Rajendran, V. Jothi Francina, "Relational Database Management Systems: Database System", LAMBERT Academic Publishing, 2023.

References

1. Elmasri Ramez , Navathe Shamkant , "Fundamentals of Database Systems ", Pearson Publications 2017, 7th Edition.

2. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management System", Springer International Edition 2008.

3. Dr.A.Indrapandi, "Oracle Mastery" Kripa Drishti Publication 2024, First Edition.

Websites/e-Learning Resources

1. https://www.geeksforgeeks.org/dbms/

2. https://www.javatpoint.com/dbms-tutorial

3. https://www.w3schools.com/sql/

4. NPTEL & MOOC courses titled Relational Database Management Systems

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	2	2	1
CO 2	3	2	2	3	3	3	2	1	2	2
CO 3	3	2	3	3	3	2	3	1	1	3
CO 4	3	3	3	3	2	3	3	2	2	2
CO 5	3	3	3	3	3	2	3	2	2	2
Average	3	2.6	2.8	3	2.8	2.6	2.8	1.6	1.8	2

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

Course Code	Name of the Course	Category	Hours/Wk	Credits
24BCA2201	Open Source Technologies	SEC	3	2

The objective of this course is to enable the student to understand the role and future of Open-source technologies and software in the industry along with the impact of legal, economic and social issues.

Course Outcomes:

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

  CO1: describe the principles and concepts of Open-Source Technologies.

  CO2: elucidate the various Linux and Unix commands.

  CO3: discuss and implement the Apache Software.

  CO4: classify the various commands in MYSQL.

  CO5: explain the ethics and the impact of Open-Source Technologies.

Unit I   **9 Hours**

Open Source – open source vs. commercial software – What is Linux– Free Software – Where I can use Linux - Linux kernel – Linux distributions.

Unit II   **9 Hours**

Introduction Linux Essential Commands – File System concept – Standard Files –The Linux Security Model – Introduction to Unix – Unix Components Unix Files – File Attributes and Permission- Pipes and Filters – Grep and Stream Editor.

Unit III   **9 Hours**

Introduction - Apache Explained – Starting, Stopping and Restarting Apache –Modifying the Default configuration – Securing Apache – Set user and Group.

Unit IV   **9 Hours**

Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table – Select, Insert, Update and Delete statement database.

Unit V   **9 Hours**

Open-Source Ethics – Open Vs Closed Source – Government – Ethics – Impact of Open source Technology – Shared Software – Shared Source.

Learning Resources:

Text Book(s)

1. Kailash Vadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt Ltd 2012, 1st Edition.

References

1. Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.
2. Philipp.K Janert, "Data Analysis with Open Source Tools", O'Reilly Media, Inc., 2010, First Editon.

Websites/e-Learning Resources

1. https://elearningindustry.com/directory/software-categories/learning-management-systems/license/open
2. https://moodle.com/about/open-source

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	3	2	3	2	1	2	1	2
CO 2	3	3	3	3	3	2	2	2	2	2
CO 3	3	3	3	3	3	3	3	2	1	2
CO 4	3	3	3	3	3	3	2	2	2	2
CO 5	3	3	3	2	3	2	1	3	3	2
Average	3	2.8	3	2.6	3	2.4	1.8	2.2	1.8	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2402	Programming in JAVA	Core	4	4

The objective of this course is to introduce the programming concepts and knowledge about object-oriented paradigm in Java and to enrich the creativity of GUI applications using Java with Database Connectivity and Swing components

Course Outcomes:

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

CO1: gain knowledge about the fundamentals of Java programming language

CO2: apply the concepts of Class, packages in Java

CO3: write Java Programs using IO Streams and threads.

CO4: analyze Java Applet Programs with AWT

CO5: develop applications using swing, Exception Handling and JDBC concepts.

Unit I: **12 Hours**

Java Fundamentals -Features of Java-OOPs concepts-JVM architecture - Data types, variable, arrays, operators, and control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – Static Method – String and String Buffer Classes

Unit II: **12 Hours**

Inheritance - Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword -Packages-Definition-Access Protection –Importing Packages Interfaces-Definition–Implementation–Extending Interfaces

Unit III: **12 Hours**

Multithreading- Thread Class – Runnable Interface -Simple thread program-Thread synchronization-Inter Thread Communication -Input streams-Output streams-Object serialization-Deserialization-Sample programs on IO files-Filter and pipe streams

Unit IV: **12 Hours**

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- Event Listeners

Unit V: **12 Hours**

Exception handling - Try catch finally- Throw, throws – Built in exceptions- Swing - Hierarchy of swing components. JButton - JToggleButton - JCheckBox - JRadioButton – Jlabel JTextField - JTextArea - JList - JComboBox - JScrollPane.- Database Connectivity

Learning Resources:

Text Book(s)

1. E. Balaguruswamy, Programming with Java A Primer, Tata McGraw Hill,5th Edition , 2017

References

1. Herbert Scheldt , Java - The Complete Reference, McGraw Hill Education; Tenth edition, 2017

2. R. Nageswara Rao, Core Java: An Integrated Approach, New: Includes All Versions up to Java 8, Dream tech Press ,2016

3. Troy Dimes, Java Programming: A Beginners Guide to Learning Java, Create Space Independent Publishing Platform, 2015.

Websites/e-Learning Resources

1. www.tutorialspoint.com/javaexamples.

2. www.vogella.com/tutorials/JavaIntroduction/article.html.

3. www.udemy.com/java-tutorial.

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	2	2	3	2	2	2	2	3
CO 2	3	2	2	2	1	2	2	2	2	2
CO 3	3	3	3	2	3	3	2	2	2	2
CO 4	3	3	3	3	2	3	3	2	1	1
CO 5	3	3	3	3	2	3	3	2	2	3
Average	3	2.6	2.6	2.4	2.2	2.6	2.4	2	1.8	2.2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2404	Computer Networks	Core	4	4

The objective of this course is to enable the student to understand the basics of computer networks and to develop knowledge about different components of computer networks, various protocols, modern technologies and their applications.

Course Outcomes

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

CO1: gain knowledge about OSI and TCP/IP reference model and Data communication.

CO2: discuss Wireless Transmission, Error Detection and Correction.

CO3: describe various Protocols in Data Link Layer.

CO4: categorize different Routing algorithms and Protocols in Network Layer

CO5: explain Transport Layer, UDP, TCP and Network Security.

Unit I: 12 Hours

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Network Topology ,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 – Bluetooth

Unit IV: 12 Hours

Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols- ICMP- IGMP

Unit V: **12 Hours**

Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – User Datagram Protocol(UDP) –Transmission control protocol(TCP)- Network Security: Cryptography.

Learning Resources:

Text Book(s)

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

References

1. "Computer Networks"6th edition,Andrew S. Tanenbaum, Nick Feamster, David J.Wetherall, Pearson Eduction, 2022

2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017

3. Computer Networks Hardcover, Andrew S. Tanenbaum , David J.Wetherall2010.

4. F. Halsall, "Data Communications,   Computer Networks and Open Systems", Pearson Education, 2008

5. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.

6. 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	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	1	2	2	2	1	2	2
CO 2	3	3	1	2	2	2	2	1	2	3
CO 3	3	3	3	2	2	2	1	1	2	2
CO 4	3	3	3	2	2	3	2	1	2	2
CO 5	3	3	3	2	2	3	2	1	2	2
Average	3	3	2.4	1.8	2	2.4	1.8	1	2	2.2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2406	Dot Net Programming (TcL)	Core	4	4

The objective of this course is to enable the student to gain depth knowledge and acquire skills to develop windows based applications and Rich Internet Web applications.

Course Outcomes:

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

CO1: familiarize with dot net framework and its features

CO2: explain the VB.NET and write programs including oops concepts

CO3: apply exceptions and create menus in vb.net

CO4: analyze the features of ADO.NET and use SQL commands for data manipulation

CO5: create dynamic Websites/e-Learning Resources using ASP.NET.

Unit I: **12 Hours**

Introduction to Dot Net platform-advantages of Dot Net-working of Dot Net- .basic architecture of net frame work-common language run time-common language specification-unified programming classes-security in Dot Net-CLR: Meta data –assembly-MSIL-Just in Time compiler-class loader-verifier-architecture of CLR-features of CLR.

Unit II: **12 Hours**

VB.NET: Visual studio .net IDE-Programming concepts- operators – control and looping statements - arrays - writing procedures-sub procedure – function procedure – property procedure – operator procedure - OOPs in VB.net: class-object-inheritance-polymorphism-inheritance-my base class keyword-my class keyword-abstract base class

Unit III: **12 Hours**

Exception handling-working with forms-Advanced window application: basic controls and methods – advanced controls – menustrip - context menu strip – status bar – rich text box – web browser - graphical application-custom window controls. Data access using ADO.NET: Overview of ODBC-UDA-ADO.NET Component model.

Unit IV: **12 Hours**

SQL Commands –Data Definition Language – Data Manipulation Language – Data Control Language - ADO.NET object model- managed provider in ADO.net –ADO.net name spaces and classes-Connection –Command – dataadapter – dataset –data reader - error –datagridview - advantages of using ADO.net-data access using ADO-using ADO.net data form wizard.

Unit V: **12 Hours**

ASP.NET: Features of ASP.net-structure of an ASP.net page-creating simple web application-using common web control-ASP.net Objects – request – response – server – session – application – error – Master page – validation controls- ASP.net State Management – web configuration - create web application using data base connectivity – web services.

Learning Resources:

Text Book(s)

1. Kogent Learning Solutions Inc., .Net 4.0 Programming 6-in-1, Black Book (with CD), 2011.

References

1. EvangelosPetroutsos, "Mastering Visual Basic .NET" 3d Edition, SYBEX, 2006

2. Bill Hamilton, "ADO.NET 3.5 Cookbook: Building Data Centic .net Applications", 2nd edition, O'Reilly, 2008.

3. Joseph Albahari, Ben Albahari, "C# 7.0 in a nutshell: The Definitive Reference", 1st edition, O'Reilly Media, 2017.

4. Dino Esposito, "Programming ASP.NET Core (Developer Reference)", 1st edition, Microsoft Press, 2018.

Websites/e-Learning Resources

1. https://www.javatpoint.com/net-framework
2. https://www.w3schools.com/asp/webpages_intro.asp

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	3	1	2	2	1	-	1
CO 2	3	3	3	3	1	1	3	2	1	1
CO 3	3	3	3	3	2	3	3	2	3	2
CO 4	3	3	3	3	3	3	2	1	1	2
CO 5	3	3	3	2	1	2	2	3	3	2
Average	3	2.8	3	2.8	1.6	2.2	2.4	1.8	2	1.6

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2408	Programming in Java lab	Core	4	4

The objective of this course is to enable the students, to attain a good practical knowledge about the Object Oriented features of Java Language and its syntax to develop Java Applications.

Course Outcomes:

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

CO1: illustrate the basic concept of Java programming

CO2: build Multithreading Java programs using predefined class libraries

CO3: develop Java Programs by applying Control Structures

CO4: create Java Applications using the concepts of interfaces, inheritance, packages and exceptions

CO5: write Java database connectivity program using applet and swing concepts

(Total - 60 Hours)

LIST OF EXERCISES

1. Java program to print all prime numbers.
2. Java program to multiply two given matrices.
3. Java program that displays the number of characters, lines and words in a text.
4. Using Random class to generate random numbers.
5. String Manipulation.
6. String operation using String Class
7. String operations using String Buffer Class
8. Multithreading
9. Threading
10. Exception handling mechanism.
11. Files
12. AWT
13. Event handling
14. Concept of buttons
15. Swing

Learning Resources:

Text Book(s)

1. E. Balaguruswamy, Programming with Java A Primer, Tata McGraw Hill,5th Edition , 2017

References

1. Herbert Scheldt , Java - The Complete Reference, McGraw Hill Education; Tenth edition, 2017

2. R. Nageswara Rao, Core Java: An Integrated Approach, New: Includes All Versions up to Java 8, Dream tech Press ,2016

3. Troy Dimes, Java Programming: A Beginners Guide to Learning Java, Create Space Independent Publishing Platform, 2015.

Websites/e-Learning Resources

1. www.tutorialspoint.com/javaexamples.
2. www.vogella.com/tutorials/JavaIntroduction/article.html.
3. www.udemy.com/java-tutorial.

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	2	2	2	2	2	2	3
CO 2	3	2	2	2	2	3	2	2	2	2
CO 3	3	2	3	3	2	2	2	2	2	2
CO 4	3	1	2	2	1	3	2	2	2	3
CO 5	3	2	3	2	2	2	2	2	2	1
Average	3	1.8	2.6	2.2	1.8	2.4	2	2	2	2.2

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA2202	Enterprise Resource Planning	SEC	3	2

The objective of this course is to enable the students to understand the basic concepts of ERP systems, activities in the ERP life cycle and to develop a process driven thinking towards business processes and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:

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

    CO1: describe the basic concepts in ERP systems.

    CO2: elucidate the different technologies used in ERP.

    CO3: classify and apply the concepts of ERP Manufacturing, Perspective and ERP Modules.

    CO4: design the ERP implementation strategies.

    CO5: apply the different tools used in ERP.

Unit I   **9 Hours**

ERP Introduction-Benefits-Origin, Evolution and Structure: Conceptual Model of ERP-Evolution of ERP- Structure of ERP- Components and needs of ERP- ERP Vendors-Benefits and limitations of ERP Packages.

Unit II   **9 Hours**

ERP-Information mapping-Role of common shared Enterprise Database-System Integration- Benefits and limitations of System Integration- Business Process Reengineering-Data Warehousing-Data Mining-OLAP- Supply chain Management.

Unit III   **9 Hours**

ERP Marketplace and Marketplace Dynamics: Market Overview- Marketplace Dynamics-Functional Modules: Introduction-Functional Modules of ERP Software- Integration of ERP-Supply chain and Customer Relationship Applications- Cloud and Open Source-Quality Management.

Unit IV   **9 Hours**

ERP Implementation Basics-ERP implementation Strategy-ERP Implementation Life Cycle-
Pre-Implementation task- Role of SDLC/SSAD- Object Oriented Architecture.

Unit V   **9 Hours**

ERP and E-Commerce-Future Directives in ERP-ERP and Internet-Critical success and failure
factors-Integrating ERP into organizational culture- Using ERP tool: SAP- Consultants,
Vendors and Employees.

Learning Resources:

Text Book(s)

1. Alexis Leon, Enterprise Resource Planning, Tata McGraw Hill, 2008, Second Edition.

References

1. Alexis Leon, Enterprise Resource Planning, TMH, 2014, Third Edition.
2. Ravi Shankar and S. Jaiswal, Galgotia, Enterprise Resource Planning, 1999, Second
   Edition.

Websites/e-Learning Resources

1. https://www.coursera.org/articles/what-is-erp.
2. https://erpnext.com/

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	3	2	3	2	2	3
CO 2	3	2	3	3	3	3	2	2	2	3
CO 3	3	2	3	3	3	2	2	2	2	2
CO 4	2	2	3	3	3	2	2	2	2	2
CO 5	2	2	3	3	3	2	2	2	2	2
Average	2.6	2	2.8	2.8	3	2.2	2.2	2	2	2.4

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3601	Software Engineering	Core	6	6

The objective of this course is to enable the students to understand Software requirements, specification, Software design techniques for developing large software systems, Software testing, documentation and maintenance.

Course Outcomes:

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

CO1: discuss the different Software Life Cycle Models.

CO2: describe requirements Analysis, its Specification and SRS Documents.

CO3: explain Function-Oriented Software Design and User-Interface design

CO4: inspect various Testing Strategies and Quality Management.

CO5: apply CASE Tools in different CASE environment and Software Maintenance.

Unit I: **18 Hours**

Introduction: 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 Analysis and Specification: Software Requirement engineering; 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**

Function-Oriented Software Design: 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 and Testing: Testing strategies; A strategic approach to software testing; testing in the large vs testing in the small; Unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; validation and 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**

Computer Aided Software Engineering: 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; Risk identification, Risk projection. Software quality, Achieving software quality, estimation of maintenance cost

Learning Resources:

Text Book(s)

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.

Websites/e-Learning Resources:

1. Introduction to Software Engineering - Software Engineering - GeeksforGeeks
2. Software engineering - Wikipedia

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	1	2	2	2	2	2
CO 2	3	3	2	2	1	2	2	2	2	3
CO 3	3	3	3	2	1	2	2	2	2	2
CO 4	3	3	3	2	1	3	2	1	2	2
CO 5	3	3	3	2	1	3	2	1	2	2
Average	3	3	2.6	2	1	2.4	2	1.6	2	2.2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3603	Python Programming (TcL)	Core	6	6

The objective of this course is to enable the students to understand the fundamentals of programming with Python and apply objects, classes and methods in Python, and utilize variables, data types, control flow and loops, functions and data structures to develop python applications

Course Outcomes:

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

CO1: explain the basics of python, write simple programs on python.

CO2: develop program using Control Structures

CO3: write User defined functions for the given task

CO4: develop applications using various data structures in Python

CO5: create Python applications to handle Files.

Unit I: **18 Hours**

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

Unit II: **18 Hours**

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

Unit III: **18 Hours**

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

Unit IV: **18 Hours**

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

Unit V: **18 Hours**

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

Learning Resources:

Text Book(s)

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. VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.
2. Mark Lutz, "Learning Python", Orielly.
3. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.

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 - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	2	1	1	1	1
CO 2	3	3	3	2	3	2	1	1	1	1
CO 3	3	3	3	3	3	2	2	1	1	1
CO 4	3	2	3	2	3	3	2	1	1	1
CO 5	3	2	3	2	2	3	2	1	2	1
Average	3	2.6	3	2.4	2.8	2.4	1.6	1	1.2	1

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3605	Mobile Application Development (TCL)	Core	6	6

The objective of this course is to enable the students to understand the fundamentals of Android OS and to enhance the programming skills to design and develop high quality mobile applications.

Course outcomes:

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

CO1: describe the fundamentals of Android and its architecture.

CO2: implement the various options available in views

CO3: explain the file handling concepts and thereby enabling to manage data efficiently.

CO4: discuss the process of SMS messaging

CO5: illustrate the concepts of Location Based Services

Unit I: **18 Hours**

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

Unit II: **18 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: **18 Hours**

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: **18 Hours**

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

Unit V: **18 Hours**

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 Book(s)

1. WeiMeng Lee (2012), "Beginning Android Application Development", WroxPublications (John Wiley, New York)

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. https://www.tutorialspoint.com/mobile_development_tutorials.htm

2. https://www.tutorialspoint.com › Android › Android – Home

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	3	1	2	1	1
CO 2	3	3	3	3	2	3	2	2	1	1
CO 3	3	3	2	3	3	2	2	2	2	1
CO 4	3	3	2	2	2	3	2	2	2	1
CO 5	3	3	2	3	3	3	2	2	1	1
Average	3	3	2.2	2.6	2.4	2.8	1.8	2	1.4	1

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3401	Cloud Computing	DSE	5	4

The objective of this course is to enable the students to understand the basic principles of cloud computing, Cloud Architecture, web services and the steps involved in designing Cloud based Applications.

Course Outcomes:

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

CO1: describe fundamental concepts and Technologies in Cloud Computing.

CO2: explore and classify various cloud service types and pitfalls.

CO3: illustrate Cloud Architecture and Application design.

CO4: develop the various aspects of application design, benchmarking and security.

CO5: discuss 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 – Map Reduce – 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 Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services

Unit III: **15 Hours**

Cloud Application Design: 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.

Unit IV: **15 Hours**

Cloud Application Benchmarking and Tuning: 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

Unit V : **15 Hours**

Case Studies: 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(s)

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

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	2	3	2	2	2	2	2
CO 2	3	3	3	3	3	3	2	2	2	2
CO 3	3	3	3	3	3	3	3	2	2	2
CO 4	3	3	3	3	3	3	3	3	2	2
CO 5	3	3	3	3	2	3	3	3	2	2
Average	3	3	3	2.8	2.8	2.8	2.6	2.4	2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3403	Software Project Management	DSE	5	4

The objective of this course is to enable the students to understand the concepts of planning, organizing and coordinating resources and apply various software management principles and techniques during software development.

Course Outcomes:

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

CO1: communicate effectively the principles and concepts of software project management.

CO2: demonstrate skills required to train project managers.

CO3: evaluate and mitigate risks associated with software development process.

CO4: create comprehensive project plans.

CO5: apply software project management strategies and metrics during software engineering.

Unit I: **15 Hours**

Introduction to Software Project Management - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and Models - International Organization for Standardization.

Unit II: **15 Hours**

Project Selection Models - Project Portfolio Management - Selecting a Project Team - Goal and Scope of the Software Project - Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones.

Unit III: **15 Hours**

Tasks and Activities - Software Size and Reuse Estimating - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - Organizational Planning - Project Roles and Skills Needed.

Unit IV: **15 Hours**

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Levelling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.

Unit V: **15 Hours**

Quality: Requirements – The SEI CMM - Guidelines - Challenges - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study.

Learning Resources:

Text Book(s)

1. Robert T. Futrell, Donald F. Shafer, Linda I. Safer, Quality Software Project Management, Pearson Education Asia, 2002.

References

1. Pankaj Jalote, Software Project Management in Practice, Addison Wesley, 2002.
2. Hughes, Software Project Management, Tata McGraw Hill, 2004, 3rd Edition.

Websites/e-Learning Resources

1. NPTEL & MOOC courses titled Software Project Management
2. www.smartworld.com/notes/software-project-management

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	2	2	2	2
CO 3	3	3	3	3	3	3	3	2	2	2
CO 4	3	3	3	3	3	3	3	3	2	2
CO 5	3	3	3	3	3	3	3	3	2	2
Average	3	3	3	2.8	2.8	2.8	2.6	2.4	2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3405	Artificial Intelligence	DSE	5	4

The objective of this course is to enable the students, to develop systems that can analyze large datasets, identify patterns, and make data-driven decisions and to identify appropriate AI methods to solve a given problem.

Course Outcomes:

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

CO1: summarize the various concepts of AI Techniques, foundation and principles

CO2: identify the various Search Algorithms in AI.

CO3: explain the knowledge in probabilistic reasoning and models in AI.

CO4: infer information about Markov Decision Process.

CO5: explore the various Reinforcement learning.

Unit I: 15 Hours

Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

Unit II: 15 Hours

Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.

Unit III: 15 Hours

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

Unit IV: 15Hours

Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

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Unit V: **15 Hours**

Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

Learning Resources:

Text Book(s)

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall, 2022.

References

1. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi. 2020.

2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.

Websites/e-Learning Resources

1.https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/

2.https://notegpt.io/

3.https://www.deeplearning.ai/ai-notes/index.html

4.NPTEL&MOOC courses titled Artificial Intelligence and Expert Systems

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	2	3	3	3	2	2	2
CO 2	3	3	3	3	2	3	2	2	2	2
CO 3	3	3	3	3	3	2	3	2	2	2
CO 4	2	3	3	3	3	3	2	3	2	2
CO 5	3	3	3	3	3	3	3	3	2	2
Average	2.8	3	3	2.8	2.8	2.8	2.6	2.4	2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3301	Introduction to HTML	GE	4	3

The objective of this course is to enable the students to develop a Web Page using various elements of HTML and to enrich the creativity of web design.

Course Outcomes:

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

    CO1: illustrate the basic concepts of Internet and its services

    CO2: describe the concepts of HTML and Insert heading levels within a web page.

    CO3: insert ordered and unordered lists within a web page.

    CO4: create a web page using Tables, images and Hyper links

    CO5: develop web pages using Form Elements and Frameset

Unit I: **12 Hours**

Introduction- Web Basics: What is Internet – Web browsers – What is Webpage – HTML Basics – Understanding tags Tags for Document structure (HTML, Head, and Body Tag)

Unit II: **12 Hours**

Block level text elements: Headings paragraph (<p> tag) –Font style elements: (bold, italic, font, small, strong, strike, big tags) - HTML Div Element - HTML Colors

Unit III: **12 Hours**

Lists: Types of lists: Ordered, Unordered– Definition Lists - Nesting Lists – Other tags: Marquee, HR, BR.

Unit IV: **12 Hours**

Tables: Creating basic Table, Table elements, Caption – Table and cell alignment – Rowspan, Colspan –Cell padding – Using Images –Creating Hyperlinks.

Unit V: **12 Hours**

Frames: The Frameset, No Frame Element – Creating Link between Frames – Nested Frameset, Form: Text Fields – Password Field – Radio Button – Check Box – Submit Button – Reset Button – Button – Select – Option – Text area

Learning Resources:

Text Book(s)

1. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"

References

1. TeachUComp Inc., "Mastering HTML5 and CSS3 Made Easy", 2014.
2. Laura Lemay, RafeColburn, Jennifer Kyrnin, "Mastering HTML, CSS &Javascript Web Publishing", 2016.
3. Kogent Learning Solutions Inc., Html5 Black Book, Released 2011.

Web Sites

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

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	3	2	2	2	2	2	2	2
CO 2	3	3	2	3	3	2	2	2	3	2
CO 3	3	3	2	2	2	2	3	2	2	2
CO 4	3	3	3	3	2	3	2	2	2	2
CO 5	3	3	3	2	2	3	3	2	2	2
Average	3	2.8	2.6	2.4	2.2	2.4	2.4	2	2.2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3303	Digital Marketing	GE	4	3

The objective of this course is to equip students with fundamental digital marketing knowledge and concepts relevant to marketing mix in the digital era, social media marketing, and web analytics.

Course Outcome:

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

CO1: explain the evolution of digital marketing and its strategy

CO2: build and host a website.

CO3: analyse the success of digital marketing

CO4: articulate the email marketing

CO5: apply digital marketing in various fields

Unit I: **12 Hours**

The evolution of digital marketing- technology behind digital marketing – the need for digital marketing strategy, business and digital marketing, defining digital marketing strategy - Understanding the digital consumer- Mind your P's: Product, Price, Promotion, and Place.

Unit II: **12 Hours**

The website: the hub of the digital marketing world - Building an effective website: the main steps of building a website - choosing the domain name - Hosting – the website's home on the internet -Arranging the information- writing effective web content- About the search engines - Optimizing the site for the engines - Advertising on the search engines.

Unit III: **12 Hours**

Website intelligence and return on investment. Measuring the way to digital marketing success - How information is measured - Measuring what's important, Testing, investing, tweaking, reinvesting - Action stations -Harness the power of online data, and watch the ROI take off.

Unit IV: **12 Hours**

Concept of e-mail marketing:Planning the campaign - Dos and don'ts of an e-mail marketing campaign- Measuring the success - Social media and online consumer engagement– Introduction to social media - The different forms of social media - the rules of engagement -

Adding social media to the own site.

Unit V: **12 Hours**

Online PR and reputation management - fostering a positive online image - promoting the business through online channels –Introduction to affiliate marketing – Digital media creative – mobile marketing – In-game advertising.

Learning Resources:

Text Book(s)

1. Damian Ryan, Calvin Jones, Kogan Page, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, 4th edition, 2016.

References

1. Damian Ryan, Calvin Jones, Kogan Page, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, 1st edition, 2008.

2. Susan Sweeney CA, Internet marketing for your Tourism, New Age International (P) Limited Publishers, New Delhi, 2005.

Websites/e-Learning Resources

1. www.coursera.org/specialization/digitalmarketing
2. www.digitalvidya.com
3. www.marketingsay.com

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	3	2	2	3	3
CO 2	3	3	3	2	2	3	3	2	2	2
CO 3	3	3	3	3	3	2	3	2	2	1
CO 4	3	3	2	2	2	2	2	2	2	2
CO 5	3	3	3	3	2	2	2	2	2	2
Average	3	2.8	2.6	2.4	2.2	2.4	2.4	2	2.2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3255	Internship*	IS	-	2

The objective of this course is to enable the students to explore career alternatives prior to graduation by integrating theory and practice.

Course Outcomes:

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

CO1: exploit the theoretical learning in practical situations assigned during the internship period.

CO2: apply various soft skills and communication skills during performance of the tasks assigned in internship organization.

CO3: integrate professional and ethical skills to get exposure to team-work and leadership quality.

CO4: analyze the functioning of internship organization and recommend changes for improvement in processes.

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

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	2	3	2	3	2	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	2.8	3	2.8	3	2.8	3	3

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3201	Cyber Security	SEC	3	2

The objective of this course is to familiarize students with the categories and types of cybercrimes in context of confidentiality, authentication, and integrity, and various cyber security issues and policies.

Course Outcomes:

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

    CO1: explain Computer Networks, cybercrimes, and protection from cybercrimes.

    CO2: discuss cyber attacks and security needs of an organization.

    CO3: identify cyber terrorism attacks and the challenges to our nation.

    CO4: illustrate cyber security management policies in India.

    CO5: elucidate intellectual property rights and the issues related to intellectual property rights.

Unit I   **9 Hours**

History of Internet - Internet Infrastructure - Internet Addresses - Classification of Cyber Crimes - Reasons for Commission of Cyber Crimes –Types of Cyber Crimes - Risks, Threats, and Vulnerabilities – Detection of Cyber Crimes - Protection from Cyber Crimes.

Unit II   **9 Hours**

Cyber Attacks - Types of Cyber Attacks - Malware and its Types - Authentication - Encryption - Digital Signatures - Antivirus - Firewall - Steganography - Computer Forensics.

Unit III   **9 Hours**

Cyber Terrorism – Methods of Cyber Terrorism Attacks – Tools for Cyber Terrorism – Challenges to India's National Security – Existing Cyber Security Initiatives - Challenges and Concerns.

Unit IV   **9 Hours**

Cyber Security – Cyber Security Tools – Cyber Laws and Issues in India - Cyber Security in India Present Status – National Cyber Security Policy – Indian Cyberspace – Private-Public Partnership – R & D in the Field of Cyber Security.

Unit V   **9 Hours**

Intellectual Property Rights – Issues in Intellectual Property Rights – Preparing for a Career in
Intellectual Property Rights and Cyber Security – Fellowship & Other OpportUnities.

Learning Resources:

Text Book(s)

1. Avantika Yadav, "Cyber Security", Narosa publishing House Pvt., Ltd., New Delhi,
   2017

References

1. JeetendraPande, Dr.JeetendraPande, Assistant Professor- School of CS & IT,
   Uttarakhand Open University, Introduction to Cyber Security, Haldwani, 2015
2. Eric A. Fischer Senior Specialist in Science and Technology, Cyber security
   Issues and Challenges: In Brief, August 12, 2016.
3. Joan Ruttenberg, Intellectual property and cyber law, 2013
4. James Graham, Cyber Security Essentials, Taylor and Francis Group, LLC,
   20115.

Websites/e-Learning Resources

1. www.tutorialspoint.com/information_security_cyber_law/information_security_
   cyber _law_tutorial.pdf

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	2	1	3	2	2	1	1	2
CO 2	3	3	1	2	2	2	2	1	1	3
CO 3	3	3	3	2	3	2	1	2	1	2
CO 4	3	3	3	2	3	3	2	1	1	2
CO 5	3	3	3	2	2	3	2	1	2	2
Average	3	3	2.4	1.8	2.6	2.4	1.8	1.2	1.2	2.2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3602	Machine Learning (TcL)	CC	6	6

The objective of this course is to provide students with the ability to apply machine learning concepts to real-world issues and to apply fundamental clustering and classification algorithms to both text and numerical data.

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

CO1: describe the importance of Machine Intelligence and applications of Machine Learning

CO2: explore the data gathered, Apply machine learning algorithms to real-world applications

CO3: identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision-making problems.

CO4: create instant based learning models

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

Unit I: **18 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 neighbour, support vector machines.

Unit II: **18 Hours**

Neural networks and genetic algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Genetic Algorithms – Hypothesis Space Search – Genetic Programming - Handwritten Digit Recognition using multi-layer neural network

Unit III: **18 Hours**

Bayesian and computational learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – text classification using Naive Bayes classifier.

Unit IV: **18 Hours**

Instant based learning: K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning, The k-means clustering algorithm - Improving cluster performance with postprocessing, customer segmentation using k-means Analysis.

Unit V: **18 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 – Reinforcement Learning – Task – Q-Learning – steps involved in Q-learning – Temporal Difference Learning.

Learning Resources:

Text Book(s)

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Peter Harrington, __ Machine Learning in Action, published by Manning, 2012.
3. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press

References

1. EthemAlpaydin, ―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://www.geeksforgeeks.org/classification-of-text-documents-using-the-approach-of-naive-bayes/
2. https://www.geeksforgeeks.org/multi-layer-perceptron-learning-in-tensorflow/
3. https://utsavdesai26.medium.com/mastering-q-learning-hands-on-examples-and-key-concepts-5e610d91a12b
4. https://www.kaggle.com/code/obrunet/customer-segmentation-k-means-analysis/notebook

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	1	2	1	1	2	3
CO 2	3	3	3	3	3	3	2	2	2	3
CO 3	3	3	3	3	3	3	2	2	2	3
CO 4	3	3	3	3	3	3	2	2	2	3
CO 5	3	3	2	2	3	3	2	2	2	3
Average	3	3	2.6	2.6	2.6	2.8	1.8	1.8	2	3

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3604	Data Science using R Programming (TcL)	Core	6	6

The objective of this course is to enable the students to understand the concepts of Data Science and the fundamentals of R programming with various tools available for presentation, visualization and analytics.

Course Outcomes:

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

CO1: communicate effectively the concepts of Data Science andData Analytics.

CO2: demonstrate the operations and utility of various data structures in R.

CO3: analyze the efficiency of various R data structures and tools for solving real-world problems.

CO4: create effective solutions for various business problems.

CO5: evaluate suitability of various data visualization tools for presenting data analytics results.

Unit I: **18 Hours**

Introduction to Data Science: Key Functions of Data Science, Functions of Data Scientist, Skillset of Data Scientist – Big data and its Types – Characteristics of Big data – Sources of Big data – Challenges with Big data – Big data Analytics and its Types – Steps in Big data Analytics – Tools for Big data Analytics – Benefits of Big data Analytics – Applications of Big data Analytics - Overview of Hadoop – Hadoop Architecture – Hadoop Ecosystem.

Unit II: **18 Hours**

Introduction to R: Features of R – Data types in R – Operators in R – Control Structures in R – Strings and String Operations in R – Functions in R – Introduction to Data Structures in R.   **Vectors in R**: Create, Add, Delete, and Update Operations – Obtaining Length of Vector - Extracting Vector Elements – Sorting Vector Elements – Vector Arithmetic – Repeating Vector – Cycling Vector Elements.

Unit III: **18 Hours**

Lists in R: Create, Add, Delete and Update Operations – Obtaining Length of List – Extracting List Elements – Checking Presence of Item in a List - Merging Lists – Converting List to Vector.

Matrices in R: Create, Add Column, Add Row, Remove Row, Remove Column – Finding Number of Elements - Finding Number of Rows and Columns – Extracting Matrix Elements – Checking Presence of Item in a Matrix - Combining Matrices – Matrix Manipulations – Transpose of Matrix – Getting Sum of Row Elements – Getting Sum of Column Elements – Getting Mean of Rows – Minima and Maxima.

Unit IV: **18 Hours**

Tables in R: Working with Tables – Array-like Operations on Tables – Extracting a Sub-table – Finding the Largest Cell in a Table.

Factors in R: Creating Factor – Factors and Levels - Changing Item Value in Factor - Obtaining Length of Factor – Extracting Factor Elements.

Functions in R: Functions for Statistical Distributions – Math Functions – Probability Functions.

Unit V: **18 Hours**

Data Frames in R: Create Data Frame – Extracting Columns or Rows from Data Frame – Adding Columns to Data Frame – Adding Rows to Data Frame – Merging Data Frames.

Importing Files into R: Importing csv Files – Importing Excel – Importing XML Files.

Data Visualization Tools: Line Chart – Bar Chart – Histogram – Pie Chart – Box Plot – Scatter Plot.

Learning Resources:

Text Book(s)

1. Dr. M. DavamaniChristober,Concepts of Data Science using R, KanthagaPookalPathipagam, 1st Edition, 2021,

2. Roger D. Peng, R Programming for Data Science,2012.

3. Norman Matloff, The Art of R Programming- A Tour of Statistical Software Design, 2011.

References

1. Garrett Grolemund, Hadley Wickham, Hands-On Programming with R: Write Your Own Functions and Simulations, 1st Edition, 2014.

2. Venables , W.N., Ripley, S programming, Springer, 2000.

Websites/e-Learning Resources

1. https://www.simplilearn.com

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	2	3	3
CO 2	3	3	3	3	3	3	3	2	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	2	3	3
Average	3	3	2.8	2.8	2.8	2.8	2.8	2.2	3	3

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3606	Project	Core	6	6

The objective of this course is to apply the acquired problem solving skills for real-time problems by implementing software solutions to obtain deep content knowledge in critical thinking, collaboration, creativity, and communication skills and to develop software projects.

Course Outcomes:

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

CO1: identify skills and capabilities that intersect effectively with the needs of industry.

CO2: design software solutions for complex problems by utilising systems approach**.**

CO3: apply and practice the theoretical concepts to evaluate real-time problems

CO4: communicate with clients in written and oral forms and deploy the projects to the commUnity at large.

CO5: demonstrate the knowledge, skills and attitudes of a professional in delivering the result of the developed project

Total Hours: 90

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	2	3	2	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	2	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	2.8	3	2.6	2.6	3

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3402	IOT and its Applications	DSE	5	4

The objective of this course is to enable the students to evaluate the challenges and design goals associated with IoT architecture and propose strategies to address them effectively.

Course Outcomes:

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

CO1: use of Devices, Gateways and Data Management in IoT

CO2: design IoT applications in different domain and be able to analyze their performance.

CO3: implement basic IoT applications on embedded platform.

CO4: gain knowledge on Industry Internet of Things.

CO5: discover the privacy and Security issues in IoT.

Unit I: **15 Hours**

The Internet of Things Today, Internet of Things Vision, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization.

Unit II: **15 Hours**

A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline.

Unit III: **15 Hours**

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

Unit IV: **15 Hours**

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management.

Unit V: **15 Hours**

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

Learning Resources:

Text Book(s)

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

References

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

2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", A press Publications 2013, 1st Edition,.

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

Websites/e-Learning Resources

1.https://www.simplilearn.com

2.https://www.javatpoint.com

3.https://www.w3schools.com

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	2	2	1	2	1
CO 2	3	3	3	2	2	2	2	1	1	2
CO 3	3	3	3	2	2	2	2	2	2	2
CO 4	3	3	3	2	2	2	2	2	2	2
CO 5	3	3	2	2	2	2	2	2	2	2
Average	3	3	2.8	2.2	2.2	2	2	1.6	1.8	1.8

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3404	Information Security	DSE	5	4

The objective of this course is to enable the students to understand the security problems, cryptographic techniques and the concepts of network security.

Course Outcomes:

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

CO1: illustrate the basic objectives of information security

CO2: explain the importance and application of each of confidentiality, integrity, authentication and availability.

CO3: describe various cryptographic algorithms.

CO4: classify the basic categories of threats to computers and networks.

CO5: discuss about the concepts of security in networks, web security.

Unit I: **15 Hours**

Introduction to Information Security: Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.

Unit II: **15 Hours**

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defence. Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption.

Unit III: **15 Hours**

Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms. Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.

Unit IV: **15 Hours**

Program Security : Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples

Unit V: **15 H ours**

Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction

Learning Resources:

Text Book(s)

1. Charles P. Pfleeger, Security in Computing, Fifth Edition, Pearson Education, 2018.
2. William Stallings, Cryptography and Network Security Principles and Practice, 7th Edition, Pearson, 2017.

References

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security, Wiley India, 2011.
2. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Education, 2008.
3. Mark Stamp, Information Security, Principles and Practice, Wiley India, 2021.
4. WM.Arthur Conklin, Greg White, Principles of Computer Security, 4th Edition, TMH, McGraw-Hill Education, 2016.

Web Sites

1. https://www.geeksforgeeks.org/what-is-information-security/
2. https://www.tutorialspoint.com/what-is-information-security#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20alteration%2C%20and%20disruption.

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	1	2	1
CO 2	3	3	3	2	2	2	2	1	2	2
CO 3	3	3	3	2	2	2	2	2	2	2
CO 4	3	3	3	2	2	2	2	2	1	2
CO 5	3	3	3	3	3	2	2	2	2	2
Average	3	3	2.8	2.2	2.2	2	2	1.6	1.8	1.8

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3406	Human Computer Interaction	DSE	5	4

The objective of this course is to enable the students to understand the fundamental theories and concepts of human-computer interaction (HCI), the design and evaluation of user interfaces.

Course Outcomes:

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

   CO1: explain the fundamentals of HCI.

   CO2: illustrate the design and software process technologies.

   CO3: describe HCI models and theories.

   CO4: discuss mobile ecosystem, different types of mobile applications and architecture.

   CO5: explain the various types of Web Interface Design.

Unit I: **15 Hours**

The Human: I/O channels – Memory -Reasoning and problem solving; The Computer: Devices – Memory – processing and networks - Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies.

Unit II :   **15 Hours**

Interactive Design - Basics - process - scenarios - Navigation: screen design Iteration and prototyping - HCI in software process - Software life cycle - usability engineering -Prototyping in practice - design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques - Universal Design

Unit III: **15 Hours**

HCI Models: Cognitive models: - Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit IV: **15 Hours**

Mobile Ecosystem: Platforms, Application Frameworks-Types of Mobile Applications: Widgets, Applications, Games-Mobile Information Architecture, Mobile 2.0- Mobile Design: Elements of Mobile Design, Tools. - Case Studies

Unit V :   **15 Hours**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

Learning Resources:

Text Book(s)

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale," Human -Computer Interaction‖", III Edition, Pearson Education, 2004 (UNIT I, II & III)

2. Brian Fling," Mobile Design and Development", I Edition, O 'Reilly Media Inc., 2009(UNIT–IV)

3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O 'Reilly, 2009. (UNIT-V)

References

1. Shneiderman, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", V Edition, Pearson Education.

Websites/e-Learning Resources

1. https://www.interaction-design.org/literature/topics/human-computer-interaction
2. https://link.springer.com/10.1007/978-0-387-39940-9_192
3. https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	2	1	1
CO 2	3	3	3	3	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	2	1	2
CO 4	3	3	3	2	2	2	2	1	3	2
CO 5	3	3	3	2	3	2	2	1	2	2
Average	3	3	2.8	2.2	2.2	2	2	1.6	1.8	1.8

Strong-3   Medium-2   Low-1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3302	Advanced Excel	GE	4	3

The objective of this course is to facilitate the students to handle large amounts of data, aggregate numeric data into categories and subcategories, filter, sort, and group data or subsets of data, create pivot tables to consolidate information from multiple files, and present data effectively through charts and graphs.

Course Outcomes:

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

CO1: explain the Basic of Excel and to handle the working of different functions.

CO2: analyze data validations and standardization of worksheets.

CO3: construct pivot tables to consolidate data from multiple tables.

CO4: demonstrate different functions with formatting options.

CO5: illustrate presenting data in the form of charts and graphs.

Unit I :   **12 Hours**

Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VLOOKUP with Exact Match, Approximate Match- Nested VLOOKUP with Exact Match- VLOOKUP with Tables, Dynamic Ranges- Nested VLOOKUP with Exact Match- Using VLOOKUP to consolidate Data from Multiple Sheets

Unit II: **12 Hours**

Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data -Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.

Unit III :   **12 Hours**

Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of

Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.

Unit IV: **12 Hours**

More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.

Unit V :   **12 Hours**

Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.

Learning Resources:

Text Book(s)

1. Michael Alexander and Dick Kusleika "Excel 2021 Power Programming with VBA" (2022)
2. Michael Alexander and John Walkenbach, "Excel 2021 Power Query and Power Pivot" (2022)
3. James Bernstein, "Mastering Excel 2021: A Step-by-Step Guide to Learning Excel" (2022)

References

1. Michael Alexander, "Excel 2021 Power Pivot and Power Query: Your Guide to Analyzing Data, Creating Reports, and Building Dashboards"
2. Michael Alexander and John Walkenbach, "Excel 2021 Formulas and Functions"

Websites/e-Learning Resources

1. https://www.simplilearn.com
2. https://www.javatpoint.com
3. https://www.w3schools.com

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	3	3	1	3	2	1	2	2
CO 2	3	3	2	2	1	2	2	1	2	2
CO 3	3	3	3	2	2	2	2	2	2	2
CO 4	3	3	3	2	2	2	3	1	3	3
CO 5	3	3	3	3	2	3	2	1	3	3
Average	3	2.8	2.8	2.4	1.6	2.4	2.2	1.2	2.4	2.4

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3304	Introduction to Data Science	GE	4	3

The objective of this course is to enable the students to understand the fundamentals of Data Science and Big Data, Hadoop framework and Data Science Process life cycle.

Course Outcomes:

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

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

   CO2: discuss the overview and building process in Data Science.

   CO3: classify various Algorithms in Data Science for real time applications.

   CO4: elucidate the concept Hadoop Framework in Data Science.

   CO5: analyze the Case study of Disease Prediction in Data Science.

Unit I: **12 Hours**

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

Unit II: **12 Hours**

The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.

Unit III: **12 Hours**

Algorithms: Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised.

Unit IV: **12 Hours**

Introduction to Hadoop: Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types.

Unit V: **12 Hours**

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

Learning Resources:

Text Book(s)

1. 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. MurtazaHaider, "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.
5. Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013.
6. Lillian Pierson, "Data Science for Dummies", 2017 II 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 - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	1	3	2	1	2	2
CO 2	3	3	3	2	2	2	2	1	2	2
CO 3	3	3	3	3	1	2	2	1	3	2
CO 4	3	3	3	3	2	2	2	1	3	3
CO 5	3	3	3	2	2	3	3	2	2	3
Average	3	2.8	2.8	2.4	1.6	2.4	2.2	1.2	2.4	2.4

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA3266	Professional Competency Skill	SEC	3	2

The objective of the course is to enable the students to encompass a broader set of knowledge, skills, attitudes, and behaviors necessary for success in a particular profession and lifelong career management.

Course Outcomes:

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

CO1: apply the acquired skills to reach solutions and an open mind to new opportUnities

CO2: manage time and resources to achieve academic, personal and professional commitments

CO3: identify the implications of professional values, ethics and attitudes in decision making

CO4: communicate clearly and concisely when presenting, discussing and reporting knowledge and ideas in formal and informal situations

CO5: anticipate challenges and plan potential solutions with collaboration, cooperation, and teamwork when working towards organizational goals

Total Hours: 45

CO - PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	3	3	2	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	2	3	3	3	3
Average	3	3	3	3	3	2.8	3	2.8	2.8	3

Strong-3   Medium-2   Low-1

COURSES OFFERED TO COMMERCE DEPARTMENT

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA1405	Programming in C (TcL)	Supportive	5	4

The objective of this course is to enable the students to understand the concepts of Structured 'C' Programming language and to acquire knowledge on Control Structure, Arrays, Pointers, functions, Structures and Unions.

Course Outcomes:

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

CO1: explain the features of C Language

CO2: identify the Data types, operators, variables and keywords in C

CO3: describe the use of control structures

CO4: apply the concept of arrays to solve problems related to searching, sorting and matrix operations and to write programs using functions

CO5: compare and Contrast Structures and Unions

Unit I: 15 Hours

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

Unit II: 15 Hours

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

Unit III: 15 Hours

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

Unit IV: 15 Hours

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

Unit V: **15 Hours**

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

Learning Resources:

Text Book(s)

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

2. PradipDey, ManasGhosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

References

1. YashavantP.Kanetkar,"LetUsC",16thEdition,2019,BPBPublications,ISBN:978-93-8728-449-4.

2. JacquelineAJonesandKeithHarrow,"ProblemSolvingwithC",PearsonEducation.ISBN:978-93-325-3800-9.

3. Dr.GuruprasadNagraj,"CProgrammingforProblemSolving",HimalayaPublishing House.ISBN-978-93-5299-361-1.

Websites/e-Learning Resources

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

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

CO-PO Mapping

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

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA1406	Programming in C++ (TcL)	Supportive	5	4

The objective of this course is to enable the students to impart knowledge in C++ language and syntax to design and implement programming solutions by applying Object- oriented concepts.

Course Outcomes:

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

CO1: state the various basic concepts of Object-orientation.

CO2: describe the working of functions and operator overloading

CO3: implement the concept of Inheritances

CO4: discuss the function overriding concepts

CO5: explain the concepts of Exception handling and I/O Streams

Unit I: **15 Hours**

Object Oriented Programming Concepts: Complexity in software - The need for object-orientation – Abstraction – Encapsulation – Modularity – Hierarchy. Basic Elements of C++: Classes – Objects – Data members and member functions – private and public access specifiers - Static members - Constructors – Singleton class – Destructors.

Unit II: **15 Hours**

Friend Functions and Friend Classes: Array of objects – Pointer to objects - this pointer – References – Dynamic memory allocation - Namespaces. Function Overloading: Overloading a function- Default arguments – Overloading Constructors. Operator Overloading:Overloading an operator as a member function – Overloading an operator as a friend function.

Unit III: **15 Hours**

Overloading the operators [], (), -> and comma operators – Conversion Functions. Inheritance: Types of inheritance – protected access specifier –Virtual Base Class – Base class and derived class constructors. Run-time Polymorphism: Virtual Functions

Unit IV: **15 Hours**

Function overriding - Pure virtual function – Abstract base class. Templates: Function templates – Overloading a function template – Class templates.

Unit V: **15 Hours**

Exception Handling: Exceptions – try, catch, throw – Rethrowing an exception – Restricting exceptions - Handling exceptions in derived classes - terminate(), abort(), unexpected(), set_terminate(). I/O Streams: Formatted I/O with ios class functions - Manipulators – Creating own manipulator – Overloading << and >> operators.

Learning Resources:

Text Book(s)

    1.Bjarne Strousstrup, The C++ Programming Language, 4th Edition,2013.

References

    1.J.P.CohoonandJ.W.Davidson,C++ProgramDesign–An Introduction to
        Programming and Object-Oriented Design, Second Edition,McGraw
        Hill,1999.

    2.C.J.Lippman,C++Primer,ThirdEdition,AddisonWesley, 2000.

Websites/e-Learning Resources

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

CO – PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	3	3	3	3	3	2	2	2
CO 2	3	3	3	2	3	2	2	2	2	2
CO 3	3	2	3	3	3	2	2	1	1	2
CO 4	3	2	3	3	2	2	3	2	2	2
CO 5	3	3	2	2	2	2	2	2	3	2
Average	3	2.6	2.8	2.6	2.6	2.2	2.4	1.8	2	2

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

Department of BCA
VALUE ADDED COURSES
w.e.f.2024-2025

Sem	Course Code	Course Title	Hours/Wk	Credits
2	24BCA122V	Graphics Design with CorelDraw	2	2
3	24BCA221V	Content Management System using WordPress	2	2
5	24BCA321V	Machine Learning using Azure Machine Learning Studio	2	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA122V	Graphics Design with CorelDraw	VAC	2	2

The objective of this course is to enable the students to learn the concept of CorelDraw, to gain immense knowledge of CorelDraw and to create vector art and illustrations for logos, web graphics, brochures.

Course Outcomes:

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

CO1: describe the basics of CorelDraw

CO2: explain the workspace and its various tools

CO3: design various kinds of logos, brochures and flyers by using special effects

CO4: illustrate the concepts of importing tables and adding images

CO5: create web graphics using bitmap

Unit I: 6 Hours

CorelDraw basics – Start and open drawings – scan images, work with multiple drawings, undo redo, and repeat actions, zoom, pan and scroll, preview, drawings, viewing modes, views save drawings.

Unit II: 6 Hours

CorelDraw workspace tour – Application window – standard toolbar – toolbox – property bar – Dockers – Status bar, Line Shapes, and Outlines – Object, Symbols and Layers

Unit III: 6 Hours

Special effects – Lenses – Add 3D effects – Mosaics – Text – Format text – Manage Fonts - Writing tools – Templates and styles – Color styles

Unit IV: 6 Hours

Tables – Add tables – Select, move and navigate table components, insert and delete table rows and columns, resize table cell, rows and columns, format tables and cells, text in tables, convert tables to text, merge and split tables and cells, manipulate tables as objects, add images, graphics and backgrounds to tables- import tables.

Unit V: 6 Hours

Work with bitmaps – Special effects categories – Bitmap color modes, Trace, Printing, Web graphics, File formats

Learning Resources:

Text Books

1. "CorelDraw 2020 user guide", Corel Corporation, 2020

References

1. "CorelDRAW Graphics Suite 2019 Quick Start Guide

Websites/e-Learning Resources

1. https://www.entheosweb.com/tutorials/coreldraw/default.asp
2. https://www.insidegraphics.com/category/coreldraw-tools/

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	3	3	3	3	3	2	2	1
CO 2	3	3	2	3	3	3	2	1	2	2
CO 3	3	3	3	3	3	2	3	1	2	3
CO 4	3	3	3	3	2	3	3	2	2	2
CO 5	3	3	3	3	3	2	3	2	2	2
Average	3	3	2.8	3	2.8	2.6	2.8	1.6	2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA221V	Content Management System using WordPress	VAC	2	2

The objective of this course is to enable the students to develop interactive Websites/e-Learning Resources and blogs using CMS tool WordPress.

Course Outcomes:

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

  CO1: Understand the CMS concept and its tool WordPress

  CO2 : Design a blog using CMS tool WordPress

  CO3 : Illustrating the Blog's media Library

  CO4 : Apply the theme and widget in Blog

  CO5 : Classify the WordPress Plug-ins

Unit I: **6 Hours**

Introduction – Content Management System – WordPress tool - Getting Started - Installing the WordPress Software on your Web Server - Prepare the WordPress - Configuration file - Loading the WordPress Files to Your Web Server - Configuring the FTP.

Unit II: **6 Hours**

Managing Users in WordPress Adding New Users to WordPress - User Roles in WordPress Deleting a User Account - Creating Categories for your Blog - Creating "Static" Pages in WordPress Configure the WordPress - Publishing Blog Posts in WordPress Accessing the WordPress Post – Menu - Writing a Blog Post in WordPress Editing an Existing Post - Deleting Existing – Posts - Writing a Blog Post in WordPress Entering Your Post Information Entering the Post Content Using the HTML View to Edit your Post

Unit III: **6 Hours**

Inserting Media into Your Posts - Inserting Images into Posts - Inserting Media from your Computer Feature Images - Inserting a Link to Media on Other Web Sites Inserting Media from your Blog's Media Library

Unit IV: **6 Hours**

Controlling the Look of a WordPress Blog Using Themes - Working With Themes in the WordPress Dashboard - Previewing a WordPress Theme -Installing a New Theme - Manually Adding Themes to WordPress - Finding High Quality Themes on the Internet - Add Content to Areas of your Blog using Widgets - Adding Widgets to Your Site Removing Widgets from the Sidebar and Footer

Unit V: **6 Hours**

Managing WordPress Plug-ins Activating Plug-ins - Deactivating Plug-ins Adding Plug-ins to Your Site Adding Plug-ins from the WordPress Plug-ins Directory - Adding Multiple Plug-ins using FTP Software - Removing Unwanted Plug-ins - Posting to WordPress Using Desktop Software

Learning Resources:
Text Book
1. Neil Staib, "A Step by step guide on WP", 2017

Reference
1. Christopher Masiello,"Wordpress: From Beginner to Expert", Kindle Edition, 2011
2. Sarah McHarry, "WrodPress to Go", 2013

Web Resources:
1. https://www.wp101.com
2. https://www.hostinger.in/tutorials/wordpress/

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CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
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CO 2	3	3	2	3	3	3	2	2	2	2
CO 3	3	3	3	3	3	2	3	1	2	2
CO 4	3	3	3	3	2	3	3	2	2	2
CO 5	3	3	3	3	3	3	3	2	2	2
Average	3	3	2.8	3	2.8	2.8	2.8	1.8	2	2

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

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24BCA321V	Machine Learning using Azure Machine Learning Studio	VAC	2	2

The objective of the course is to enable the students to understand the various problem-solving methods via appropriate usage of Machine Learning techniques and hands-on experience in Azure ML Studio of choosing an algorithm, running data through a model, and deploying a trained model as a predictive web service.

Course Outcomes:

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

CO1 : understand the Concepts and Intuition of Machine Learning Algorithms.

CO2 : prepare Data for use by an Azure Machine Learning Studio Experiment.

CO3: apply Machine Learning No-Code Approach to Build and Evaluate Regression Models using Azure ML Studio.

CO4 : train and Evaluate Classification Models in Azure Machine Learning Studio.

CO5 : build Clustering Models and Deploy Trained Models to make Predictions.

Unit I **6 Hours**

Compare Machine Learning Categories - Overview of Supervised, Unsupervised and Reinforcement Learning- Choose the Correct Machine Learning Category- Create Free Azure Account- Define Azure ML Studio Feature.

Unit II **6 Hours**

Azure ML Terminology- Azure ML Studio Service- Azure ML Workspace-Workflow of Azure Machine Learning Experiment- Data Exploration and Visualization-Getting Data in ML Studio- Data Format Conversion- Getting Data from ML Studio.

Unit III **6 Hours**

Data Preparation- Data Manipulation- Splitting Data-Apply SQL Transformation Module- Understanding Regression Algorithm – Train, Score and Evaluate Models-Linear Regression- Parameters and their Impact.

Unit IV   **6 Hours**

Understanding Classification-Training, Scoring and Evaluating Modules-Classifying Diabetes or not- Confusion Matrix-Predicting Adult Income with Decision-Tree-Based Models-Multiclass Classification with the Iris Dataset.

Unit V   **6 Hours**

Understanding the K-means Clustering Algorithm-Creating a K-means Clustering Model using ML Studio-Clustering versus Classification-Preparing the Trained Model for Publishing as a Web Service.

Learning Resources:

Text Book(s)

1.   Sumit Mund , "Microsoft Azure Machine Learning**",** 1ʳᵈEdition**,** Packt Publishing, 2015
2.   Jeff Barnes, "Azure Machine Learning", Microsoft Corporation, 1ˢᵗ Edition, 2015

References

1.   Shai Shalev-Shwartz and Shai Ben-David , "Understanding Machine Learning", Cambridge University Press. 2017.
2.

Websites/e-Learning Resources

1.   https://cloudacademy.com/course/introduction-to-azure-machine-learning-studio/training-a-model/
2.   https://www.udemy.com/course/machine-learning-using-azureml/
3.   https://www.udemy.com/course/machine-learning-no-code-approach-using-azure-ml-studio/
4.   https://towardsdatascience.com/introduction-to-machine-learning-for-beginners-eed6024fdb08
5.   https://medium.com/towards-artificial-intelligence/machine-learning-algorithms-for-beginners-with-python-code-examples-ml-19c6afd60daa
6.   https://intellipaat.com/blog/tutorial/microsoft-azure-tutorial/azure-machine-learning-ml-tutorial/
7.   https://medium.com/data-science-reporter/a-simple-hands-on-tutorial-of-azure-machine-learning-studio-b6f05595dd73

CO - PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	3	3	3	3	3	2	2	2
CO 2	3	3	2	3	3	3	2	1	2	3
CO 3	3	3	3	3	3	2	3	1	2	3
CO 4	3	3	3	3	3	3	3	2	2	3
CO 5	3	3	3	3	3	2	3	2	2	3
Average	3	3	2.8	3	5	2.6	2.8	1.6	2	2.8

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