Thiagarajar College

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-Accredited with 'A++' Grade by NAAC

CURRICULUM & SYLLABUS

I & II Semester

DEPARTMENT OF COMPUTER SCIENCE

B.Sc. Computer Science

Programme Code - UCS

(Aided & SF)

Programme outcome-PO (Aligned with Graduate Attributes) - Bachelor of Science(B.Sc.,)

Scientific Knowledge and Critical Thinking

Apply the knowledge of Life Science, Physical and Chemical Science, Mathematics, statistics, Computer science and humanities for the attainment of solutions to the problems that come across in our day-to-daylife/activities.

Problem Solving

Identify and analyze the problem and formulate solutions for problems using the principles of mathematics, natural sciences with appropriate consideration for the public health, safety and environmental considerations.,

Communication and Computer Literacy

Communicate the fundamental and advanced concepts of their discipline in written and oral form. Able to make appropriate and effective use of information and information technology relevant to their discipline

Life-Long Learning

Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Ethical, Social and Professional Understanding

Commitment to principles, codes of conduct and social responsibility in order to behave consistently with personal respect. Acquire the responsibility to contribute for the personal development and for the development of the community. Respect the ethical values, social responsibilities and diversity.

Innovative, Leadership and Entrepreneur Skill Development

Function as an individual, and as a member or leader in diverse teams and in multidisciplinary settings. Become an entrepreneur by acquiring technical, communicative, problem solving, and intellectual skills.

Vision:

- To be frontier in educating Computer Science and to produce globally competent graduates with moral values committed to build a vibrant nation.

Mission:

- To strengthen the core competence in Computer Science through analytical learning.
- To produce successful graduates with personal and professional responsibilities and commitment to lifelong learning.
- To uplift innovative research in computer science to serve the needs of industry, government and society.

Programme Educational Objective (PEO):

Graduates will be able to

PEO1	Be employed successfully or continue their professional education.
PEO2	Apply knowledge of computing, mathematics and basic sciences that are relevant and appropriate to the domain.
PEO3	Use and develop skills as required for effective professional practices
PEO4	Remain abreast in their profession and be leaders in our technologically vibrant society.
PEO5	Lead a successful technical or professional career including supportive and leadership roles on multidisciplinary teams.

Programme Specific Outcome (PSO):-B.Sc., Computer Science

On the successful completion of B.Sc., Computer Science the students will

PSO1	Develop the knowledge on principles of hardware and software aspects of computing systems.
PSO2	Build up programming efficiency by designing algorithms and applying standard practices in software project development.
PSO3	Apply knowledge on software development tools, software systems and open source platforms.
PSO4	Perceive technical, practical and communicative skills among the students to face the industrial needs.
PSO5	Create awareness on the current issues, latest trends in technological development and there by innovate new ideas and solutions to existing problems.

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DEPARTMENT OF COMPUTER SCIENCE
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Programme Code: UCS

Semester-I

Part	List of Courses	Code No.	Subject	Hrs/ week	Cred.	Total Hrs	Max Marks CA	Max Marks SE	Total
Part-I	Tamil	U23P1TA11B	பொதுத்தமிழ் - I	3	3	45	25	75	100
Part-II	English	U23P2EN11	General English - II	4	3	60	25	75	100
Part-III	CC1	UCS23CT11	Digital Computer Fundamentals	5	4	75	25	75	100
	CC2	UCS23CT12	C Programming	5	4	75	25	75	100
	Generic Elective 1	UMA23GT11S	Discrete Mathematical Structure	5	3	75	25	75	100
Part-IV	NME 1	UCS23NT11	Web Designing	2	2	30	25	75	100
	Foundation Course	UCS23FL11	C Programming Lab	4	2	60	25	75	100
	AECC 1	UEN23AT11 Handled by Comp. Sci	Soft skill 1 - Introduction to Personality Development	2	2	30	25	75	100
TOTAL				30	23				

Semester-II

Part	List of Courses	Code No.	Subject	Hrs/ week	Cred.	Total Hrs	Max Marks CA	Max Marks SE	Total
Part-I	Language	U23P1TA21B	பொதுத்தமிழ் - II	3	3	45	25	75	100
Part-II	English	U23P2EN21	General English - II	4	3	60	25	75	100
Part-III	CC3	UCS23CT21	Java Programming	5	4	75	25	75	100
	CC4	UCS23CL21	Java Programming Lab	4	4	60	25	75	100
	Generic Elective 2	UMA23GT21S	Statistics Basic Level	5	3	75	25	75	100
Part-IV	NME 2	UCS23NT21	Office Automation	2	2	30	25	75	100
	SEC 1	UCS23SL21	Web Application Development	5	2	75	25	75	100
	AECC 2	UEN23AT21 Handled by Comp. Sci	Soft skill 2 – Employability Skills	2	2	30	25	75	100
TOTAL				30	23				
Extra Credit			**Naan Mudhalvan** Language Proficiency for Employability		**02**				

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Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS23CT11	Digital Computer Fundamentals	Core 1	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	I	25	75	100

Preamble:

This course trains the students on the basic concepts of Digital Computer Fundamentals. It imparts the in-depth knowledge of logic gates, Boolean algebra, combinatorial circuits and Sequential circuits.

Course Outcomes:

On the successful completion of this course, Students will be able to

#	Description	Expected Proficiency	Expected Attainment
CO1	Perform number conversions and identify the logic gates with their functionalities.	60%	70%
CO2	Perform simplification of binary functions and binary arithmetic	60%	70%
CO3	Understand the functions of combinational circuits	60%	70%
CO4	Understand the basics of Flip-flops and Registers	60%	70%
CO5	Design different counters and understand various memory types	60%	70%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	-	-	M	M
CO2	S	M	-	-	L
CO3	M	-	M	S	-
CO4	S	L	-	M	-
CO5	S	M	-	M	L

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs Outcome

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	M	-	-	L
CO2	M	S	M	L	-	-
CO3	S	M	M	-	L	S
CO4	S	-	M	L	-	M
CO5	S	-	M	-	L	S

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy:

	CA		End of Semester
	First	Second	
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Contents:

UNIT: I   15 Hours

   Number Systems and Codes: Number System–Base Conversion– ASCII Code -- Binary Codes—Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.

UNIT: II   15 Hours

   Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions – Using Theorems, K-Map – Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers – Arithmetic Building Blocks – Adder – Subtractor.

UNIT: III   15 Hours

   Combinational Logic: Multiplexers – Demultiplexers – Decoders – Encoders – Parity Generators and Checkers.

UNIT: IV   15 Hours

   Flip flops: RS flip-flops-Gated flip-flops- Edge Triggered RS, D, and JK Flip-Flops – JK Master-Slave Flip-Flops. Registers: Types of Registers- Serial In-Serial Out- Serial In- Parallel Out- Parallel In-Serial Out and Parallel In-Parallel Out.

UNIT: V   15 Hours

   Counters: Asynchronous Counters – Decoding Gates, Synchronous Counters, Changing the Counter modulus, Decade counters. Memory: Basic Terms and Ideas –ROMs, PROMs, EPROMs and RAMs.

Text Book:

1. D.P.Leach and A.P.Malvino, Digital Principles and Applications – TMH – Seventh Edition – 2002.

Chapters:

Unit - I : 5.1 to 5.8, 2.1,2.2

Unit – II : 3.1 to 3.8, 6.1 to 6.8

Unit - III : 4.1 to 4.8

Unit – IV : 8.1 to 8.5, 8.8, 9.1 to 9.5

Unit - V :, 10.1 to 10.5,13.1,13.5,13.6

References:

1. V.Rajaraman and T.Radhakrishnan, Digital Computer Design, Prentice Hallof India, 2001
2. M. Moris Mano, Digital Logic and Computer Design, PHI, 2001.
3. T.C.Bartee, Digital Computer Fundamentals, 6th Edition, Tata McGraw Hill,1991.

Web Resources:

https://byjus.com/maths/number-system/
 https//tutorialspoint.com/
https://www.geeksforgeeks.org/

Course Designers:

Dr. Sumathi M.R.

Mrs. Nalini G.

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Course code	Course Title	Category	L	T	P	Credit
UCS23CT12	C Programming	Core 2	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble
To gain knowledge in C language and to inculcate fundamental programming skills.

Course Outcomes
On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Remember the program structure of C with its syntax and semantics.	60%	70%
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	60%	70%
CO3	Apply the programming principles learnt in real-time problems.	60%	70%
CO4	Analyze the various methods of solving a problem and choose the best method.	60%	70%
CO5	Code, debug and test the programs with appropriate test cases.	60%	70%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S
CO2	L	-	M	S	S
CO3	-	S	-	S	M
CO4	M	-	S	M	M
CO5	-	M	S	-	S

S-STRONG   M-MEDIUM   L-LOW

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	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	-	S	-	S	M
CO2	S	M	S	-	-	S
CO3	-	S	-	M	M	S
CO4	S	S	M	-	S	M
CO5	M	M	-	S	M	S

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy:

	CA		End of
	First	Second	Semester
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Contents:

Unit- I   **12 hours**

Overview of C: Importance of C, sample C program, C program structure, executing C program. Constants, Variables, and Data Types, Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables---Assignment statement, declaring a variable as constant, as volatile.

Operators and Expression: Arithmetic, Relational, logical, assignment, increment, decrement, conditional, bitwise and special operators, arithmetic expressions, operator precedence, type conversions, mathematical functions.

Managing Input and Output Operators: Reading and writing a character, formatted input, formatted output.

Unit – II   **12 hours**

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

Unit – III   **12 hours**

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

Unit - IV   **12 hours**

Structures and Unions: Defining, giving values to members, initialization and comparison of structure variables, arrays of structure, arrays within structures, structures within structures, structures and functions, unions.

Preprocessors: Macro substitution, file inclusion.

Unit – V   **12 hours**

Pointers: definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.

File Management in C: Opening, closing and I/O operations on files, random access to files, command line arguments.

Text Book:

1. E. Balagurusamy, Programming in ANSI C, Sixth Edition, Tata McGraw-Hill, 2014.

References:

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

Chapters (Relevant topics only)

Unit - I   : Chapters 1,2,3,4
Unit - II   : Chapters 5,6
Unit – III : Chapters 7,9
Unit – IV : Chapters 10,14
Unit - V   : Chapters 11,12

Web Resources:

https://www.cprogramming.com/
https://www.geeksforgeeks.org/c-programming-language/
https://codeforwin.org/

Course Designers:

Dr. K. Natarajan, Mrs. K. Suriya Prabha

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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2023)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS23NT11	Web Designing	NME	2	-	-	2

L – Lecture **T – Tutorial** **P – Practical**

Year	Semester	Int. marks	Ext. Marks	Total
I	I	25	75	100

Preamble:

This course gives an exploration towards web page design using HTML and CSS. This course, provide a chance to the students to create static and dynamic web pages by their own.

Course Outcomes:

On the successful completion of this course, Students will be able to

#	Description	Expected Proficiency	Expected Attainment
CO1	Learn the basics of Web Design, Internet and Working of Web.	75%	75%
CO2	Understand HTML Page Structure, Paragraph and List tags.	75%	75%
CO3	Create a web page with links, tables and process forms.	75%	75%
CO4	Explore the basics of CSS and text formatting with CSS.	75%	75%
CO5	Design web pages with page colors, background setting and CSS Box model.	75%	75%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	L	L
CO2	S	L	S	M	S
CO3	M	L	L	L	L
CO4	S	L	S	M	S
CO5	S	M	M	L	S

S-STRONG   **M-MEDIUM**   **L-LOW**

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B.Sc. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	S	S	L
CO2	L	M	M	M	S	L
CO3	L	M	L	M	S	L
CO4	S	M	L	M	S	M
CO5	S	M	L	M	S	S

S-STRONG **M-MEDIUM** **L-LOW**

B.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	S	S
CO2	M	S	M	M	M	M
CO3	L	M	S	L	M	M
CO4	S	M	M	S	M	S
CO5	S	M	M	S	S	S

S-STRONG **M-MEDIUM** **L-LOW**

B.B.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	S
CO2	S	L	L	M	S	L
CO3	M	L	L	L	M	M
CO4	S	M	M	L	S	M
CO5	S	M	M	S	M	L

S-STRONG **M-MEDIUM** **L-LOW**

B.Com. P.O.

#	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	M	S
CO2	L	M	L	L	M
CO3	M	M	L	L	M
CO4	S	S	L	M	S
CO5	S	L	M	M	S

S-STRONG　　　　**M-MEDIUM**　　　　**L-LOW**

B.C.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	S	S
CO2	M	M	M	M	S	S
CO3	M	M	L	M	M	M
CO4	M	L	L	M	M	M
CO5	S	L	M	S	S	S

S-STRONG　　　　**M-MEDIUM**　　　　**L-LOW**

Blooms taxonomy:

	CA		End of
	First	**Second**	**Semester**
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Contents:

UNIT: I　　　　　　　　　　　　　　　　　　　**6 HOURS**

Getting Started in Web Design: Where Do I Start? It Takes a Village (Website Creation Roles) Gearing Up for Web Design, What You've Learned. **How the Web Works**: The Internet Vs The Web, Serving Up Your Information, A Word About Browsers, Web Page Addresses (URLs), The Anatomy of a Web Page.

UNIT: II　　　　　　　　　　　　　　　　　　**6 HOURS**

Creating a Simple Page: A Web Page, Step-By-Step, Launch a Text Editor, Step 1: Start with Content, Step 2; Give the HTML Document Structure, Step 3: Identify Text Elements, Step 4: Add an Image, Step 5: Change the Look with a Style Sheet, When

Good Pages Go Bad, Validating Your Documents. **Marking Up Text**: Paragraphs, Headings, Thematic Breaks (Horizontal Rule), Lists, More Content Elements, Organizing Page Content, The Inline Element Roundup, Generic Elements (div and span), Improving Accessibility with ARIA, Character Escapes.

UNIT: III   **6 HOURS**

Adding Links: The href Attribute, Linking to Pages on the Web, Linking within Your Own Site, Targeting a New Browser Window, Mail links, Telephone Links. **Table Markup:** How to Use Tables, Minimal Table Structure, Table Headers, Spanning Cells, Table Accessibility, Row and Column Groups, Wrapping Up Tables. **Forms:** How Forms Work? The Form Element, Variables and Content, The Great Form Control Roundup, Form Accessibility Features, Form Layout and Design.

UNIT: IV

6 HOURS

Introducing Cascading Style Sheets: The Benefits of CSS, How Style Sheets Work? The Big Concepts, CSS Units of Measurement, Developer Tools Right in your Browser, Moving Forward with CSS. **Formatting Text:** Basic Font Properties, Advanced Typography with CSS3, Changing Text Color, A Few More Selector Types, Text line Adjustments, underlines and Other "Decorations", Changing Capitalization, Spaced Out, Text Shadow, Changing List Bullets and Numbers.

UNIT: V   **6 HOURS**

Colors and Backgrounds: Specifying Color Values, Foreground Color, background Color. Clipping the Background, Playing with Opacity, Pseudo-Class Selectors, Pseudo-Element Selectors, Attribute Selectors, Background Images, The Shorthand background property, like a Rainbow (Gradients), Finally, External Style Sheets, Wrapping It Up.

Thinking Inside the Box: The Element Box, Specifying Box Dimensions, padding, Borders, Margins, Assigning Display Types, Box Drop Shadows.

Text Book:

1.   Leaning Web Design, 5th Edition, by Jennifer Robbins, Released by May 2018, Publisher: O'Reilley Media, Inc.

Chapters:

References:

1. Sams Teach yourself HTML, CSS and JavaScript, by Julie C. Meloni, Publisher: Pearson education, Inc.

2. HTML & CSS design and build websites, by Jon Duckett, Publisher: John Wiley & Sons, Inc.

3. HTML & CSS: The Complete Reference, Fifth Edition, by Thomas A. Powell, Publisher: The McGraw-hill Companies.

Web Resources:

https://www.w3schools.com/html/
https://www.w3schools.com/css/default.asp
https://www.javatpoint.com/html-with-css

Course Designers:

Dr. A.M. Hema

Dr. A. Sharmista

Dr. Sumathi M.R.

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DEPARTMENT OF COMPUTER SCIENCE
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Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS23FL11	C Programming Lab	Foundation Course	-	-	4	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble:

This lab course is designed to understand the power of three decade old programming language concepts and features that leads to learn other language with ease and promotes to survive in IT field.

Course Outcomes:

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Outline the logic using flowchart for a given problem and develop programs using conditional and looping statements	75%	75%
CO2	Develop programs with implementation of arrays, functions and parameter passing techniques.	75%	75%
CO3	Develop programs with string handling functions	75%	75%
CO4	Construct programs with features of Structure.	75%	75%
CO5	Gain skills to write file programs and perform various operations.	75%	75%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	-	-	-	-
CO2	-	-	M	-	-
CO3	-	-	M	-	-
CO4	-	-	M	M	-
CO5	-	-	M	M	-

S-STRONG   M-MEDIUM   L-LOW

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Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	-	-	-	-
CO2	-	M	-	M	-	-
CO3	-	-	-	L	M	-
CO4	-	S	-	M	M	-
CO5	-	-	-	-	M	L

S-STRON   M-MEDIUM   L-LOW

Contents:

Simple programs

1. Simple interest.
2. Find the biggest from two numbers -ordinary /switch case/conditional operator methods.
3. Find the biggest from three given numbers.
4. Check a given number is odd or even –ordinary/switch case/conditional operator methods
5. Find the sum of digits of a given number.
6. Prime number checking / Generate all prime numbers between any two given limit.
7. Binary to decimal- Decimal to binary conversion.
8. Least common multiple of two integes.
9. Greatest common divisor of two integers.
10. Fibonacci series.

Array programs

1. Ordering of 'n' given numbers.
2. Matrix Addition.
3. Matrix Subtraction.
4. Matrix Multiplication.
5. Transpose of a Matrix.
6. Call by Value.
7. Call by Address.
8. Recursion (Factorial value).

String programs

1. Alphabetical order.
2. Palindrome Checking.
3. Substring detection.
4. Finding the number of vowels and consonants in a given string.

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Structure programs

1.   Mark list processing- Structure and call by value technique
2.   EB bill calculation- Structure and call by reference technique

File programs

1.   Create a data file to store 'n' numbers and separate odd and even numbers.
2.   Create a data file to store 'n' characters and separate vowel and non-vowels.

Web Resources:

https://www.tutorialspoint.com/cprogramming/

https://www.programiz.com/c-programming https://www.geeksforgeeks.org/c-language-set-1-introduction/

Course Designers:

Dr. K. Natarajan
Mrs. K. Suriya Prabha

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Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
U23ATEN11	Introduction to Personality Development	Ability Enhancement Compulsory Course – Soft Skills - I	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	I	25	75	100

Preamble:

This course gives confidence through self-awareness for personality development to transform students as an efficient leaders.

Course Outcomes:

On the successful completion of this course, Students will be able to:

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand the intrapersonal and interpersonal skills	75%	75%
CO2	Analyze and develop sense of self by building confidence.	75%	75%
CO3	Demonstrate one's ability through motivation and personality development.	75%	75%
CO4	Learn to communicate and persuade people in life.	75%	75%
CO5	Develop the ability to lead and build team in workspace.	75%	75%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of Cos with POs Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	M	M
CO2	S	S	S	M	M	M
CO3	S	S	S	M	M	M
CO4	S	S	S	M	M	M
CO5	S	S	S	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Contents:

UNIT – I: **6 HOURS**

 Soft Skills: Introduction and Importance   -   Soft Skills and Hard Skills (Difference)

UNIT – II: **6 HOURS**

Self-Awareness – Confidence Building

UNIT – III: **6 HOURS**

Personality Development – Motivation and Will Power

UNIT – IV: **6 HOURS**

Communication skills – Negotiation Skills

UNIT – V: **6 HOURS**

Leadership skills – Team Building and Managerial Skills

Text Books:

 1. Gupta, Seema. *Soft Skill: Interpersonal and Intrapersonal Skills Development*. V and S Publishers,

 New Delhi: 2019.Print

 2. Sharma, Prashant Soft Skills Personality Development for Life Success. BPS Publications, New Delhi

Reference:

1. Joshi, Gangadhar. *Campus to Corporate: Your Roadmap to Employability*. New Delhi: SAGE Pvt.

Ltd. 2016

Web Resources:

https://www.youtube.com/watch?v=DUlsNJtg2L8andlist=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q

(Soft Skills at NPTEL)

https://www.futurelearn.com/info/blog/what-is-anxiety

https://www.youtube.com/watch?v=C5dyGh3oMVQ (Self-Image Management at TEDx)

https://youtu.be/5x5alGZrLe8 (Will Power and behavioral change)

https://youtu.be/qp0HIF3SfI4 (Leadership skills)

https://www.youtube.com/watch?v=cQruENyLNYIandlist=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH

(Communication Skills at NPTEL)

https://youtu.be/3boKz0Exros (Team building)

Course Designers:

Dr.G.Rakesh

Dr. A. Sharmista

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2023)

Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS23CT21	Java Programming	Core 3	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble:

This course enable the students to understand the basic and object oriented concepts of Java, Packages, Interfaces, Exception Handling, Multithreaded Programming, Applets, Event Handling, AWT controls and Swing.

Course Outcomes:

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Understand the basic object-oriented concepts and the basic constructs of Core Java	70 %	60%
CO2	Illustrate the concepts of Inheritance, Packages and Interfaces of Core Java	70 %	60%
CO3	Apply Exception Handling and Multi-Threading concepts of Core Java.	70 %	60%
CO4	Implement Applets and Event Handling.	70 %	60%
CO5	Implement AWT and Swing.	70 %	60%

Mapping of COs with PSOs :

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	L	L
CO2	M	S	M	M	L
CO3	M	S	M	M	M
CO4	M	S	M	M	S
CO5	M	S	S	M	S

S-STRONG   M-MEDIUM   L-LOW

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	M	M	-	L
CO2	S	S	S	M	-	L
CO3	S	S	S	S	L	M
CO4	S	S	S	S	L	S
CO5	S	S	S	S	L	S

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy:

	CA		End of
	First	**Second**	**Semester**
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Contents:

Unit-I :   **15 Hours**

Introduction: Review of Object Oriented concepts - History of Java - Java Buzzwords – JVM Architecture – Data Types – Variables – Scope and life time of variables – Operators – Control Statements - Simple Java Program**.**

Arrays: One-Dimensional Arrays - Multidimensional Arrays - Alternative Array Declaration Syntax.

Introducing classes: Class fundamentals - Declaring objects - Assigning object reference variables - Introducing methods – Overloading Methods - Constructors – Overloading Constructors - The this Keyword - Garbage collection - The finalize() method – A Stack class.

Unit-II: **15 Hours**

Inheritance: Inheritance basics - Using super - Creating a Multilevel hierarchy - Method overriding - Dynamic method dispatch - Using Abstract classes - Using final with Inheritance - The Object class.

Packages: Defining a Packages - Access protection - Importing packages.

Interfaces: Defining an Interface – Implementation – Extending Interfaces.

Unit-III: **15 Hours**

Exception Handling: Exception Handling fundamentals - try - catch - throw - throws - finally - Built-in Exceptions - Creating own Exception classes.

Multithreaded Programming: The Java Thread Model - Creating a Thread - Creating Multiple Threads – Synchronization - Using synchronized methods - Using synchronized statement.

Unit-IV: **15 Hours**

Applet Fundamentals: Applet Basics - Applet Architecture -Applet Skeleton -Simple Applet display method.

Event Handling: Event Handling Mechanisms - Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events.

Introducing the AWT: AWT classes - Window Fundamentals – Introducing Graphics - Working with color - Working with fonts.

Unit-V: **15 Hours**

Using AWT Controls and Layout Managers: Control fundamentals - Labels - Using buttons - Applying check boxes - CheckBoxGroup - Choice controls - Using List - Managing scroll bars - Using a TextField - Using a Text Area - Understanding Layout Managers.

Swing: Jlabels – JTextFields – JButton – JToggleButton - Check Boxes – Radio Button - JComboBox – JScrollPane – JTable.

Text Book:

Herbert Schildt, 2014, Java The Complete Reference, 9thedition, McGraw Hill Edition

Chapters: (Relevant Topics only)

```
UNIT – I        : 1, 2, 3, 4, 5, 6, 7
UNIT – II       : 8, 9
UNIT – III      : 10, 11
UNIT – IV       : 23, 24, 25
UNIT – V        : 26, 32
```

References:
1. CAY S.Horstmann Gary Cornell, 2005, Core JAVA 2 Volume-1 Fundamental, 7thedn, Pearson Education
2. E.Balagurusamy, 2010, Programming with JAVA A Primer, 4thedn, Tata McGraw Hill

Web Resources:
https://www.javatpoint.com/java-tutorial
https://www.guru99.com/java-tutorial.html
https://www.cs.usfca.edu/~parrt/doc/java/JavaBasics-notes.pdf

Course Designers:
Mrs.SM.Valli

Mrs.K.Sharmila

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2023)

Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS23CL21	Java Programming Lab	Core 4	-	-	4	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble:

This course enable the students to understand the basic and object oriented concepts of Java, Packages, Interfaces, Exception Handling, Multithreaded Programming, Applets, Event Handling, AWT controls and Swing.

Course Outcomes:

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Create Single and Multidimensional arrays.	75%	75%
CO2	Create user defined packages and to demonstrate interfaces.	75%	75%
CO3	Implement exception handling mechanism and multithreading concepts.	75%	75%
CO4	Develop program using Java applets and Event Handling.	75%	75%
CO5	Develop GUI applications using AWT controls and Swing	75%	75%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	L
CO2	M	S	M	S	M
CO3	M	S	M	S	M
CO4	M	S	S	S	S
CO5	M	S	S	S	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	M	L	-	M
CO2	S	S	S	M	-	S
CO3	S	S	S	S	L	S
CO4	S	S	S	S	L	S
CO5	S	S	S	S	L	S

S-STRONG   M-MEDIUM   L-LOW

Contents:

1. Program to demonstrate Single and Multidimensional arrays.
2. Program to demonstrate Method Overloading.
3. Program to demonstrate Constructor Overloading.
4. Program to demonstrate Single and Multilevel Inheritance.
5. Program to demonstrate Method Overriding.
6. Program to demonstrate Dynamic Method dispatch.
7. Program to demonstrate Interfaces.
8. Program to demonstrate Packages.
9. Program to demonstrate Built-in exception and User-defined exception.
10. Program to demonstrate Multi-threading concept.
11. Program to demonstrate Graphics class.
12. Program to demonstrate Font and Color class.
13. Program to demonstrate basic AWTcontrols i.e. Button, labels, checkbox etc.
14. Program to demonstrate layout manager.
15. Program to demonstrate keyboard events.
16. Program to demonstrate mouse events.
17. Program to demonstrate to demonstrate basic swing controls i.e JLabel, JButton, JTextField, JCombobox etc.

Web Resources:

https://www.javatpoint.com/java-tutorial
https://www.guru99.com/java-tutorial.html

Course Designers:

Mrs.SM.Valli
Mrs.K.Sharmila

(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2023)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS23NT21	Office Automation	NME	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	II	25	75	100

Preamble :   :

Basic skills in Computer operations. The impart training for students in Microsoft Office which has different components like MS Word, MS Excel, MS Outlook and Power point. To acquire knowledge on word editor, spread sheet, send and receive email messages and presentation software. To expel knowledge by practicing with examples.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand the basics of Microsoft office and its Components.	75%	75%
CO2	Apply the basic concepts of a word processing package.	75%	75%
CO3	Learn the basic concepts excel software.	75%	75%
CO4	Create a presentation using PowerPoint tool.	75%	75%
CO5	Design E-mail messages using Microsoft Outlook	75%	75%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	-	-	-
CO2	S	M	L	M	L
CO3	S	M	L	M	L
CO4	S	L	L	M	-
CO5	M	L	M	M	L

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs:

B.Sc. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	S	S	L
CO2	L	M	M	M	S	L
CO3	L	M	L	M	S	L
CO4	S	M	L	M	S	M
CO5	S	M	L	M	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

B.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	S	S
CO2	M	S	M	M	M	M
CO3	L	M	S	L	M	M
CO4	S	M	M	S	M	S
CO5	S	M	M	S	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

B.B.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	S
CO2	S	L	L	M	S	L
CO3	M	L	L	L	M	M
CO4	S	M	M	L	S	M
CO5	S	M	M	S	M	L

S-STRONG   **M-MEDIUM**   **L-LOW**

B.Com. P.O.

#	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	M	S
CO2	L	M	L	L	M
CO3	M	M	L	L	M
CO4	S	S	L	M	S
CO5	S	L	M	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

B.C.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	S	S
CO2	M	M	M	M	S	S
CO3	M	M	L	M	M	M
CO4	M	L	L	M	M	M
CO5	S	L	M	S	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Blooms taxonomy:

	CA		End of
	First	**Second**	**Semester**
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Contents:

UNIT: I   **6 HOURS**

Explore Office 2016: Work in the Office user interface - Change Office and app options - Customize the Quick Access Toolbar - Customize the ribbon. **Create and manage files:** Create files - Open and move around in files - Display different views of files - Save and close files.

UNIT: II   **6 HOURS**

Microsoft Word 2016: Modify the structure and appearance of text: Apply paragraph formatting - Apply character formatting - Apply built-in styles to text. **Collaborate on documents:** Mark up documents - Display and review document markup - Compare and merge documents - Control content changes.

UNIT: III   **6 HOURS**

Microsoft Excel 2016: Perform calculations on data: Name groups of data - Define Excel tables - Create formulas to calculate values. **Manage worksheet data:** Limit data that appears on your screen - Manipulate worksheet data - Define valid sets of values for ranges of cells.

UNIT: IV   **6 HOURS**

Microsoft PowerPoint 2016: Create and manage slides: Add and remove slides - Divide presentations into sections - Apply themes - Change slide backgrounds. **Insert and manage simple graphics:** Insert, move, and resize pictures - Edit and format pictures - Draw and modify shapes. **Add sound and movement to slides:** Animate text and pictures on slides - Add audio content to slides - Add video content to slides.

UNIT: V   **6 HOURS**

Microsoft Outlook 2016: Send and receive email messages: Create and send messages - Attach files and Outlook items to messages - Display messages and message attachments - Display message participant information - Respond to messages.

Text Book:

1. Joan Lambert, Curtis Frye, "Microsoft Office 2016 Step by Step" –Microsoft.

Web Resources:

Textbook link:
https://ptgmedia.pearsoncmg.com/images/9780735699236/samplepages/9780735699236.pdf

Other link:
http://mnl.mclinc.org/wp-content/uploads/ComputerLab/ClassResources/Microsoft%20Word%202016/Word%202016%20Step-by-Step%20Guide.pdf

Chapters:

Unit I: Chapters 1,2
Unit II: Chapters 3,4
Unit III: Chapters 6,7
Unit IV: Chapters 10, 11, 12
Unit V: Chapters 13

Course designers

Dr.A.M.Hema
Dr. Sumathi M.R.
Dr. A. Sharmista

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2023)
Programme Code: UCS

Course Code	Course Title	Category	L	T	P	Credit
UCS23SL21	Web Application Development	Skill Enhancement Course – 3	-	-	5	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int.Marks	Ext.Marks	Total
I	II	25	75	100

Preamble:

This course is designed to develop an ability to design and implement static and dynamic web sites. Students will be able to develop websites using basic html tags, CSS and do validate by JavaScript.

Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Illustrate basic presentational tags, Text formatting tags, List tags, table tags, frame tags and marquee tags.	75%	75%
CO2	Build forms, form implementation, form design using CSS, dynamic form creation.	75%	75%
CO3	Learn CSS Styles for Text, images, translator and transformation and Layouts.	75%	75%
CO4	Understand simple programs on JavaScript using control statements, JavaScript objects and methods implementation using examples.	75%	75%
CO5	Learn Validation concepts and other JavaScript libraries implementation.	75%	75%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	-	M	-	M
CO2	-	M	S	-	M
CO3	-	M	L	-	M
CO4	M	-	L	-	M
CO5	-	-	S	M	M

S– STRONG   M–MEDIUM   L- LOW

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Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	L	-	-	M
CO2	S	L	-	M	L	-
CO3	L	L	L	M	-	-
CO4	S	L	-	M	M	M
CO5	S	L	-	L	S	M

S– STRONG   M–MEDIUM   L- LOW

Contents:

1. Create a web page to illustrate presentational tags.
2. Create a web page to illustrate Text formatting tags.
3. Create a web page to illustrate list tags and its attributes.
4. Create a web page to illustrate table tags and its attributes.
5. Create a web page to illustrate nested table.
6. Create a web page to illustrate frame tags.
7. Create a web page to illustrate marquee tags and its attributes.
8. Create a web page to display student's biodata using form elements.
9. Create a web page to design form for EB bill.
10. Program to create form for +2 and 10th mark sheet using CSS.
11. Program to create form for payment receipt.
12. Program to create form for online admission.

Program in Javascript

13. To illustrate IF and IF..ELSE statement.
14. To illustrate FOR statement.
15. To illustrate While statement.
16. To illustrate function.
17. To illustrate Array objects.
18. To illustrate Number objects.
19. To illustrate String objects.
20. To illustrate Date objects.
21. To illustrate Math objects.
22. To illustrate events.
23. Form validation using JavaScript.
24. To illustrate JavaScript Library.

Web Resources:

https://www.w3schools.com
https://www.javatpoint.com
https://www.simplylearn.com
https://www.w3resources.com
https://www.tutorialspoint.com

Course Designers:

Dr.A.M.Hema

Mrs.G.Nalini

(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2023)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
U23ATEN21	Employability Skills	Ability Enhancement Compulsory Course – Soft Skills - II	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	II	25	75	100

Preamble:

This course gives importance of socializing, human resources and relationship in order to develop business and work ethics.

Course Outcomes:

On the successful completion of this course, Students will be able to:

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand, develop and exhibit accurate sense of self.	75%	75%
CO2	Learn to control stress and anger to maintain dignity in society	75%	75%
CO3	Demonstrate organizing ability and value of time in work and life.	75%	75%
CO4	Comprehend others feelings and empathize to build unity in society	75%	75%
CO5	Attain competence in managing and handling customers, clients and human resource in general	75%	75%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S– STRONG   M–MEDIUM   L- LOW

Mapping of COs with POs Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	M	M
CO2	S	S	S	M	M	M
CO3	S	S	S	M	M	M
CO4	S	S	S	M	M	M
CO5	S	S	S	M	M	M

S– STRONG   M–MEDIUM   L- LOW

Contents:

UNIT – I: **6 HOURS**

Introduction to Self-Image - Personal Grooming

UNIT – II: **6 HOURS**

Stress Management - Anger Management

UNIT – III: **6 HOURS**

Time Management - Organizational Skills

UNIT – IV: **6 HOURS**

Socializing - Being Understanding and Caring

UNIT – V: **6 HOURS**

Human Resources Management - Customer Relationship Management

Text Books:

1. Gupta, Seema. *Soft Skill: Interpersonal and Intrapersonal Skills Development*. V and S Publishers, New Delhi: 2019.Print

2. Sharma, Prashant Soft Skills Personality Development for Life Success. BPS Publications, New Delhi

References:

1. Joshi, Gangadhar. *Campus to Corporate: Your Roadmap to Employability*. New Delhi: SAGE Pvt. Ltd. 2016

Web Resources:

https://www.youtube.com/watch?v=C5dyGh3oMVQ

(Self-Image Management at TEDx)

https://www.youtube.com/watch?v=RcGyVTAoXEU

(Stress Management at TEDx)

https://www.youtube.com/watch?v=WXBA4eWskrc

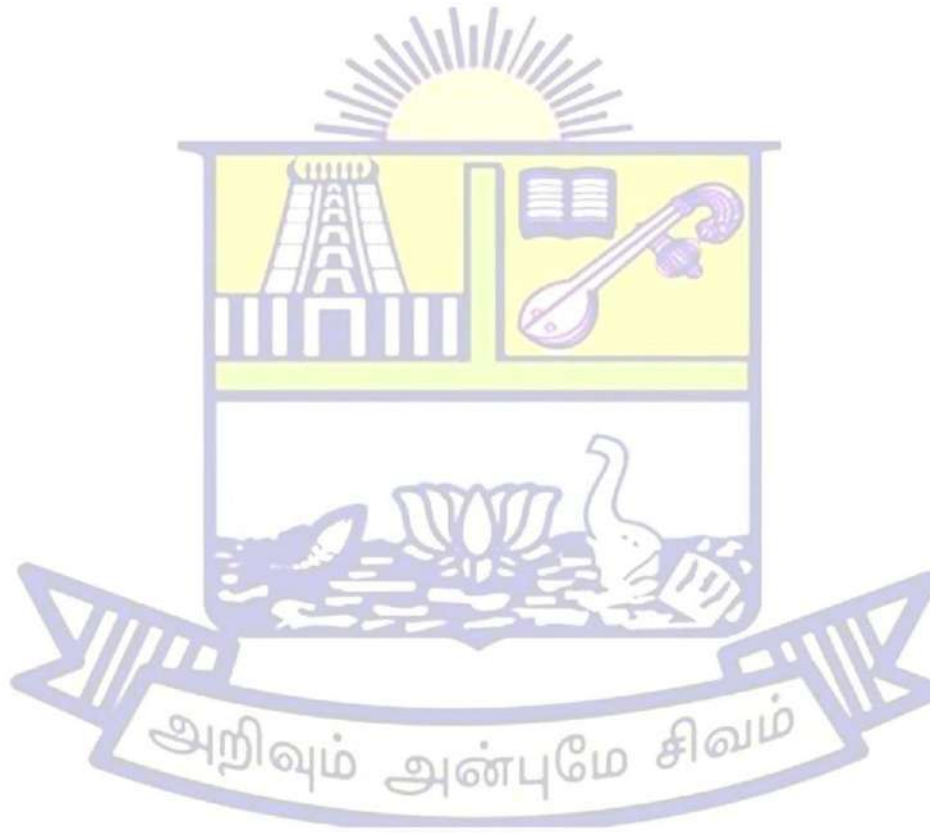(Time Management at TEDx)

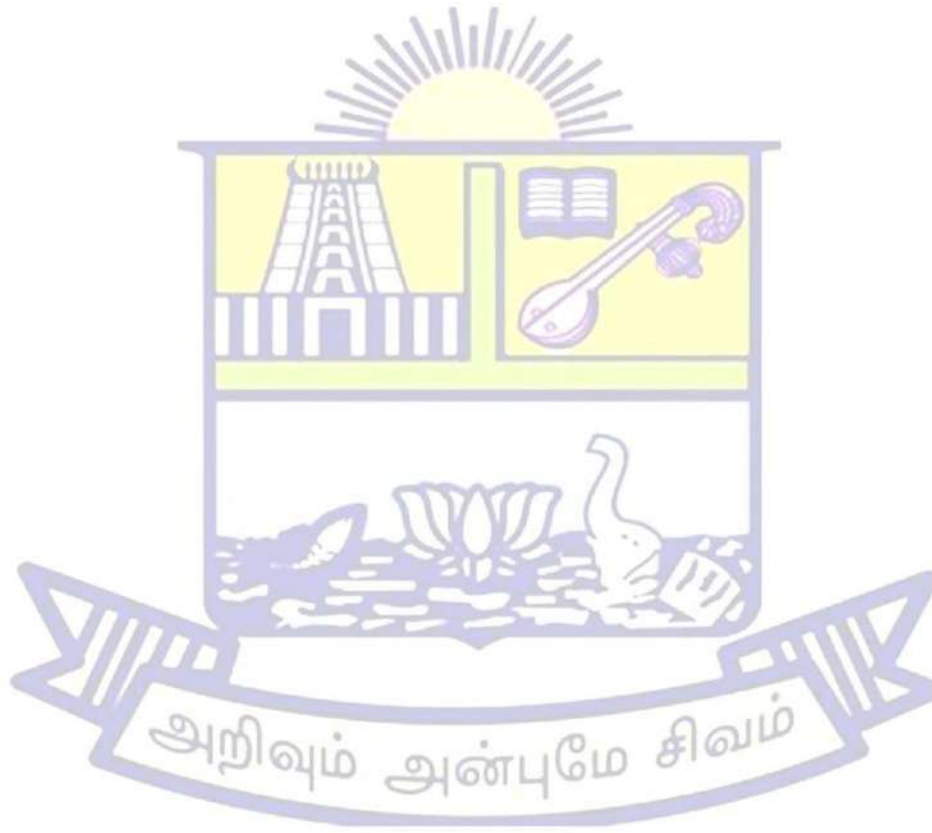**Course Designers:**

Dr.G.Rakesh

Dr. A. Sharmista

Thiagarajar College, Madurai - 625 009

(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Re-Accredited with "A++" Grade by NAAC

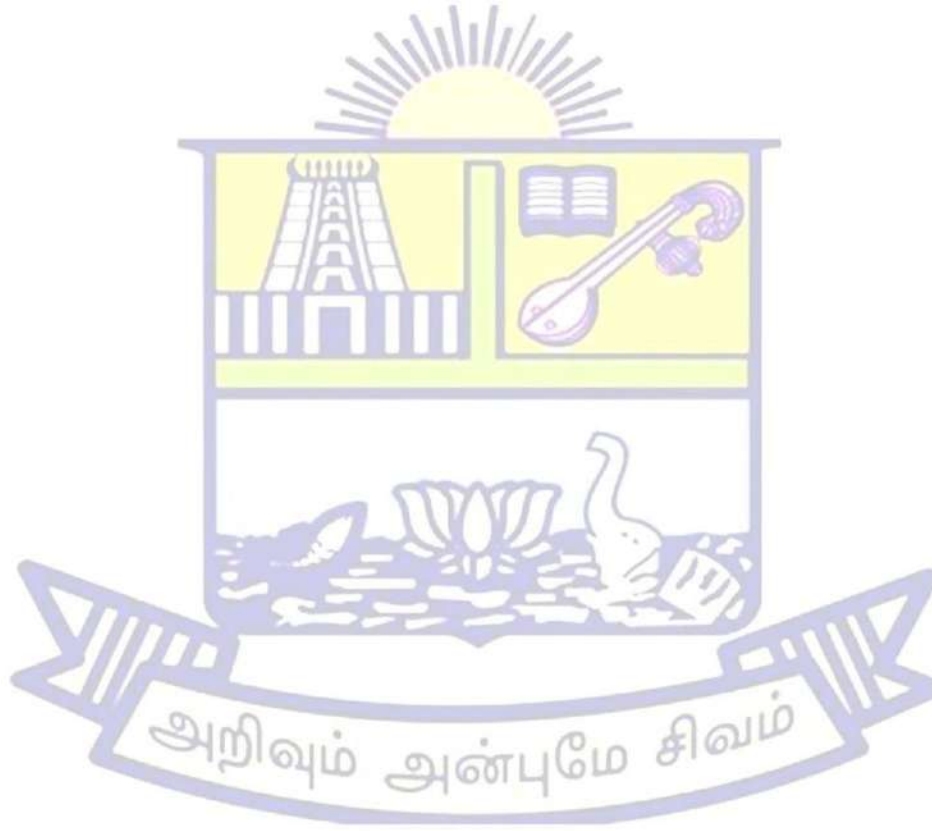**Academic Council Meeting**
June 2023

DEPARTMENT OF COMPUTER SCIENCE
M.Sc. Computer Science
Syllabus - 2023 - 2024

M.Sc. Computer Science Programme Code- PCS

THIAGARAJAR COLLEGE, MADURAI – 9.
(Re-Accredited with 'A++' Grade by NAAC)
Curriculum Structure for PG

Semester	Category	No. of Courses	Credit Distribution
I	Core	3	12
	Elective	2	6
	SEC	1	2
	AECC	1	2
II	Core	3	12
	Elective	2	6
	SEC	1	2
	AECC	1	2
III	Core	3	12
	Elective	1	3
	CIM	1	3
	SEC	1	2
	AECC	1	2
	Internship	1	2
IV	Core	3	12
	Elective	1	3
	Project	1	3
	SEC	1	2
	AECC	1	2
	Extension	1	1
	Total Credits		91

For Choice Based Credit System (CBCS)
- **Choices should be offered for Elective Courses**
- **Total Credits for Core Courses - 48**
- **Total Credits for Elective Courses - 24 (7 Electives + 1 Project)**
- **Total Credits for SEC - 8**
- **Total Credits for AECC - 8**
- **Total Credits for Internship and Extension- 3 (2 + 1)**

Programme outcome-PO (Aligned with Graduate Attributes)-Master of Science (M.Sc.,)

PO1 Knowledge

Acquire an overview of concepts, fundamentals and advancements of science across a range of fields, with in-depth knowledge in at least one area of study. Develop focused field knowledge and amalgamate knowledge across different disciplines.

PO2 Complementary skills

Students will be able to engage in critical investigation through principle approaches or methods and through effective information search and evaluation strategies. Employ highly developed conceptual, analytical, quantitative and technical skills and are adept with a range of technologies;

PO3 Applied learning

Students will be able to apply disciplinary or interdisciplinary learning across multiple contexts, integrating knowledge and practice. Recognize the need for information; effectively search for, evaluate, manage and apply that information in support of scientific investigation or scholarly debate;

PO4 Communication

Communicate effectively on scientific achievements, basic concepts and recent developments with experts and with society at large. Able to comprehend and write reports, documents, make effective presentation by oral and/or written form.

PO5 Problem solving

Investigate, design and apply appropriate methods to solve problems in science, mathematics, technology and/or engineering.

PO6 Environment and sustainability

Understand the impact of the solutions in ethical, societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

PO7 Teamwork, collaborative and management skills

Recognize the opportunities and contribute positively in collaborative scientific research. Engage in intellectual exchange of ideas with researchers of other disciplines to address important research issues

THIAGARAJAR COLLEGE – AUTONOMOUS MADURAI – 625 009.
(Re-Accredited With 'A++' Grade by NAAC)
Department of Computer Science M.Sc. Computer Science
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code : PCS

Vision

To be frontier in educating Computer Science and to produce globally competent Post graduates with moral values committed to build a vibrant nation.

Mission
- To strengthen the core competence in Computer Science through analytical learning.
- To produce successful post graduates with personal and professional responsibilities and commitment to lifelong learning.
- To uplift innovative research in computer science to serve the needs of industry, government and society.

PROGRAMME EDUCATIONAL OBJECTIVES : (PEOS)

PEO1	Graduates are prepared to acquire broad knowledge of Computer Science and a focused understanding of the in area of interest.
PEO2	Graduates will gain the ability to work effectively as a team member and/or leader in Dynamic professional environment.
PEO3	Graduates will be capable to take up research programmes.
PEO4	Graduates are prepared to survive in rapidly changing technology and engage in life-long learning.
PEO5	Graduates work effectively in multi-disciplinary and multi-cultural environments by Respecting professional is man ethical practices with in organization and society at national and international level.

PROGRAMME SPECIFIC OUTCOMES: (PSO)

| PSO1	Demonstrate understanding of the principles and working of the hardware and Software aspects of computer systems.
PSO2	Assess to understand the structure and development methodologies of software systems.
PSO3	Possess professional skills and knowledge of software design process.
PSO4	Familiarity and practical competence with a broad range of programming language and open source platforms.
PSO5	Be at ease with the contemporary issues, latest trends in technological development And there by innovate new ideas and solutions to existing problems.

M.Sc Computer Science
Programme Code – PCS

(Curriculum & Syllabus 2023)

I & II Semester

Department of Computer Science
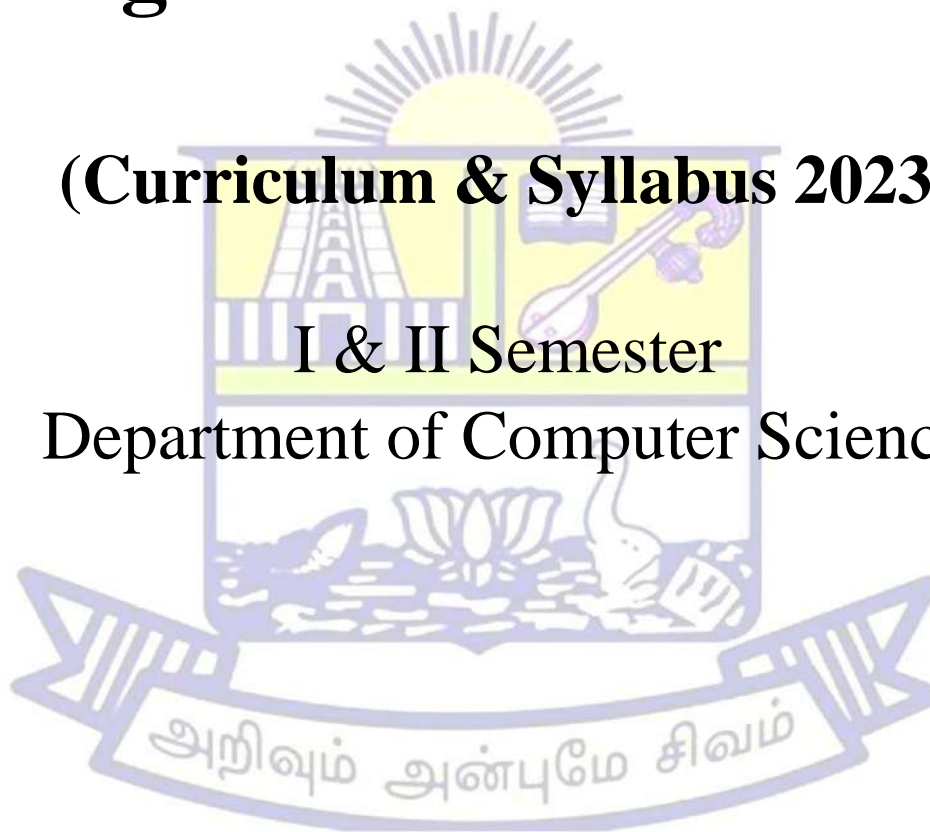
THIAGARAJAR COLLEGE (AUTONOMOUS) MADURAI – 625 009.
(Re-Accredited With "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code : PCS

Code No.	Type of Paper	Title of the paper	Hrs /wk	Crd	Total Hrs	CA	SE	TOT
I SEMESTER								
PCS23CT11	Core 1	Advanced DBMS	5	4	75	25	75	100
PCS23CT12	Core 2	Wireless Networks	5	4	75	25	75	100
PCS23CL11	Core lab1	Advanced DBMS Lab	4	4	60	25	75	100
PCS23ET11	Elective 1	Elective Paper -I (Group A)	5	3	75	25	75	100
PCS23ET12	Elective 2	Elective Paper -II (Group B)	5	3	75	25	75	100
PCS23SL11	*SEC 1	Advanced web Technology Lab	4	2	60	25	75	100
PCS23AT11	**AECC 1	Research Methodology	2	2	30	25	75	100
		Total	30	22				700
II SEMESTER								
PCS23CT21	Core 3	Machine Learning	5	4	75	25	75	100
PCS23CT22	Core 4	Cryptography & Network Security	5	4	75	25	75	100
PCS23CL21	Core lab2	Machine Learning Lab	4	4	60	25	75	100
PCS23ET21	Elective 3	Elective Paper –III (Group A)	5	3	75	25	75	100
PCS23ET22	Elective 4	Elective Paper –IV (Group B)	5	3	75	25	75	100
PCS23SL21	*SEC 2	Advanced Java Lab	4	2	60	25	75	100
PCS23AT21	**AECC 2	Open Source Software	2	2	30	25	75	100
		Total	30	22				700

*SEC- Skill Enhancement Course   **AECC- Ability Enhancement Compulsory Course

M.Sc. Computer Science

(For those joined M.Sc. Computer Science on or after June 2023)

List of Electives – Group A

A) Advanced Data Structures & Algorithm

B) Management Information System

C) Theory of Computation

D) Digital Image Processing

E) Software Project Management

F) Data Mining

List of Electives – Group B

A) Distributed Operating system

B) Cloud Computing

C) Embedded System

D) Big Data Analytics

E) Compiler Design

F) Virtual Reality

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)

Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23CT11	Advanced DBMS	Core 1	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	I	25	75	100

Preamble:

Acquire Knowledge of SQL, Relational Data Base, ER Model, Normalization, Query Processing, Distributed Data Base, Spatial and Temporal Database, Database storage structures, Database Models, Applications of Database Models and Emerging trends.

Pre-requisite:

Basic knowledge on elements of Computer, Computer Architecture, Data Structures.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Summarize Relational model and basic SQL queries.	60%	70%
CO2	Develop database using ER Model and Normalization	60%	70%
CO3	Summarize Storage and File structures and Query processing	60%	70%
CO4	Illustrate the role of Indexing and Hashing	60%	70%
CO5	Outline the features of Information retrieval, Spatial and Temporal Data	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	L	S	L	L
CO2	M	M	S	L	M	L	M
CO3	S	M	M	M	S	M	S
CO4	M	M	L	M	M	L	M
CO5	S	M	L	M	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	S
CO2	M	L	L	S	M
CO3	L	S	S	L	L
CO4	S	L	L	M	L
CO5	L	S	L	M	M

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit-I   15 Hrs

Introduction to the Relational Model: Structure of Relational Databases -Database Schema - Keys - Schema Diagrams -Relational Query Languages -Relational Operations. Introduction to SQL: Introduction -SQL Data Definition -Basic Structure of SQL Queries -Additional Basic Operations -Set Operations -Null Values - Aggregate Functions - Nested Subqueries -Modification of the Database.

Unit-II   15 Hrs

Database Design: Database Design and the E-R Model-overview of the Design Process-The Entity Relationship Model-constraints-Removing Redundant Attributes in Entity Sets-Entity Relationship Diagrams-Reduction to Relational Schemas-Entity Relationship Design Issues-Extended E-R Features- Alternative Notations for Modelling Data-Other Aspects of Database Design. Relational Database Design: Features of Good Relational Designs-Atomic Domains and First Normal Form-Decomposition Using Functional Dependencies-Functional-Dependency Theory-Algorithm for Decomposition-Decomposition Using Multivalued Dependencies-More Normal Forms-Database Design Process- Modeling Temporal Data.

Unit-III   15 Hrs

Storage and File Structure: Physical Storage Media - Magnetic Disk and Flash Storage – RAID - Tertiary Storage - File Organization - Organization of Records in Files - Data-Dictionary Storage -Database Buffer. Query Processing: Overview-Measures of Query Cost-Selection Operation-Sorting-Join Operation-Other Operations-Evaluation of Expressions.

Unit-IV   **15 Hrs**

Indexing and Hashing: Basic Concepts -Ordered Indices -B+-Tree Index Files -Multiple-Key Access -
Static Hashing - Dynamic Hashing. Distributed Databases: Homogenous and Heterogeneous
Databases-Distributed Data Storage-Distributed Transactions-Commit Protocols- Concurrency
Control in Distributed Databases-Availability-Distributed Query Processing- Heterogeneous
Distributed Databases- Cloud-Based Databases-Directory Systems.

Unit-V   **15 Hrs**

Information Retrieval: overview-Relevance Ranking Using Terms-Relevance Using Hyperlinks-
Synonyms, Homonyms and Ontologies - Indexing of Documents-Measuring Retrieval Effectiveness.
Spatial and Temporal Data and Mobility: Motivation-Time in Databases-Spatial and Geographic Data
–Multimedia Databases-Mobility and Personal Databases.

Text Book

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth
Edition, Tata McGraw Hill, 2013.

Chapters

Unit 1: Chapter 2, 3
Unit 2: Chapter 7, 8
Unit 3: Chapter 10, 12
Unit 4: Chapter 11, 19
Unit 5: Chapter 21, 25

Reference Books

1.C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition,
  Pearson Education, 2006.
2.Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fifth Edition,
  Pearson,2008.
3.Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata McGraw Hill,2010.
4.G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.

Web Resources:

1. https://www.tutorialspoint.com/dbms/ (DBMS)
2. https://www.tankonyvtar.hu/...advanced_database_systems/20... (Advanced DBMS)

Course Designers:

Mr.G.D.Kesavan and Dr. T.S.Urmila

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23CT12	Wireless Networks	Core 2	4	1	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I	25	75	100

Preamble

To provide an in-depth knowledge in Wireless and mobile communication system, telecommunication system, satellite system, different LAN technologies, Mobile Ad hoc networks routing protocols, Mobile Transport Layer and congestion control.

Pre-requisite:

Students are expected to know and understand the concepts of wireless networks and its classification.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Outline the wireless transmission concepts	60%	70%
CO2	Demonstrate the different Telecommunication Systems	60%	70%
CO3	Develop the wireless LAN Technologies	60%	70%
CO4	Analyze the different MANET protocols	60%	70%
CO5	Evaluate the Mobile Transport layer design principles	60%	70%

Mapping COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	S	M	M	M	M
CO2	M	M	S	S	M	M	M
CO3	S	M	M	S	S	M	S
CO4	M	M	S	S	M	M	S
CO5	S	M	M	M	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	M	S	M	M	S
CO3	M	S	S	S	S
CO4	S	S	M	S	M
CO5	M	M	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

Unit I   **15 Hrs**.
Wireless Transmission- Frequencies for Radio Transmission- Signals-Antennas-Signal Propagation-Multiplexing- Modulation-Spread Spectrum-Cellular Systems- Medium Access Control: Motivation for a specialized MAC- SDMA-FDMA-TDMA-CDMA-Comparison of S/T/F/CDMA.

Unit II   **15 Hrs**.
Telecommunication Systems- GSM-DECT-TETRA-UMTS and IMT-2000- Satellite Systems-History-Applications-Basics-Routing-Localization-Handover.

Unit III   **15 Hrs**.
Wireless LAN – Infra red vs radio transmission-Infrastructure and ad-hoc networks- IEEE 802.11- HIPERLAN-Historical: HIPERLAN1- WATM, BRAN, HiperLAN2- Bluetooth

Unit IV   **15 H**rs.
Mobile Network Layer - Mobile IP-IP Packet Delivery, Agent Discovery, Registration- Tunneling and Encapsulation-Optimizations- Reverse tunnelling-IPv6-IP micro-mobility support- Dynamic host configuration protocol- Mobile adhoc networks

Unit V   **15 Hrs**.

Mobile Transport Layer - Traditional TCP: Congestion Control, slow start-Fast Retransmit/Fast Recovery, Implications of Mobility – Classical TCP Improvements-TCP over 2.5/3G Wireless Networks-Performance enhancing proxies.

Text Book

1. Jochen H.Schiller, "Mobile Communications", Second Edition, Pearson education, 2012.

Chapters

Unit-I   : Chapter 2.1 to 2.8, 3.1 to 3.6
Unit-II   : Chapter 4.1 to 4.4, 5.1 to 5.6
Unit-III   : Chapter 7.1 to 7.5
Unit-IV   : Chapter 8.1 to 8.3
Unit-V   : Chapter 9.1 to 9.4

References

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE For Mobile Broadband", Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy Kuri, "Wireless Networking", First Edition, Elsevier 2011.
3. Simon Haykin Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education, 2013.
4. David G. Messerschmitt, "Understanding Networked Applications",Elsevier, 2010.

Web Resources

1.https://www.cse.wustl.edu/~jain/cis788-97/ftp/wireless_atm/index.html **(WirelessATM)**
2.https://commsbrief.com/difference-between-gsm-umts-lte/ **(GSM,UMTS)**
3.https://medium.com/@sarpkoksal/core-network-evolution-3g-vs-4g-vs-5g-7738267503c7
   (Evolution of Core Network)

Course Designers

Dr.P.Manickam and G.D.Kesavan

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)

Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23CL11	Advanced DBMS Lab	Core Lab1	-	-	4	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	I	25	75	100

Preamble:

Acquire Knowledge of various Databases, Sub queries, DDL, DML,TCL, Constraints, Join Queries, Views, Triggers, Procedures, Functions and Exceptions and Emerging Trends.

Pre-requisite:

Students should know about basic Data Structures, basics of programming language.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Demonstrate DDL, DML, TCL, Constraints, Join Queries	60%	70%
CO2	Illustrate functions on Duals, Sub Queries and Views.	60%	70%
CO3	Implement Stored Procedures and Functions.	60%	70%
CO4	Demonstrate Triggers, Assertions and Exceptions.	60%	70%
CO5	Illustrate applications using DBMS and any programming language.	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	L	S	M	L
CO2	M	M	S	M	S	L	L
CO3	M	M	M	L	S	M	M
CO4	M	M	S	S	M	M	S
CO5	M	L	L	L	M	L	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	L	L
CO2	L	S	M	L	L
CO3	S	L	L	L	L
CO4	L	M	L	S	L
CO5	L	S	L	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

1.   Queries to implement DDL, DML, TCL Queries for any tables.
2.   Queries to implement Constraints, Join Queries.
3.   Queries to Implement String, Date/time, Numeric functions on Dual.
4.   Queries to Implement Sub Queries and Views.
5.   Program to Stored Procedures and Functions.
6.   Program to implement Triggers.
7.   Program to implement Assertions and Exceptions.
8.   Program to implement some applications using DBMS and any programming language.

Course Designers:

Mr.G.D.Kesavan and Dr. P.Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23SL11	Advanced Web Technology Lab	SEC 1	-	-	4	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I	25	75	100

Preamble:
Learn about ASP.NET application frameworks and to create dynamic and interactive websites. The students will gain the ability to develop web sites using ASP.net for real time applications.

Pre-requisite:

Programming experience of any web based technologies.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Acquire knowledge on C#, console application in .Net framework. Design and Implementation	60%	70%
CO2	Apply web controls to develop a simple Web Application.	60%	70%
CO3	Create a web application and apply validation control, cookies and session in the web page	60%	70%
CO4	Apply the knowledge of ASP .NET object, ADO.NET data access and SQL to develop a client server model and to access data using Data grid controls.	60%	70%
CO5	Develop a Web site for real time application.	60%	70%

Mapping COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	L	M	L	L	L
CO2	S	S	M	L	L	M	M
CO3	S	S	M	M	L	M	M
CO4	S	S	M	M	S	M	M
CO5	L	S	S	M	M	M	S

S-STRONG　　　　**M-MEDIUM**　　　　**L-LOW**

Mapping COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	L	L	S
CO2	M	S	S	L	S
CO3	M	S	S	L	S
CO4	L	M	S	L	S
CO5	L	M	M	L	S

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Console Application:

1.　　　Manipulate Student details and print in neat format using C# .Net.
2.　　　Implement Conditional and Looping statements in C# .Net.
3.　　　Implement in-built Array functions in C# .Net.
4.　　　Apply Inheritance and abstract class in C# .Net.
5.　　　Manipulate Interface and Exception handling in C# .Net

Windows Application:

6.   Create a Simple application using web controls.
7.   Create an online application using ASP.NET without validation controls.
8.   Develop an ASP.NET Application to validate the form.
9.   Create an online application using in-built validation controls available in ASP.NET.
10.   Develop an application using ADO.NET.
11.   Develop an ASP.NET Application to implement data binding in data grid using ADO .Net.
12.   Develop an ASP.NET Application to implement data binding in data grid using XML.
13.   Develop an ASP.NET Application to handle session tracking.
14.   Develop an ASP.NET Application to implement the cookies.
15.   Develop a site for simple online reservation.

Course Designers:

Dr. T.S. Urmila and Mr. G.D.Kesavan

(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23AT11	Research Methodology	AECC 1	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I	25	75	100

Preamble

To provide in-depth knowledge about defining the research problem, carrying out the research, data collection, data preparation, data viewing, interpretation of results, finding similarities and writing reports.

Pre-requisite:

Basic knowledge in research, analyzes as well as reporting the results

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Understand the different types of research	60%	70%
CO2	Identify different types of research design	60%	70%
CO3	Develop the data collection	60%	70%
CO4	Elaborate the data preparation process	60%	70%
CO5	Analyze the interpretation and writing report	60%	70%

Mapping COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	M
CO3	S	S	S	S	S	M	S
CO4	S	S	M	S	S	M	S
CO5	S	M	M	S	M	M	S

S-STRONG   M-MEDIUM   L-LOW

Mapping COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S
CO2	M	S	S	S	S
CO3	M	M	S	M	S
CO4	S	S	S	S	S
CO5	S	M	S	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit I   6 Hrs.

Research Methodology: An Introduction-Meaning of Research- Objectives of Research-Types of Research-Research Approaches- Significance of Research- Research Methods versus Methodology-Research and Scientific Method- Research Process- Criteria of Good Research -Problems Encountered by Researchers in India.

Unit II   6 Hrs.

Defining the Research Problem: What is a Research Problem? - Selecting the Problem - Necessity of Defining the Problem - Technique Involved in Defining a Problem -An Illustration – Conclusion

Unit III   6 Hrs.

Research Design: Meaning of Research Design - Need for Research Design - Features of a Good Design - Important Concepts Relating to Research Design - Different Research Designs - Basic Principles of Experimental Designs – Important Experimental Designs – Conclusion.

Unit IV   6 Hrs.

Data Collection: Introduction-Experimental and Surveys-Collection of Primary Data- Collection of Secondary Data-Selection of Appropriate method for data collection- case study method.
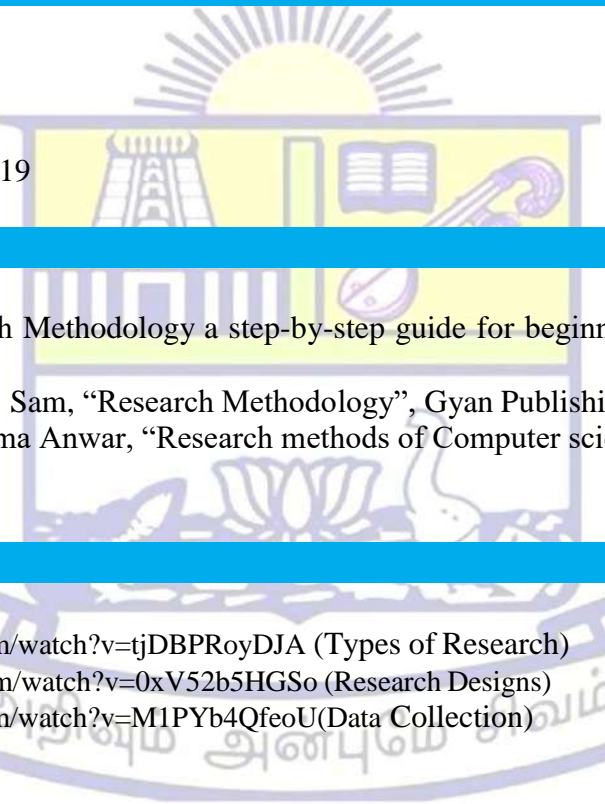
Unit V 6 Hrs.

Data Preparation: Data Preparation Process-Some problems in Preparation Process-Missing values and outliers-Types of Analysis-Statistics in Research- Interpretation and Report Writing: Meaning of Interpretation -Why Interpretation?- Technique of Interpretation: Precaution in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports – Oral Presentation - Mechanics of Writing a Research Report -Precautions for Writing Research Reports - Conclusions

Text Book

Kothari C.R and Gaurav Garg, "Research Methodology methods and techniques", Fourth Edition, New Age International Publishers, 2020.

Chapters
Unit I   : Chapter 1
Unit II   : Chapter 2
Unit III   : Chapter 3
Unit IV   : Chapter 6
Unit V   : Chapter 7,19

References

1. Ranjit Kumar, "Research Methodology a step-by-step guide for beginners", Third Edition,Sage Publications, 2011.
2. Sam Daniel P, Aroma G. Sam, "Research Methodology", Gyan Publishing House, 2011.
3. Ehtiram Raza Khan, Huma Anwar, "Research methods of Computer science", University Science Press, 2016.

Web Resources

1. https://www.youtube.com/watch?v=tjDBPRoyDJA (Types of Research)
2. https://www.youtube.com/watch?v=0xV52b5HGSo (Research Designs)
3. https://www.youtube.com/watch?v=M1PYb4QfeoU(Data Collection)

Course Designers

Dr.P.Manickam and G.D.Kesavan

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)

Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23CT21	Machine Learning	Core 3	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	II	25	75	100

Preamble:

To Learn about Machine Intelligence and Machine Learning applications, implement and apply machinelearning algorithms to real-world applications

Pre-requisite:

Basic knowledge of software functionality, data structures and algorithms.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Acquire the Learning Problems, Decision tree algorithm	60%	70%
CO2	Learn the Neural Network Representation and genetic algorithm	60%	70%
CO3	Describe the Bayes Theorem Concept learning	60%	70%
CO4	Elaborate the Instance Based Learning	60%	70%
CO5	Analyze the Advanced Learning problems	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	S	M	S	L	M
CO2	M	M	S	L	M	M	S
CO3	S	M	L	M	S	M	L
CO4	M	M	S	L	M	L	M
CO5	M	M	L	L	M	L	L

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	L	L
CO2	L	S	L	L	L
CO3	L	L	L	L	L
CO4	L	M	L	S	L
CO5	L	S	L	M	S

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		**End of Semester**
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

UNIT I   15 Hrs

INTRODUCTION: Well posed Learning Problems– Perspectives and Issues in Machine Learning– Concept Learning Task– Find S -Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning– Representation– Algorithm –Heuristic Space Search in Decision Tree Learning.

UNIT II   15 Hrs

NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation– Problems–Perceptrons–Multilayer Networks and Back Propagation Algorithms–Advanced Topics in ANN– Evaluating Hypothesis- Estimating Hypothesis Accuracy- Sampling Theory- Deriving Confidence Intervals- Difference in error of two hypothesis.

UNIT III   15 Hrs

BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem – Concept Learning– Maximum Likelihood–Minimum Description Length Principle–Bayes Optimal Classifier–Gibbs Algorithm–Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning–Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model of Learning.

UNIT IV   15 Hrs

INSTANT BASED LEARNING: K- Nearest Neighbor Learning– Locally weighted Regression –Radial Basis Functions – Case Based Learning. Genetic Algorithms– Hypothesis Space Search – GeneticProgramming – Models of Evaluation and Learning.

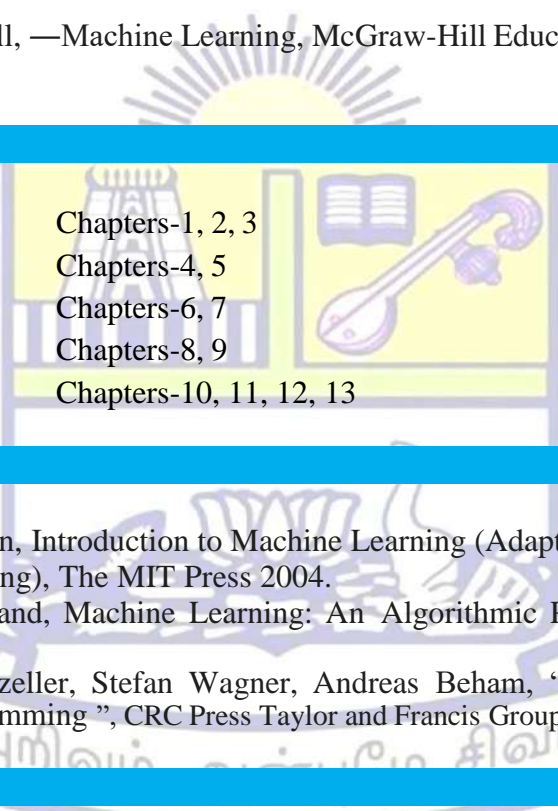## UNIT V   15 Hrs

ADVANCED LEARNING: Learning Sets of Rules–Sequential Covering Algorithm– Learning Rule Set – First Order Rules– Sets of First Order Rules– Induction on Inverted Deduction– Inverting Resolution–Analytical Learning– Perfect Domain Theories– Explanation Base Learning– FOCL Algorithm – Reinforcement Learning– Task – Q-Learning–Temporal Difference Learning.

Text Book

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited,2013.

Chapters

Unit-I	-	Chapters-1, 2, 3
Unit-II	-	Chapters-4, 5
Unit-III	-	Chapters-6, 7
Unit-IV	-	Chapters-8, 9
Unit-V	-	Chapters-10, 11, 12, 13

Reference Books

1. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and MachineLearning), The MIT Press 2004.
2. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. Michael Affenzeller, Stefan Wagner, Andreas Beham, "Genetic Algorithms and Genetic Programming ", CRC Press Taylor and Francis Group.

Web Resources:

1. https://www.cs.ubbcluj.ro/~gabis/ml/ml-books/McGrawHill%20-%20Machine%20Learning%20- Tom%20Mitchell.pdf **(machinelearning)**
2. http://www.cs.cmu.edu/~tom/mlbook.html**(machine learning text book)**
3. https://cse.iitkgp.ac.in/~pabitra/course/cs674.html**(Machine Learning Course)**

Course Designers:

Mr.G.D.Kesavan and Dr.P.Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade
by NAAC) DEPARTMENT OF
COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23CT22	Cryptography & Network Security	Core 4	4	1	-	4

L – Lecture T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	II	25	75	100

Preamble:

To provide an in-depth knowledge in various types of attacks, threats and cryptography algorithms, key management concept and system security.

Prerequisite:

Basic knowledge about attacks in computer Networks.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	List the different attacks and Encryption Techniques	60%	70%
CO2	Understand the Public Key Cryptographic Techniques	60%	70%
CO3	Develop the Digital Signature and Key Management Concept	60%	70%
CO4	Examine the security at Application Layer and Transport Layer	60%	70%
CO5	Evaluate the Security at IP Security and System security	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	S	M	M
CO2	S	S	S	M	S	M	M
CO3	M	M	S	S	S	M	M
CO4	S	M	M	M	M	M	M
CO5	M	M	S	S	M	M	S

Mapping of Cos with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S
CO2	M	S	S	S	M
CO3	M	M	M	M	S
CO4	S	S	M	M	M
CO5	M	M	M	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy	CA		End of Semester
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit I   **15 Hrs**.

Introduction: Security Goals-Cryptographic Attacks-Services and Mechanism-Techniques for security goals- Implementation-Traditional Symmetric -key ciphers: Symmetric key ciphers-categories of traditional ciphers-stream and block ciphers-Introduction to modern symmetric-key ciphers: Modern block ciphers-Components of a modern block cipher -two classes of product ciphers-Attacks designed for block ciphers-Modern stream ciphers.

Unit II   **15 Hrs**.

Encipherment using modern symmetric key ciphers: Use of modern block ciphers-Use of stream ciphers-other issues-Asymmetric key Cryptography: Difference between symmetric key and asymmetric key Cryptosystems-RSA Cryptosystem-Rabin Cryptosystem-ElGamal Cryptosystem-Elliptic Curve Cryptosystems.

Unit III   **15 Hrs**.

Digital Signature: Comparison- Process-Services-Attacks on Digital Signature-Digital Signature Schemes-Variations and Applications-Entity Authentication: Entity Authentication and message authentication-password-based Authentication-Challenge-Response Protocols-Zero-Knowledge Protocols-Biometrics-Key Management: Symmetric Key Distribution-Kerberos- Symmetric Key Agreement- Public key distribution-Hijacking.

Unit IV   **15 Hrs**.

Security at the Application layer: PGP and S/MIME: E-mail system-Pretty Good Privacy (PGP)-Secure/Multipurpose Internet Mail Extension(S/MIME)-Security at the Transport Layer: SSL and TLS: Security Service at the Transport Layer-SSL Architecture-Four protocols-SSL Message Formats-Transport Layer Security.

Unit V   **15 Hrs**.

Security at the Network Layer: (IPSec)- IP Security (IPSec)-Modes of IPSec-Two Security Protocols-Security Association-Security Policy-Internet Key Exchange (IKE)-System Security: Description of the system-Buffer overflow and Malicious Software-Malicious Programs-Intrusion Detection Systems (IDS)-Firewalls: Definitions, Construction, and working principles.

Text Book

1. Behrouz A Forouzan , Debdeep Mukhopadhyay, "Cryptography and Network Security", Third Edition, McGraw Hill, 2018.

Chapters

Unit I   : 1, 3, 5
Unit II   : 8, 10
Unit III : 13, 14, 15
Unit IV : 16, 17
Unit V   : 18, 19

References

1. Charles Pfleeger, "Security In Computing", 4th Edition, Prentice Hall OfIndia, 2006.
2. William Stallings, "Cryptography and Network Security: Principles and Practices",Third Edition, Pearson Education, 2002
3. Charlie Kaufman And Radia Perlman, Mike Speciner, "Network Security,Second Edition, Private Communication in Public World", PHI 2002.

Web Resources

1. https://www.youtube.com/watch?v=L2NAQbZeRXo (Substitution techniques)
2. https://www.youtube.com/watch?v=gAtBM06xwaw (Elliptic Curve Cryptography)
3. https://www.youtube.com/watch?v=hExRDVZHhig (Secure Sockets Layer)
4. https://www.youtube.com/watch?v=yiEOUMJkL7M (Firewall)

Course Designer

Dr.P.Manickam and G.D.Kesavan

**(Re-Accredited with 'A++' Grade
by NAAC) DEPARTMENT OF
COMPUTER SCIENCE**

(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23CL21	Machine Learning Lab	Core Lab 2	-	-	4	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	II	25	75	100

Preamble:

Make use of Data sets in implementing the machine learning algorithms. Implement the machine learning concepts and algorithms in any suitable language of choice.

Pre-requisite:

Students should know about basic Data Structures, basics of programming language.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Demonstrate the basic Hypothesis and Regression programs	60%	70%
CO2	Create programs for classification algorithms.	60%	70%
CO3	Implement Clustering based programs.	60%	70%
CO4	Create programs to implement Neural network and Genetic Algorithm.	60%	70%
CO5	Analyze SVM algorithms and advanced ML programs.	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	L	S	M	M
CO2	M	M	L	M	L	L	L
CO3	S	M	M	L	S	M	M
CO4	M	M	S	S	M	M	S
CO5	M	M	M	L	M	L	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	L	L
CO2	L	S	M	L	L
CO3	S	L	L	L	L
CO4	L	M	L	S	L
CO5	L	S	L	M	S

S-STRONG　　　　**M-MEDIUM**　　　　**L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			End of Semester
	CA		
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

1. Program to implement Basic Hypothesis framing programs.
2. Create program to demonstrate Linear Regression, Logistic Regression programs.
3. Create program to implement Classification based programs.
4. Develop program to implement Clustering.
5. Write programs to implement Neural Network and Genetic Algorithm concepts.
6. Generate program to implement SVM and advanced ML based programs.

Course Designers:

Mr.G.D.Kesavan and Dr.P.Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23SL21	Advanced Java Lab	SEC 2	-	-	4	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	II	25	75	100

Preamble:

To enable the students to learn the applets, swings, JSP, AWT Components, Servlets, JDBC concepts of Java Programming language.

Pre-requisite:

Basic knowledge of software programming and Database Query language.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Create program to implement Basic Java Programs and Java collection Frameworks	60%	70%
CO2	Develop programs to implement Java Applets and AWT Components.	60%	70%
CO3	Demonstrate Java swing and Java network concepts.	60%	70%
CO4	Illustrate Java Servlets and JSP.	60%	70%
CO5	Create program to implement Java script and JDBC.	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	-	S	M	M
CO2	M	M	S	M	S	-	S
CO3	S	M	M	-	S	M	M
CO4	M	M	S	S	M	M	S
CO5	M	-	M	-	M	-	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	L	L
CO2	M	L	L	S	L
CO3	M	L	L	L	S
CO4	L	L	M	L	S
CO5	L	M	L	L	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

1. Create program to implement Basic Java Programs.
2. Create program to implement program using Java Collections Framework.
3. Create program to implement program using Java Applets.
4. Create program to implement program using Java AWT Components.
5. Develop program to implement program using Java Swing Concepts.
6. Manipulate Java network applications concepts.
7. Create program to implement Java Servlets.
8. Develop program for Java Server pages.
9. Create program for Java script concepts
10. Manipulate program to implement Java with Database.

Course Designers:

Mr.G.D.Kesavan and Dr. P. Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23AT21	Open Source Software	AECC 2	2	-	-	2

L – Lecture T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	II	25	75	100

Preamble

To provide an in-depth knowledge on MongoDB Queries and administration.

Prerequisite:

Basic knowledge about documents, data types and Queries.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Learn the different data types	60%	70%
CO2	Understand the Queries	60%	70%
CO3	Construct the aggregation function	60%	70%
CO4	Analyze the security and administration concept	60%	70%
CO5	Assess the Administration concepts	60%	70%

Mapping Course Outcome with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	S	M	S
CO2	S	S	S	M	S	M	S
CO3	S	M	S	M	M	M	M
CO4	S	M	M	M	M	M	M
CO5	M	S	M	S	M	M	M

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	M	S	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	S	S
CO5	M	S	S	S	M

S-STRONG　　　　**M-MEDIUM**　　　　**L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit I   **6 Hrs**.
Introduction-Getting Started -Documents-Collections – Databases-Getting and Starting MongoDB- MongoDB Shell-Data Types-Basic Data Types -Numbers-Dates-Arrays-Embedded Documents _id and Object Ids.

Unit II   **6 Hrs**.
Creating, Updating, and Deleting Documents-Inserting and Saving Documents- Removing Documents-Updating Documents-The Fastest Write This Side of Mississippi-Requests and Connections-Querying: Introduction to find-Query Criteria-Type Specific Queries-$where Queries-Cursors-Cursor Internals.

Unit III   **6 Hrs**.
Indexing: Introduction to Indexing-Unique Indexes-Using explain and hint-Index Administration-Geospatial Indexing-Aggregation: count-distinct-group-MapReduce.

Unit IV   **6 Hrs**.

AdvancedTopics: Database Commands-Capped Collections-GridFS: Storing Files-Server-Side Scripting- Database References-Administration: Starting and Stopping MongoDB-Monitoring-Security and Authentication-Backup and Repair.

Unit V   **6 Hrs**.
Replication: Master-Slave Replication-Replica Sets-Performing operations on slave-How it works-Administration-Sharding: Introduction-The key to sharding-setting up sharding-production configuration- sharding administration.

1. Kristina Chodorow and Michael Dirolf "MongoDB: The Definitive Guide", 2010, O'Reilly Media Inc.

Chapters

Unit I   : 1, 2
Unit II   : 3, 4
Unit III   : 5, 6
Unit IV   : 7, 8
Unit V   : 9,10

References

1. Rick Copeland, "MongoDB Applied Design Patterns", 2013, O'Reilly Media, Inc.
2. "Learning MongoDB", Stack Overflow Contributors, RIP Tutorial.

Web Resources

1. https://www.youtube.com/watch?v=SnqPyqRh4r4 (MongoDB)

2. https://www.youtube.com/watch?v=dNXID1rZ5qU&list=PLYxzS 5yYQmr3HQQJMPBMbKtMY3 7sdsv (MongoDB Aggregation)

3. https://www.youtube.com/watch?v=Q0fHeQDszOg (MongoDB Administration)

Course Designer

Mr. G.D.Kesavan and Dr.P.Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET11A/ PCS23ET21A	Advanced Data Structures & Algorithms	Elective	3	2	-	3

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	I / II	25	75	100

Preamble:

Learn advanced Data structures, its implementation and applications, Problem solving in computing applications effectively and analyze the algorithmic procedure to demonstrate the computational complexity of the algorithms.

Pre-requisite:
Basic Knowledge about Data structure and algorithm, Programming Language constructs.

Course Outcomes

On the successful completion of this course, Students will be able to:

| #	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Outline Basic Data structure and its functionalities	60%	70%
CO2	Build Algorithm performance analysis and Divide conquer strategy.	60%	70%
CO3	Develop Greedy based solution for a problem.	60%	70%
CO4	Apply dynamic programming technique to solve the problem.	60%	70%
CO5	Construct backtracking solutions for a problem.	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	S	L	M	L	M
CO2	S	M	S	M	L	L	S
CO3	M	S	S	L	S	S	L
CO4	L	M	S	M	M	L	M
CO5	M	L	L	M	M	M	S

S-STRONG   M-MEDIUM   L-LOW
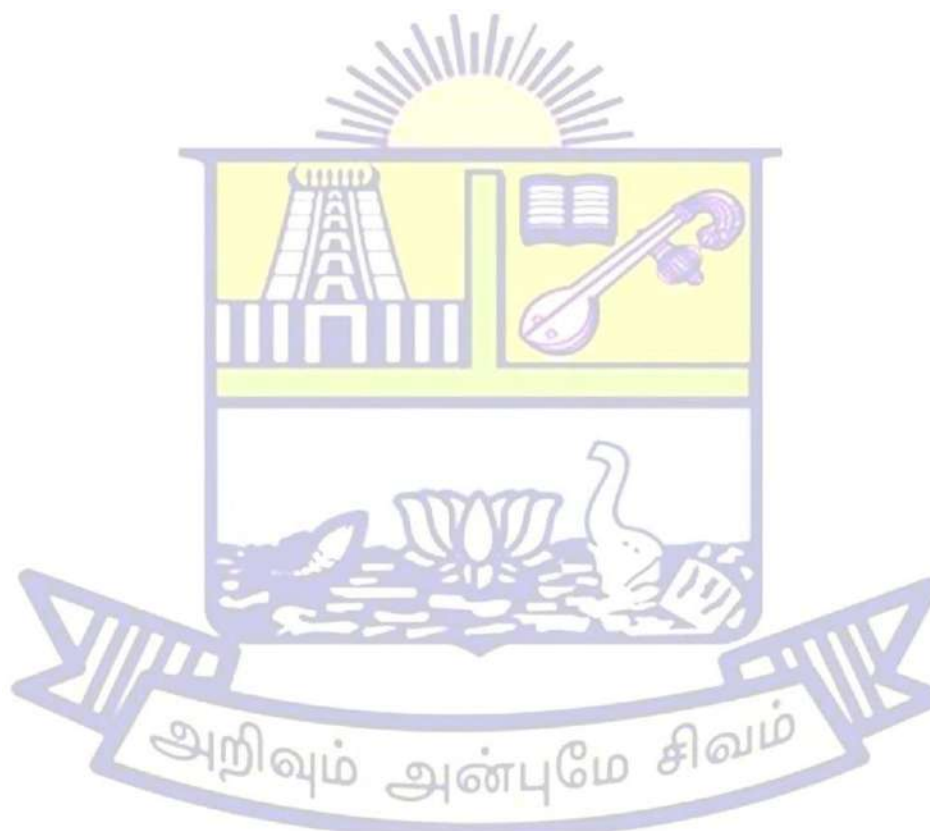
Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	L	L
CO2	S	S	L	L	L
CO3	L	M	S	L	L
CO4	L	L	L	M	L
CO5	L	L	L	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		**End of Semester**
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

Unit I   **15 hrs.**

Introduction: General Trees - Binary Trees -Implementing Trees -Tree Traversal Algorithms -The Priority Queue Abstract Data Type -Implementing a Priority Queue – Heaps- Binary Search Trees – Balanced Search Trees.

Unit II   **15 hrs.**

Algorithm Definition – Algorithm Specification – Performance Analysis- Asymptotic Notations. Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort.

Unit III   **15 hrs.**

The Greedy Method: General Method - Knapsack Problem - Tree Vertex Splitting – Job Sequencing with Deadlines - Minimum Cost Spanning Trees - Single Source Shortest Paths.

Unit IV   **15 hrs.**

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths - Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1 Knapsack - The Traveling Salesperson Problem. Connected Components and Spanning Trees - Biconnected Components and DFS.

Unit V   **15 hrs.**

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost search - 0/1 Knapsack Problem.

Text Book

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Java", Sixth Edition.
2. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, Second Edition

Chapters

Unit I: Chapter 8.1, 8.2, 8.3, 8.4, 9.1,9.2,9.3,11,1, 11,2 (Book1)
Unit II: Chapter 1.1, 1.2, 1.3, 3.1,3.2,3.3,3.4,3.5 (Book2)
Unit III: Chapter 4.1,4.2,4.3,4.4,4.5,4.8 (Book2)
Unit IV: Chapter 5.1 – 5.7, 5.9,6.3,6.5 (Book2)
Unit V: Chapter 7.1-7.6,8.1,8.2 (Book2)

Reference Books

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E.Goodman, Hedetniem-TMH.
4. Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen, "Evolutionary Algorithms for Solving Multi-Objective Problems",Springer 2nd Edition, 2007.

Web Resources:

1. https://www.programiz.com/dsa/divide-and-conquer (Divide and Conquer)
2. https://www.youtube.com/watch?v=ARvQcqJ_-NY (Greedy Method)
3. https://www.youtube.com/watch?v=ewXklhesC-w (Dynamic Programming Technique)
4. https://www.hackerearth.com/practice/algorithms/dynamic-programming/introduction- to- dynamic- programming-1/tutorial/ (Dynamic Programming Problems)
5. https://medium.com/educative/5-dynamic-programming-problems-and-solutions-for- your-next-coding- interview-ad938bce2351 (Problem Solving using Dynamic Programming)

Course Designers:

Mr.G.D.Kesavan and Dr.T.S. Urmila

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET11B/ PCS23ET21B	Management Information System	Elective	3	2	-	3

L – Lecture T – Tutorial P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble
To provide in depth knowledge about different types of management system and decision making concepts, Management information base, organizing a system, information collection, knowledge representation.

Prerequisite:
Basic knowledge about operation procedures of an organization, Management and Organizing basics.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Show the Management Information System Concepts	60%	70%
CO2	Understand the Strategic Management of Business	60%	70%
CO3	Build the concepts for Development of the MIS	60%	70%
CO4	Analyze the applications of MIS	60%	70%
CO5	Assess the Decision Support Systems and Enterprise Management System and Technology in MIS	60%	70%

Mapping Course Outcome with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	S	S	S
CO2	S	S	S	M	S	M	M
CO3	M	M	S	S	S	M	M
CO4	S	M	M	M	S	S	S
CO5	S	S	S	S	M	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	M
CO2	M	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	M	M
CO5	M	M	S	S	S

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

Unit I   15 Hrs.

Introduction: Management Information System (MIS): Concept- MIS Definition- Role of the Management Information System- Impact of the Management Information System- MIS and Computer-MIS and Academics-MIS and the User- Role and Importance of Management: Introduction to Management-Approaches to management-Functions of the Manager-Managers and Environment-Management as a controlsystem-Management by Exception- MIS: A support to the management-Process of Management: Management Effectiveness-Planning-Organising-Staffing-Coordinating and Directing- Controlling-MIS: A tool or management process.

Unit II   15 Hrs.

Strategic Management of Business: The concept of corporate planning-Essentiality of strategic planning-Development of the Business Strategies-Types of strategies-Short range planning-Tools of planning-MIS: Business Planning- Decision Making: Decision Making Concepts-Decision methods, Tools and Procedures- Behavioural Concepts in Decision Making- Organisational Decision Making MIS and Decision-Making concepts-Information: Information Concepts- Information: A Quality Product- Classification of the Information methods of Data and Information Collection - Value of the Information- General model of a Human as an Information Processor- Summary of Information Concepts and their Implications-Organization and Information-MIS and the Information Concepts.

Unit III   **15 Hrs**.

Development of MIS: Development of Long Range Plans of the MIS-Ascertaining the class of Information- Determining the Information Requirement- Development and Implementation of the MIS-Management of Quality in the MIS-Organization for Development of the MIS-MIS: The factors of Success and Failure-Choice of Information Technology: Nature of IT Decision- Strategic Decision-Configuration Design-Evaluation-Information Technology Implementation plan-Choice of the 'Information Technology' and the 'Management Information System'.

Unit IV   **15 Hrs**.

Applications in Manufacturing Sector: Introduction-Personnel Management(PM)-Financial Management (FM)-Production Management(PM)-Materials Management(MM)-Marketing Management(MM)-Corporate Overview- Applications in Service Sector: Introduction to Service Sector-Creating a Distinctive Service-MIS applications in service Industry-MIS: Service Industry.

Unit V   **15 Hrs**.

Decision Support Systems: Decision Support Systems(DSS): Concept and Philosophy-DSS: Deterministic Systems-Artificial Intelligence(AI)System-Knowledge Based Expert System(KBES)- MIS and the Role of DSS-Enterprise Management Systems- Enterprise Management Systems(EMS)- Enterprise Resource Planning(ERP) System- ERP Basic Features-Benefits of ERP-ERP Selection-ERP Implementation-EMS and MIS-Technology of Information Systems-Introduction-Data Processing-Transaction Processing -Application Processing-Information System Processing-TQM of Information Systems-Human Factors and User Interface-Real Time Systems and Design-Prog. Language for system coding-Case Tools and I-Case.

Text Book

1. Jawadekar.W.S , "Management Information Systems", Tata McGraw Hill, Second Edition ,2002.

Chapters

Unit I   : 1, 2, 3
Unit II   : 5, 6, 7
Unit III   : 10, 11
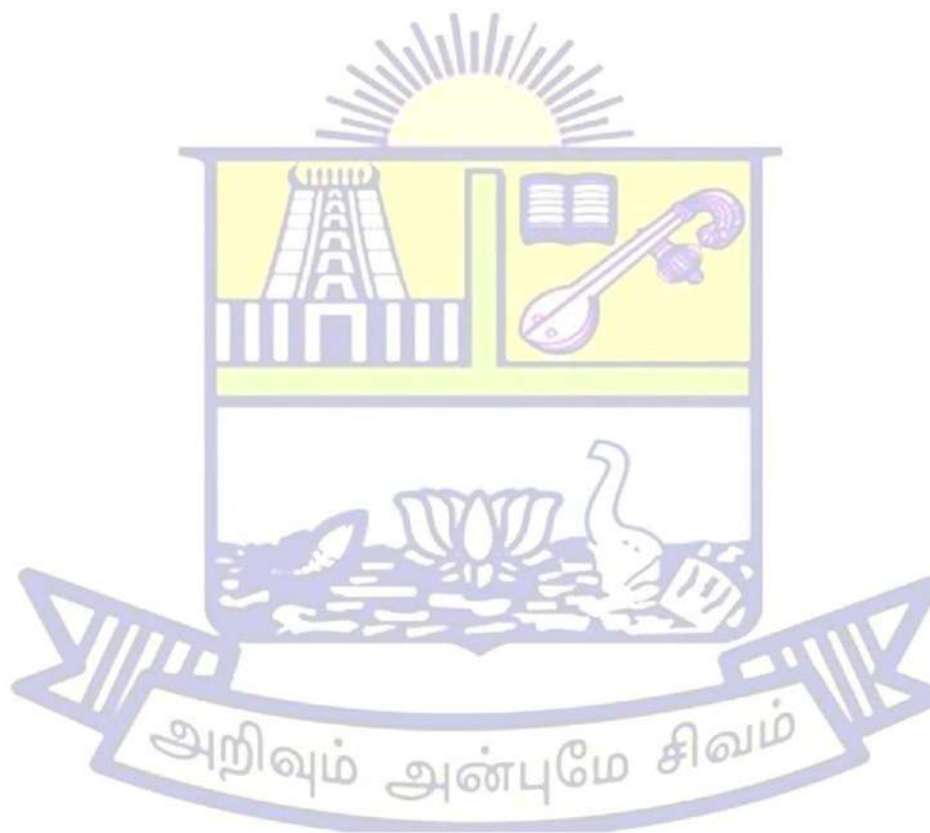Unit IV   : 12, 13
Unit V   : 14, 15, 16

References

1. Prof. Nitin C. Kamat, "Management Information Systems", Himalaya Publishing Ltd., 2014
2. Sadagopan s., "Management information systems", second edition, PHI learning.
3. Rafael Lapiedra Alcami, Carlos Devece Caranana, "Introduction to Management Information systems", 2012, Universitat Jaume Publications.

Web Resources

1. https://www.youtube.com/watch?v=-18Py3sX5sM (MIS Concepts)
2. https://www.youtube.com/watch?v=xyEtrq2q7zk (MIS Decision Making)
3. https://www.youtube.com/watch?v=fLMNnB7q7To (ERP)

Course Designer

Dr.P.Manickam and G.D.Kesavan

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET11C/ PCS23ET21C	Theory of Computation	Elective	3	2	-	3

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble

Introductions to automata theory, Automata types, the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability and also about Turing Machine

Prerequisite:

A basic Knowledge on Mathematical Foundation Concepts.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Understand the Basic Concepts of Mathematical Preliminaries, NFA and DFA	60%	70%
CO2	Explore Regular Languages, Grammars and Closure Properties	60%	70%
CO3	Demonstrate Context Free Language and methods of transforming Grammar.	60%	70%
CO4	Analyse Pushdown Automata and its Properties	60%	70%
CO5	Illustrate Turing Machine and its Complex storage	60%	70%

Mapping of COs with PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	L	L	L	L	M
CO2	S	M	L	L	M	L	M
CO3	S	M	L	L	L	M	M
CO4	S	M	S	L	M	M	M
CO5	S	M	S	L	M	M	M

S-STRONG   M-MEDIUM L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M
CO2	S	M	L	M	M
CO3	L	M	M	M	M
CO4	L	M	L	M	L
CO5	L	M	M	M	L

S-STRONG   M-MEDIUM L-LOW

Contents

Unit I   15 hrs

Introduction to Theory of Computation: Mathematical Preliminaries and Notation – Basic Concepts – Finite Automata: DFA – NFA

Unit II   15 hrs

Regular Languages and Regular Grammars: Regular Expressions – Connection between Regular Expressions and Regular Languages – Regular Grammars. Properties of Regular Languages: Closure Properties of Regular Languages – Identifying Non regular languages

Unit III   15 hrs

Context-Free Languages: Context-Free Grammars – Parsing and Ambiguity – Simplificationof Context-Free Grammars and Normal Forms: Methods for Transforming Grammars – Two important Normal forms

Unit IV   15 hrs

Pushdown Automata: Nondeterministic Pushdown Automata - Pushdown Automata and Context-Free Languages – Deterministic Pushdown Automata and Deterministic Context-Freelanguage– Grammars for Deterministic context Free Languages - Properties of Context-Free Language: Two pumping Lemmas – Closure Properties and Decision Algorithms for Context- Free languages

Unit V   15 hrs

Turing Machines: The standard Turing Machine – Combining Turing Machines for Complicated Tasks – Turing's Thesis – Other Models of Turing Machines: Minor Variations on the Turning Machine Theme – Turing Machines with More Complex Storage – Nondeterministic Turing Machines – A universal Turing Machines -Linear Bounded Automata

Text Book

Peter Linz, "An Introduction to Formal Languages and Automata" Third Edition ,Narosa

Chapters

Unit I: Chapters 1,2
Unit II: Chapters 3,4
Unit III: Chapters 5,6
Unit IV: Chapters 7,8
Unit V: Chapters 9,10

References

1. .E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education, 2007.

2. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education, 2003.

3. Thomas A. Sudkamp," An Introduction to the Theory of Computer Science, Languages and Machines", Third Edition, Pearson Education, 2007.

Web Resources

1.https://www.section.io/engineering-education/introduction-to-theory-of-computation/. (Introduction to TOC)

2. https://www.geeksforgeeks.org/regular-expressions-regular-grammar-and-regular- languages/ (Regular languages and Grammars)

3. https://iq.opengenus.org/context-free-language/ (context free languages)

4.https://www.tutorialspoint.com/what-is-push-down-automata-in-toc (Push down automata)

5. https://www.tutorialspoint.com/what-is-turing-machine-in-toc#:~:text=A%20Turing%20machine%20is%20a,compared%20with%20FA%20and%20PDA. &text=Q%20represents%20the%20finite%2C%20non%2Dempty%20set%20of%20states. (Turing Machine)

Course Designer

Dr. T.S. Urmila and Dr.P. Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course Code	Course Title	Category	L	T	P	Credit
PCS23ET11D/ PCS23ET21D	Digital Image Processing	Elective	3	2	-	3

L – Lecture   T – Tutorial P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble

To provide complete knowledge on Digital Image Processing methods, such as image processing methods in Spatial domain and Frequency domain, Edge detection, Compression, Segmentation and Morphological concepts, which enable the students to understand the concepts and implement them empirically.

Prerequisite:

Familiarity with basics of mathematics, Fundamental image concepts and programming skills

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Gain the Knowledge about fundamentals of Image Processing and sensing, acquisition and quantization concepts	60%	70%
CO2	Applying various Filtering techniques for Images	60%	70%
CO3	Explain Image Restoration and Reconstruction and Color Image Processing	60%	70%
CO4	Analyze various Compression Techniques	60%	70%
CO5	Evaluating various Segmentation Techniques	60%	70%

Mapping Course Outcome with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	L	M	M	S	S	L	S
CO2	L	M	L	S	L	L	S
CO3	L	M	L	M	L	L	S
CO4	L	M	M	M	L	L	L
CO5	L	M	M	L	L	L	S

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	M	M	M
CO2	S	L	M	M	M
CO3	S	L	S	L	M
CO4	S	S	S	L	L
CO5	S	S	S	L	L

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy			End of Semester
	CA		
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit I   15 hrs
Introduction: Origin – Fields – Fundamentals steps – Components of the Image Processing System. Digital Image Fundamentals – Elements of Visual Perceptron – Light and Electro magnetic spectrum – Image sensing and Acquisition – Sampling and Quantization – Basic mathematical tools

Unit II   15 hrs
Intensity Transformation and Spatial Filtering: Histogram Processing – Fundamentals of Spatial Filtering – Low pass, High pass Filtering – Filtering in the Frequency Domain: Fourier Transform – Discrete Fourier Transform – Properties – Basic Filtering – Image Smoothing – Imagesharpening – selective filtering

Unit III   15 hrs
Image Restoration and Reconstruction: Model of the Image Degradation – Noise models – Restoration – Periodic Noise reduction – Liner, Position-invariant Degradation – Estimation function – Inverse Filtering – Mean Square Error – Constraint Least Square Filtering - GM filter - Image recognition from Projections. Color Image Processing – Color Model – Pseudocolor – Full

color image processing – color transformation – smoothing and sharpening – Image segmentation – Noise in color image – color image compression

Unit IV   15 hrs

Image Compression and Watermarking: Huffman coding – Golomb coding – Arithmetic coding – LZW coding – Run length coding – Symbol-based coding – Bit plane coding – Block Transform coding – Predictive coding – Wavelet coding – Digital Image watermarking

Unit V   15 hrs
Image Segmentation: - Point, Line and Edge Detection – Thresholding – Region Splitting and Merging – Clustering and Super pixels – Segmentation using Graph Cuts – Morphological watersheds – Use of motion in Segmentation

Text Book

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, PHI/PearsonEducation
   a. Edition ,2002.

Chapters
 Unit I   : 1, 2
 Unit II   : 3,4
 Unit III   : 5,6
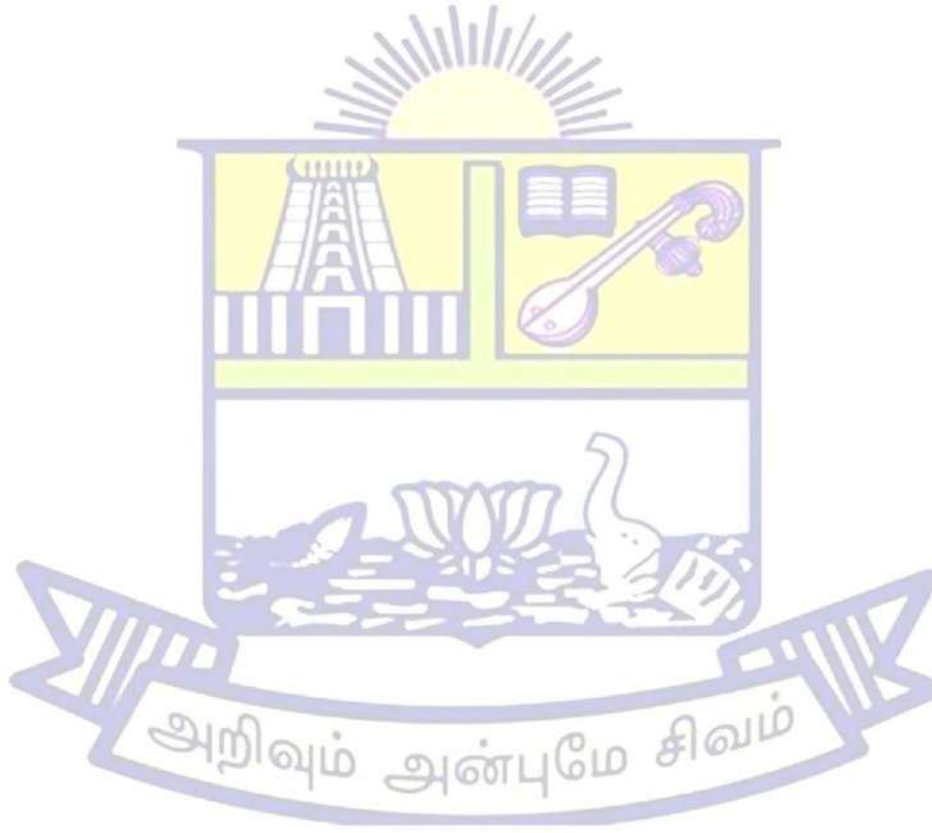 Unit IV   : 8
 Unit V   : 10

References

1. B. Chan la, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.
2. Nick Elford, "Digital Image Processing a practical introducing using Java", Pearson Education,2004.
3. Todd R.Reed, "Digital Image Sequence Processing, Compression, and Analysis", CRC Press,2015.
4. L.Prasad, S.S.Iyengar, "Wavelet Analysis with Applications to Image Processing", CRC Press, 2015.

Web Resources

1. https://www.simplilearn.com/image-processing-article (Fundamentals)
2. https://uotechnology.edu.iq/ce/lecture%202013n/4th%20Image%20Processing%20_Lectures /DIP_Lecture6.pdf (Spatial Filtering)
3. https://www.owlnet.rice.edu/~elec539/Projects99/BACH/proj2/intro.html(Image Degradation)
4. https://www.keycdn.com/support/what-is-image-compression#:~:text=There%20are%20two%20main%20types%20of%20image%20compression%20%2D%20lossless%20vs%20lossy. (Image Compression)
5. https://datagen.tech/guides/image-annotation/image-segmentation/ (Image Segmentation)

Course Designer

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THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET11E/ PCS23ET21E	Software Project Management	Elective	3	2	-	3

L – Lecture T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble

To provide an in-depth knowledge on the Software project management concepts and processmodels, Managing requirements, time managements, scheduling, deadlines, quality, quality parameters etc.

Prerequisite:

Students are expected to know about previous project and its requirements.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the relationship among project management	60%	70%
CO2	Understand the project scope management	60%	70%
CO3	Plan the project time management schedule	60%	70%
CO4	Analyze the project quality management concepts	60%	70%
CO5	Assess the project Risk management	60%	70%

Mapping COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	S	S	M
CO2	M	M	S	M	M	M	S
CO3	S	M	S	M	S	M	S
CO4	M	S	S	M	M	S	S
CO5	M	M	M	M	M	M	S

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S
CO2	M	M	S	M	M
CO3	S	S	S	S	M
CO4	S	M	M	S	S
CO5	S	M	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit I   15 Hrs.
Project Management Framework: Introduction: Project - Project management-Relationships Among Portfolio Management, Program Management, Project Management, and Organizational Project Management-Relationship Between Project Management, Operations Management, and Organizational Strategy-Business Value-Role of the Project Manager-Project Management Body of Knowledge-Organizational Influences And Project Life Cycle: Organizational Influences on Project Management-Project Stakeholders And Governance-Project Team-Project Life Cycle-Project Management Processes.

Unit II   15 Hrs.
Project integration management: Develop project charter-develop project management plan- direct and manage project work-Monitor and control project work- perform integrated change control-Close project or phase-project scope management: Plan scope management-Collect requirements-Define scope- Create WBS-validate scope-Control scope.

Unit III   15 Hrs.
Project time management: plan schedule management- define activities-sequence activities-estimate activity resources-estimate activity durations- develop schedule- control schedule- project cost management: plan cost management-estimate cost-determine budget-control cost.

Unit IV   15 Hrs.
Project quality management: Plan quality management-perform quality assurance-control quality-project human resource management: Plan human resource management- acquire projectteam-develop project team- manage project team

Unit V   15 Hrs.
Project communications management: plan communications management- manage

communications- control communications-Project Risk management: Plan Risk Management-Identify Risks-Perform Qualitative Risk Analysis- Perform Quantitative Risk Analysis -Plan Risk Responses-control Risks.

Text Book

1. "A Guide to the Project Management Body of Knowledge (PMBOK Guide)", Fifth Edition, Project Management Institute, Pennsylvania, 2013.

Chapters

Unit-I: 1,2,3   Unit-II:4,5   Unit-III: 6, 7
Unit-IV:8,9   Unit-V:10,11

References

1. Futrell, "Quality Software Project Management", Pearson Education India.
2. Royce, "Software Project Management", Pearson Education India.
3. C.Ravindranath Pandian, "Applied Software Risk Management-A Guide for Software ProjectManagers", Auerbach Publications, 2015.
4. Benjamin   A.   Lieberman,   "The   Art   of   Software   Modeling", Auerbach Publications,2010.

Web Resources

1. https://www.tutorialspoint.com/management_concepts/project_management_softwares.html (Project Management Software)
2. https://www.pmi.org/learning/library/risk-analysis-project-management-7070 (Risk analysis and management)

Course Designer

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THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET11F/ PCS23ET21F	Data Mining	Elective	3	2	-	3

L – Lecture   T – Tutorial P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble
Introducing the fundamental concepts of Data Mining Techniques and various Algorithms used for Information Retrieval from Datasets. Familiarize with basic data mining concepts for solving real world problems.

.Prerequisite:
Basic knowledge of Querying Databases with Data Manipulations from the Databases.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the role of Data Mining, Data Preprocessing.	60 %	70 %
CO2	List down the Implementation of Data Ware House Concepts.	60 %	70 %
CO3	Analyzing various Pattern based and Classification Algorithms.	60 %	70 %
CO4	Develop the various Clustering Algorithms.	60 %	70 %
CO5	Outline the processing of Outlier Data and Data Mining Trends.	60 %	70 %

Mapping COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	L	L	L
CO2	M	M	S	L	M	M	S
CO3	S	M	M	L	S	M	L
CO4	M	M	S	L	M	L	S
CO5	S	M	S	L	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Mapping COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	M	L
CO2	M	S	L	M	M
CO3	S	M	L	L	L
CO4	S	M	L	L	L
CO5	L	L	L	M	S

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy	CA		End of Semester
	First	Second	
Knowledge -K1	15% (9)	15% (9)	20% (30)
Understand -K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	**60**	**60**	**150**

Contents

Unit I   15 hrs.
Data Mining And Data Preprocessing: Data Mining – Definition –Kinds of Data Mined– Kindsof patterns Mined- Technologies used – Kinds of applications targeted – Major Issues in Data Mining – Objects and Attribute Types- Data Preprocessing – Definition – Data Cleaning – Integration, Transformation and Discretization – Data Reduction.

Unit II   15 hrs.
Data Warehousing: Data Warehouse: A Multitiered Architecture - Multidimensional Data Model - Schemas for Multidimensional Data Models-Dimensions-Measures- OLAP Operations – Data Warehouse Design and Usage- Data Warehouse Implementation.

Unit III   15 hrs.
Frequent Patterns, Associations And Classification: The Apriori Algorithm – Definition of Classification and Prediction – Classification by Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation –Support Vector Machines- Lazy Learners – K-Nearest Neighbor – Other Classification Methods.

Unit IV   15 hrs.
Cluster Analysis: Cluster Analysis –Partitioning Methods– Hierarchical Clustering – Density Based Methods – Grid Based Methods – Clustering Graph and Network Data.

Unit V   15 hrs.
Outlier Detection: Outlier Analysis - Outlier Detection Methods - Statistical approaches – Proximity Based Approaches – Data Mining Trends: Mining Complex Data types – Data Mining Applications.

Text Book

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques (TheMorgan Kaufmann Series in Data Management Systems) 3rd Edition, July 6, 2011.

Chapters

Unit I: Chapter 1.1 to 1.7,2.1, 3.1 to 3.5

Unit II: Chapter 4.1.4, 4.2, 4.3, 4.4

Unit III: Chapter 6.2, 8.1 to 8.4, 9.2, 9.3, 9.5, 9.6

Unit IV: Chapter 10.1 to 10.5,12.1

Unit V: Chapter 12.1 to 12.4, 13.1, 13.3

References

1. Margret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2003.
2. M. Awad, Latifur Khan, Bhavani Thuraisingham, Lei Wang, "Design and Implementation of Data Mining Tools", CRC Press- Taylor & Francis Group, 2015.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining-Instructor's Solution Manual", Pearson Education, First Edition, 2016.
4. Mohammed J.Zaki, Wagner Meira JR, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge India, 2016.

Web Resources

1. https://www.guru99.com/online-analytical-processing.html#:~:text=   Online   %20 Analytical%20Processing%20(OLAP)%20is,group%2C%20aggregate%20and%20join%2   0 data.(Cube, Operations and Types in Data Warehouse)
2. http://staffwww.itn.liu.se/~aidvi/courses/06/dm/lectures/lec7.pdf (Apriori Algorithm)
3. https://www.slideshare.net/archnaswaminathan/cdm-44314029#:~:   text= Partitioning%20Method%20%E2%80%A2%20Suppose%20we,belong%20to%20exactly %20one%20group. (Clustering in Data Mining)
4. https://www.springer.com/gp/book/9780792373490 (Mining World Wide Web)

Course Designer

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THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course Code	Course Title	Category	L	T	P	Credit
PCS23ET12A/ PCS23ET22A	Distributed Operating System	Elective	3	2	-	3

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble
To provide an in in-depth knowledge in Distributed Operating Systems, message passing, remote procedure call, models of DSM, Resource and Process management, Concepts.

.Prerequisite:

Students are expected to know and understand the fundamentals of operating systems which includes design and implementation of operating systems, file systems, and distributed operating systems.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Learn the fundamentals and the basic message passing methods	60%	70%
CO2	Outline the Remote procedure calls , basic models, protocols and Exception handling	60%	70%
CO3	Demonstrate the general architecture , implementation and models of DSM	60%	70%
CO4	Examine the Resource Management and Process Management Techniques	60%	70%
CO5	Describe distributed file system.	60%	70%

Mapping COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	S	S	M
CO2	M	M	S	M	S	S	S
CO3	M	M	S	S	S	M	M
CO4	M	M	S	S	M	S	M

CO5	**S**	**M**	**S**	**M**	**M**	**M**	**S**

Mapping COs with PSOs

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	M	S
CO2	M	S	S	M	M
CO3	S	M	L	S	S
CO4	S	M	L	S	S
CO5	S	S	S	M	S

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		
	First	**Second**	
			End of Semester
Knowledge -K1	15% (9)	15% (9)	20% (30)
Understand -K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	**60**	**60**	**150**

Contents

Unit I   15 hrs

Fundamentals: Distributed Computer System– Evolution of Distributed Computing Systems-Distributed Computing Systems Models- Distributed Computing Systems Gaining Popularity-Distributed Operating System- Issues in Designing a Distributed operating System- Introduction to Distributed Computing Environment(DCE). Message Passing: Introduction-Desirable Features of a Good Message-Passing System-Issues in IPC by Message Passing- Synchronization-Buffering-Multidatagram Messages-Encoding and Decoding of Message Data- Process Addressing-Failure handling-Group Communication-Case Study: 4.3 BSD UNIX IPC Mechanism.

Unit II   15 hrs

Remote Procedure Calls: Introduction-The RPC Model-Transparency of RPC-Implementing RPC Mechanism-Sub Generation-RPC Messages-Marshaling Arguments and Results-Server Management-Parameter-Passing Semantics-Call Semantics-Communication Protocols for RPCs-Complicated RPCs-Client Server Binding-Exception Handling-Security-Some Special Types of RPCs-RPC is Heterogeneous Environments-Light weight RPC-Optimizations for Better Performance-Case Studies: Sun RPC, DCE, and IPC.

Unit III   **15 hrs**

Distributed Shared Memory: Introduction-General Architecture of DSM Systems-Design and jmplementation issues of DSM-Granularity-Structure of Shared Memory Space-Consistency Models-Replacement Strategy-Thrashing-Other Approaches to DSM-Heterogeneous DSM-Advantages DSM.

Unit IV   **15 hrs**

Resource Management: Introduction-Desirable Features of a Good Global Scheduling Algorithm-Task Assignment Approach-Load-Balancing Approach-Load Sharing Approach.Process Management: Introduction-Process Migration-Threads.

Unit V   **15 hrs**

Distributed File System: Introduction-Desirable Features of a Good Distributed File System-File Models –File-Accessing Models-File sharing Semantics-File Caching Schemes-File Replication-Fault Tolerance-Atomic Transactions-Design Principles-Case Study: DCE Distributed File Service.

TextBook

1. Pradeep.K.Sinha, "Distributed Operating Systems Concepts and Design", PHI, First Edition.

Chapters

Unit I : Chapter 1, 3
Unit II : Chapter 4,5
Unit III: Chapter 6,7
Unit IV: Chapter 8,9
Unit V: Chapter 10,11

References

1. Distributed Operating Systems-Andrews S.Tanenbaum, I edition PHI
2. Distributed Operating System and Algorithms and Analysis-Randy chow, Theodore.Johnson, Pearson Education, Inc.-Addison Wesley.

Web Resources

1. https://www.w3schools.in/operating-system-tutorial/distributed-system/

2. https://www.ecomputernotes.com

3. https://www.ics.uci.edu/~cs230/lectures/DistributedOSintro.pdf

Course Designer

Dr. T.S. Urmila and Dr. P. Manickam

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET12B/ PCS23ET22B	Cloud Computing	Elective	3	2	-	3

L – Lecture T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble

To provide an in-depth knowledge in cloud computing architecture, cloud application programming,services and applications.

Prerequisite:

Basic knowledge in Computer Networks and programming language

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Learn the types of clouds and cloud applicationprogramming	60%	70%
CO2	Understand the thread programming	60%	70%
CO3	Develop the task computing and programming model	60%	70%
CO4	Analyze the cloud services	60%	70%
CO5	Assess the cloud applications	60%	70%

Mapping Course Outcome with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	M	S	M	S
CO2	S	S	S	M	S	M	S
CO3	S	M	S	S	S	M	S
CO4	S	M	S	M	S	M	S
CO5	S	S	S	S	S	M	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	M	S
CO4	S	S	S	S	M
CO5	M	S	M	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy : Assessment Pattern

Blooms taxonomy	CA		End of Semester
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

Unit I   15 Hrs.

Cloud Computing Architecture-Introduction-The cloud reference model-Types of clouds-Economics of the cloud-Open Challenges-Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform-Framework overview-Anatomy of the Aneka container-Building Aneka clouds-Cloud programming and management.

Unit II   15 Hrs.

Concurrent Computing Thread Programming: Cloud programming and management-Programming applications with threads- What is a thread?- Thread APIs- POSIX Threads-Threading support in java and .NET- Techniques for parallel computation with threads- Domain decomposition- Functional decomposition-Computation vs. communication- Multithreading with Aneka- Introducing the thread programming model- Aneka thread vs. common threads-Programming applications with Aneka threads.

Unit III   15 Hrs.

High-Throughput Computing: Task computing- Characterizing a task- Computing categories-Frameworks for task computing-Task-based application models- Embarrassingly parallel applications- Parameter sweep applications- MPI applications- Workflow applications with task

dependencies-Aneka task-based programming- Task programming model- Developing applications with the task model- Developing a parameter sweep application- Data-Intensive Computing: What is data-intensive computing- Characterizing data-intensive computations- Challenges ahead- Historical perspective- Technologies for data-intensive computing- Storage systems- Programming platforms- Aneka MapReduce programming.

Unit IV   **15 Hrs**.
Cloud Platforms in Industry: Amazon web services- Compute services- Storage services- Communication services- Additional services- Google AppEngine- Architecture and core concepts- Application life cycle- Cost model- Observations- Microsoft Azure- Azure core concepts- SQL Azure- Windows Azure platform appliance- Observations

Unit V   **15 Hrs**.
Cloud Applications: Scientific applications- Healthcare: ECG analysis in the cloud- Biology: protein structure prediction- Biology: gene expression data analysis for cancer diagnosis- Geoscience :satellite image processing - Business and consumer applications- AdvancedTopics in Cloud Computing: Energy efficiency in clouds- Market-based management of clouds- Federated clouds/Inter Cloud- Third-party cloud services

Text Book

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud   Computing Foundations and Applications Programming", MK publications,2013.

Chapters

   Unit I   : Chapters 4, 5

   Unit II   : Chapters 6

   Unit III   : Chapters 7, 8

   Unit IV   : Chapters 9

   Unit V   : Chapters 10, 11

References

1. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing: A Hands – On Approach" Universities press (India) Pvt. limited 2016.
2. Ritting house and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
3. Michael Miller "Cloud Computing Web based application that change the way you work and collaborate online". Pearson edition, 2008.

Web Resources

1. https://www.ripublication.com/aeee_spl/aeeev4n1spl_15.pdf (Cloud ComputingServices and its Applications)
2. https://cloud.google.com/products/databases (Google Cloud based Databases)

Course Designer
   Dr.P.Manickam and G.D.Kesavan

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE

(For those joined M.Sc. Computer Science on or after June 2023)

Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET12C/ PCS23ET22C	Embedded Systems	Elective	3	2	-	3

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. marks	Total
I	I / II	25	75	100

Preamble:

This Embedded System course focuses on embedded system design and embedded processors, learn applications using Embedded/Real-Time Operating Systems and testing hardware

Pre-requisite:

Basic knowledge of software functionality, hardware use and programming language.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Learn the concepts and elements of Embedded systems	60%	70%
CO2	Illustrate embedded system communication components and qualityattributes	60%	70%
CO3	Outline the 8 bit Microcontrollers and its programming.	60%	70%
CO4	Learn RTOS based embedded system features, scheduling andsynchronization	60%	70%
CO5	Build application specific, domain specific Embedded Software design,development and testing	60%	70%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	L	L	S	M	L
CO2	S	M	S	L	S	M	L
CO3	S	M	S	S	S	M	L
CO4	M	M	L	S	M	S	L
CO5	L	S	L	L	M	L	L

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M
CO2	S	S	L	M	M
CO3	S	S	S	M	M
CO4	S	M	M	S	L
CO5	S	M	M	L	S

S-STRONG   M-MEDIUM   L-LOW

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		End of Semester
	First	Second	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Content

Unit -I :   **15 hrs**

Introduction to Embedded system - Embedded system vs General computing systems - History - Classification - Major Application Areas - Purpose of Embedded systems - Wearable Devices: The innovative bonding of lifestyle with embedded technology. Typical Embedded System: Core of Embedded System- Memory- Sensors and Actuators.

Unit- II :   **15 hrs**

Typical Embedded System: Communication Interface- Embedded Firmware- Other Components- PCB and Passive components- Characteristics and Quality Attributes of Embedded Systems

Unit-III :   **15 hrs**

Programming the 8051 Microcontroller: Different addressing modes in 8051- 8051 Instruction set.

Unit-IV: **15 hrs**

RTOS based Embedded System Design: Operating System Basics - Types of operating Systems - Tasks, process and Threads - Multiprocessing and Multitasking - Task Scheduling- Threads, Processes and Scheduling- Task Communication - Task Synchronization - Device Drivers - choosing an RTOS.

Unit V: **15 hrs**

Embedded Systems - Washing machine: Application-specific - Automotive: Domain specific. Hardware Software Co-Design - Computational Models – Embedded Firmware Design Approaches- Embedded Firmware Development Languages   - Integration and testing of Embedded Hardware and firmware.

Text Book

1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009.

Chapters

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       Unit 1: Chapter 1,2
       Unit 2: Chapter 2,3
       Unit 3: Chapter 5,6
       Unit 4: Chapter 10
       Unit 5: Chapter 4, 9, 12

Reference Books

1. Raj Kamal, 'Embedded Systems Architecture, Programming and Design', Tata Mc-Graw-Hill.
2. R.J.A.Buhr, D.L.Bailey, "An Introduction to Real Time Systems: Design to Networking with C/C++", Prentice- Hall, International.

Web Resources:

1. https://lecturenotes.in/subject/456/embedded-and-real-time-systems-erts
2. https://nptel.ac.in/downloads/108105057/
3. https://www.iitg.ac.in/pbhaduri/cs522-13/Introduction%20to%20Embedded%20Systems%20(ver%200.5,%20Aug%20 2010).pdf

Course Designers:

Mr.G.D.Kesavan and Dr.T.S. Urmila

(Re-Accredited with 'A++' Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined M.Sc. Computer Science on or after June 2023)
Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET12D/ PCS23ET22D	Big Data Analytics	Elective	3	2	-	3

L – Lecture T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble

To provide an in-depth knowledge on the process of collecting, organizing and analyzing and extracting the hidden knowledge from the large volume of data.

Prerequisite:

Basic knowledge about fundamentals of Data Mining, Pattern concepts.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Learn the Big data ecosystem & data analytics life cycle	60%	70%
CO2	Understand the components of HDFS	60%	70%
CO3	Develop a Map Reduce Application	60%	70%
CO4	Analyze the Hadoop Configuration	60%	70%
CO5	Evaluate Applications using Pig and Hive	60%	70%

Mapping COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	S	M	S	M	M
CO2	S	S	S	M	S	M	S
CO3	M	M	S	S	S	M	S
CO4	S	M	M	M	M	M	S
CO5	S	S	S	S	M	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S
CO2	M	S	S	S	M
CO3	M	S	S	M	S
CO4	S	S	M	S	M
CO5	S	M	S	S	S

S-STRONG　　　　　**M-MEDIUM**　　　　　**L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			End of Semester
	CA		
	First	**Second**	
Knowledge –K1	15% (9)	15% (9)	20% (30)
Understand –K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	60	60	150

Contents

Unit I　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**15 Hrs**.
Introduction to Big Data Analytics: Big Data Overview– Data Structures – Analyst Perspective on Data Repositories-State of the Practice in Analytics–BIVersus Data Science-Current Analytical Architecture –Drivers of Big Data–Big Data Ecosystem-Data Analytics Lifecycle: Data Discovery–Data Preparation–Model Planning– Model Building– Communicate Results – Operationalize-Case Study: Global Innovation Network and Analysis (GINA).

Unit II　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**15 Hrs**.
HADOOP Fundamentals: History of Hadoop- Apache Hadoop and the Hadoop Ecosystem – MapReduce: A weather dataset-Analyzing the data with Unix Tools-Analyzing the Data with Hadoop-Scaling Out-Hadoop Streaming-Hadoop Pipes-The Hadoop Distributed File System: The Design of HDFS-HDFS Concepts-The command line Interface-Hadoop Filesystems-The Java Interface-Data flow-Parallel Copying with distcp-Hadoop Archives

Unit III　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**15 Hrs**.
Developing a Map Reduce Application: The Configuration API- Configuring the Development Environment-Writing Unit Test- Running Locally on Test Data-Running on a Cluster –Tuning a Job-MapReduce Work flows-How Map Reduce Works: Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution.

Unit IV　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**15 Hrs**.
Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop – Benchmarking a Hadoop Cluster-Hadoop in the cloud-

Administering Hadoop: HDFS - Monitoring-Maintenance.

Unit V   **15 Hrs**.

FRAMEWORKS Applications on Big Data Using Pig and Hive: Installing and Running Pig-Comparison with Databases-Pig Latin-User-define Function- Data processing operators – Hive : Installing Hive -Running Hive-Comparison with Traditional Databases-HiveQL-Tables-Querying Data-User defined functions.

Text Book

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services Published by John Wiley & Sons, Inc.2015.

2. Tom White "Hadoop: The Definitive Guide" Third Edition, O"reilly Media, 2012.

Chapters

Unit I   : 1, 2 (Text Book-1)

Unit II   : 1, 2, 3 (Text Book-2)

Unit III   : 5, 6 (Text Book-2)

Unit IV   : 9, 10 (Text Book-2)

Unit V   : 11, 12 (Text Book-2)

References

1. Noreen Burlingame, "The little book on Big Data", New Street publishers, 2012.

2. Anil Maheshwari, "Data Analytics", McGraw Hill Education, 2017.

3. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", Starch Press, First edition , 2011.

4. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.

Web Resources

1. https://www.edureka.co/blog/videos/big-data-tutorial/ (Introduction to Big Data)
2. https://www.tutorialspoint.com/ (Hbase, Hive, Pig)
3. https://www.edureka.co/blog/videos/hadoop-tutorial/ (Hadoop, MapReduce)

Course Designer

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DEPARTMENT OF COMPUTER SCIENCE
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Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET12E/ PCS23ET22E	Compiler Design	Elective	3	2	-	3

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Discover Principles, algorithms and techniques that can be used to construct various phases of compiler. Acquire knowledge about finite automata and regular expressions, Learn context free grammars, compiler parsing techniques. Explore knowledge about Syntax directed definitions and translation scheme. Understand intermediate machine representations and
actual code generation.

Prerequisite:

Basic knowledge about Computer Architecture

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Learn Lexical Analysis and Finite Automata concepts	60%	70%
CO2	Describe the Basics of Syntax Analysis and Methodologies	60%	70%
CO3	Analyse Semantic Analysis and applications of syntax directed applications	60%	70%
CO4	Explain Intermediate Code Generation Concepts	60%	70%
CO5	Illustrate Code generation and Optimization	60%	70%

Mapping COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	L	L	L
CO2	M	M	S	L	M	M	S
CO3	S	M	M	L	S	M	L
CO4	M	M	S	L	M	L	S
CO5	S	M	S	L	M	M	M

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S
CO2	M	S	S	M	M
CO3	S	M	L	S	S
CO4	S	M	L	S	S
CO5	S	S	S	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy			
	CA		
	First	**Second**	**End of Semester**
Knowledge -K1	15% (9)	15% (9)	20% (30)
Understand -K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	**60**	**60**	**150**

Contents

Unit I   **15 hrs.**
Lexical analysis - Language Processors, The Structure of a Compiler, Evolution of Programming Languages - Science of Building a Compiler- Applications of Compiler Technology-Programming language basics - Lexical Analysis - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – Lexical Analyzer generator Lex

Unit II   **15 hrs.**
Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - SimpleLR - More powerful LR parsers- Using Ambiguousgrammars - Parser generators.

Unit III   **15 hrs.**
Semantic Analysis - Syntax Directed Translation - Syntax Directed Definition – Evaluation orderof SDD- Applications of Syntax Directed Translation - Syntax Directed Translation Schemes-Implementing L-Attributed SDD's.

Unit IV   **15 hrs**.

Intermediate Code Generation - Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements.

Unit V   **15 hrs.**

Code Generation and Code Optimization - Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization ofBasic Blocks - A simple code generator – Peephole Optimization.

TextBook

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers- Principles, Techniques and Tools", Second Edition, Pearson Education Asia, 2009

Chapters

Unit I : Chapter 1, 3.1-3.6
Unit II : Chapter 4
Unit III: Chapter 5
Unit IV: Chapter 6
Unit V: Chapter 8.1-8.7

References

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools,Addison-Wesley, 2003.
2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.
3. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.
5. S.Godfrey Winster, S.Aruna Devi, R.Sujatha, "Compiler Design", yesdee Publishers, Third Reprint 2019.

Web Resources

1. https://www.tutorialspoint.com/compiler_design/compiler_design_lexical_anal ysis.htm#:~:text=Lexical%20analysis%20is%20the%20first,comments%20in%20the %20source%20code. (Lexical Analysis)
2. https://www.geeksforgeeks.org/introduction-to-syntax-analysis-in-compiler- design/ (Syntax Analysis)
3. https://www.geeksforgeeks.org/semantic-analysis-in-compiler- design/ (Semantic Analysis)
4. https://www.slideshare.net/TasifTanzim/intermediate-code-generation- compiler- design (Intermediate Code Generation)
5. https://www.tutorialspoint.com/compiler_design/compiler_design_code_g eneration.ht m (Code Generation)

Course Designer

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THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE

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Programme Code – PCS

Course code	Course Title	Category	L	T	P	Credit
PCS23ET12F/ PCS23ET22F	Virtual Reality	Elective	3	2	-	3

L – Lecture T – Tutorial   P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	I/II	25	75	100

Preamble

Students can able to expose the knowledge about Geometry of Virtual worlds and motion in virtual world and Tracking

Prerequisite:

Basic Knowledge about Image Processing and Computer Graphics

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Understand the Basics and Geometry of Virtual Worlds	60%	70%
CO2	Analyze Light and Optics and Physiology of Human vision	60%	70%
CO3	Explore Visual Perception and Rendering	60%	70%
CO4	Demonstrate Motion in Real and Virtual world and Tracking	60%	70%
CO5	Illustrate Interaction and Audio Concepts	60%	70%

Mapping COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	L	M	L	S	L
CO2	S	M	M	M	L	S	L
CO3	S	M	M	S	L	M	M
CO4	S	M	S	S	M	M	M
CO5	S	M	S	S	M	M	L

S-STRONG　　　　　**M-MEDIUM**　　　　　**L-LOW**

Mapping COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S
CO2	S	S	S	M	M
CO3	S	M	M	M	S
CO4	S	M	M	M	S
CO5	S	M	S	M	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Bloom's Taxonomy: Assessment Pattern

Blooms taxonomy	CA		
	First	**Second**	**End of Semester**
Knowledge -K1	15% (9)	15% (9)	20% (30)
Understand -K2	15% (9)	15% (9)	20% (30)
Apply-K3	30% (18)	30% (18)	20% (30)
Analyze-K4	20% (12)	20% (12)	20% (30)
Evaluate-K5	20% (12)	20% (12)	20% (30)
Total Marks	**60**	**60**	**150**

Contents

Unit I   **15 hrs**
Introduction: What is Virtual Reality? – Modern VR experiences – History repeats – Hardware –Software – Human Physiology and Perception – Geometry of Virtual worlds

Unit II   **15 hrs**
Lights and Optics: Basic behavior of Light- Lenses – Optical aberrations – Human eye –Cameras – Displays – The Physiology of Human Vision – From the camera to photoreceptors –from photo receptors to visual cortex – Eye moments – Implications of VR.

Unit III   **15 hrs**
Visual Perception: Perception of depth – Motion – Color -Combing sources of Information - Visual Rendering: Ray tracing and shading models – Rasterization – Correcting optical distortions – Improving latency and frame rates – Immersive photos and videos

Unit IV   **15 hrs**
Motion in Real and Virtual worlds: Velocities and Accelerations – Vestibular system – Physics in the virtual world – Mismatched motion and vection – Tracking: Tracking 2D Orientation – 3D Orientation – Position and Orientation – Attached bodies – 3D Scanning of environments.

Unit V   **15 hrs**

Interaction: Motor programming and remapping – Locomotion – Manipulation – serial interaction Additional interaction mechanisms – Audio: Physics of Sound – Physiology ofHuman hearing Auditory Perception – Auditory Rendering

Text Book

1. Steven M. LaValle, "Virtual Reality" ,University of Oulu.

Chapters

Unit I : Chapter 1,2,3
Unit II : Chapter 4,5
Unit III: Chapter 6,7
Unit IV: Chapter 8,9
Unit V: Chapter 10,11

References

1. Tony Parisi – "Learning Virtual Reality: Developing Immersive Experiences and Applications

forDesktop, Web, and Mobile" - 2015.

2. Howard Rheingold -Virtual Reality

Web Resources

1. https://collegedunia.com/exams/optics-physics-articleid-796#:~:text=The%20term%20'light'%20refers%20to,visible%20light%2C%20and%20infrared%20light. (Lights and Optics)
2. https://www.onlinebiologynotes.com/physiology-of-vision/ (Physiology of human vision)
3. http://lavalle.pl/vr/node192.html (visual rendering)
4. https://www.mechatech.co.uk/journal/how-do-common-virtual-reality-tracking- systems-work (Tracking)

Course Designer

Dr. T.S. Urmila and Mr. G.D. Kesavan

Thiagarajar College

CURRICULUM & SYLLABUS

III & IV SEMESTER

DEPARTMENT OF COMPUTER SCIENCE

B.Sc., Data Science

Programme Code:UDS

Program Educational Objective (PEO):

Graduates will be able to

PEO 1	Be employed as a Data Scientist or they can pursue the professional degree in M.Sc Data science
PEO 2	Apply the knowledge of data science coupled with modern programming by inculcating mathematical skills in the relevant domain
PEO 3	Develop the skills as required for data analytics for ethical and professional expertise in IT industry standards
PEO 4	Retain programming and analytical practices in the prevailing modern technological society which pertains to use high level and distributed computing
PEO 5	Lead a dynamic and vibrant career as a Data scientist and Data analyst in several social community sites or either in marketing field of IT and other multidisciplinary fields

Program Specific Outcome (PSO):

On successful completion of B.Sc Data Science course, the students will

PSO 1	Develop the knowledge of Data Science and its relevant programming skills in various domains
PSO 2	Build up analytical skills combined with mathematical knowledge to implement various numerical methods using algorithms for applying standard practices in data science
PSO 3	Apply knowledge of problem solving and programming using modern high level programming concepts to inculcate statistical approach
PSO 4	Maintain remarkable programming and communication skills among the young dynamic students to satisfy the corporate requirements
PSO 5	Generate cognizance on the current industrial and social practices for solving the statistical and marketing problems in accordance to the current scenario

THIAGARAJAR COLLEGE (AUTONOMOUS) :: MADURAI – 09
(Re-Accredited with "A++" Grade by NAAC)

DEPARTMENT OF COMPUTER SCIENCE
B.Sc., Data Science

(For those who joined in 2022 and after)

Course	Code No.	Title of the paper	Hrs/wk	Crd.	Total Hrs	CIA	SE	TOT
III SEMESTER								
Core 6	UDS22C31	Programming in Java	5	4	75	25	75	100
Core 7	UDS22C32	Relational Database Management System	5	4	75	25	75	100
Core 8	UDS22C33	Linear Algebra	5	4	75	25	75	100
Allied 3	UMA22G31D	Numerical methods	5	5	75	25	75	100
Core Lab 4	UDS22CL31	Lab in Java Programming	4	2	60	40	60	100
Core Lab 5	UDS22CL32	RDBMS Lab	4	2	60	40	60	100
NME I	UDS22NE31	Web Development	2	2	30	15	35	50
Total			**30**	**23**				**650**

Course	Code No.	Title of the paper	Hrs/wk	Crd.	Total Hrs	CIA	SE	TOT
IV SEMESTER								
Core 9	UDS22C41	Data Warehousing and Data Mining	5	4	75	25	75	100
Core 10	UDS22C42	R Programming	5	4	75	25	75	100
Allied 4	UMA22G41D	Transform & their Applications	5	5	75	25	75	100
Core 11	UDS22C43	Predictive Analytics	5	4	75	25	75	100
Core Lab 6	UDS22CL41	Data Warehousing and Data Mining Lab	4	2	60	40	60	100
Core Lab 7	UDS22CL42	Lab in R Programming	4	2	60	40	60	100
NME II	UDS22NE41	Internet Applications	2	2	30	15	35	50
Total			**30**	**23**				**650**

V SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	SE	TOT
Core 12		Machine Learning	6	5	90	25	75	100
Core 13		Data Analytics	6	5	90	25	75	100
Core 14		Software Engineering	5	4	75	25	75	100
Core Lab 8		Machine Learning Lab	6	2	90	40	60	100
Elective I		Elective- I	5	5	75	25	75	100
SEC I		SEC - I	2	2	30	15	35	50
Total			**30**	**23**				**550**

VI SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	SE	TOT
Core 15		Deep Learning	5	4	75	25	75	100
Core 16		Reinforcement Learning	5	4	75	25	75	100
Core Lab 9		Deep Learning Lab	5	2	75	40	60	100
Elective II		Elective - II	5	5	75	25	75	100
Project		Project	8	4	120	25	75	100
SEC II		SEC - II	2	2	30	15	35	50
Part V		NCC/NSS/PE		1				
Total			**30**	**22**				**550**

List of SEC:
1. SPSS – Statistical Package
2. Open Source Technology
3. Data Analysis using Spreadsheet
4. PHP Programming

List of Electives:
1. Big Data Systems
2. Information Security
3. Business Analytics
4. Data Visualization

Consolidation of contact hours and Credits: UG

Semester	Contact Hrs/Week	Credits
I	30 Hrs	25
II	30 Hrs	24
III	30 Hrs	23
IV	30 Hrs	23
V	30 Hrs	23
VI	30 Hrs	22
Total	180 Hrs	140

(Re-Accredited with „A" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science by 2022 or after)

Course code	Course Title	Category	L	T	P	Credit
UDS22C31	Programming in Java	Core 6	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	III	25	75	100

Preamble

This course enable the students to construct object oriented java programs using the concept of abstraction, encapsulation, exceptions, thread, packages, interfaces and AWTcontrols

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Proficiency
CO1	Understand the basics and object oriented concepts of Java.	70%	60%
CO2	Recognize methods, classes and inheritance concepts.	70%	60%
CO3	Illustrate the concepts of Packages, Interfaces and Exception.	70%	60%
CO4	Apply Multithreading concepts and Collections Framework	70%	60%
CO5	Implement programs using Applets and AWT controls.	70%	60%

K1-Knowledge   **K2-Understand**   **K3-Apply**

Mapping of COs with POs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	L	L
CO2	S	M	M	M	L
CO3	S	S	M	M	M
CO4	S	S	M	S	S

CO5	**S**	**S**	**M**	**S**	**S**

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	S	M	-	L
CO2	S	S	M	M	-	L
CO3	S	S	M	M	L	L
CO4	S	S	S	S	L	M
CO5	S	S	M	S	L	M

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%
Total Marks	52	52	140

Contents

Unit I: **15Hours**
The History and Evolution of Java: Java's Lineage-The Creation of Java–Java and Internet-Java's Magic: The Byte
code-The Java Buzzwords.
An overview of Java: Object Oriented Programming-A First Simple Program.
Arrays: One-Dimensional Arrays - Multidimensional Arrays - Alternative Array Declaration Syntax.
Introducing classes: Class fundamentals-Declaring objects-Assigning object reference variables-Introducing methods-Constructors-The this Keyword-Garbage collection-The finalize() method–A Stack class.
Unit II: **15Hours**
A Closer look at Methods and Classes: Overloading methods - Using objects as parameters - A Closer look at Argument passing - Returning objects - Recursion - Introducing Access control - Understanding static - Introducing final - Arrays Revisited - Introducing Nested and Inner classes - Exploring the String class-Using command line Arguments.
Inheritance: Inheritance basics - Using super - Creating a Multilevel hierarchy -Method overriding –Dynamic method dispatch –Using Abstract classes -Using final with Inheritance –The Object class.
Unit III: **15Hours**
Packages and Interfaces: Packages-Access protection-Importing packages-Interfaces.

Exception Handling: Exception Handling fundamentals-Exception types – Uncaught Exceptions – Using try and catch - Multiple catch clauses - Nested try statements - throw - throws - finally - Java's Built-in Exceptions-Creating your own exception Subclasses.

Unit IV: 15Hours

Multithreaded Programming: The Java Thread Model - The Main Thread - Creating a Thread - Creating Multiple Threads.

The Collections Framework: Collections Overview – The Collection Interfaces : The Collection Interface – The List Interface – The Collection Classes: The ArrayList Class – The LinkedList Class – The HashSet Class – The TreeSet Class – Accessing a Collection via an Iterator – Working with Maps– The Enumeration Interface – Vector – Stack – Dictionary - Hashtable.

Unit V: 15Hours

Applet Fundamentals: Applet Basics-Applet Architecture-Applet Skeleton–Simple Applet display method.

Introducing the AWT: AWT classes–Window Fundamentals - Introducing Graphics - Working with Colors - Working with Fonts.

Using AWT Controls and Layout Managers: Control fundamentals - Labels -Using buttons – Applying check boxes – CheckBoxGroup - Choice controls - Using Lists - Managing scroll bars - Using a TextField- Using a TextArea- Understanding Layout Managers.

Text Book:

HerbertSchildt,2014, Java The Complete Reference, 9th edition, McGraw Hill Edition

Chapters:(Relevant Topics only)
UNIT I : 1, 2, 3, 6
UNIT II : 7, 8
UNIT III :9,10
UNIT IV :11,18
UNIT V :23, 25,26

References:

1. CAY S.Horstmann Gary Cornell, 2005, Core JAVA 2 Volume-1 Fundamental, 7_{th}edn, PearsonEducation
2. E.Balagurusamy,2010,ProgrammingwithJAVA APrimer,4_{th}edn,TataMcGrawHill

Web Resources:

1. https://www.javatpoint.com/java-tutorial
2. https://www.guru99.com/java-tutorial.html
3. https://www.cs.usfca.edu/~parrt/doc/java/JavaBasics-notes.pdf

Course Designer

Mrs.SM. Valli
Mr.R.Chandrasekar

THIAGARAJAR COLLEGE, MADURAI - 09
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc., Data Science in 2022 and after)

Course code	Course Title	Category	L	T	P	Credit
UDS22C32	Relational Database Management System	Core 7	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	IV	25	75	100

Preamble

This course is to present an introduction to database management concepts, with an emphasis on how to design, organize, maintain and retrieve - efficiently and effectively - data from a Data Base.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Outline and elaborate the database concepts, Relational data model, database design and normalization	65	60
CO2	Infer and Apply the DDL commands in manipulating schema of table.	65	60
CO3	Understand and implement DML commands, function, grouping, join and views.	65	60
CO4	Understand, Interpret and implement the PL/SQL structure and using control structures, embedded SQL in PL/SQL for data manipulation.	65	60
CO5	Illustrate and Apply Cursor, Trigger, Exception and Procedures for database.	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5

CO1	**S**	**M**	**L**	**M**	**L**
CO2	**S**	**L**	**M**	**L**	**L**
CO3	**S**	**M**	**M**	**M**	**M**
CO4	**S**	**S**	**M**	**M**	**M**
CO5	**S**	**S**	**M**	**M**	**M**

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S-STRONG   M-MEDIUM   L-LOW

</div>

Mapping of COs with POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	**S**	**M**	**M**	**M**	**M**	**L**
CO2	**S**	**S**	**M**	**M**	**L**	**L**
CO3	**S**	**S**	**S**	**M**	**M**	**M**
CO4	**M**	**S**	**S**	**M**	**M**	**M**
CO5	**M**	**S**	**M**	**M**	**M**	**M**

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S-STRONG   M-MEDIUM   L-LOW

</div>

Blooms taxonomy

	CA		**End of Semester**
	First	**Second**	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Content

Unit -I: **15 Hours**
Database Concepts-A Relational approach: Database - Relationships - DBMS - Relational data model - Integrity rules - Theoretical relational languages.
Database Design: Data Modelling-Dependency - Database design - Normal forms - Dependency diagrams - Denormalization
Unit - II: **15 Hours**
Structured Query Language (SQL): Introduction - DDL - Naming rules and conventions - Data types- Constraints- Creating a table- Displaying t able information - Altering an existing table - Dropping, renaming and truncating table - Table types.
Unit - III: **15 Hours**
Working with tables: DML - Adding a new Row/Record - Customized prompts - Updating and deleting an existing rows/records - Retrieving data from table - Arithmetic operations - Restricting data with WHERE clause - Sorting - Substitution variables - DEFINE command - CASE structure.
Functions and Grouping: Built-in functions - Grouping data.
Joins and Views: Join - join types-**Views:** Views - Creating a view - Removing a view - Altering a view
Unit IV: **15 Hours**
PL/SQL: Fundamentals - Block structure - comments - Data types – Other data types - Variable declaration - Assignment operation - Bind variables - Substitution variables - Printing.

Control Structures and Embedded SQL: Control structures - Nested blocks - SQL in PL/SQL – Data manipulation - Transaction control statements

Unit - V: **15 Hours**

PL/SQL Cursors and Exceptions: Cursors - Implicit & explicit cursors and attributes - cursor FOR loops - SELECT…FOR UPDATE - WHERE CURRENT OF Clause - cursor with parameters - Cursor variables - Exceptions - Types of exceptions - Records - Tables -Procedures -Functions-Triggers

Text Books

    1. Nilesh Shah, ―Database Systems Using ORACLE‖, PHI, 2nd Edition, 2011

Chapter (Relevant Topics Only)

UNIT I   :1,2
UNIT II   :4
UNIT III   :5,6,7,9
UNIT IV   :10,11
UNIT V   :12,13,14

References

1. Database System Concepts, 7/e, AviSilberchartz, Henry F. Korth and S.Sudarshan, McGraw–Hill Higher Education, International Edition, 2019.
2. John Garmany, 2005, Easy oracle PL/SQL programming : Get started fast withworking PL/SQL code Example, Easy oracle series.

Web Resources

https://www.javatpoint.com/dbms-tutorial (DBMS concepts)
https://www.w3schools.com/sql/ (SQL queries)
http://www.tutorialspoint.com/sql/sql_tutorial.pdf (SQL queries)

Course Designer

    Mrs.AM. Hema
    Mrs.K. Vennila

THIAGARAJAR COLLEGE, MADURAI - 09
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc., Data Science in 2022 and after)

Course Code	Course Title	Category	L	T	P	Credit
UDS22C33	Linear Algebra	Core 8	4	1	-	5

L-Lecture   T-Tutorial   P–Practical

Year	Semester	Int. Marks	Ext. Marks	Total
II	III	25	75	100

Preamble

This course provides many analytical methods to solve the system of linear equations and the concepts of base and vector space that are crucial to many areas of computer science including image, processing, machine learning, cryptography, optimization and information retrieval.

Course Outcome
On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Explain the basic concept of matrices and system of linear equations	90	85
CO2	Demonstrate understanding of concepts of vector space and subspace	85	75
CO3	Demonstrate the concept of linear mappings and linear operators with matrix representation.	80	75
CO4	Explain the inner product space and analyze the orthogonal bases from Gram Schmidt Orthogonaliztion process	85	75
CO5	Find the eigenvalues and eigenvectors for a given matrix and diagonalizing a given matrix using eigenvalues and eigenvectors.	90	80

Mapping of Cos with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	M
CO2	S	M	M	M	L
CO3	L	S	S	M	M
CO4	S	M	S	M	M
CO5	S	S	S	S	L

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	S	S	S
CO2	S	M	S	M	S	M
CO3	S	M	M	M	S	S
CO4	M	M	M	S	S	M
CO5	S	S	S	M	S	M

Blooms taxonomy

	CA		End of
	First	Second	Semester
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Contents

Unit I (15 Hours)

Algebra of Matrices: Introduction – Matrices Addition and Scalar multiplication – Matrix Multiplication – Transpose of a Matrix – Square Matrices – Polynomials in Matrices – Invertible Matrices – Special Types of Square Matrices.

System of Linear Equations: Introduction– Basic Definitions, Solutions– Equivalent Systems, Elementary Operations– Systems in Triangular and Echelon Forms– Gaussian Elimination – Echelon Matrices, Row Canonical Form, Row Equivalence– Gaussian Elimination, Matrix Formulation– Matrix Equation of a System of Linear Equations– Elementary Matrices– LU Decomposition.

Unit II (15 Hours)

Vector Spaces: Introduction– Vector Spaces– Examples of Vector Spaces– Linear Combinations, Spanning Sets– Subspaces – Linear Dependence and Independence– Basis and Dimension– Application to Matrices, Rank of a Matrix– Sums and Direct Sums.

Unit III (15 Hours)

Linear Mappings: Introduction– Mappings, Functions– Linear Mappings (Linear Transformations)– Kernel and Image of a Linear Mapping– Singular and Nonsingular Linear Mappings, Isomorphisms– Operations with Linear Mappings.

Linear Mappings and Matrices: Introduction– Matrix Representation of a Linear Operator – Change of Basis– Similarity.

Unit IV (15 Hours)

Inner Product Spaces, Orthogonality: Introduction– Inner Product Spaces– Examples of Inner Product Spaces– Cauchy–Schwarz Inequality– Orthogonality– Orthogonal Sets and Bases– Gram–Schmidt Orthogonalization Process - Orthogonal and Positive Definite Matrices.

Unit V (15 Hours)

Diagonalization: Eigenvalues and Eigenvectors: – Introduction– Polynomials of Matrices– Characteristic Polynomial, Cayley–Hamilton Theorem– Diagonalization, Eigenvalues and Eigenvectors– Computing Eigenvalues and Eigenvectors, Diagonalizing Matrices– Diagonalizing Real Symmetric Matrices and Quadratic Forms– Minimal Polynomial.

Text Book: .

**Seymour Loipshutz , Marc Lipson, Linear Algebra, 4th edition , 2009 Mc Graw Hill ,
Schaum's Outline Series**

Unit	Chapter/Section
I	Chapter 2(2.1-2.7, 2.9-2.10), 3(3.1-3.3, 3.5-3.10, 3.12,3.13)
II	Chapter 4(4.1- 4.8, 4.10)
III	Chapter 5(5.1-5.6), 6(6.1-6.4)
IV	Chapter 7(7.1-7.8)
V	Chapter 9(9.1-9.7)

References:

1. Topics in algebra, I.N. Herstein, 2nd edition 2022,Wiley.

2. Abstract algebra by Vijay K Khanna, 5th edition 2022, Vikas Publishing house.

3. Linear algebra and its application, Reprint on 2016 by David CLay, Steven RLay, Judi Mcdonald, Pearson
Publication.

Web resources:

1. https://towardsdatascience.com/teach-yourself-data-science-in-2021-math-linear-algebra-6282be71e2b6
2. https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/video_galleries/video-lectures/
3. https://www.youtube.com/playlist?list=PL49CF3715CB9EF31D

Course Designers:

1. Mr. G. Gowtham
2. Mr. K. V. Janarthanan

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with „A" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after 2022)

Course code	Course Title	Category	L	T	P	Credit
UDS22CL31	Java Programming Lab	Core Lab 4	-	-	5	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	IV	40	60	100

Preamble

This course enable the students to construct object oriented java programs using the Concept of abstraction, encapsulation, exceptions, thread, packages, interfaces and AWT controls

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Proficiency
CO1	Implement Object Oriented programming concept.	75%	75%
CO2	Create user defined packages and to demonstrate interfaces	75%	75%
CO3	Implement exception handling mechanism and multithreading concept.	75%	75%
CO4	Demonstrate the Collections Framework.	75%	75%
CO5	Develop programs using Java applets and AWT components.	75%	75%

K1-Knowledge   **K2-Understand**   **K3-Apply**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	L
CO2	S	S	M	S	M
CO3	S	S	M	S	M
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	M	-	M
CO2	S	-	M	M	-	M
CO3	S	S	S	S	L	M
CO4	S	S	S	S	L	S
CO5	S	S	S	S	L	S

S-STRONG   M-MEDIUM   L-LOW

Contents

1. Program to demonstrate Single and Multidimensional arrays.
2. Program to demonstrate Method Overloading.
3. Program to demonstrate Constructor Overloading.
4. Program to demonstrate Single and Multilevel Inheritance.
5. Program to demonstrate Method Overriding.
6. Program to demonstrate Dynamic Method dispatch.
7. Program to demonstrate Interfaces.
8. Program to demonstrate Packages.
9. Program to demonstrate Built-in exception and User-defined exception.
10. Program to demonstrate Multi-threading concept.
11. Program to demonstrate Array List and LinkedList.
12. Program to demonstrate Tree Map and Hash Map.
13. Program To demonstrate Vector, Stack and Hash Table.
14. Program to demonstrate Animation.
15. Program to demonstrate Graphics class.
16. Program to demonstrate Font and Color class.
17. Applet program to demonstrate basic controls i.e. Button, labels, checkbox etc.
18. Program to demonstrate layout manager.

Web Resources:

https://www.javatpoint.com/java-tutorial
https://www.guru99.com/java-tutorial.html

Course Designers:

Mrs.S.M.Valli, Mr.R.Chandrasekar

THIAGARAJAR COLLEGE, MADURAI - 09
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DEPARTMENT OF COMPUTER SCIENCE
(For those who joined B.Sc., Data Science in 2022 and after)

Course code	Course Title	Category	L	T	P	Credit
UDS22CL32	RDBMS Lab	Core Lab 5	-	-	4	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	IV	40	60	100

Preamble

This course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently and effectively - data from a Data Base.

Course Outcomes

On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Illustrate DDL and DML Commands	70	65
CO2	Develop PL/SQL Programs	70	65
CO3	Implement Join & Set operations	70	65
CO4	Demonstrate Functions and Procedures	70	65
CO5	Experiment Cursor, Trigger and Exception	70	65

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	L	M
CO2	S	S	M	M	M
CO3	S	S	S	M	S
CO4	S	S	L	L	S
CO5	S	S	L	L	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	S
CO2	M	M	M	S	M	M
CO3	S	L	M	S	M	S
CO4	M	S	S	S	S	S
CO5	M	L	L	S	M	M

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Content

1. Using Different operators
2. Using Control Structures
3. Implement Built-in functions
4. Implement update and Alter table
5. Implementing PL/SQL Block
6. Implement PL/SQL table and record
7. Performing Join & Set operations
8. Using Functions
9. Using Procedures
10. Using Exception
11. Using Cursors
12. Using Triggers

Web Resources:

https://www.w3schools.com/sql/
http://www.tutorialspoint.com/sql/sql_tutorial.pdf

Course Designers:

Mrs.AM.Hema, Mrs.K. Vennila

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with „A" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science by 2022 or after)

Course code	Course Title	Category	L	T	P	Credit
UDS22NE31	Web Development	NME 1	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	III	15	35	50

Preamble:

This course is designed to understand and design a webpage using HTML and CSS and it facilitate the students to create an interactive web pages.

Course Outcome:

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Proficiency
CO1	Understand an HTML document.	70%	60%
CO2	Create interactive content using HTML forms.	70%	60%
CO3	Incorporate CSS , Inheritance	70%	60%
CO4	Design web pages using Selector and Pseudo elements	70%	60%
CO5	Apply filters and transitions for innovative web pages.	70%	60%

K1-Knowledge   **K2-Understand**   **K3-Apply**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	M	-	-
CO2	S	S	M	-	-
CO3	S	S	M	-	-
CO4	S	S	M	-	--
CO5				-	-

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M			S	L
CO2	L	S			S	L
CO3	M	S			S	L
CO4	M	S			S	M
CO5	M	S			S	M

S-STRONG   **M-MEDIUM**   **L-LOW**

	CA		End of Semester
	First	**Second**	
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%
Total Marks	52	52	140

Contents:

Unit-I: 14 Hrs
HTML: Introduction-SGML-outlineofanHTMLDocument–Headsection–BodySection-HTMLforms.
Unit-II: 16 Hrs
  DynamicHTML(DHTML): Introduction–CascadingStyleSheets(CSS)-FiltersandTransitions.

Text Book:

N.P.Gopalan&J.Akilandeswari , 2016, Web Technology A Developer's Perspective, 2nd Edition,PHILearning Private Limited, Delhi.
Chapters:
UnitI :4
UnitII :7.1, 7.2, 7.5

References:

JonDuckett,2015,BeginningHTML,XHTML,CSSandJavascript,WileyIndiaPvt.Ltd,NewDelhi.

Web Resources:

1. https://developer.mozilla.org/en-US/docs/Learn/HTML/Introduction_to_HTML
2. https://careerfoundry.com/en/tutorials/web-development-for-beginners/introduction-to-html/
3. https://www.mygreatlearning.com/blog/css-tutorial/
4. https://codepen.io/adrianparr/pen/AXdQNy?css-preprocessor=sass
5. https://css-tricks.com/almanac/properties/t/transition/

Course Designer

MrsSM Valli, Mr.R. Chandrasekar

THIAGARAJAR COLLEGE, MADURAI - 9.

(Re-Accredited with 'A++' Grade by NAAC)

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Data science on 2002 or after)

Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS22C41	Data Warehousing & Data Mining	Core Theory 9	4	1	--	4

L–Lecture   T– Tutorial   P –Practical

Year	Semester	Internal	External	Total
II	IV	25	75	100

Preamble

In this course the students will learn how to classify the data and how to avoid noisy or redundant data. Data preprocessing methods and how to implement data warehousing.

Course Outcomes

On the completion of the course the student will be able to :

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Understand the principles of Data warehousing and Data Mining	65	60
CO2	Be familiar with the Data warehouse architecture and its Implementation.	65	60
CO3	Know the Architecture of a Data Mining system.	65	60
CO4	Understand the various Data preprocessing Methods.	65	60
CO5	Perform classification and prediction of data.	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	S
CO2	M	M	M	S	S
CO3	S	M	L	S	M
CO4	M	M	S	L	M
CO5	S	S	S	M	L

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	M	M	S
CO2	S	M	S	M	M	M
CO3	S	S	M	L	S	M
CO4	S	S	S	S	S	L
CO5	S	M	M	S	S	S

S-STRONG   M-MEDIUM   L-LOW

	CA		End of Semester
	First	Second	
Knowledge - K1	40%	40%	40%
Understand - K2	40%	40%	40%
Apply - K3	20%	20%	20%

Content

Unit - I   15 HOURS

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Unit - II   15 HOURS

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Unit - III   15 HOURS

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification

Unit - IV   15 HOURS

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods.

Unit - V   15   HOURS

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Text Books

Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.

Chapter (Relevant Topics Only)

UNIT I   : Chapters 4 (4.1-4.2)
UNIT II   : Chapters 8 (8.1-8.4)
UNIT III   : Chapters 9 (9.1-9.7)
UNIT IV   : Chapters 10 (10.1- 10.5)
UNIT V   : Chapters 13 (13.1- 13.4)

Reference Books

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

Course designer

DR.G.RAKESH

THIAGARAJAR COLLEGE, MADURAI - 09
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those who joined B.Sc., Data Science in 2022 and after)

Course code	Course Title	Category	L	T	P	Credit
UDS22C42	R Programming	Core 10	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	IV	25	75	100

Preamble
This course is to learn the basics of R programming. This course will enlighten the students to analyse the data sets at various levels according to the model.

Course Outcomes
On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	learn the basics of R and its data structures	65	60
CO2	Understand basic functions in R, arrays and matrices	65	60
CO3	Know the concept of lists and data frames in R	65	60
CO4	Explore the concept of factors and handling tables, statements and operators	65	60
CO5	Create Math simulations in R, String manipulation and debugging tools	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	L
CO2	S	L	M	L	L
CO3	S	M	M	M	M
CO4	S	S	M	M	M
CO5	S	S	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	L
CO2	S	S	M	M	L	L
CO3	S	S	S	M	M	M
CO4	M	S	S	M	M	M
CO5	M	S	M	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Content

Unit -I: **15 Hours**
Getting Started- How to run R – A First R Session – Introduction to Functions – Preview of some important R Data Structures – Vectors – Scalers, Vectors, Arrays and Matrices – Declarations – Recycling – Common Vector operations – Using all() and any() – Vectorized operations – NA and NULL values - Filtering – A Vectorized if-then-else

Unit - II: **15 Hours**
Matrices and Arrays: Creating Matrices – General Matrix operations – Applying Functions to Matrix rows and columns – More on Vector/Matrix Distinction – Avoided unintended Dimension reduction – Naming Matrix row and columns – Higher Dimensional Arrays.

Unit - III: **15 Hours**
Lists: Creating Lists – General List operations – Accessing list components and values – Applying functions to lists – Recursive lists – Data Frames : Creating Data Frames – Other matrix like operations – Merging data frames – Applying Functions to data frames

Unit IV: **15 Hours**
Factors and Tables : Factors and levels – Common functions used with factors – Working with tables – Other Factor and table related functions – R programming structures : Control Statements – Arithmetic and Boolean operators and values – Default values for Arguments – Return values - Functions are Objects – Environment and Scope issues – No pointers in R – Writing Upstairs

Unit - V: **15 Hours**
Doing Math and Simulations in R: Math Functions – Functions for statistical distributions – Sorting – Linear algebra operations on Vector and Matrices – Set Operations – Simulation programming in R – String Manipulation : An overview of string manipulation functions – Regular Expressions – Use of string utilities in the edtdbg Debugging tool.

Text Books
1. The art of R Programming by Norman Matloff , No Starch Press 2011.

Chapter (Relevant Topics Only)
UNIT I: Chapters1 (1.1 to 1.4.6) , 2 (2.1 to 2.9)
UNIT 2: Chapters 3 (3.1 to 3.8)
UNIT 3: Chapters 4 (4.1 to 4.5) , 5 (5.1 to 5.4)
UNIT 4: Chapters 6 (6.1 to 6.4) , 7 (7.1 to 7.8)
UNIT 5: : Chapters 8 (8.1 to 8.6) , 11 (11.1 to 11.3)

References
1. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics",

   Addison-Wesley Data & Analytics Series, 2013.

2. Learning R: A Step-By-Step Function Guide to Data Analysis, 2013.

3. Mark Gardener, " Beginning R – The Statistical Programming Language", Wiley, 2013

Web Resources

https://www.javatpoint.com

https://www.w3schools.com

http://www.tutorialspoint.com

Course Designer

Mr.J. Prakash, Dr.N. Gnanasankaran

THIAGARAJAR COLLEGE, MADURAI – 9.
(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Re-Accredited with 'A++' Grade by NAAC
DEPARTMENT OF COMPUTER SCIENCE
(For those who joined B.Sc. Data Science on or after June 2022)

Course Code	Course Title	Category	L	T	P	Credit
UDS22C43	**Predictive Analysis**	**Core**	4	1	-	4

L - Lecture   T - Tutorial   P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
II	IV	25	75	100

Preamble:

This course will enable students to apply specific statistical and regression analysis methods applicable to predictive analytics to identify new trends and patterns, uncover relationships, create forecasts and to develop and use various quantitative and classification predictive models based on various regression and models.

Course Outcome:

On the completion of the course the student will be able to

	Course Outcome	Expected Proficiency(%)	Expected Attainment(%)
CO1	Apply the concept of multiple linear regressions to find interpretation of regression coefficients.	85	80
CO2	Interpret each of the standard nonparametric hypothesis tests	85	80
CO3	Use regression-based techniques to estimate and forecast the trend in a time series	90	85
CO4	Calculate various kinds of index numbers by familiar with the principal types of indices: price indices, quantity indices and value indices	75	70
CO5	Apply methods for making decisions under uncertainty and use expected value and utility as decision criteria	80	75

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	M
CO2	M	S	M	S	M
CO3	S	M	S	M	S
CO4	S	M	S	M	M
CO5	M	S	S	M	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	M	M
CO2	M	S	M	M	M	M
CO3	M	S	S	S	M	S
CO4	M	S	M	M	S	M
CO5	S	S	S	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester (Marks)
	First(Marks)	Second(Marks)	
Knowledge– K1	40 %	40 %	40 %
Understand – K2	40 %	40 %	40 %
Apply – K3	20 %	20 %	20 %

Contents:

UNIT I : Multiple Regression and Modeling   (15 Hours)

Multiple regression and correlation analysis - Multiple-regression equation - Making inferences about population parameters

UNIT II : Nonparametric Methods   (15 Hours)

Introduction to nonparametric statistics - The sign test for paired data - Rank sum tests - The one-sample runs test.

UNIT III : Time Series and Forecasting   (15 Hours)

Introduction - Variations in time series - Trend analysis - Cyclical variation - Seasonal variation - Irregular variation - A problem involving all four components of a time series - Time-series analysis in forecasting

UNIT IV : Index Numbers   (15 Hours)

Defining an index number – Unweighted Aggregates index – Weighted Aggregates index – Average of Relatives Methods – Quantity and Value Indices

UNIT V : Decision Theory   (15 Hours)

The decision environment - Expected profit under uncertainty - Using continuous distributions: Marginal analysis - Utility as a decision criterion

Text Books:

Richard I. Levin, Masood H. Siddiqui, David S. Rubin and Sanjay Rastogi, "Statistics for Management", 8th Edition, Pearson Education, 2017.

Unit	Chapter/Section
I	Chapter 13: 13.1, 13.2, 13.4 Pages : 664 – 674, 684 – 695
II	Chapter 14 : 14.1, 14.2, 14.3, 14.4 Pages : 734 – 748, 750 – 752, 755 – 762, 764 – 767
III	Chapter 15 : 15.1 to 15.6, 15.8 Pages : 803 – 844
IV	Chapter 16 : 16.1 to 16.5 Pages : 855 - 885
V	Chapter 17: 17.1 to 17.4 Pages : 898 - 920

References:

1. Anderson, Sweeney and Williams, "Statistics for Business and Economics", Cengage Learning, 2011.
2. Ronald E. Walpole, Raymond H. Meyers, Sharon L. Meyers, "Probability and Statistics for Engineers and Scientists", Pearson Education, 2014.
3. Ken Black , "Business Statistics For Contemporary Decision Making", 6th Edition, John Wiley & Sons, 2010.
4. Pillai R.S.N and Bagavathi, "Statistics Theory and Practice", 8th Edition, Sultan Chand & Company Pvt. Ltd., 2016.

Web Resources:

1. https://us.sagepub.com/sites/default/files/upm-assets/78103_book_item_78103.pdf
2. https://sadbhavnapublications.org/research-enrichment-material/2-Statistical-Books/Nonparametric-Statistics-Theory-and-Methods.pdf
3. http://home.iitj.ac.in/~parmod/document/introduction%20time%20series.pdf

Course Designers:

1. Dr. S. Vijaya
2. Dr. D. Murugeswari

THIAGARAJAR COLLEGE, MADURAI - 9.

(Re-Accredited with 'A++' Grade by NAAC)

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Data Science on or after 2022)

Programme Code : UDS

Course code	Course Title	Category	L	T	P	Credit
UDS22CL41	Data Warehousing & Data Mining Lab	Core Lab 6	-	-	4	2

L–Lecture   T– Tutorial   P –Practical

Year	Semester	Internal	External	Total
II	IV	40	60	100

Preamble

In this course the students will learn data mining concepts implementation suing modern data mining tools, handling various types of data sets, data classification, data preprocessing and applying various algorithms to handle the datasets.

Course Outcomes

On the completion of the course the student will be able to :

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Learn to perform data mining tasks using a data mining toolkit	65	60
CO2	Understand the data sets and data preprocessing.	65	60
CO3	Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression	65	60
CO4	Apply the data mining techniques with varied input values for different parameters	65	60
CO5	Obtain Practical Experience Working with all real datasets	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	S
CO2	S	M	S	M	S
CO3	S	S	S	M	S
CO4	S	S	M	S	M
CO5	S	S	S	S	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	M	S	S
CO2	S	M	S	S	S	M
CO3	M	S	S	M	M	S
CO4	S	S	M	S	M	M
CO5	S	M	S	S	M	M

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge - K1	40%	40%	40%
Understand - K2	40%	40%	40%
Apply - K3	20%	20%	20%

Content

1. **Use Weka tool and create Arff file**
2. **Preprocessing Techniques on Data set**
3. **Generate Association rules using Apriori algorithm**
4. **Build a Decision tree using J48 algorithm**
5. **Naïve bayes classification on a given data set**
6. **Apply K means clustering on a given data set**
7. **OLAP cube and its different operations**
8. **Case study : data set and processing for KNN**

Web Resources

1. **www.javapoint.com**
2. **www.mygreatlearning.com**

Course designer

Dr.G.RAKESH

THIAGARAJAR COLLEGE, MADURAI - 09
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those who joined B.Sc., Data Science in 2022 and after)

Course code	Course Title	Category	L	T	P	Credit
UDS22CL42	Lab in R Programming	Core Lab 7	-	-	5	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
II	IV	40	60	100

Preamble
This course is to practice the R programming practically by applying algorithms to the data sets at various levels and analyse the statistical data. Visualising the data by various plotting and graph methods.

Course Outcomes
On the successful completion of this course, Students will be able to:

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Learn the basics of R and its data structures	65	60
CO2	Apply basic functions in R, arrays and matrices	65	60
CO3	Experiment the concept of lists and data frames in R	65	60
CO4	Demonstrate the concept of factors and handling tables, statements and operators	65	60
CO5	Analyse Math simulations in R, String manipulation and debugging tools	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	L
CO2	S	L	M	L	L
CO3	S	M	M	M	M
CO4	S	S	M	M	M
CO5	S	S	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	L
CO2	S	S	M	M	L	L
CO3	S	S	S	M	M	M
CO4	M	S	S	M	M	M
CO5	M	S	M	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Content

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
3. Program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Program to join columns and rows in a data frame using cbind() and rbind() in R
6. Factors: creating and plotting categorized data.
7. Interact data through .csv files (Import from and export to .csv files).
8. Working with graphics in R - visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
9. Data Visualization using ggplot2.
10. Implement Set Operations
11. Implement Linear and Multiple Regression
12. Implement String Functions

Web Resources

www.w3schools.com
www.tutorialspoint.com
www.guru99.com

Course Designer

Mr.J.Prakash, Dr.N.Gnanasankaran

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with „A" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science by 2022 or after)

Course code	Course Title	Category	L	T	P	Credit
UDS22NE41	Internet Applications	NME 2	2	-	-	2

L – Lecture		T – Tutorial		P – Practical	

Year	Semester	Internal	External	Total
II	IV	15	35	50

Preamble:

The aim of the course is to familiarize students with the Internet, Intranet technologies, features of emails and web site designing.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Proficiency
CO1	Understand the basic Internet concepts and protocols.	70%	60%
CO2	Recognize the importance of Email concepts and protocols.	70%	60%
CO3	Infer the basic concepts of Intranet	70%	60%
CO4	Understand the basic html tags	70%	60%
CO5	Acquire knowledge to implement web pages..	70%	60%

K1-Knowledge   **K2-Understand**   **K3-Apply**

Mappling of Pso and CO:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	L	L
CO2	S	L	S	M	S
CO3	M	L	L	L	L
CO4	S	L	S	M	S
CO5	S	M	M	L	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Mappling of PO and CO:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	L	M	L
CO2	M	S	M	M	S	L
CO3	L	S	M	L	M	L
CO4	M	L	M	L	S	M
CO5	M	S	M	L	S	S

S-STRONG   **M-MEDIUM**   **L-LOW**

	CA		End of Semester
	First	**Second**	
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%
Total Marks	52	52	140

Contents:

UNIT1:

Internet and World Wide Web:

Introduction: What is special about Internet –Internet Access – Internet Basics – Internet Protocols –Internet

Addressing – The World Wide Web (WWW) – Web Pages and HTML – Web Browsers – Searching the Web –Internet Chat.

Overview of Electronic Mail:

Introduction: Why use E-MAIL - How E-MAIL Works -- How Private is E-MAIL – E-MAIL Names

&Addresses–Mailing Basics . E-MAIL Ethics–Internet Code of Conduct – Spamming–E-MAIL–

Advantages & Disadvantages- Tips for Effective E-MAIL use – Smileys (Emoticons) – Useful EMAIL Services– Mailing Lists–News Groups.

UNITII:

Introduction to Intranets:

Introduction – Characteristics of Intranet – Advantages of Intranets – Business Benefits of Intranets –

Drawbacks of Intranets – Why does an Organization need Intranet – Intranet vs Groupware – Intranetvs.Email–Intranetvs.Client/ServerSystems–Extranet–Intranets,ExtranetsandE-Commerce.

Introduction to Web Design:

Introduction–Web Design–Creating a Website –Web Hosting –Website Promotion.

Text Book:

AlexisLeonandMathewsLeon,FundamentalsofInformationTechnology,SecondEdition,VikasPublishing HousePvt. Ltd.

Chapters:

Unit I : 24,25

UnitII:26,28

References:

1. DouglasE. Comer,2009, The InternetBook, FourthEdition, PHILearningPvt. Ltd.
2. YoungKaiSeng, 2000,UsingtheInternettheEasyWay,First Edition,, MinervaPublications.
3. RameshBangia,2011,InternetTech

Web Resources:

1. https://www.tutorialspoint.com/internet_technologies/www_overview.htm
2. https://www.geeksforgeeks.org/world-wide-web-www
3. https://www.tutorialspoint.com/internet_technologies/e_mail_overview.htm

Course Designer

Mrs AM Hema, Mrs.G. Nalini

THIAGARAJAR COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-Accredited with 'A++' Grade by NAAC

CURRICULUM & SYLLABUS

I & II SEMESTER (June 2023 onwards)

DEPARTMENT OF COMPUTER SCIENCE

B.Sc.
Data Science
Programme code: UDS

Program Educational Objective (PEO):

Graduates will be able to

PEO 1	Be employed as a Data Scientist or they can pursue the professional degree in M.Sc Data science
PEO 2	Apply the knowledge of data science coupled with modern programming by inculcating mathematical skills in the relevant domain
PEO 3	Develop the skills as required for data analytics for ethical and professional expertise in IT industry standards
PEO 4	Retain programming and analytical practices in the prevailing modern technological society which pertains to use high level and distributed computing
PEO 5	Lead a dynamic and vibrant career as a Data scientist and Data analyst in several social community sites or either in marketing field of IT and other multidisciplinary fields

Program Specific Outcome (PSO):

On successful completion of B.Sc Data Science course, the students will

PSO 1	Develop the knowledge of Data Science and its relevant programming skills in various domains
PSO 2	Build up analytical skills combined with mathematical knowledge to implement various numerical methods using algorithms for applying standard practices in data science
PSO 3	Apply knowledge of problem solving and programming using modern high level programming concepts to inculcate statistical approach
PSO 4	Maintain remarkable programming and communication skills among the young dynamic students to satisfy the corporate requirements
PSO 5	Generate cognizance on the current industrial and social practices for solving the statistical and marketing problems in accordance to the current scenario

THIAGARAJAR COLLEGE (AUTONOMOUS) :: MADURAI – 09
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
B.Sc., Data Science
(For those joined B.Sc. Data Science on or after June 2023)

Semester – I

Part	List of Courses	Code No.	Subject	Hrs/ week	Cred.	Total Hrs	Max Marks CA	Max Marks SE	Total
Part-I	Tamil	U23PITA11B	பொதுத்தமிழ் - I	3	3	45	25	75	100
Part-II	English	U23P2EN11	General English - I	4	3	60	25	75	100
Part-III	CC1	UDS23CT11	Calculus	5	4	75	25	75	100
	CC2	UDS23CT12	C Programming	5	4	75	25	75	100
	Generic Elective 1	UMA23GT11S	Discrete Mathematical Structure	5	3	75	25	75	100
Part-IV	NME 1	UDS23NT11	Web designing	2	2	30	25	75	100
	Foundation Course	UDS23FL11	C Programming Lab	4	2	60	25	75	100
	AECC 1	UEN23AT11 Handled by CS Datascience Dept	Soft Skill – 1 - Introduction to Personality Development	2	2	30	25	75	100
TOTAL				30	23				

Semester – II

Part	List of Courses	Code No.	Subject	Hrs/ week	Cred.	Total Hrs	Max Marks CA	Max Marks SE	Total
Part-I	Tamil	UDS23P1TA21B	பொதுத்தமிழ் - II	3	3	45	25	75	100
Part-II	English	U23P2EN21	General English - 2	4	3	60	25	75	100
Part-III	CC3	UDS23CT21	Java Programming	5	4	75	25	75	100
	CC4	UDS23CT22	Linear Algebra	5	4	75	25	75	100
	Generic Elective 2	UDS23GT21	Basic Statistics	5	3	75	25	75	100
Part-IV	NME 2	UDS23NT21	Python Programming	2	2	30	25	75	100
	SEC - 1	UDS23SL21	Java Programming Lab	4	2	60	25	75	100
	AECC 2	UEN23AT21 Handled by CS Datascience Dept	Soft skill 2 - Employability Skills	2	2	30	25	75	100
TOTAL				30	23				

Extra Credit		**U23NM21**	**Naan Mudhalvan** Language Proficiency for Employability		**2**				

(For those who joined B.Sc., Data Science on 2023 and after)

Course Code	Course Title	Category	L	T	P	Credit
UDS23CT11	Calculus	Core 1	4	1	-	5
	L - Lecture **T - Tutorial** **P – Practical**					

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble

The objective of this course is to achieve conceptual understanding and to retain the best traditions of calculus. The syllabus is designed to provide the basic tools of calculus which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering and computer science, among other disciplines.

Course Outcomes

On successful completion of the course, the student will be able to:

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall the basic concepts in successive differentiation.	80	70
CO2	Determine the maxima and minima of the given functions.	75	70
CO3	Develop problem solving skills using partial derivatives	80	70
CO4	Solve problems in double and triple integrals using transformation of one coordinate system to another	75	70
CO5	Analyze the properties of Beta and Gamma functions.	70	65

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M
CO2	S	S	L	M	M
CO3	L	M	M	S	S
CO4	M	L	M	M	S
CO5	S	M	S	M	M

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M	M	L	M	M
CO2	S	M	M	M	M	M
CO3	S	M	M	M	M	S
CO4	M	S	M	S	S	S
CO5	M	M	M	S	M	S

S-STRONG **M-MEDIUM** **L-LOW**

Blooms taxonomy

	CA		End of Semester (Marks)
	First(Marks)	Second(Marks)	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Content

Unit I   (15 Hours)

Successive differentiation – Leibnitz's theorem for the nth derivative of the product of two functions – Fundamental theorems – Expansions of functions – Indeterminate forms.

Unit II   (15 Hours)

Increasing and decreasing functions – Maxima and minima - Functions of two or more variables – Partial derivatives – Homogeneous functions.

Unit III   (15 Hours)

Total derivative – Change of variables –Jacobians - Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

Unit IV   (15 Hours)

Reduction Formula – Definite Integrals –Integrals as the limit of a sum - Double integrals - Change of order of integration – Double integrals in polar coordinates.

Unit V   (15 Hours)

Triple integrals – Change of variables – Beta function - Gamma function – Relation between Beta and Gamma functions.

Text Book

B.S. Grewal, 2017,Higher Engineering Mathematics, 44th Edition, Khanna Publishers Pvt. Ltd., New Delhi, India.

Chapters (Relevant Topics Only)

Unit I	:	IV (4.1 – 4.5)
Unit II	:	IV (4.14 & 4.15) V (5.1 , 5.2, 5.4)
Unit III	:	V(5.5 - 5.7, 5.11, 5.12)
Unit IV	:	VI(6.1 – 6.9) VII(7.1 – 7.3)
Unit V	:	VII(7.5, 7.7, 7.14 – 7.16)

References

1. S.Arumugam and A. Thangapandi Isaac, 2014, Calculus, New Gamma Publishiung House, Palayamkottai, India.
2. P.R.Vittal and V. Malini, 2014, Calculus, Third Edition, Margham Publications, Chennai, India.
3. Tom M. Apostal, 2007, Calculus, Volume II Wiley Student Publications, New Jersey, United States.
4. Shanti Narayan, Integral Calculus, 2002, 9th Edition, S. Chand and Company Ltd., New Delhi, India.
5. Shanti Narayan, Differential Calculus, 2002, 14th Edition, S. Chand and Company Ltd, New Delhi, India.

Course Designers

1. Dr.K. Kayathri
2. Mrs. P. Kalai Mathy
3. Mrs. B. Ambika

THIAGARAJAR COLLEGE, MADURAI – 9
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS23CT12	**C PROGRAMMING**	Core - 2	4	1	-	4

L – Lecture　　　　　T – Tutorial　　　　　P – Practical

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble

To gain knowledge in C language and to inculcate fundamental programming skills.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Remember the program structure of C with its syntax and semantics.	75%	75%
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	75%	75%
CO3	Apply the programming principles learnt in real-time problems.	75%	75%
CO4	Analyze the various methods of solving a problem and choose the best method.	75%	75%
CO5	Code, debug and test the programs with appropriate test cases.	75%	75%

K1-Knowledge　　　　　**K2-Understand**　　　　　**K3-Apply**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S
CO2	L	-	M	S	S
CO3	-	S	-	S	M
CO4	M	-	S	M	M
CO5	-	M	S	-	S

S-STRONG　　　　　**M-MEDIUM**　　　　　**L-LOW**

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	-	S	-	S	M
CO2	S	M	S	-	-	S
CO3	-	S	-	M	M	S
CO4	S	S	M	-	S	M
CO5	M	M	-	S	M	S

S-STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of
	First	Second	Semester
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Content

Unit- I   **12 hours**

Overview of C: Importance of C, sample C program, C program structure, executing C program. Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables---Assignment statement, declaring a variable as constant, as volatile.

Operators and Expression: Arithmetic, Relational, logical, assignment, increment, decrement, conditional, bitwise and special operators, arithmetic expressions, operator precedence, type conversions, mathematical functions

Managing Input and Output Operators: Reading and writing a character, formatted input, formatted output.

Unit – II   **12 hours**

Decision Making and Branching: Decision making with If, simple IF, IF ELSE, nested IF ELSE, ELSE IF ladder, switch, GOTO statement.

Decision Making and Looping: While, Do-While, For, Jumps in loops.

Unit – III   **12 hours**

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

Functions: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference, storage classes-character arrays and string functions.

Unit - IV   **12 hours**

Structures and Unions: Defining, giving values to members, initialization and comparison of structure variables, arrays of structure, arrays within structures, structures within structures, structures and functions, unions.

Preprocessors: Macro substitution, file inclusion.

Unit – V   **12 hours**

Pointers: definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.

File Management in C: Opening, closing and I/O operations on files, random access to files, command line arguments.

Text Book

1. E. Balagurusamy, Programming in ANSI C, Sixth Edition, Tata McGraw-Hill, 2014.

References

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

Chapters (Relevant topics only)

Unit - I   : Chapters 1,2,3,4
Unit - II   : Chapters 5,6
Unit – III : Chapters 7,9
Unit – IV : Chapters 10,14
Unit - V   : Chapters 11,12

Web Resources

https://www.cprogramming.com/
https://www.geeksforgeeks.org/c-programming-language/
https://codeforwin.org/

Course Designers

Dr. K. Natarajan, Mrs. K. Suriya Prabha

(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS23FL11	C Programming Lab	Foundation Course	-	-	4	2

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble

This lab course is designed to understand the power of three decade old programming language conceptsand features and leads to learn other language with ease and promotes to survive in IT field.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Outline the logic using flowchart for a given problem and develop programs using conditional and looping statements	75%	75%
CO2	Develop programs with implementation of arrays, functions and parameter passing techniques.	75%	75%
CO3	Develop programs with string handling functions	75%	75%
CO4	Construct programs with features of Structure.	75%	75%
CO5	Gain skills to write file programs and perform various operations.	75%	75%

-   **K1-Knowledge**   **K2-Understand**   **K3-Apply**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	-	-	-	-
CO2	-	-	M	-	-
CO3	-	-	M	-	-
CO4	-	-	M	M	-
CO5	-	-	M	M	-

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	-	-	-	-
CO2	-	M	-	M	-	-
CO3	-	-	-	L	M	-
CO4	-	S	-	M	M	-
CO5	-	-	-	-	M	L

Content

Simple programs

1. Simple interest.
2. Find the biggest from two numbers -ordinary /switch case/conditional operator methods.
3. Find the biggest from three given numbers.
4. Check a given number is odd or even –ordinary/switch case/conditional operator methods
5. Find the sum of digits of a given number.
6. Prime number checking / Generate all prime numbers between any two given limit.
7. Binary to decimal- Decimal to binary conversion.
8. Least common multiple of two integers.
9. Greatest common divisor of two integers.
10. Fibonacci series.

Array programs

1. Ordering of 'n' given numbers.
2. Matrix Addition.
3. Matrix Subtraction.
4. Matrix Multiplication.
5. Transpose of a Matrix.
6. Call by Value.
7. Call by Address.
8. Recursion (Factorial value).

String programs

1. Alphabetical order.
2. Palindrome Checking.
3. Substring detection.
4. Finding the number of vowels and consonants in a given string.

Structure programs

1. Mark list processing- Structure and call by value technique
2. EB bill calculation- Structure and call by reference technique

File programs

1. Create a data file to store 'n' numbers and separate odd and even numbers.
2. Create a data file to store 'n' characters and separate vowel and non-vowels.

Web Resources

https://www.tutorialspoint.com/cprogramming/

https://www.programiz.com/c-programming

https://www.geeksforgeeks.org/c-language-set-1-introduction/

Course Designers

Dr. K. Natarajan, Mrs. Suriya Praba

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS23NT11	Web Designing	Skill Enhancement Course (Non-Major Elective - I)	-	2	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	II	25	75	100

Preamble:

This course gives an exploration towards web page design using HTML and CSS. This course, provide a chance to the students to create static and dynamic web pages by their own.

Course Outcomes :

On the successful completion of this course, Students will be able to create static and dynamic web pages using the basic concepts of HTML and CSS

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand the basics of Web Design, Internet and Working of Web.	75%	75%
CO2	Understand HTML Page Structure, Paragraph and List tags.	75%	75%
CO3	Create a web page with links, tables and process forms.	75%	75%
CO4	Understand the basics of CSS and text formatting with CSS.	75%	75%
CO5	Design web pages with page colors, background setting and CSS Box model.	75%	75%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	-	-
CO2	M	M	M	M	-
CO3	S	S	M	M	L
CO4	M	M	M	L	M
CO5	M	M	M	L	L

S-STRONG   **M-MEDIUM**   **L-LOW**

Mapping of COs with POs Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	L	L	-	-	-
CO2	S	M	L	L	L	L
CO3	S	S	M	L	L	L
CO4	S	S	M	L	L	L
CO5	S	S	S	L	L	L

S-STRONG   **M-MEDIUM**   **L-LOW**

Content:

UNIT: I

Getting Started in Web Design: Where Do I Start? It Takes a Village (Website Creation Roles) Gearing Up for Web Design, What You've Learned. **How the Web Works**: The Internet Vs The Web, Serving Up Your Information, A Word About Browsers, Web Page Addresses (URLs), The Anatomy of a Web Page.

UNIT: II

Creating a Simple Page: A Web Page, Step-By-Step, Launch a Text Editor, Step 1: Start with Content, Step 2; Give the HTML Document Structure, Step 3: Identify Text Elements, Step 4: Add an Image, Step 5: Change the Look with a Style Sheet, When Good Pages Go Bad, Validating Your Documents. **Marking Up Text**: Paragraphs, Headings, Thematic Breaks (Horizontal Rule), Lists, More Content Elements, Organizing Page Content, The Inline Element Roundup, Generic Elements (div and span), Improving Accessibility with ARIA, Character Escapes.

UNIT: III

Adding Links: The href Attribute, Linking to Pages on the Web, Linking within Your Own Site, Targeting a New Browser Window, Mail links, Telephone Links. **Table Markup:** How to Use Tables, Minimal Table Structure, Table Headers, Spanning Cells, Table Accessibility, Row and Column Groups, Wrapping Up Tables. **Forms:** How Forms Work? The Form Element, Variables and Content, The Great Form Control Roundup, Form Accessibility Features, Form Layout and Design.

UNIT: IV

Introducing Cascading Style Sheets; The Benefits of CSS, How Style Sheets Work? The Big Concepts, CSS Units of Measurement, Developer Tools Right in your Browser, Moving Forward with CSS. **Formatting Text:** Basic Font Properties, Advanced Typography with CSS3, Changing Text Color, A Few More Selector Types, Text line Adjustments, underlines and Other "Decorations", Changing Capitalization, Spaced Out, Text Shadow, Changing List Bullets and Numbers.

UNIT: V

Colors and Backgrounds: Specifying Color Values, Foreground Color, background Color. Clipping the Background, Playing with Opacity, Pseudo-Class Selectors, Pseudo-Element Selectors, Attribute Selectors, Background Images, The Shorthand background property, like a Rainbow (Gradients), Finally, External Style Sheets, Wrapping It Up. **Thinking Inside the Box:** The Element Box, Specifying Box Dimensions, padding, Borders, Margins, Assigning Display Types, Box Drop Shadows.

Text Book:

1.Leaning Web Design, 5th Edition, by Jennifer Robbins, Released by May 2018, Publisher: O'Reilley Media, Inc.

References:

1.Sams Teach yourself HTML, CSS and JavaScript, by Julie C. Meloni, Publisher: Pearson education, Inc.

2. HTML & CSS design and build websites, by Jon Duckett, Publisher: John Wiley & Sons, In

3. HTML & CSS: The Complete Reference, Fifth Edition, by Thomas A. Powell, Publisher: The McGraw-hill.

Web Resources:

https://www.w3schools.com/html/
https://www.w3schools.com/css/default.asp
https://www.javatpoint.com/html-with-css\

Chapters :

Unit - I: Chapters 1, 2
Unit – II: Chapters 4, 5
Unit - III: Chapters 6, 8, 9
Unit – IV: Chapters 11, 12
Unit - V: Chapters 13, 14

Course designers

Mrs. A.M. Hema

Dr. A. Sharmista

Dr. M.R. Sumathi

THIAGARAJAR COLLEGE, MADURAI - 9.
(Re-Accredited with "A++" Grade by NAAC)

DEPARTMENT OF COMPUTER SCIENCE

(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
U23ATEN11	Introduction to Personality Development	Ability Enhancement Compulsory Course – Soft Skills - I	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	I	25	75	100

Preamble:

This course gives confidence through self-awareness for personality development to transform students as an efficient leaders.

Course Outcomes:

On the successful completion of this course, Students will be able to:

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand the intrapersonal and interpersonal skills	75%	75%
CO2	Analyze and develop sense of self by building confidence.	75%	75%
CO3	Demonstrate one's ability through motivation and personality development.	75%	75%
CO4	Learn to communicate and persuade people in life.	75%	75%
CO5	Develop the ability to lead and build team in workspace.	75%	75%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S-STRONG   M-MEDIUM L-LOW

Mapping of Cos with POs Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	M	M
CO2	S	S	S	M	M	M
CO3	S	S	S	M	M	M
CO4	S	S	S	M	M	M
CO5	S	S	S	M	M	M

S-STRONG   M-MEDIUM   L-LOW

Contents:

UNIT – I: **6 HOURS**

 Soft Skills: Introduction and Importance   - Soft Skills and Hard Skills (Difference)

UNIT – II: **6 HOURS**

Self-Awareness – Confidence Building

UNIT – III: **6 HOURS**

Personality Development – Motivation and Will Power

UNIT – IV: **6 HOURS**

Communication skills – Negotiation Skills

UNIT – V: **6 HOURS**

Leadership skills – Team Building and Managerial Skills

Text Books:

 1. Gupta, Seema. *Soft Skill: Interpersonal and Intrapersonal Skills Development*. V and S Publishers,

 New Delhi: 2019.Print

 2. Sharma, Prashant Soft Skills Personality Development for Life Success. BPS Publications, New Delhi

Reference:

1. Joshi, Gangadhar. *Campus to Corporate: Your Roadmap to Employability*. New Delhi: SAGE Pvt.

Ltd. 2016

Web Resources:

https://www.youtube.com/watch?v=DUlsNJtg2L8andlist=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q

(Soft Skills at NPTEL)

https://www.futurelearn.com/info/blog/what-is-anxiety

https://www.youtube.com/watch?v=C5dyGh3oMVQ (Self-Image Management at TEDx)

https://youtu.be/5x5alGZrLe8 (Will Power and behavioral change)

https://youtu.be/qp0HIF3SfI4 (Leadership skills)

https://www.youtube.com/watch?v=cQruENyLNYIandlist=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH

(Communication Skills at NPTEL)

https://youtu.be/3boKz0Exros (Team building)

Course Designers:

   Dr.G.Rakesh

   Dr. A. Sharmista

THIAGARAJAR COLLEGE, MADURAI – 9
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS23CT21	Java Programming	Core 3	4	1	-	4

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble:

This course enable the students to understand the basic and object oriented concepts of Java, Packages, Interfaces, Exception Handling, Multithreaded Programming, Applets, Event Handling, AWT controls and Swing.

Course Outcomes:

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Understand the basic object-oriented concepts and the basic constructs of Core Java	75%	75%
CO2	Illustrate the concepts of Inheritance, Packages and Interfaces of Core Java	75%	75%
CO3	Apply Exception Handling and Multi-Threading concepts of Core Java.	75%	75%
CO4	Implement Applets and Event Handling.	75%	75%
CO5	Implement AWT and Swing.	75%	75%

Mapping of COs with PSOs :

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	L	L
CO2	M	S	M	M	L
CO3	M	S	M	M	M
CO4	M	S	M	M	S
CO5	M	S	S	M	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	M	M	-	L
CO2	S	S	S	M	-	L
CO3	S	S	S	S	L	M
CO4	S	S	S	S	L	S
CO5	S	S	S	S	L	S

S-STRONG   **M-MEDIUM**   **L-LOW**

Blooms taxonomy:

	CA		End of Semester
	First	Second	
Knowledge-K1	40%	40%	40%
Understand-K2	40%	40%	40%
Apply-K3	20%	20%	20%

Contents:

Unit-I :   **15 Hours**
Introduction: Review of Object Oriented concepts - History of Java - Java Buzzwords – JVM Architecture – Data Types – Variables – Scope and life time of variables – Operators – Control Statements - Simple Java Program**.**
Arrays: One-Dimensional Arrays - Multidimensional Arrays - Alternative Array Declaration Syntax.
Introducing classes: Class fundamentals - Declaring objects - Assigning object reference variables - Introducing methods – Overloading Methods - Constructors – Overloading Constructors - The this Keyword - Garbage collection - The finalize() method – A Stack class.
Unit-II: **15 Hours**
Inheritance: Inheritance basics - Using super - Creating a Multilevel hierarchy - Method overriding - Dynamic method dispatch - Using Abstract classes - Using final with Inheritance - The Object class.
Packages: Defining a Packages - Access protection - Importing packages.
Interfaces: Defining an Interface – Implementation – Extending Interfaces.
Unit-III: **15 Hours**
Exception Handling: Exception Handling fundamentals - try - catch - throw - throws - finally - Built-in Exceptions - Creating own Exception classes.
Multithreaded Programming: The Java Thread Model - Creating a Thread - Creating Multiple Threads – Synchronization - Using synchronized methods - Using synchronized statement.
Unit-IV: **15 Hours**
Applet Fundamentals: Applet Basics - Applet Architecture -Applet Skeleton -Simple Applet display method.
Event Handling: Event Handling Mechanisms - Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events.

Introducing the AWT: AWT classes - Window Fundamentals – Introducing Graphics - Working with color - Working with fonts.

Unit-V: **15 Hours**

Using AWT Controls and Layout Managers: Control fundamentals - Labels - Using buttons - Applying check boxes - CheckBoxGroup - Choice controls - Using List - Managing scroll bars - Using a TextField - Using a Text Area - Understanding Layout Managers.

Swing: Jlabels – JTextFields – JButton – JToggleButton - Check Boxes – Radio Button - JComboBox – JScrollPane – JTable.

Text Book:

Herbert Schildt, 2014, Java The Complete Reference, 9thedition, McGraw Hill Edition

Chapters: (Relevant Topics only)

UNIT – I	: 1, 2, 3, 4, 5, 6, 7
UNIT – II	: 8, 9
UNIT – III	: 10, 11
UNIT – IV	: 23, 24, 25
UNIT – V	: 26, 32

References:

1. CAY S.Horstmann Gary Cornell, 2005, Core JAVA 2 Volume-1 Fundamental, 7thedn, Pearson Education
2. E.Balagurusamy, 2010, Programming with JAVA A Primer, 4thedn, Tata McGraw Hill

Web Resources:

https://www.javatpoint.com/java-tutorial
https://www.guru99.com/java-tutorial.html
https://www.cs.usfca.edu/~parrt/doc/java/JavaBasics-notes.pdf

Course designers:

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THIAGARAJAR COLLEGE, MADURAI – 9
(Re-Accredited with "A++" Grade by NAAC)
DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course Code	Course Title	Category	L	T	P	Credit
UDS23CT22	Linear Algebra	Core 4	4	1	-	4

L-Lecture   T-Tutorial   P–Practical

Year	Semester	Int. Marks	Ext. Marks	Total
I	II	25	75	100

Preamble

This course provides many analytical methods to solve the system of linear equations and the concepts of base and vector space that are crucial to many areas of computer science including image, processing, machine learning, cryptography, optimization and information retrieval.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Explain the basic concept of matrices and system of linear equations	90	85
CO2	Demonstrate understanding of concepts of vector space and subspace	85	75
CO3	Demonstrate the concept of linear mappings and linear operators with matrix representation.	80	75
CO4	Explain the inner product space and analyze the orthogonal bases from Gram Schmidt Orthogonaliztion process	85	75
CO5	Find the eigenvalues and eigenvectors for a given matrix and diagonalizing a given matrix using eigenvalues and eigenvectors.	90	80

Mapping of Coswith PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	M
CO2	S	M	M	M	L
CO3	L	S	S	M	M
CO4	S	M	S	M	M
CO5	S	S	S	S	L

S- STRONG   M-MEDIUM   L-LOW

Mapping of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	S	S	S
CO2	S	M	S	M	S	M
CO3	S	M	M	M	S	S
CO4	M	M	M	S	S	M
CO5	S	S	S	M	S	M

S- STRONG   M-MEDIUM   L-LOW

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Contents

Unit I (15 Hours)
Algebra of Matrices: Introduction – Matrices Addition and Scalar multiplication – Matrix Multiplication – Transpose of a Matrix – Square Matrices – Polynomials in Matrices – Invertible Matrices – Special Types of Square Matrices.
System of Linear Equations: Introduction– Basic Definitions, Solutions– Equivalent Systems, Elementary Operations– Systems in Triangular and Echelon Forms– Gaussian Elimination – Echelon Matrices, Row Canonical Form, Row Equivalence– Gaussian Elimination, Matrix Formulation– Matrix Equation of a System of Linear Equations– Elementary Matrices– LU Decomposition.
Unit II (15 Hours)
Vector Spaces: Introduction– Vector Spaces– Examples of Vector Spaces– Linear Combinations, Spanning Sets– Subspaces – Linear Dependence and Independence– Basis and Dimension– Application to Matrices, Rank of a Matrix– Sums and Direct Sums.

Unit III (15 Hours)

Linear Mappings: Introduction– Mappings, Functions– Linear Mappings (Linear Transformations)– Kernel and Image of a Linear Mapping– Singular and Nonsingular Linear Mappings, Isomorphisms– Operations with Linear Mappings.

Linear Mappings and Matrices: Introduction– Matrix Representation of a Linear Operator – Change of Basis– Similarity.

Unit IV (15 Hours)

Inner Product Spaces, Orthogonality: Introduction– Inner Product Spaces– Examples of Inner Product Spaces– Cauchy–Schwarz Inequality– Orthogonality– Orthogonal Sets and Bases– Gram–Schmidt Orthogonalization Process - Orthogonal and Positive Definite Matrices.

Unit V (15 Hours)

Diagonalization: Eigenvalues and Eigenvectors: – Introduction– Polynomials of Matrices– Characteristic Polynomial, Cayley–Hamilton Theorem– Diagonalization, Eigenvalues and Eigenvectors– Computing Eigenvalues and Eigenvectors, Diagonalizing Matrices– Diagonalizing Real Symmetric Matrices and Quadratic Forms– Minimal Polynomial.

Text Book:

Seymour Loipshutz , Marc Lipson, Linear Algebra, 4th edition , 2009 Mc Graw Hill , Schaum's Outline Series

Unit	Chapter/Section
I	Chapter 2(2.1-2.7, 2.9-2.10), 3(3.1-3.3, 3.5-3.10, 3.12,3.13)
II	Chapter 4(4.1- 4.8, 4.10)
III	Chapter 5(5.1-5.6), 6(6.1-6.4)
IV	Chapter 7(7.1-7.8)
V	Chapter 9(9.1-9.7)

References:

1. Topics in algebra, I.N. Herstein, 2nd edition 2022,Wiley.
2. Abstract algebra by Vijay K Khanna, 5th edition 2022, Vikas Publishing house.
3. Linear algebra and its application, Reprint on 2016 by David CLay, Steven RLay, Judi Mcdonald, Pearson Publication.

Web resources:

1. https://towardsdatascience.com/teach-yourself-data-science-in-2021-math-linear-algebra-6282be71e2b6
2. https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/video_galleries/video-lectures/
3. https://www.youtube.com/playlist?list=PL49CF3715CB9EF31D

Course Designers:

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2. Mr. K. V. Janarthanan

THIAGARAJAR COLLEGE, MADURAI – 9
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS23NT21	Python Programming	Non-Major Elective - II	2	-	-	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	II	25	75	100

Preamble

This course trains the students on the core syntax and semantics of Python programming language and on structuring the data using lists, dictionaries, tuples and sets.

Course Outcomes

On the successful completion of this course, Students will be able to

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand the essence of computational problem solving and its limitations.	60%	70%
CO2	Understand the basics of Python programming language like literals, variables, operators, expressions and data types.	60%	70%
CO3	Develop simple programs using different control structures	60%	70%
CO4	Represent data using lists, dictionaries and sets.	60%	70%
CO5	Understand software objects and develop graphical programs using turtle in Python	60%	70%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	L	L
CO2	S	L	S	M	S
CO3	M	L	L	L	L
CO4	S	L	S	M	S
CO5	S	M	M	L	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs:

B.Sc. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	M	S	S	L
CO2	L	M	M	M	S	L
CO3	L	M	L	M	S	L
CO4	S	M	L	M	S	M
CO5	S	M	L	M	S	S

S-STRONG   M-MEDIUM   L-LOW

B.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	S	S
CO2	M	S	M	M	M	M
CO3	L	M	S	L	M	M
CO4	S	M	M	S	M	S
CO5	S	M	M	S	S	S

S-STRONG   M-MEDIUM   L-LOW

B.B.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	S
CO2	S	L	L	M	S	L
CO3	M	L	L	L	M	M
CO4	S	M	M	L	S	M
CO5	S	M	M	S	M	L

S-STRONG   M-MEDIUM   L-LOW

B.Com. P.O.

#	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	M	S
CO2	L	M	L	L	M
CO3	M	M	L	L	M
CO4	S	S	L	M	S
CO5	S	L	M	M	S

S-STRONG   M-MEDIUM   L-LOW

B.C.A. P.O.

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	S	S
CO2	M	M	M	M	S	S
CO3	M	M	L	M	M	M
CO4	M	L	L	M	M	M
CO5	S	L	M	S	S	S

S-STRONG   M-MEDIUM   L-LOW

Contents:

UNIT: I   **6 Hours**
Introduction: The essence of computational problem solving – Limits of computational problem solving-Computer algorithms-Computer Hardware-Computer Software-The process of computational problem solving.

UNIT: II   **6 Hours**
Python programming language - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / output.

UNIT: III   **6 Hours**

Control Structures: Boolean Expressions - Selection Control - If Statement- Indentation in Python- Multi-Way Selection -- Iterative Control- While Statement- Infinite loops- Definite vs. Indefinite Loops.

UNIT: IV   **6 Hours**

List Structures: List – Common List operations – List Traversal – Lists (Sequences) in Python – Python List Type – Tuples – Sequences - Nested Lists – Dictionaries and Sets: Dictionary Type in Python – Set Data Type.

UNIT: V   **6 Hours**

Objects and their use: Software Objects: Object – Object References - Turtle Graphics: Creating a Turtle Graphics Window – The Default Turtle – Fundamental Turtle Attributes and BehaviorTurtle attributes

Text Book

1. Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem   solving Focus", Wiley India Edition, 2015.

References

1. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education, 2016

2. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th   Edition.

3. Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1 st Edition.

Web References:

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

Chapters :

Unit - I: 1.1 to 1.5
Unit – II: 1.6, 2.1 to 2.4
Unit - III: 3.1 to 3.4
Unit – IV: 4.1, 4.2, 9.1, 9.2
Unit - V: 6.1: 6.1.1, 6.1.2, 6.2: 6.2.1 to 6.2.3

Course designers

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THIAGARAJAR COLLEGE, MADURAI – 9

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DEPARTMENT OF COMPUTER SCIENCE

(For those joined B.Sc. Data Science on or after June 2023)

Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
UDS23SL21	Java Programming Lab	SEC 3- Skill enhancement course	-	-	4	2

L – Lecture   T – Tutorial   P – Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble:

This course enable the students to understand the basic and object oriented concepts of Java, Packages, Interfaces, Exception Handling, Multithreaded Programming, Applets, Event Handling, AWT controls and Swing.

Course Outcomes:

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Create Single and Multidimensional arrays.	75%	75%
CO2	Create user defined packages and to demonstrate interfaces.	75%	75%
CO3	Implement exception handling mechanism and multithreading concepts.	75%	75%
CO4	Develop program using Java applets and Event Handling.	75%	75%
CO5	Develop GUI applications using AWT controls and Swing	75%	75%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	L
CO2	M	S	M	S	M
CO3	M	S	M	S	M
CO4	M	S	S	S	S
CO5	M	S	S	S	S

S-STRONG   M-MEDIUM   L-LOW

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	M	L	-	M
CO2	S	S	S	M	-	S
CO3	S	S	S	S	L	S
CO4	S	S	S	S	L	S
CO5	S	S	S	S	L	S

S-STRONG   M-MEDIUM   L-LOW

Contents:

1. Program to demonstrate Single and Multidimensional arrays.
2. Program to demonstrate Method Overloading.
3. Program to demonstrate Constructor Overloading.
4. Program to demonstrate Single and Multilevel Inheritance.
5. Program to demonstrate Method Overriding.
6. Program to demonstrate Dynamic Method dispatch.
7. Program to demonstrate Interfaces.
8. Program to demonstrate Packages.
9. Program to demonstrate Built-in exception and User-defined exception.
10. Program to demonstrate Multi-threading concept.
11. Program to demonstrate Graphics class.
12. Program to demonstrate Font and Color class.
13. Program to demonstrate basic AWTcontrols i.e. Button, labels, checkbox etc.
14. Program to demonstrate layout manager.
15. Program to demonstrate keyboard events.
16. Program to demonstrate mouse events.
17. Program to demonstrate to demonstrate basic swing controls i.e JLabel, JButton, JTextField, JCombobox etc.

Web Resources:

https://www.javatpoint.com/java-tutorial
https://www.guru99.com/java-tutorial.html

Course Designers:

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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Data Science on or after June 2023)
Programme Code: UDS

Course code	Course Title	Category	L	T	P	Credit
U23ATEN21	Employability Skills	Ability Enhancement Compulsory Course – Soft Skills - II	2	-	-	2

L – Lecture   T – Tutorial P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
I	II	25	75	100

Preamble:

   This course gives importance of socializing, human resources and relationship in order to develop business and work ethics.

Course Outcomes:

On the successful completion of this course, Students will be able to:

#	Description	Expected Proficiency	Expected Attainment
CO1	Understand, develop and exhibit accurate sense of self.	75%	75%
CO2	Learn to control stress and anger to maintain dignity in society	75%	75%
CO3	Demonstrate organizing ability and value of time in work and life.	75%	75%
CO4	Comprehend others feelings and empathize to build unity in society	75%	75%
CO5	Attain competence in managing and handling customers, clients and human resource in general	75%	75%

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

   S– STRONG   M–MEDIUM   L- LOW

Mapping of COs with POs Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	M	M
CO2	S	S	S	M	M	M
CO3	S	S	S	M	M	M
CO4	S	S	S	M	M	M
CO5	S	S	S	M	M	M

S– STRONG   M–MEDIUM   L- LOW

Contents:

UNIT – I: 6 HOURS
Introduction to Self-Image - Personal Grooming
UNIT – II: 6 HOURS
Stress Management - Anger Management
UNIT – III: 6 HOURS
Time Management - Organizational Skills
UNIT – IV: 6 HOURS
Socializing - Being Understanding and Caring
UNIT – V: 6 HOURS
Human Resources Management - Customer Relationship Management

Text Books:

Gupta, Seema. *Soft Skill: Interpersonal and Intrapersonal Skills Development*. V and S Publishers, New Delhi: 2019.Print
 Sharma, Prashant Soft Skills Personality Development for Life Success. BPS Publications, New Delhi

References:

1. Joshi, Gangadhar. *Campus to Corporate: Your Roadmap to Employability*. New Delhi: SAGE Pvt. Ltd. 2016

Web Resources:

https://www.youtube.com/watch?v=C5dyGh3oMVQ
(Self-Image Management at TEDx)
https://www.youtube.com/watch?v=RcGyVTAoXEU
(Stress Management at TEDx)
https://www.youtube.com/watch?v=WXBA4eWskrc
(Time Management at TEDx)

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