



University of Madras

Chepauk, Chennai 600 005

[Est. 1857, State University, NAAC 'A++' Grade, CGPA 3.59, NIRF 2019 Rank: 20]
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Undergraduate Programme in Computer Science

Syllabus for
B.Sc Computer Science
(With effect from the Academic Year 2023 -24)

Learning Outcome Based Curriculum Framework

Note: The Board of Studies is designed Learning Outcomes Based Curriculum Framework of Under Graduate Computer Science Programme prescribed by UGC

Syllabus for B.Sc. Computer Science

(With effect from the Academic Year 2023-24)

I Preamble

Bachelor of Computer Science is a 3 – Year under Graduate Programme spread over six semesters. The course is designed to achieve high degree of technical skills in Problem solving and application development. The course develops requisite professional skills and problem solving abilities for pursuing a successful career in software industry and forms the required basics for pursuing higher studies in Computer Science.

II Eligibility

A pass in the Higher secondary Examination (Academic Stream) conducted by the Government of Tamil Nadu with Mathematics as one of the subjects.

III Programme Objectives

PO1	Scientific aptitude will be developed in Students
PO2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
PO3	Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
PO4	Students will possess basic subject knowledge required for higher studies, professional and applied courses.
PO5	Students will be aware of and able to develop solution-oriented approach towards various Social and Environmental issues.
PO6	Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
PO7	The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
PO8	Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.
PO9	Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
PO10	Mould the students into responsible citizens in a rapidly changing interdependent society.

IV Programme Specific Objectives

PSO1	Think in a critical and logical based manner
PSO2	Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.
PSO3	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively usethat information for the issue or problem at hand.
PSO4	Understand, formulate, develop programming model with logical approaches to Address issues arisingin social science, business and other contexts.
PSO5	Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.
PSO6	Provide students/learners sufficient knowledge and skills enabling them to undertake further studies inComputer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.
PSO7	Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.
PSO8	Develop a range of generic skills helpful in employment, internships& societal activities.
PSO9	Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.
PSO10	The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured

B.Sc. Computer Science - COURSE STRUCTURE
YEAR – I SEMESTER – I

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-I	3	6	25	75	100
Part-II	100L1Z	English Paper-I	3	6	25	75	100
Part-III	125C1A	CC- I: Python Programming @#\$%&	5	4	25	75	100
	125C11	CC- II: Python Programming Practical @#\$%&	5	5	40	60	100
	125E1A 125E1B 125E1C	EC - I Generic / Discipline Specific (Any one): Mathematics I @#\$%& / Statistics I @#\$%& / Physics I #\$%	3	5	25	75	100
			2	3	25	75	100
	---	Physics-I Practical #\$%	---	2	---	---	---
Part-IV	125S1A	SEC - I: Office Automation @#\$%& *	2	2	25	75	100
	100S1A	Basic Tamil-I (Other Language Students) *					
	100S1B	Advanced Tamil-I (Other Language Students) *					
	125B1A	FC: Fundamentals of Computers @#\$%&	2	2	25	75	100
			22/23	30			

*** PART-IV: SEC-1 / Basic Tamil / Advanced Tamil (Any one)**

1. Students who have studied Tamil upto XII STD and also have taken Tamil in Part I shall take SEC-I.
2. Students who have not studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take Basic Tamil comprising of Two Courses (level will be at 6th Std.).
3. Students who have studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take Advanced Tamil comprising of Two Courses.

YEAR – I SEMESTER – II

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-II	3	6	25	75	100
Part-II	100L2Z	English Paper-II	3	6	25	75	100
Part-III	125C2A	CC-III: Introduction to Computer Architecture and Microprocessor \$	5	4	25	75	100
	125C21	CC - IV: Introduction to Computer Architecture and Microprocessor Practical \$	5	5	40	60	100
	125E2A 125E2B 125E2C	EC-II Generic / Discipline Specific: Mathematics II @#\$%&/ Statistics II @#\$%&/ Physics II #\$%	3	5	25	75	100
			2	3	25	75	100
	125E21	Physics I & II (Practicals) #\$%	2	2	40	60	100
Part-IV	125S2A	SEC- II: Quantitative Aptitude @#\$%& *	2	2	25	75	100
	100S2A	Basic Tamil-II (Other Language Students) *					
	100S2B	Advanced Tamil-II (Other Language Students) *					
	125S2B	SEC- III: Problem Solving Techniques \$	2	2	25	75	100
			23/24	30			

YEAR – II SEMESTER – III

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-III	3	6	25	75	100
Part-II	200L3Z	English Paper-III	3	6	25	75	100
Part-III	225C3A	CC - V: Java Programming @#\$%&	5	4	25	75	100
	225C31	CC - VI: Java Programming Practical @#\$%&	5	5	40	60	100
	225E3A	EC-III Generic / Discipline Specific: Mathematics I @#\$%&/ Statistics I @#\$%&/ Physics I #\$%	3	5	25	75	100
	225E3B		2	3	25	75	100
	225E3C		---	2	---	---	---
Part-IV	225S31	SEC- IV: (Entrepreneurial Based): Web Page Design Practical @#\$%&	1	1	40	60	100
	225S32	SEC- V: Desktop Publishing Practical @#\$%&	2	2	40	60	100
	----	Environmental Science	--	1	--	--	--
			21/22	30			

YEAR – II SEMESTER – IV

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-IV	3	6	25	75	100
Part-II	200L4Z	English Paper-IV	3	6	25	75	100
Part-III	225C4A	CC - VII: Data Structures and Algorithms \$	5	4	25	75	100
	225C41	CC -VIII: Data Structures and Algorithms Practical \$	5	4	40	60	100
	225E4A	EC-IV Generic / Discipline Specific : Mathematics II @#\$%&/ Statistics II @#\$%&/ Physics II #\$%	3	5	25	75	100
	225E4B		2	3	25	75	100
	225E4C		225E41	Physics I & II (Practicals) #\$%	2	2	40
Part-IV	225S4A	SEC -VI: Emotional Intelligence @#\$%&	2	2	25	75	100
	225S4B	SEC -VII: Technical Writing @#\$%&	2	2	25	75	100
	---	Environmental Science	2	1	25	75	100
			25/26	30			

YEAR – III SEMESTER – V

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	325C5A	CC - IX: Operating System @\$	3	5	25	75	100
	325C51	CC - X: Operating System Practical \$	5	5	40	60	100
	325C5B	CC - XI: Relational Database Management System @#\$	4	5	25	75	100
	325C52	CC-XII: Relational Database Management System Practical #\$	4	5	40	60	100
	325E5A 325E5B 325E5C	EC-V: Computer Networks #\$%&/ Mobile Ad-hoc Network @#\$%& / Data Mining and Warehousing @#\$%&	3	4	25	75	100
	325E5D 325E5E 325E5F	EC -VI: Software Engineering @#\$%& / Software Testing \$ / Digital Image Processing \$	3	4	25	75	100
Part-IV	---	Value Education	2	2	25	75	100
	---	Internship / Industrial Training (During summer vacation at the end of IV semester)	2	--	--	--	--
			26	30			

YEAR – III SEMESTER – VI

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	325C6A	CC- XIII: Programming in ASP.NET #\$	4	6	25	75	100
	325C61	CC- XIV: Programming in ASP.NET Practical #\$	4	6	40	60	100
	325C62	CC - XV: Project with Viva voce #\$	4	6	40	60	100
	325E6A 325E6B 325E6C	EC -VII: Artificial Intelligence \$ / Introduction To Data Science @#\$ / Internet of Things and its Applications @#\$%&	3	5	25	75	100
	325E6D 325E6E 325E6F	EC -VIII: Cloud Computing @#\$%& / Big Data Analytics @#\$%& / Block Chain Technology \$	3	5	25	75	100
Part-IV	325S61	Professional Competency Skill Course: Advanced Excel Practical #\$	2	2	40	60	100
Part-V	---	Extension Activity	1	--	--	--	--
			21	30			

@ - Common to B.C.A.

- Common to B.Sc. Software Applications

\$ - Common to B.Sc. Computer Science

% - Common to B.Sc. Computer Science with Artificial Intelligence

& - Common to B.Sc. Computer Science with Data Science

UNIVERSITY OF MADRAS
B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE
SYLLABUS WITH EFFECT FROM 2023-2024

Year: I	Semester:I
Core-I: Python Programming (Common to B.Sc.-CS with AI, CS with DS, Software Appl.& BCA)	125C1A
Credits 5	Lecture Hours:4 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field) <ul style="list-style-type: none"> • Describe the core syntax and semantics of Python programming language. • Discover the need for working with the strings and functions. • Illustrate the process of structuring the data using lists, dictionaries, tuples and sets. • Understand the usage of packages and Dictionaries Course Outcomes: (for students: To know what they are going to learn) CO1: Develop and execute simple Python programs CO2: Write simple Python programs using conditionals and looping for solving problems CO3: Decompose a Python program into functions CO4: Represent compound data using Python lists, tuples, dictionaries etc. CO5: Read and write data from/to files in Python programs	

UNITS	CONTENTS
I	Introduction: The essence of computational problem solving – Limits of computational problem solving-Computer algorithms-Computer Hardware-Computer Software-The process of computational problem solving-Python programming language - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / output.
II	Control Structures: Boolean Expressions - Selection Control - If Statement- Indentation in Python- Multi-Way Selection -- Iterative Control- While Statement- Infinite loops- Definite vs. Indefinite Loops- Boolean Flag. String, List and Dictionary, Manipulations Building blocks of python programs, Understanding and using ranges.
III	Functions: Program Routines- Defining Functions- More on Functions: Calling Value-Returning Functions- Calling Non-Value-Returning Functions- Parameter Passing - Keyword Arguments in Python - Default Arguments in Python-Variable Scope. Recursion: Recursive Functions.
IV	Objects and their use: Software Objects - Turtle Graphics – Turtle attributes- Modular Design: Modules - Top-Down Design - Python Modules - Text Files: Opening, reading and writing text files – Exception Handling.
V	Dictionaries and Sets: Dictionary type in Python - Set Data type. Object Oriented Programming using Python: Encapsulation - Inheritance – Polymorphism. Python packages: Simple programs using the built-in functions of packages matplotlib, NumPy, pandas etc.

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Learning Resources:

Recommended Texts

1. Charles Dierbach, “Introduction to Computer Science using Python - A computational Problem-solving Focus”, Wiley India Edition, 2015.
2. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016

Reference Books

1. Mark Lutz, “Learning Python Powerful Object Oriented Programming”, O’reilly Media 2018, 5th Edition.
2. Timothy A. Budd, “Exploring Python”, Tata McGraw Hill Education Private Limited 2011, 1 st Edition.
3. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1590282410
4. Michel Dawson, “Python Programming for Absolute Beginners” , Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-143545500

Web resources

1. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

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Year: I

Semester: II

Introduction to Computer Architecture and Microprocessor		125C2A
Credits 5		Lecture Hours:4 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)		
<ul style="list-style-type: none"> • To introduce the internal organization of Intel 8085 Microprocessor. • To enable the students to write assembly language programs using 8085. • To interface the peripheral devices to 8085 using Interrupt controller and DMA interface. 		
Course Outcomes: (for students: To know what they are going to learn)		
CO1: Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085.		
CO2: Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic..		
CO3: Applying different types of instructions to convert binary codes and analysing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.		
CO4: Analyse how peripheral devices are connected to 8085 using Interrupts and DMA controller.		

Units	Contents
I	Digital Computers - Microcomputer Organization-Computer languages Number Systems: Decimal, Binary, Octal. Hexadecimal. Conversions: Conversion between all four number systems of integer and floating-point values. Data representation: fixed point and floating-point representation - Character codes
II	Addition, subtraction (9's Complement for decimal, 10's complement for decimal, 1's complement, 2's complement methods), multiplication and division of binary numbers. - Differentiate Binary and BCD representations - BCD to Binary and Binary to BCD conversions, BCD addition and Subtraction. 8085 Microprocessor: Architecture, Pinout and Signals – Functional block diagram -
III	8085 Instruction Set and addressing modes- 8085 sample programs using data transfer, arithmetic and JMP instructions– function calls in 8085
IV	The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.
V	Program control- RISC - Pipelining -Arithmetic instruction- RISC pipeline - Vector processing and Array processors.

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TEXT BOOKS:

1. M.M. Mano, "Computer System architecture". Pearson, Third Edition, 2007
2. R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram- 2009.
3. Tripti Dodiya & Zakiya Malek, "Computer Organization and Advanced Microprocessors", CengageLearning, 2012.

REFERENCE BOOKS:

1. Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill-1993.
2. P. K. Ghosh and P. R. Sridhar- "0000 to 8085: Introduction to Microprocessors for Engineers and Scientists"- 2nd Edition- PHI- 1995.
3. NagoorKani- "Microprocessor (8085) and its Applications"- 2nd Edition- RBA Publications- 2006.
4. V. Vijayendran- "Fundamentals of Microprocessors – 8085"- S. Viswanathan Pvt. Ltd.- 2008.

WEB REFERENCES:

NPTEL & MOOC courses titled Computer organization

<https://nptel.ac.in/courses/106105163/>

<https://nptel.ac.in/courses/106103068>

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Year: I	Semester:I
Core-II: Python Programming Practical (Common to B.Sc.-CS with AI, CS with DS, Software Appl.& BCA)	125C11
Credits 5	Lecture Hours:5 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)	
<ul style="list-style-type: none"> • Acquire programming skills in core Python. • Acquire Object-oriented programming skills in Python. • Develop the skill of designing graphical-user interfaces (GUI) in Python. • Develop the ability to write database applications in Python. • Acquire Python programming skills to move into specific branches 	
Course Outcomes: (for students: To know what they are going to learn)	
CO1: To understand the problem solving approaches CO2: To learn the basic programming constructs in Python CO3: To practice various computing strategies for Python-based solutions to real world problems CO4: To use Python data structures - lists, tuples, dictionaries. CO5: To do input/output with files in Python.	

List of Programs						
<ol style="list-style-type: none"> 1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice. 2. Write a Python program to construct the following pattern, using a nested loop <pre style="text-align: center;">* ** *** **** ***** **** *** ** *</pre> 3. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Grade A: Percentage ≥ 80</td> <td style="width: 50%;">Grade B: Percentage ≥ 70 and 80</td> </tr> <tr> <td>Grade C: Percentage ≥ 60 and < 70</td> <td>Grade D: Percentage ≥ 40 and < 60</td> </tr> <tr> <td>Grade E: Percentage < 40</td> <td></td> </tr> </table> 4. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user. 5. Write a Python script that prints prime numbers less than 20. 6. Program to find factorial of the given number using recursive function. 	Grade A: Percentage ≥ 80	Grade B: Percentage ≥ 70 and 80	Grade C: Percentage ≥ 60 and < 70	Grade D: Percentage ≥ 40 and < 60	Grade E: Percentage < 40	
Grade A: Percentage ≥ 80	Grade B: Percentage ≥ 70 and 80					
Grade C: Percentage ≥ 60 and < 70	Grade D: Percentage ≥ 40 and < 60					
Grade E: Percentage < 40						

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<ul style="list-style-type: none">7. Write a Python program to count the number of even and odd numbers from array of N numbers.8. Write a Python class to reverse a string word by word.9. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input: tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output: 3)10. Create a Savings Account class that behaves just like a Bank Account, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint: use Inheritance).11. Read a file content and copy only the contents at odd lines into a new file.12. Create a Turtle graphics window with specific size.13. Write a Python program for Towers of Hanoi using recursion14. Create a menu driven Python program with a dictionary for words and their meanings.15. Devise a Python program to implement the Hangman Game.

Learning Resources:

Recommended Texts

- 1. Charles Dierbach, “Introduction to Computer Science using Python - A computational Problem-solving Focus”, Wiley India Edition, 2015.
- 2. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016

Reference Books

- 1. Mark Lutz, “Learning Python Powerful Object Oriented Programming”, O’reilly Media 2018, 5th Edition.
- 2. Timothy A. Budd, “Exploring Python”, Tata McGraw Hill Education Private Limited 2011, 1 st Edition.
- 3. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410
- 4. Michel Dawson, “Python Programming for Absolute Beginners”, Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009

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Year: I

Semester: II

Introduction to Computer Architecture and Microprocessor Practical	125C21
Credits 5	Lecture Hours:5 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)	
<ul style="list-style-type: none"> • To introduce the internal organization of Intel 8085 Microprocessor. • To enable the students to write assembly language programs using 8085. • To interface the peripheral devices to 8085 using Interrupt controller and DMA interface. • To provide real-life applications using microcontroller. 	
Course Outcomes: (for students: To know what they are going to learn)	
CO1: Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085. CO2: Understanding the 8085-instruction set and their classifications, enables the students to write the programs easily on their own using different logic. CO3: Applying different types of instructions to convert binary codes and analysing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations. CO4: Analyse how peripheral devices are connected to 8085 using Interrupts and DMA controller.	

List of Programs

Addition and Subtraction

1. 8 - bit addition
2. 16 - bit addition
3. 8 - bit subtraction
4. BCD subtraction

Multiplication and Division

1. 8 - bit multiplication
2. BCD multiplication
3. 8 - bit division

Sorting and Searching

1. Searching for an element in an array.
2. Sorting in Ascending and Descending order.
3. Finding the largest and smallest elements in an array.
4. Reversing array elements.
5. Block move.

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Code Conversion

1. BCD to Hex and Hex to BCD
2. Binary to ASCII and ASCII to binary
3. ASCII to BCD and BCD to ASCII

Applications

1. Square of a single byte Hex number
2. Square of a two-digit BCD number
3. Square root of a single byte Hex number
4. Square root of a two-digit BCD number

TEXT BOOKS:

1. M.M. Mano, "Computer System architecture". Pearson, Third Edition, 2007
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3. Tripti Dodiya & Zakiya Malek, "Computer Organization and Advanced Microprocessors", CengageLearning, 2012.

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2. P. K. Ghosh and P. R. Sridhar- "0000 to 8085: Introduction to Microprocessors for Engineers and Scientists"- 2nd Edition- PHI- 1995.
3. NagoorKani- "Microprocessor (8085) and its Applications"- 2nd Edition- RBA Publications- 2006.
4. V. Vijayendran- "Fundamentals of Microprocessors – 8085"- S. Viswanathan Pvt. Ltd.- 2008.

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Year:I

Semester: I

Title of the Course		MATHEMATICS-I (Common to B.Sc Physics, Physics with CA, Chemistry, ECS, DataScience, Artificial Intelligence, Software Applications & BCA)								
Paper Number		ELECTIVE COURSE I								
Category	Elective	Year	I	Credits	3	Course Code	125E1A			
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total					
		4	1	--	5					
Pre-requisite		12 th Standard Mathematics								
Objectives of the Course		<ul style="list-style-type: none"> Students gain knowledge about the basic concepts of Algebra, Theory of Equations. They also gain the basic knowledge in Matrices, Trigonometry and Differential Calculus. 								
Course Outline		UNIT-I: Summation of series: Binomial series -Exponential series - Logarithmic series -Simple Problems. Hours:15 Chapter2: Sections:2.1.3,2.2,2.2.1,2.3,2.3.3. UNIT II: Matrices: Symmetric– Skew-Symmetric–Hermitian– Skew-Hermitian–Orthogonal and Unitary matrices–Cayley-Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem. Chapter4: Sections:4.1.1–4.1.6,4.5.2 and 4.5.3. Hours:15								
		Unit III: Numerical Methods: Newton's method to find a root approximately. Finite Differences: Interpolation: Operators, $\Delta, \nabla, E, E^{-1}$ difference tables. Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula. Hours:15 Chapter3: Sections 3.4.1. Chapter 5: Sections: 5.1 and 5.2.								
		Unit IV: Trigonometry: Expansions of $\sin^n \theta, \cos^n \theta$ in a series of powers of $\sin \theta$ and $\cos \theta$ -Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series of sines and cosines of multiples of " θ " -Expansions of $\sin \theta, \cos \theta$ and $\tan \theta$ in a series of powers of " θ " -Hyperbolic and inverse hyperbolic functions . Chapter6: Section 6.1 – 6.3 Hours:15								
		Unit V: Differential Calculus: Successive differentiation, n th derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems Chapter1, Section 1.1 to 1.3.1. Hours:15 Total Hours: 75								

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Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Allied Mathematics, Volume I and Volume II by P. Durai Pandian and S. Udayabaskaran, S. Chand Publications Volume I: Unit I – IV, Volume II – Unit V
Reference Books	1. Ancillary Mathematics by S. Narayanan and T. K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai Allied Mathematics by A. Singaravelu Allied Mathematics by P. R. Vittal
Website and e-Learning Source	1. http://www.themathpage.com 2. http://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Understand the concept of Summation of Series.

CLO2: Understand the concept of Cayley Hamilton Theorem and inverse matrices.

CLO3: Understand the concept of finite differences.

CLO4: Understand the knowledge about expansions, hyperbolic and inverse hyperbolic functions.

CLO5: Understand the concept of Leibnitz theorem and functions of two variables

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	2	3	1	3	1	1	3	1	1
CLO 2	3	2	1	3	1	1	3	1	1
CLO 3	3	2	1	3	1	1	3	1	1
CLO 4	3	3	1	3	1	1	3	1	1
CLO 5	3	2	1	3	1	1	3	1	1

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SYLLABUS WITH EFFECT FROM 2023-2024

Year: I	Semester: I
Elective: Statistics-I (Common to B.Sc.-CS with AI, CS with DS, Software Appl. & BCA)	125E1B
Lecture Hours: 5 per week	Credits: 3
Learning Objectives: (for teachers: what they have to do in the class/lab/field)	
Course Outcomes: (for students: To know what they are going to learn) <ol style="list-style-type: none"> 1. Know the uses of statistics in society 2. Organize, manage and present data 3. Analyze the statistical data graphically using frequency distribution and cumulative frequency distribution. 4. Analyze statistical data using measures of central tendency, dispersion and location. 5. To understand correlation between continuous variables and association between categorical variables. 	
Units	Contents
I	Methods of collection: Complete enumeration – Sample Survey - Primary data - Secondary data sources - Types of variables. Nominal, ordinal and scale data. Presentation of Data: Presentation of data by tables - construction of tables (Univariate and Bivariate) – frequency table and contingency table
II	Diagrammatic presentation: Line diagram, Bar diagrams: Simple, multiple, subdivided and Percentage-Pie chart, comparative pie chart - Graphical representation of a frequency distribution by histogram and frequency polygon and Ogives
III	Analysis of Data (Univariate): Measures of central tendency: Arithmetic mean- Median and Mode choice of an average-characteristic of a good average
IV	Measures of dispersion: Range-Quartile deviation-mean deviation - standard deviation - relative measures of dispersion - Coefficient of Variance
V	Analysis of Data (Bivariate): Correlation- Scatter plot-coefficient of correlation- Pearson's Correlation Coefficient, Spearmen's rank correlation coefficient- correlation coefficient for bivariate frequency table- Association of attributes: Chi-square test of independence of attributes
Suggested Readings: Books for study: <ol style="list-style-type: none"> 1. Gupta, S.C and Kapoor, V. K (2002), <i>Fundamentals of Mathematical Statistics</i>, Sultan Chand and Sons, New Delhi. 2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): <i>Fundamentals of Statistics</i>, Vol. I & II, 8th Edn. The World Press, Kolkata. 3. Irwin Miller, Marylees Miller (2006): <i>John E. Freund's Mathematical Statistics with Applications</i>, (7th Edn.), Prentice Hall International INC. 4. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): <i>Introduction to the Theory of Statistics</i>, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd Books for reference: <ol style="list-style-type: none"> 1. Saxena H.C.: <i>Elementary Statistics</i>. S. Chand & Co., 2009. 	

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Title of the Course		MATHEMATICS – II (Common to B.Sc. Physics, Physics with CA, Chemistry, Computer Science, ECS, Data Science, Artificial Intelligence, Software Applications & BCA)								
Paper Number		ELECTIVE COURSE II								
Category	Elective	Year	I	Credits	3	Course Code	125E2A			
		Semester	II							
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total					
		4	1	--	5					
Pre-requisite		12 th Standard Mathematics								
Objectives of the Course		<ul style="list-style-type: none"> Students gain some knowledge in Integral Calculus, Differential Equations. They also learn the basic concepts in Laplace Transforms and Vector Calculus. 								
		Unit I: Integral calculus: Bernouli's Formula, Reduction Formula $\sin^n \theta, \cos^n \theta, \sin^m \theta \cos^n \theta$ – Simple Problems.								
		Unit II : Fourier Series: Fourier series for functions $(0, 2\pi), (-\pi, \pi)$								
		Chapter 4: Section : 4.1, 4.1.1								
		Unit III: Differential Equations: Ordinary Differential Equations: second order non- homogeneous differential equations with constant coefficients of the form $ay'' + by' + cy = X$ where X is of the form cos and sin - Related problems only.								
		Partial Differential Equations: Formation, complete integrals and general integrals, four standard types and solving Lagrange's linear equation $P p + Q q = R$.								
		Chapter 5: Section 5.2.1, Chapter 6: Section 6.1 to 6.4								
		Chapter 5: Section 5.2.1, Chapter 6: Section 6.1 to 6.4								
		Hours: 15								
		Unit IV: Laplace Transforms: Laplace transformations of standard functions and simple properties, inverse Laplace transforms.								
		Chapter 7: Section 7.1.1 to 7.1.4 & 7.2 to 7.2.3								
		Hours: 15								
		Unit V: Vector Differentiation: Introduction, Scalar point functions, Vector point functions, vector differential operator Gradient, Divergence, Curl, Solenoidal, irrotational, identities.								
		Chapter 8, Section 8.1 to 8.4.4								
		Hours: 15								

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Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)	Total Hours: 75
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	
Recommended Text	Allied Mathematics, Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications	
Reference Books	1. Ancillary Mathematics by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai 2. Allied Mathematics by A. Singaravelu 3. Allied Mathematics by P.R. Vittal	
Website and e-Learning Source	1. http://www.themathpage.com 2. http://nptel.ac.in	

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the various concepts of Bernoulli's and Reduction Formula.

CLO 2: Understand the concepts of Fourier Series

CLO 3: Understand the concepts of Non-Homogenous and Partial Differential Equations

CLO 4: Understand the Laplace Transforms

CLO 5: Understand the concepts of Vector Differentiation.

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	1	3	2	3	1	1	3	1	1
CLO 2	2	3	1	3	1	1	3	1	1
CLO 3	3	2	1	3	1	1	3	1	1
CLO 4	2	3	1	3	1	1	3	1	1
CLO 5	3	3	2	3	1	1	3	1	1

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Year: I

Semester: II

Elective: Statistics-II (Common to B.Sc.-CS, CS with AI, CS with DS, Software Appl. & BCA)		125E2B
Lecture Hours: 5 per week		Credits:3
Learning Objectives: (for teachers: what they have to do in the class/lab/field)		
Course Objectives:		
<ol style="list-style-type: none"> 1. Understand Probability and its properties 2. Learn characteristics of different discrete and continuous distributions. 3. Know situation to which different distributions can be applied. 4. Comprehend the Sampling distributions. 5. Learn how to apply statistical tests to get information from data 		
Units	Contents	
I	Basic concepts of Probability: Random Experiments, Sample space, Trial, Events, - Classical and empirical approach to probability and their limitations -Types of events: Exhaustive, mutually exclusive, equally likely and Independent events - Axiomatic approach to probability - Basic theorems on probability using axiomatic approach. Bayes Theorem (statement only)	
II	Discrete probability mass function, cumulative distribution function- Theory and problems based on it. Bernoulli distribution, Binomial Distribution and Poisson Distribution	
III	Continuous probability density function, cumulative distribution function - Theory and problems based on it. Normal Distribution and its properties, Standard Normal distribution, Problems based on it. Exponential Distribution	
IV	Introduction of Sampling distributions- student's t and chi-square distributions, distribution of sample mean from normal distribution. Density function and Properties only.	
V	Testing of Hypothesis, Single mean test and double means test based on normal distribution and students t-distribution. Proportion test, Chi-square test, ANOVA test.	

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Course Outcomes: Upon finishing point of this course, students will be able to

1. understand the basic concept of Probability
2. identify the characteristics of different discrete and continuous distributions.
3. identify the type of statistical situation to which different distributions can be applied comprehend the Sampling distributions.
4. understand how to apply statistical tests to get information from data.

Suggested Readings:

Books for study:

1. Gupta,S.CandKapoor,V.K(2002),*Fundamentals of Mathematical Statistics*,SultanChandSons,NewDelhi.
2. GoonA.M.,GuptaM.K.andDasguptaB.(2002):*Fundamentals of Statistics*,Vol.I&II,8thEdn.TheWorldPress,Kolkata.
3. IrwinMiller,MaryleesMiller(2006):*JohnE.Freund's Mathematical Statistics with Applications*,(7thEdn.),PrenticeHallInternationalINC.
4. Mood,A.M.Graybill,F.A.andBoes,D.C.(2007):*Introduction to the Theory of Statistics*,3rdEdn.,(Reprint),TataMcGraw-HillPub.Co.Ltd

Books for reference:

- 1.SaxenaH.C.:*Elementary Statistics*.S.Chand&Co.,2009.

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Year: II

Semester: III

Java Programming Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS		225C3A
Credits 5		Lecture Hours:4 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)		
<ul style="list-style-type: none"> To provide fundamental knowledge of object-oriented programming. To equip the student with programming knowledge in Core Java from the basics up. To enable the students to use AWT controls, Event Handling and Swing for GUI. 		
Course Outcomes: (for students: To know what they are going to learn)		
CO1: Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java		
CO2: Implement inheritance, packages, interfaces and exception handling of Core Java.		
CO3: Implement multi-threading and I/O Streams of Core Java		
CO4: Implement AWT and Event handling.		
CO5: Use Swing to create GUI.		

Units	Contents
I	Introduction: Review of Object-Oriented concepts - Java buzzwords (Platform independence, Portability, Threads)- JVM architecture –Java Program structure - –Java main method - Java Console output(System.out) - simple java program - Data types - Variables - type conversion and casting- Java Console input: Buffered input - operators - control statements - Static Data - Static Method - String and String Buffer Classes
II	Java user defined Classes and Objects – Arrays – constructors - 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
III	Exception Handling: try – catch - throw - throws -- finally – Built-in exceptions - Creating own Exception classes - garbage collection, finalise -Multithreaded Programming: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication – Deadlock.
IV	The AWT class hierarchy - Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox – JScrollPane - Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events
V	Adapter classes - Inner classes -Java Util Package / Collections Framework:Collection & Iterator Interface- Enumeration- List and ArrayList- Vector- Comparator

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Learning Resources:

Recommended Texts

Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

Head First Java, O’Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

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Year: II	Semester: IV
Data Structures and Algorithms	225C4A
Credits 5	Lecture Hours:4 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)	
<ul style="list-style-type: none"> • To impart the basic concepts of data structures and algorithms. • To acquaint the student with the basics of the various data structures • This course also gives insight into the various algorithm design techniques 	
Course Outcomes: (for students: To know what they are going to learn)	
CO1: To introduce the concepts of Data structures and to understand simple linear data structures.	
CO2: Learn the basics of stack data structure, its implementation and application	
CO3: Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.	
CO4: To introduce the basic concepts of algorithms	
CO5: To give clear idea on algorithmic design paradigms like Divide and conquer and Backtracking,	

Units	Contents
I	INTRODUCTION TO DATA STRUCTURES: Data Structures: Definition- Time & Space Complexity - Arrays: Representation of arrays, Applications of arrays, sparse matrix and its representation - Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list - Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations.
II	STACKS and QUEUES: Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation - Queues: operations on queues, array and linked representations - Circular Queue: operations, applications of queues.
III	TREES & GRAPHS: Trees: Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder, preorder), Binary search trees in arrays– Heaps - AVL Trees – B Trees Graphs: Representation of Graphs- Types of graphs
IV	INTRODUCTION TO ALGORITHMS: Definition of Algorithms- Overview and importance of algorithms- pseudocode conventions, Asymptotic notations, practical complexities. Graph Applications: Breadth first traversal – Depth first traversal- -Single source shortest path – Minimal spanning trees – prim's and kruskal's algorithms
V	DIVIDE AND CONQUER ALGORITHMS: General Method – Binary Search- Quick Sort- Merge Sort. BACKTRACKING: General method, 8 Queens, Graph coloring, Hamiltonian cycle.

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Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition , “Fundamentals of Computer Algorithms “ Universities Press

Reference Books

1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.
5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of ComputerAlgorithms”, Addison Wesley, Boston, 1974
6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
7. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

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Year: II	Semester:III
Java Programming Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	225C31
Credits 5	Lecture Hours:5 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> • To gain practical expertise in coding Core Java programs • To become proficient in the use of AWT, Event Handling and Swing. <p>Course Outcomes: (for students: To know what they are going to learn)</p> <p>CO1: Code, debug and execute Java programs to solve the given problems</p> <p>CO2: Implement multi-threading and exception-handling</p> <p>CO3: Implement functionality using String and StringBuffer classes</p> <p>CO4: Demonstrate Event Handling.</p> <p>CO5: Create applications using Swing and AWT</p>	

List of Programs	
<ol style="list-style-type: none"> 1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer? 2. Write a Java program to multiply two given matrices. 3. Write a Java program that displays the number of characters, lines and words in a text? 4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated. 5. Write a program to do String Manipulation using Character Array and perform the following string operations: <ol style="list-style-type: none"> a) String length b) Finding a character at a particular position c) Concatenating two strings 6. Write a program to perform the following string operations using String class: <ol style="list-style-type: none"> a) String Concatenation b) Search a substring c) To extract substring from given string 7. Write a program to perform string operations using StringBuffer class: <ol style="list-style-type: none"> a) Length of a string b) Reverse a string c) Delete a substring from the given string 8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number. 9. Write a threading program which uses the same method asynchronously to print the 	

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numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.

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

Learning Resources:

Recommended Texts

Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

Head First Java, O’Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

Web resources: Web resources from NDL Library, E-content from open-source libraries

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Year: II

Semester: IV

Data Structures and Algorithms Practical		225C41
Credits 5		Lecture Hours:4 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)		
<ul style="list-style-type: none"> • To understand and implement basic data structures using Java • To apply linear and non-linear data structures in problem solving. • To learn to implement functions and recursive functions by means of data structures • To implement searching and sorting algorithms 		
Course Outcomes: (for students: To know what they are going to learn)		
CO1: Implement data structures using Java CO2: Implement various types of linked lists and their applications CO3: Implement Tree Traversals CO4: Implement various algorithms in Java CO5: Implement different sorting and searching algorithms		

List of Programs

Implement the following exercises using Java Programming language:

1. Array implementation of stacks
2. Array implementation of Queues
3. Linked list implementation of stacks
4. Linked list implementation of Queues
5. Convert infix expression to postfix.
6. Binary Tree Traversals (Inorder, Preorder, Postorder)
7. Implementation of Linear search and binary search
8. Implementation Insertion sort, Quick sort and Merge Sort
9. Implementation of Depth-First Search & Breadth-First Search of Graphs.
10. Finding single source shortest path of a Graph.

Learning Resources:

Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition , “Fundamentals of Computer Algorithms “ Universities Press

Reference Books

1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.

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SYLLABUS WITH EFFECT FROM 2020-2021

BCE-CSC09

CORE: COMPUTER NETWORK

(Common paper to B.Sc.Software Applications-VI Sem., B.Sc.Computer Science with
Data Science, Computer Science with AI & B.C.A.)

III YEAR / V SEM

OBJECTIVES:

- To understand the concept of Computer network
- To impart knowledge about networking and inter networking devices

OUTCOMES:

- Analyze different network models
- Describe, analyze and compare a number of data link, network and transport layer
- Analysing key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI

UNIT - I

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

UNIT - II

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

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

Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms - IP Protocol - IP Addresses - Internet Control Protocols.

UNIT - V

Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection - Simple Transport Protocol - Internet Transport Protocols (ITP) - Network Security: Cryptography.

TEXT BOOK :

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

REFERENCE BOOKS:

1. Stallings, “*Data and Computer Communications*”, Pearson Education 2012, 7th Edition.
2. B. A. Forouzan, “*Data Communications and Networking*”, Tata McGraw Hill 2007, 4th Edition.
3. F. Halsall, “*Data Communications, Computer Networks and Open Systems*”, Pearson Education 2008.
4. D. Bertsekas and R. Gallagher, “*Data Networks*”, PHI 2008, 2nd Edition.
5. Lamacchia, “*Communication Networks*”, Tata McGraw Hill 2002.

WEB REFERENCES:

- NPTEL & MOOC courses titled Computer Networks
- <https://nptel.ac.in/courses/106106091/>

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BCE-CSC10

CORE: OPERATING SYSTEM

(Common paper to B.Sc.Software Applications, B.Sc.Computer Science with
Data Science, Computer Science with AI & B.C.A.)

III YEAR / V SEM

OBJECTIVES:

- To understand the fundamental concepts and role of Operating System.
- To learn the Process Management and Scheduling Algorithms
- To understand the Memory Management policies
- To gain insight on I/O and File management techniques

OUTCOMES:

- Understand the structure and functions of Operating System
- Compare the performance of Scheduling Algorithms
- Analyze resource management techniques

UNIT - I

Introduction: Views - Types of System - OS Structure – Operations - Services – Interface- System Calls- System Structure - System Design and Implementation. Process Management: Process - Process Scheduling - Inter-process Communication. CPU Scheduling: CPU Schedulers - Scheduling Criteria - Scheduling Algorithms.

UNIT - II

Process Synchronization: Critical- Section Problem - Synchronization Hardware Semaphores - Classical Problems of Synchronization - Monitors. Deadlocks: Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Avoidance - Detection - Recovery.

UNIT - III

Memory Management: Hardware - Address Binding – Address Space - Dynamic Loading and Linking – Swapping – Contiguous Allocation - Segmentation - Paging – Structure of the Page Table.

UNIT - IV

Virtual Memory Management: Demand Paging - Page Replacement Algorithms - Thrashing. File System: File Concept - . Access Methods - Directory and Disk Structure - Protection - File System Structures - Allocation Methods - Free Space Management.

UNIT - V

I/O Systems: Overview - I/O Hardware - Application I/O Interface - Kernel I/O Subsystem - Transforming I/O Requests to Hardware Operations - Performance. System Protection: Goals - Domain - Access matrix. System Security: The Security Problem - Threats – Encryption- User Authentication.

TEXT BOOK:

1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, “*Operating System Concepts*”, Wiley India Pvt. Ltd 2018, 9th Edition,.

REFERENCES:

1. William Stallings, “*Operating Systems Internals and Design Principles*”, Pearson, 2018, 9th Edition.
2. Andrew S. Tanenbaum, Herbert Bos, “*Modern Operating Systems*”, Pearson 2014, 4th Edition.

WEB REFERENCES:

- NPTEL & MOOC courses titled Operating Systems
- <https://nptel.ac.in/courses/106106144/>

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BCE-CSC11

CORE: RELATIONAL DATABASE MANAGEMENT SYSTEM

(Common paper to B.Sc.Software Applications, B.Sc.Computer Science with
Data Science, Computer Science with AI & B.C.A.)

II / III YEAR
III / V SEM

OBJECTIVES:

- Gain a good understanding of the architecture and functioning of Database Management Systems
- Understand the use of Structured Query Language (SQL) and its syntax.
- Apply Normalization techniques to normalize a database.
- Understand the need of transaction processing and learn techniques for controlling the consequences of concurrent data access.

OUTCOMES:

- Describe basic concepts of database system
- Design a Data model and Schemas in RDBMS
- Competent in use of SQL
- Analyze functional dependencies for designing robust Database

UNIT - I

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

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

UNIT - III

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

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

UNIT - V

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

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TEXT BOOK:

1. S. Sumathi, S. Esakkirajan, “*Fundamentals of Relational Database Management System*”, Springer International Edition 2007.

REFERENCE BOOKS:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, “*Database System Concepts*”, McGrawHill 2019, 7th Edition.
2. Alexis Leon & Mathews Leon, “*Fundamentals of DBMS*”, Vijay Nicole Publications 2014, 2nd Edition.

WEB REFERENCES:

- NPTEL & MOOC courses titled Relational Database Management Systems
- <https://nptel.ac.in/courses/106106093/>
- <https://nptel.ac.in/courses/106106095/>

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SYLLABUS WITH EFFECT FROM 2020-2021

BCE-CSC12

CORE-XII: PRACTICAL – V (OPERATING SYSTEM LAB)

(Common paper to B.Sc. Software Applications & B.C.A.)

III YEAR / V SEM

OBJECTIVES:

- To learn Process management and scheduling.
- To understand the concepts and implementation of memory management policies.
- To understand the various issues in Inter Process Communication.

OUTCOMES:

- Understand the process management policies and scheduling process by CPU.
- Analyze the memory management and its allocation policies.
- To evaluate the requirement for process synchronization.

PROGRAM LIST:

1. Basic I/O programming.
To implement CPU Scheduling Algorithms:
2. Shortest Job First Algorithm.
3. First Come First Served Algorithm.
4. Round Robin and Priority Scheduling Algorithms.
5. To implement reader/writer problem using semaphore.
6. To implement Banker's algorithm for Deadlock avoidance.
Program for page replacement algorithms:
7. First In First Out Algorithm.
8. Least Recently Used Algorithm.
9. To implement first fit, best fit and worst fit algorithm for memory management.
10. Program for Inter-process Communication.

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BCE-CSC13

PRACTICAL:- PL / SQL LAB

(Common paper to B.Sc.Software Applications, B.Sc.Computer Science with
Data Science, Computer Science with AI & B.C.A.)

II / III YEAR
III / V SEM

OBJECTIVES:

- Learn the various DDL and DML commands
- Understand queries in SQL to retrieve information from data base
- Understand PL/SQL statements: Exception Handling, Cursors, and Triggers.
- Develop database applications using front-end and back-end tools.

OUTCOMES:

- Implement the DDL , DML Commands and Constraints
- Create, Update and query on the database.
- Design and Implement simple project with Front End and Back End.

LIST OF EXERCISES

- 1) DDL commands with constraints.
- 2) DML Commands with constraints.
- 3) SQL Queries: Queries, sub queries, Aggregate function
- 4) PL/SQL : Exceptional Handling
- 5) PL/SQL : Cursor
- 6) PL/SQL : Trigger
- 7) PL/SQL : Packages
- 8) Design and Develop Application for Library Management
- 9) Design and Develop Application for Student Mark Sheet Processing
- 10) Design and Develop Application for Pay Roll Processing

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BCE-CSC14

CORE-XIV: SOFTWARE ENGINEERING

(Common paper to B.Sc.Software Applications-V Sem. & B.C.A.-V Sem.)

III YEAR / VI SEM

OBJECTIVES:

- To introduce the software development life cycles
- To introduce concepts related to structured and object oriented analysis & design co
- To provide an insight into UML and software testing techniques

OUTCOMES:

- The students should be able to specify software requirements, design the software using tools
- To write test cases using different testing techniques.

UNIT- I

Introduction – Evolution – Software Development projects – Emergence of Software Engineering.
Software Life cycle models – Waterfall model – Rapid Application Development – Agile Model – Spiral Model

UNIT- II

Requirement Analysis and Specification – Gathering and Analysis – SRS – Formal System Specification

UNIT- III

Software Design – Overview – Characteristics – Cohesion & Coupling – Layered design – Approaches
Function Oriented Design – Structured Analysis – DFD – Structured Design – Detailed design

UNIT- IV

Object Modeling using UML – OO concepts – UML – Diagrams – Use case, Class, Interaction, Activity, State Chart – Postscript

UNIT- V

Coding & Testing – coding – Review – Documentation – Testing – Black-box, White-box, Integration, OO Testing, Smoke testing.

TEXT BOOK:

1. Rajib Mall, “*Fundamentals of Software Engineering*”, PHI 2018, 5th Edition.

REFERENCE BOOKS:

1. Roger S. Pressman, “*Software Engineering - A Practitioner's Approach*”, McGraw Hill 2010, 7th Edition.
2. Pankaj Jalote, “*An Integrated Approach to Software Engineering*”, Narosa Publishing House 2011, 3rd Edition.

WEB REFERENCES:

- NPTEL online course – Software Engineering - <https://nptel.ac.in/courses/106105182/>

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN COMPUTER SCIENCE
SYLLABUS WITH EFFECT FROM 2020-2021

BCE-CSC15

CORE-XV: INTRODUCTION TO DATA SCIENCE

(Common paper to B.Sc.Software Applications as Elective)

III YEAR / VI SEM

OBJECTIVES:

- To introduce the concepts, techniques and tools with respect to the various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling and effective communication.

OUTCOMES:

- To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication

UNIT-I

Introduction to Data Science – Benefits and uses – Facets of data – Data science process – Big data ecosystem and data science

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

TEXT BOOK

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “*Introducing Data Science*”, manning publications 2016.

REFERENCE BOOKS

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, 2nd Edition.

WEB REFERENCES

- NPTEL online course– Data Science for Engineers - <https://nptel.ac.in/courses/106106179/>

UNIVERSITY OF MADRAS
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SYLLABUS WITH EFFECT FROM 2020-2021

BCE-CSC16

CORE: INTRODUCTION TO CLOUD COMPUTING

(Common paper to B.Sc.Computer Science with Data Science and Computer Science with AI)

III YEAR / VI SEM

OBJECTIVES:

- To understand the concepts in Cloud Computing and its Security
- To understand the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.

OUTCOMES:

- To explain and apply levels of services of Cloud
- To describe the security aspects in cloud.

UNIT - I

Cloud Computing Foundation: Introduction to Cloud Computing – Move to Cloud Computing – Types of Cloud – Working of Cloud Computing

UNIT - II

Cloud Computing Architecture : Cloud Computing Technology – Cloud Architecture – Cloud Modeling and Design - Virtualization : Foundation – Grid, Cloud and Virtualization – Virtualization and Cloud Computing

UNIT - III

Data Storage and Cloud Computing : Data Storage – Cloud Storage – Cloud Storage from LANs to WANs – Cloud Computing Services : Cloud Services – Cloud Computing at Work

UNIT - IV

Cloud Computing and Security : Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services – Cloud Computing Tools : Tools and Technologies for Cloud – Cloud Mashaps – Apache Hadoop – Cloud Tools

UNIT - V

Cloud Applications – Moving Applications to the Cloud – Microsoft Cloud Services – Google Cloud Applications – Amazon Cloud Services – Cloud Applications

TEXT BOOK:

1. A.Srinivasan and J.Suresh, “*Cloud Computing – A Practical Approach for Learning and Implementation*”, Pearson India Publications 2014.

REFERENCE BOOK:

1. Rajkumar Buyya, James Broberg, Andrzej , “*Cloud Computing: Principles and Paradigms*”, Wiley India Publications 2011.
2. Arshdeep Bahga and Vijay Madisetti ,“*Cloud Computing – A Hands on Approach*”, Universities Press (India) Pvt Ltd. 2014.

WEB REFERENCES:

- NPTEL & MOOC courses titled Cloud computing
- <https://nptel.ac.in/courses/106105167/>

UNIVERSITY OF MADRAS
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SYLLABUS WITH EFFECT FROM 2020-2021

BCE-CSC18

PRACTICAL: MINI PROJECT

(Common paper to B.Sc.Software Applications, B.Sc.Computer Science with
Data Science and Computer Science with AI & B.C.A.)

III YEAR / VI SEM

OBJECTIVES:

The aim of the mini project is that the student has to understand the real time software development environment. The student should gain a thorough knowledge in the problem, he/she has selected and the language / software, he/she is using.

Project planning:

B.Sc (Computer Science / Software Application)/BCA Major Project is an involved exercise, which has to be planned well in advance. The topic should be chosen in the beginning of final year itself. Related reading training and discussions of first internal project viva voce should be completed in the first term of final year.

I Selection of the project work

Project work could be of three types.

a) Developing solution for real life problem

In this case a requirement for developing a computer-based solution already exists and the different stages of system development life cycle is to be implemented successfully. Examples are accounting software for particular organization, computerization of administrative function of an organization, web based commerce etc.

b) System Software Project

Projects based on system level implementation. An example is a Tamil language editor with spell checker, compiler design.

b) Research level project

These are projects which involve research and development and may not be as a structured and clear cut as in the above case. Examples are Tamil character recognition, neural net based speech recognizer etc. This type of projects provides more challenging opportunities to students.

II Selection of team

To meet the stated objectives, it is imperative that major project is done through a team effort. Though it would be ideal to select the team members at random and this should be strongly recommended, due to practical consideration students may also be given the choice of forming themselves into teams with three members. A team leader shall be selected. Team shall maintain the minutes of meeting of the team members and ensure that tasks have been assigned to every team member in writing. Team meeting minutes shall form a part of the project report. Even if students are doing project as groups, each one must independently take different modules of the work and must submit the report.

III Selection of Tools

No restrictions shall be placed on the students in the choice of platform/tools/languages to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the use of tools in the evaluation of the project.

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IV Project management

Head of the Department / Principal of the college should publish the list of student's project topic, internal guide and external organization and teams agreed before the end of July. Changes in this list may be permitted for valid reasons and shall be considered favorably by the Head of the department / Principal of the college any time before commencement of the project. Students should submit a fortnightly report of the progress, which could be indication of percentage of completion of the project work. The students should ideally keep a daily activity book. Team meeting should be documented and same should be submitted at the end of the project work.

V Documentation

Three copies of the project report must be submitted by each student (one for department library, one for the organization where the project is done and one for the student himself/herself). The final outer dimensions of the project report shall be 21cm X 30 cm. The color of the flap cover shall be light blue. Only hard binding should be done. The text of the report should be set in 12 pt, Times New Roman, 1.5 spaced.

Headings should be set as follows: CHAPTER HEADINGS 16 pt, Arial, Bold, All caps, Centered.

1. Section Headings 14 pt Bookman old style, Bold, Left adjusted.

1.1 Section Sub-heading 12 pt, Bookman old style.

Title of figures tables etc are done in 12 point, Times New Roman, Italics, centered.

Content of the Project should be relevant and specify particularly with reference to the work. The report should contain the requirement specification of the work, Analysis, Design, Coding, testing and Implementation strategies done.

- Organizational overview (of the client organization, where applicable)
- Description of the present system
- Limitations of the present system
- The Proposed system - Its advantages and features
- Context diagram of the proposed system
- Top level DFD of the proposed system with at least one additional level of expansion
- Program List (Sample code of major functions used)
- Files or tables (for DBMS projects) list. List of fields or attributes (for DBMS projects) in each file or table.
- Program – File table that shows the files/tables used by each program and the files are read, written to, updated, queried or reports were produced from them.
- Screen layouts for each data entry screen.
- Report formats for each report.

Some general guidelines on documentation are:

1. Certificate should be in the format: "**Certified that this report titled.....is a bonafide record of the project work done by Sri/ Kumunder our supervision and guidance, towards partial fulfillment of the requirement for award of the Degree of B.Sc Computer Science/BCA/BSc Software Applications of XXX College**" with dated signature of internal guide, external guide and also Head of the Department/ College.

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2. If the project is done in an external organization, another certificate on the letterhead of the organization is required: **“Certified that his/her report titledis a bonafide record of the project work done by Sri/Kum.....under my supervision and guidance, at thedepartment of..... (Organization) towards partial fulfillment of the requirement for the award of the Degree of B.Sc (Computer Science/Software Applications) / BCA of XXX College.**
3. Page numbers shall be set at right hand bottom, paragraph indent shall be set as 3.
4. Only 1.5 space need be left above a section or subsection heading and no space may be left after them.
5. References shall be IEEE format (see any IEEE magazine for detail) While doing the project keep note of all books you refer, in the correct format and include them in alphabetical order in your reference list.

VI Project Evaluation:

Internal Assessment

There shall be six components that will be considered in assessing a project work with weightage as indicated.

1. Timely completion of assigned tasks as evidenced by team meeting minutes 20%
2. Individual involvement, team work and adoption of industry work culture 10%
3. Quality of project documentation (Precision, stylistics etc) 10%
4. Achievement of project deliverables 20%
- 5 Effective technical presentation of project work 10%
6. Viva 30%

Based on the above 6 components internal mark 40 can be awarded.

External Assessment

Dissertation/Project submitted at the end of third year shall be valued by two examiners appointed by the Controller for the conduct of practical exam. The board of examiners shall award 60 marks based on the following components.

1. Achievement of project deliverables	- 20 Marks
2. Effective technical presentation of project work	- 20 Marks
3. Project Viva	- 20 Marks

There shall be a common written examination conducted for all the candidates in each group together for a minimum of 10 minutes.

- (i) Requirement Specification of Project
- (ii) Design of Project
- (iii) Testing and Implementation of Project

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SYLLABUS WITH EFFECT FROM 2020-2021

BCE-CSE2B

ELECTIVE: IOT AND ITS APPLICATIONS

(Common paper to B.Sc.Computer Science with Data Science and
Computer Science with AI as Core, B.Sc.Software Applications & B.C.A. as Elective)

III YEAR / VI SEM

OBJECTIVES:

- To understand the concepts of Internet of Things and the application of IoT.
- To Determine the Market perspective of IoT.
- To Understand the vision of IoT from a global context

OUTCOMES:

- Use of Devices, Gateways and Data Management in IoT.
- Design IoT applications in different domain and be able to analyze their performance
- Implement basic IoT applications on embedded platform.

UNIT – I

IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

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TEXT BOOK:

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

REFERENCE BOOKS:

1. Michael Miller, “*The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World*”, Pearson Education 2015.
2. Francis da Costa, “*Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*”, Apress Publications 2013, 1st Edition.
3. Waltenegeus Dargie, Christian Poellabauer, “*Fundamentals of Wireless Sensor Networks: Theory and Practice*”, Wiley 2014.
4. Cuno Pfister, “*Getting Started with the Internet of Things*”, O'Reilly Media 2011.

WEB REFERENCES:

- <https://github.com/connectIOT/iottoolkit>
- <https://www.arduino.cc/>
- <http://www.zettajs.org/>

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BCE-CSE2C

ELECTIVE-II(C): BLOCK CHAIN TECHNOLOGY
(Common paper to B.Sc.Computer Science with Data Science
and Computer Science with AI)

III YEAR / VI SEM

OBJECTIVES:

- To understand the concepts of block chain technology
- To understand the consensus and hyper ledger fabric in block chain technology.

OUTCOMES:

- State the basic concepts of block chain
- Paraphrase the list of consensus and Demonstrate and Interpret working of Hyper ledger Fabric
- Implement SDK composer tool and explain the Digital identity for government

UNIT - I

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Block chain Architecture and Design-Basic crypto primitives: Hash, Signature-Hash chain to Block chain-Basic consensus mechanisms.

UNIT - II

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.

UNIT - III

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

UNIT - IV

Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance-Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

UNIT - V

Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

TEXT BOOKS:

1. Mark Gates, “*Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money*”, Wise Fox Publishing and Mark Gates 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, “*Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer*”, 2018.
3. Bahga, Vijay Madisetti, “*Block chain Applications: A Hands-On Approach*”, Arshdeep Bahga, Vijay Madisetti publishers 2017.

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REFERENCE BOOKS :

1. Andreas Antonopoulos, “*Mastering Bitcoin: Unlocking Digital Crypto currencies*”, O'Reilly Media, Inc. 2014.
2. Melanie Swa, “*Block chain*”, O'Reilly Media 2014.

WEB REFERENCES:

- NPTEL & MOOC courses titled blockchain technology
- blockgeeks.comguide/what-is-block-chain-technology
<https://nptel.ac.in/courses/106105184/>

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN COMPUTER SCIENCE SYLLABUS
WITH EFFECT FROM 2020-2021

BCE-DSC17

CORE-XVII: PRACTICAL - VII
CASE TOOLS AND TESTING TOOLS LAB

III YEAR / VI SEM

OBJECTIVES:

- To get familiarized to the usage of UML tool kit.
- To understand the requirements of the software and to map them appropriately to subsequent phases of the software development
- To develop the ability to verify and validate their designs

OUTCOMES:

- Students must be able to analyze and design the problem at hand.
- Students should be able to use UML tools for the designing the software and test the correctness and soundness of their software through testing tools.

LIST OF EXERCISES:

1. Using UML tools produce analysis and design models for
 - a. Library Management System
 - b. Automatic Teller Machine
 - c. Student Information Management
 - d. Matrimony Service
 - e. Stock Management System
2. Study of Open source testing tools (eg. Selenium, WATIS, Apache JMeter, TestNG)

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SYLLABUS WITH EFFECT FROM 2020-2021

BCE-DSE1A

ELECTIVE-I(A): ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM

III YEAR / V SEM

OBJECTIVES:

- To Acquire Knowledge on various AI Techniques and Expert Systems
- To have enriched knowledge regarding heuristic search, Knowledge representation and Expert systems

OUTCOMES:

- Gain a working knowledge of the foundations of and modern applications in, artificial intelligence heuristic search, knowledge representation and logic.

UNIT - I

Introduction: AI Problems – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

UNIT - II

Heuristic Search techniques: Generate and Test – Hill Climbing – Best-Fist, Problem Reduction, Constraint Satisfaction, Means-end analysis.

UNIT- III

Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.

UNIT - IV

Using Predicate Logic: Representing simple facts in logic – Representing Instance and Isa relationships – Computable functions and predicates – Resolution – Natural deduction.

UNIT - V

Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge Brief explanation of Expert Systems- Definition- Characteristics-architecture- Knowledge Engineering- Expert System Life Cycle-Knowledge Acquisition Strategies- Expert System Tools.

TEXT BOOK:

1. Elaine Rich and Kevin Knight, Shiva Shankar Nair, “*Artificial Intelligence*”, McGraw-Hill Companies, 3rd edition.

REFERENCE BOOKS:

1. Stuart Russell & Peter Norvig , “*Artificial Intelligence A Modern Approach*”, Perason, 2nd Edition.
2. George F Luger , “*Artificial Intelligence*”, Pearson 2002, 4th Edition.
3. V S Janaki Raman, K Sarukesi, P Gopalakrishnan, “*Foundations of Artificial Intelligent and Expert Systems*”, MacMillan India limited.

WEB REFERENCES:

- NPTEL & MOOC courses titled Artificial Intelligence and Expert Systems
- <https://nptel.ac.in/courses/106106140/>
- <https://nptel.ac.in/courses/106106126/>

UNIVERSITY OF MADRAS
B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE
SYLLABUS WITH EFFECT FROM 2023-2024

Year: I	Semester:I
Skill Enhancement Course: Office Automation (Common to B.Sc.-CS with AI, CS with DS, Software Appl.& BCA)	125S1A
Credits 2	Lecture Hours:2 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field) <ul style="list-style-type: none"> • The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point. • The course is highly practice oriented rather than regular class room teaching. • To acquire knowledge on editor, spread sheet and presentation software. 	
Course Outcomes: (for students: To know what they are going to learn) CO1: Understand the basics of computer systems and its components. CO2: Understand and apply the basic concepts of a word processing package. CO3: Understand and apply the basic concepts of electronic spreadsheet software. CO4: Understand and apply the basic concepts of database management system. CO5: Understand and create a presentation using PowerPoint tool.	
UNITS	CONTENTS
I	Introductory concepts: Hardware and Software - Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems - Introduction to Programming Languages.
II	Word Processing: File menu operations - Editing text – tools, formatting, bullets and numbering - Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, printing – Preview, options, merge.
III	Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying
IV	Charts – creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.
V	Power point: 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: Recommended Texts <ol style="list-style-type: none"> 1. Peter Norton, “Introduction to Computers” –Tata McGraw-Hill. Reference Books <ol style="list-style-type: none"> 1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGraw- Hill. Web resources : Web content from NDL / SWAYAM or open source web resources	

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Year: I

Semester: II

Quantitative Aptitude	125S2A
Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	
Credits 2	Lecture Hours: 2 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <p>To improve the quantitative skills of the students</p> <p>To prepare the students for various competitive exams</p>	
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <p>CO1: To gain knowledge on LCM and HCF and its related problems</p> <p>CO2: To get an idea of age, profit and loss related problem solving.</p> <p>CO3: Able to understand time series simple and compound interests</p> <p>CO4: Understanding the problem related to probability, and series</p> <p>CO5: Able to understand graphs, charts</p>	

Units	Contents
I	Numbers - HCF and LCM of numbers - Decimal fractions - Simplification - Square roots and cube roots - Average - problems on Numbers
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion - partnership - Chain rule.
III	Time and work - pipes and cisterns - Time and Distance - problems on trains - Boats and streams - simple interest - compound interest - Logarithms - Area - Volume and surface area - races and Games of skill.
IV	Permutation and combination - probability - True Discount - Bankers Discount - Height and Distances - Odd man out & Series.
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation - Bar Graphs - Pie charts - Line graphs

Learning Resources:

Recommended Texts

1. “Quantitative Aptitude”, R.S. AGGARWAL., S. Chand & Company Ltd.,

Web resources: Authentic Web resources related to Competitive examinations

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Year: I	Semester: II
Problem Solving Techniques	125S2B
Credits 2	Lecture Hours:2 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field) <ul style="list-style-type: none"> • To understand the importance of algorithms and programs, and to know of the basic problem-solving strategies. • To learn efficient strategies and algorithms to solve standard problems, thus laying a firm foundation for designing algorithmic solutions to problems. 	
Course Outcomes: (for students: To know what they are going to learn) CO1: Understand the systematic approach to problem solving. CO2: Know the approach and algorithms to solve specific fundamental problems. CO3: Understand the efficient approach to solve specific factoring-related problems. CO4: Understand the efficient array-related techniques to solve specific problems. CO5: Understand the efficient methods to solve specific problems related to text processing. Understand how recursion works.	

Units	Contents
I	Introduction: Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms – The concept of Recursion.
II	Fundamental Algorithms: Exchanging the values of two variables – Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Fibonacci Series generation - Reversing the digits of an integer – Base Conversion.
III	Factoring Methods: Finding the square root of a number – The smallest divisor of an integer – Greatest common divisor of two integers - Generating prime numbers – Computing the prime factors of an integer – Generation of pseudo-random numbers - Raising a number to a large power – Computing the nth Fibonacci number.
IV	Array Techniques: Array order reversal – Array counting or histograming – Finding the maximum number in a set - Removal of duplicates from an ordered array - Partitioning an array – Finding the kth smallest element – Longest monotone subsequence.
V	Text Processing and Pattern Searching: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. Recursive algorithms: Towers of Hanoi – Permutation generation.

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Learning Resources:

Recommended Texts

1. R. G. Dromey, *How to Solve it by Computer*, Pearson India, 2007.

Reference Books

1. George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With Hints and Solutions*, Dover Publications, 2009 (Kindle Edition 2013).
2. Greg W. Scragg, *Problem Solving with Computers*, Jones & Bartlett 1st edition, 1996.

Web resources

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Year: II

Semester: IV

Emotional Intelligence	225S4A
Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	
Credits 2	Lecture Hours: 2 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> • To enable the students to understand the concepts of emotional intelligence • To teach the students on aspects relating to personality Analysis Self-analysis, Positive and Negative traits 	
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <ol style="list-style-type: none"> 1. After completion of subjects students understand and application of Emotional Intelligence. 	

Units	Contents
I	Introduction – Emotional Intelligence – Meaning, Benefits, *Importance of emotions – Self –awareness and competencies Psychological Needs, Emotional quotient Vs. IntelligenceQuotient.
II	Personality Analysis – Distinct Personality Type – Handwriting Analysis, color preference,listening, profile, self-esteem, *Will Power, Confidence.
III	Negative Traits – Anger Management – Negative Syndrome and Attitude - Negativethinking – Guilt Quotient Stress and Emotion, Adapting to Loneliness.
IV	Positive Traits – Humor and Happiness – Empathetic ability - Sensitivity profile – Empowered personality, Self – Empowerment.
V	Self-analysis: Psychological growth and adjustment - Personal Development Plan – Successful negotiator personal SWOT Analysis, Celebrating Life.

Reference Books:

1. Dr. Aparna Chattopadhyaym What's Your Emotional IQ, Pustak Mahal, May 2004.
2. Jill Dann, Hodder & Stoughton, Emotional Intelligence In a Week, 10 Edition, 2007.
3. Daniel Goleman, Emotional Intelligence: Why It can matter More than IQ.

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Year: II

Semester: IV

Technical Writing	225S4B
Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	
Credits 2	Lecture Hours: 2 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> • This course is designed to guide students towards rhetorical, professional, and compositional competencies necessary to ethically and effectively create and analyse technical documents and communication. • Technical communication competency will be accomplished through a structured exploration of professional/technical contexts and through the production of several documents and projects typical to many forms of technical writing 	
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <ol style="list-style-type: none"> 1. Students will learn to analyse communication-related problems and develop solutions through the composition of technical documents from a number of genres and within several settings (i.e., print, web, interactive software) and contexts (e.g., academic, corporate, non-profit, governmental). 2. Students will explore rhetorical and professional strategies in order to discover how to clearly identify and address audiences and stakeholders, organizational contexts, and ethical concerns in the act of communication 	

Units	Contents
I	What is technical writing? Difference between technical writing and other forms of writing. Qualities and qualifications of technical writers.
II	End products of technical writing. professionals involved-project manager/editor, writers, graphic artists; liaison with product engineers/scientists and clients.
III	Roles and responsibilities of writers, editors/project managers. 7 Cs of effective writing: Document formats – hard and soft copy versions designs.
IV	Principles of technical writing; styles in technical writing; clarity, precision, coherence and logical sequence in writing.
V	Stages of Technical writing. Document development process, Technical documentation, Planning, Tools, architecture, templates, content development, technical reviews, editorial reviews. Quality control.

Books for References

1. Technical writing style by – Dan Jones , Sam Draggan
2. Handbook of Technical writing by- Walter.E.ollu -1976
3. Technical Writing by- Serena Henning
4. Technical writing process by – Kieran Morgan and Sanja Spejic -2015
5. A guide to technical writing by – T.A. Rickard

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Year: II

Semester: III

Web Page Design Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	225S31
Credits 1	Lecture Hours:1 per week
Learning Objectives: (for teachers: what they have to do in the class/lab/field)	
<ul style="list-style-type: none"> • To develop the skill & knowledge of Web page design. • Students will understand the knowhow and can function either as an entrepreneur or can take up jobs in the multimedia and Web site development studio and other information technology sectors. 	
Course Outcomes: (for students: To know what they are going to learn)	
CO1: Define the principle of Web page design CO2: Define the basics in web design CO3: Visualize the basic concept of HTML. CO4: Recognize the elements of HTML. CO5: Introduce basics concept of CSS.	

Units	Contents
I	What is HTML? - HTML Documents - Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags.
II	Introduction to elements of HTML: Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia - Working with Forms and controls.
III	Concept of CSS: Creating Style Sheet - CSS Properties - CSS Styling(Background, Text Format, Controlling Fonts) - Working with block elements and objects - Working with Lists and Tables - CSS Id and Class - Box Model(Introduction, Border properties, Padding - Properties, Margin properties) -
IV	CSS Advanced (Grouping, Dimension, Display,Positioning, Floating, Align,Pseudo class, Navigation Bar,Image Sprites, Attribute sector)- CSS Color- Creating page Layout and Site Designs
V	Introduction to Web Graphics: Creating a Web Photo Album - Creating a Button- Creating a Web Page Banner

Learning Resources:

Text Books

1. Kogent Learning, Solutions Inc., HTML 5 in simple steps Dreamtech Press
2. A beginner's guide to HTML NCSA,14th May,2003
3. Murray,Tom/Lynchburg Creating a Web Page and Web Site College,2002

Reference Books

1. Web Designing & Architecture-Educational Technology Centre, University of Buffalo
2. Steven M. Schafer HTML, XHTML, and CSS Bible, 5ed Wiley India
3. John Duckett Beginning HTML, XHTML, CSS, and JavaScript, Wiley India

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Year: II	Semester: III
Desktop Publishing Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	225S32
Credits 2	Lecture Hours:2 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> • The objective of the course is to provide the participants understanding of the techniques essential to build their career in desktop publishing using suitable hardware and software tools. • This course offers a range of topics of immediate relevance to industry and makes the participants exactly suitable for DTP Industry. 	
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <p>CO1:Understand basics of computer and its related terminology.</p> <p>CO2:Write, Edit & Print documents using MS-WORD & EXCEL</p> <p>CO3:Understand various software used for Desktop Publishing and would be able to create and design documents with text and graphics like newspaper ad, wedding cards, visiting cards, greeting cards etc.</p> <p>CO4:Using PageMaker, CorelDraw & Photoshop. Understand Colourconcept in Printing</p>	

Units	Contents
I	Computer Fundamentals - Generations of Computer, Advantage and disadvantage of Computer, Block Diagram of a Computer, Description of Different parts of a computer. System Software and Application Software MS Office Introduction to MS Office, Word Processing Software, Electronic Spreadsheet, MS Paint
II	PageMaker Introduction to various versions, concepts and applications of PageMaker Guides & rulers. Drawing tools. Fills & outlines Photo Shop -History & introduction, the file menu, the tools, Drawing lines & shapes Photo editing inserting starting with Setting Up, introduction of layers, Understanding Design principles and color theory
III	Coral Draw-Drawing-lines, shapes inserting-pictures, objects, tables, templates, Use of various tools such as Pick tools, Zoom tools, Free hand tool, square tool, rectangle tool, Text tool, Fill tool etc. and all fonts used in designing of monograms, logos, posters, stickers, greeting cards, wedding cards, visiting cards, etc Design Principles & Color Harmony Introduction to colors Primary and Secondary in both RGB & CMYK schemes/modes

List of Programs
<ol style="list-style-type: none"> 1. Using windows explorer and other windows elements 2. Creating and opening a document in page maker 3. Formatting and editing a document 4. Saving and printing a given document 5. Insertion of text and graphics in a given document from external source 6. Using columns utility, to give the document column look

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7. Using various fonts and styles to make a document more beautiful
8. Use of page maker to make transparencies
9. Saving and printing a file that has been created
10. Formatting a given file by using undo/redo, repeat, cut, copy, paste, delete, duplicate and clone utilities
11. Inserting objects in the drawing, aligning, ordering, grouping and ungrouping of those objects
12. Use of combine, break apart, weld, intersection, trim and separate tools in given drawing
13. Use of mode edit tools ie, to line, to curve, to stretch, and rotate
14. Creating special effects i.e, transform roll-up, envelop roll up, add perspective, extrude roll up, contour roll up, power line, power clip, clear effects
15. To insert character and paragraph text in a drawing and frame, setting of tabs, indents, bullets and spacing in paragraph text
16. Filling of text to a given path, aligning it to base line, straighten text and edit text
17. Using tools such as spell checker, and thesaurus
18. Using find and replace text utility and type assist
19. Adding various symbols to a drawing and creating different pattern

Learning Resources:

1. Desk Top Publishing From A to Z by Bill Grout and Osborne; McGraw Hill
2. DTP (Desk Top Publishing) for PC user by Houghton; Galgotia Publishing House Pvt. Ltd., Daryaganj, New Delhi.
3. ADOBE PAGEMAKER 6.5 - Shashank Jain & Satish Jain - First Edition 2001, BPB Publications
4. DESKTOP PUBLISHING ON PC-M.C. Sharma, BPB Publications
5. Corel draw the Official Guide By Gray David Bouton, Corel Press.
6. The complete Reference Getting Started with Page Maker, McGraw-Hills
7. Adobe Photoshop CS2 Classroom In A Book (2020), Adobe Press.
8. Computers Today S.K.Basandra, Galgotia Publications.
9. Microsoft Office: Will Train, Gini Courter, Annette Marquis BPB Publication.

Suggested equivalent online courses:

<http://www.nptelvideos.com/adobe/adobe photoshop tutorials.php>

<https://onlinecourses.swayam2.ac.in/cec20 cs05/preview>

<https://eskillindia.org/Course/course detail/117206920200221051647>

<https://www.udemy.com/course/desktop-publishing-for-you/>

<https://www.youtube.com/watch?v=FJYgNUYUvZe>