B.Sc. Computer Science

Programme Code - UCS

(Aided & SF)

Programme outcome (PO) Bachelor of Science (B.Sc.)

PO1 **Scientific Knowledge and Critical Thinking:**

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

PO2 **Problem Solving:**

Identify and analyse 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.

PO3 **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 technique.

PO4 **Life-Ling 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.

PO5 **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.

PO6 **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.

THIAGARAJAR COLLEGE, MADURAI – 9
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)

V SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ Wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Core 10	UCS20C51	Automata Theory	5	4	75	25	75	100
Core 11	UCS20C52	Software Engineering	5	4	75	25	75	100
Core 12	UCS20C53	Python Programming	4	4	60	25	75	100
Core 13	UCS20C54	Cloud Computing	5	4	75	25	75	100
Core Elective-I	UCS20CE51	Core Elective – I	5	5	75	25	75	100
SEC – I	UCS20SE51	Skill Enhancement Course – I	2	2	30	15	35	50
Core Lab7	UCS20CL51	Python Programming Lab	4	2	60	40	60	100
Total			30	25				650
	UCS20IN	**Internship**		2		**15**	**35**	**50**

VI SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Core 14	UCS20C61	Computer Networks	5	4	75	25	75	100
Core 15	UCS20C62	Open Source Technology	4	4	60	25	75	100
Core 16	UCS20C63	Operating Systems	5	4	75	25	75	100
Core Elective-II	UCS20CE61	Core Elective- II	5	5	75	25	75	100
SEC II	UCS20SE61	Skill Enhancement Course – II	2	2	30	15	35	50
Core Lab8	UCS20CL61	Open Source Technology Lab	4	2	60	40	60	100
Project	UCS20PJ61	Project & Viva Voce	5	4	75	25	75	100
Part V		NCC/NSS/PE		1				
Total			30	26				650

List of Electives

Core Electives

- Data Mining and Warehousing
- Multimedia Technology
- Artificial Intelligence
- E-Commerce Technologies
- Fuzzy Logic

Skill Enhancement Courses

- Office Automation
- Android Programming
- PHP Programming
- Dot Net Programming
- jQuery Scripting
- XML Programming

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DEPARTMENT OF COMPUTER SCIENCE
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Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C51	Automata Theory	Core-10	4	1	-	4

L–Lecture T– Tutorial P–Practical

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

This course is designed to understand the fundamentals of set theory, relations, functions, Graphs and the basic principles of finite automata.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Describe the basic principles of finite automata.	80	75
CO2	Elaborate the concept of Deterministic finite automata and Non-Deterministic finite automata.	76	72
CO3	Solve some simple problems in automata theory.	70	68
CO4	Explain the concept of Parse tree.	72	70
CO5	Gain knowledge about context free grammar and context free language.	75	73

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

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)**

Finite Automata: Finite State Machines and its Model – Deterministic Finite Automata – Simplified Notation – FA with and without Epsilon Transitions – Language of Deterministic Finite Automata – Acceptability of a String by a DFA – Processing of Strings by DFA –Non deterministic Finite Automata – Language of NFA – Equivalence between DFA and NFA

UNIT II **(15 Hours)**

Finite Automata: NFA with and without Epsilon transitions – Two way finite automata –FA with output: Moore and Mealy machines – From finite automata to Moore machine – Interconversion between the machines – Equivalence between Moore and Mealy machines – Minimization of FA – Properties of transition function – Extending Transition function to strings– Applications of Finite automata –Limitations of finitestate machines

UNIT III **(15 Hours)**

Formal Languages: Theory of formal languages – Kleene and Positive closure – Defining languages –Recursive definition of languages -Arithmetic expressions – Grammars – Classification of Grammars and languages – Languages and their relations – Operations on languages– Chomsky Hierarchy

UNIT IV **(15 Hours)**

Regular Language and regular Grammar: Regular language – Regular expressions –Operators of regular expressions – Identity rules – Algebraic laws for RE – Finite automata and regular expressions– Equivalence of two regular expressions.

UNIT V **(15 Hours)**

Context free grammar and context free language: Definition of context free grammar – Context free language – Deterministic context free language – Deterministic context free language (DCFL) – Derivations – Parse trees – From inference to tree- Derivation tree and new notation of arithmetic expressions – sentential forms – Rightmost and leftmost derivation of strings – Ambiguity in Grammar and language.

Text Book

Rajendra Kumar,"**Theory of Automata, Languages and Computation**", 2010,Tata McGraw Hill Educations Private Limited, New Delhi

Chapters

Unit –I : Chapter 2 -2.1 – 2.10

Unit–II : Chapter 2 - 2.11 – 2.21

Unit–III : Chapter 3-3.1 – 3.10

Unit –IV : Chapter 4 –4.1 – 4.7

Unit–V : Chapter 6 - 6.1 – 6.10

Reference Books:

1. John E.Hopcroft JeffreyD.Ullman,2002, **Introduction to Automata theory, Languages and Computation**, Narosa Publishing house, NewDelhi.
2. Peter Linz , **An Introduction to Formal languages and automata** , 2011,Narosa Publishing House, NewDelhi.
3. Dr. M.K. Venkatraman , Dr. N. Sridharan , N.Chandrasekaran, 2009, **DiscreteMathematics**, The National publishing company.

Web Resources:

https://mcdtu.files.wordpress.com/2017/03/introduction-to-automatatheory.pdf
https://www.tutorialspoint.com/automata_theory/

Course Designers:

1. **Dr.B.Arivazhagan**
2. **Mrs S.Karpagam**
3. **Mrs K.Suriya Prabha**

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C52	Software Engineering	Core 11	4	1	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

To introduce the methodologies involved in the development and maintenance of software (i.e) over its entire life cycle.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	To be aware of different software life cycle models. To know the requirement dictation process.	60%	70%
CO2	To analyze the design modelling and software requirements specification.	60%	70%
CO3	To implement various testing strategies and verification, validation techniques.	60%	70%
CO4	To know the metrics of software quality, process and project metrics and analyze it.	60%	70%
CO5	To demonstrate software project planning, project management, project planning models and the risk management strategies.	60%	70%

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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 1: **15 Hours**

Nature of Software - The Software Process - Software Engineering Practice - Software Development Myths - Generic Process Model - Framework Activity- Process Patterns – Prescriptive Process Models - Agile Process Models.

UNIT II: **15 Hours**

Software Engineering Knowledge - Core Principles - Principles for Framework Activity - Requirements Engineering – Establishing the Groundwork - Eliciting Requirements - Developing Use Cases - Requirement Analysis – Scenario Based Modeling – UML Model – Design Process - Design Concepts - Design Model.

UNIT III: **15 Hours**

Software Testing Strategies: A Strategic Approach to Software Testing- Test Strategies for Conventional Software - Validation Testing- System Testing - Testing Conventional Applications: Software Testing Fundamentals- White Box Testing- Basis Path Testing- Control Structure Testing - Black Box Testing - Product Metrics: Framework for Product Metrics-Metrics for Requirement Model.

UNIT IV: **15 Hours**

Project Management Concepts: Management Spectrum – People – Product – Process – Project - W5HH Principle - Process and Project Metrics: Metrics in Process and Project Domains - Software Measurement - Metrics for Software Quality - Integrating Metrics with Software Process.

UNIT V: **15 Hours**

Estimation for Software Projects: Observations on Estimations - Project Planning Process - Scope and Feasibility – Resources - Software Project Estimation - Decomposition Techniques Empirical Estimation Models - Project Scheduling - Defining a Task Set for Software Project – Risk Management: Software Risks - Risk Identification - Risk Projection - Risk Refinement - Risk Mitigation, Monitoring and Management.

Text Book

Roger S.Pressman, Bruce R.Maxim, 2015, Software Engineering- A Practitioner's Approach, 8th edition, McGraw Hill Education.

Chapters

UNIT I : 1.1, 2.2 to 2.4, 3.1, 3.2, 3.4, 4.1, 5.3, 5.5
UNIT II : 7.1 to 7.3, 8.1 to 8.4, 9.1 to 9.3, 12.2 to 12.4
UNIT III : 22.1, 22.3, 22.7, 22.8, 23.1, 23.3, 23.4 – 23.6, 30.1, 30.2
UNIT IV : 31.1 to 31.6, 32.1 to 32.4
UNIT V : 33.1 to 33.7, 34.2, 34.3, 35.2 to 35.6

References

1. Ian Sommerville, 2000, Software Engineering, 6th edition, Pearson education Asia.
2. Pankaj Jalote, 1997, An Integrated Approach to Software Engineering, Springer Verlag.
3. James F Peters and Witold Pedryez, 2000, "Software Engineering – An EngineeringApproach", John Wiley and Sons, New Delhi.
4. Ali Behforooz and Frederick J Hudson,1996, "Software Engineering Fundamentals", OxfordUniversity Press, New Delhi.

Web Resources

https://www.ece.rutgers.edu/~marsic/books/SE/links/
https://unimelb.libguides.com/comsci_softeng_infotech
https://library.iitbbs.ac.in/open-access-e-resources.php

Course Designers

Dr. N. Gnanasankaran
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 2020)

Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C53	Python Programming	Core 12	4	-	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

This course is designed to learn basic concepts of python programming and also dealt with oops concepts, Database Connectivity and Data Science.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Realize the basic concepts of Python.	60%	70%
CO2	Implement application using list, tuples, and dictionaries functions and learn to build user defined functions in python.	60%	70%
CO3	Learn the Concept of Exception, Classes and Objects	60%	70%
CO4	Realize Inheritance and Polymorphism concept. Develop GUI based applications	60%	70%
CO5	Learn how to connect python with MySQL database and implement data science using python	60%	70%

Mapping of COs with PSOs

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

L- LOW M-MEDIUM S-STRONG

Mapping of COs with POs

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

L- LOW M-MEDIUM S-STRONG

Blooms taxonomy

	CA		End of Semester
	First	Second	
Knowledge-K1	20	20	44
Understand-K2	21	21	44
Apply-K3	11	11	22
Total Marks	52	52	110

Content

Unit-I: **11 Hours**

Introduction to Python:

Python-Features of Python- Execution of a Python Program- Viewing the Byte Code- Python Virtual Machine (PVM) – Memory Management in Python.

Data Types in Python: Numeric-Boolean-Sequences in python -Sets-Identifiers and Reserved words.

Operators in Python: Membership and Identity Operators.

Input and Output: Input Statements- Output Statements.

Control Statements: The if statements- The if…else statements- The if..elif statements – The while Loop- The for Loop- Nested Loops- break, continue and pass statements.

Unit-II: **10 Hours**

Lists, Tuples - Dictionaries.

Functions: Defining a function – Calling a function – Returning Results from a function – Returning multiple values from a function – Pass by Object Reference – Recursive function- Anonymous or Lambdas.

Unit-III: **10 Hours**

Exceptions: Errors in Python programs – Exceptions - Exception Handling – Types of Exceptions – The Except Block – User Defined Exceptions.

Classes and Objects: Creating a class – The self-variable – Constructors – Types of Methods – Inner Classes.

Unit-IV: **15 Hours**

Inheritance and Polymorphism: The super() method – Types of Inheritance – Polymorphism – Operator overloading – Method Overloading – Method Overriding.

Graphical User Interface using Tkinter:

GUI in python-The Root Window-Fonts and Colors-Working with Containers-Canvas-Frame-Widgets-Button Widget-Arranging Widgets in the Frame-Label Widget-Message Widget-Text Widget Scrollbar Widget-Check button Widget-Radio button Widget-Entry Widget-Spin box Widget-List box Widget-Menu Widget-creating Table.

Unit-V: **14 Hours**

Python's Database Connectivity

DBMS- Advantages of a DBMS over Files-Types of Databases Used with Python- Installing of MySQLdb Module- Verifying the MySQLdb interface installation- Working with MySQL Database- Using MySQL from Python- Retrieving All Rows from a table- Insert, Delete, Update in a table- Creating Databases tables through Python.

Data Science using Python

Data Frame- Creating Data Frame from an Excel Spreadsheet, .csv files- Data Visualization- Bar Graph- Creating a Pie Chart- Creating Line Graph.

Text Book

1. Title: Core Python Programming
Author: Dr. R.Nageswara Rao
Publisher: Dreamtech Press
Edition: second

Chapters

Unit-I : Chapter 1,3,4,5,6 **(Relevant Topics Only)**
Unit-II : Chapter 10,11,19 **(Relevant Topics Only)**
Unit-III : Chapter 16,13 **(Relevant Topics Only)**
Unit-IV : Chapter 14,22
Unit-V : Chapter 24,25 **(Relevant Topics Only)**

References

1. E. Balagurusamy, "Problem Solving and Python Programming" Mc Graw Hill Education 2018
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist",1st Edition 2012, O'Reilly.
3. Jeff McNeil ,"Python 2.6 Text Processing: Beginners Guide", 2010 ,Packet Publications
4. Mark Pilgrim ,"Dive Into Python " , 2nd edition 2009, Apress
5. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson, reprint 2010.

Web Resources

https://www.learnpython.org/
https://www.tutorialspoint.com/python/
https://www.programiz.com/python-programming/tutorial

Course Designer

Mrs.SM.Valli
Mr.R.Chandrasekar

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C54	Cloud Computing	Core 13	4	1	-	4

L - Lecture T - Tutorial P - Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

This course will introduce the basic concepts related to cloud computing technologies, architecture and different cloud models. It will explore on different cloud programming platforms such as Google app Engine, Amazon Web Services (AWS) and Microsoft Azure and explore with some cloud applications. This course give an opportunity to the student to get an exposure to cloud platform.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Gain knowledge about Cloud Computing and its challenges	60%	70%
CO2	Familiar with the concepts of Virtualization	60%	70%
CO3	Acquire knowledge on various cloud models, architecture and services	60%	70%
CO4	Elaborate components of various cloud services like Amazon Web Services, Microsoft Azure & Google Cloud platform	60%	70%
CO5	Understand and gain awareness about recent cloud applications	60%	70%

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

Introduction: Cloud Computing at a Glance - The Vision of Cloud Computing- Defining a Cloud - Cloud Computing Reference Model - Characteristics and Benefits - Historical Developments - Distributed Systems - Virtualization - Web 2.0 - Service Oriented Computing - Utility Oriented Computing - Building Cloud Computing Environments - Application Development - Infrastructure and System Development - Computing Platforms and Technologies - Amazon Web Services - Google AppEngine- Microsoft Azure - Hadoop - Force.com and Salesforce.com -Manjrasoft Aneka.

Unit-II: **15 Hours**

Virtualization: Introduction - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Execution Virtualization - Other Types of Virtualization - Virtualization and Cloud Computing - Pros and Cons of Virtualization -Technology Examples - Xen: Paravirtualization - VMWare: Full Virtualization -Microsoft Hyper-V.

Unit-III: **15 Hours**

Cloud Computing Architecture: Introduction - Cloud Reference Model - Architecture - Infrastructure / Hardware as a Service - Platform as a Service - Software as a Service- Types of Clouds - Public Clouds - Private Clouds - Hybrid Clouds - Community Clouds - Economics of the Cloud - Open Challenges - Cloud Definition - Cloud Interoperability and Standards -

Scalability and Fault Tolerance - Security, Trust and Privacy - Organizational Aspects.

Unit-IV: **15 Hours**

Cloud Platforms in Industry: Amazon Web Services - Compute Services - Storage Services -Communication Services - Additional Services - Google App Engine - Architecture and Core Concepts - Application Life Cycle - Cost Model -Microsoft Azure- Azure core concepts - SQL Azure - Windows Azure Platform Appliance

Unit-V: **15 Hours**

Cloud Applications: Scientific Applications - Healthcare: ECG Analysis in the Cloud - Biology: Protein Structure Protection - Biology: Gene Expression Data Analysis for Cancer Diagnosis - Geoscience: Satellite Image Processing- Business and Consumer Applications - CRM and ERP - Productivity - Social Networking - Media Applications - Multiplayer Online Gaming.

Text Book:

Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, reprint 2019, Mastering CloudComputing, McGraw Hill Education Private Limited, India

Chapters

UNIT - I : 1
UNIT - II : 3
UNIT - III : 4
UNIT - IV : 9
UNIT - V : 10

References Books

1. M.N.Rao, 2015, Cloud Computing, 1st Edn, PHI Learning PrivateLimited, India.
2. Aravind Doss, Rajeev Nanda, Cloud Computing:A Practitioner's Guide,1st Edn, McGraw Hill Education Private Limited, India

Web resources

https://azure.microsoft.com/en-in/overview/what-is-cloud-computing/
https://aws.amazon.com/what-is-cloud-computing
https://www.javatpoint.com/virtualization-in-cloud-computing
https://www.vmware.com/pdf/vi3_35/esx_3/r35u2/vi3_35_25_u2_intro_vi.pdf
https://snscourseware.org/snscenew/files/1570845125.pdf

Course Designers

Mrs.A.M.Hema
Mrs.K.Sharmila

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20CL51	Python Programming Lab	Core Lab 7	-	-	4	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V	40	60	100

Preamble

This course is designed to develop python programs using OOPs, List, tuple, set, dictionaries,widgets concepts and also dealt with MySQL database connectivity.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Develop applications using control statements, membership and identity operators.	70	70
CO2	Implement applications using set, list, tuple, dictionaries and Exception handling	70	70
CO3	Develop applications using OOPs concepts in python	70	70
CO4	Create GUI applications using widgets and menu bar	70	70
CO5	Develop interactive applications using MySQL database and to create application using data frame and data visualization	70	70

Mapping of COs with PSOs

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

L- LOW M-MEDIUM S-STRONG

Mapping of COs with POs

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

L- LOW M-MEDIUM S-STRONG

Content

1. Program to demonstrate membership and Identity operators
2. Program to demonstrate Control statements.
3. Program to demonstrate built-in and user defined functions
4. Program to demonstrate list and its operations and functions.
5. Program to demonstrate Set operations
6. Program to demonstrate tuple and its operations and functions
7. Program to demonstrate dictionaries and its operations and functions.
8. Program to demonstrate Exception Handling
9. Program to demonstrate Classes and Objects.
10. Program to demonstrate Constructors.
11. Program to demonstrate inner classes.
12. Program to demonstrate Single and Multiple inheritance.
13. Program to demonstrate Operator Overloading.
14. Program to demonstrate Method Overloading.
15. Program to demonstrate Method Overriding.
16. Program to demonstrate various widgets.
17. Program to demonstrate menu bar
18. Program to demonstrate MySQL Database connectivity, insert, delete, update datain a table.
19. Program to demonstrate data frame and its functions.
20. Program to demonstrate Bar graph, Line graph and Pie Chart.

Course Designer

Mrs.SM.Valli Mr.R.Chandrasekar

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C61	Computer Networks	Core 14	4	1	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

The aim of this course is to discuss and explain about basics of data communication and networking concepts. Some of the major topics which are included in this course are the OSI reference model, TCP/IP implementation, LANs, WANs, internetworking technologies, Routing and Addressing. Gain the Knowledge in Cryptography and Network Security.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Recognize the working principles of computer networks, Distinguish OSI model & TCP/IP protocol suite	60%	70%
CO2	Know about the types of transmission medium, Summarize various error detection & error correction code	60%	70%
CO3	Summarize various controls of data link layer, Learn the structure of Ethernet	60%	70%
CO4	Acquire the knowledge in IPv4 Addresses, Describe the concepts of routing algorithms, Learn about transport layer functionalities.	60%	70%
CO5	Learn functionalities of Application Layer, Enrich their knowledge in Cryptography and Network Security	60%	70%

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PO6
CO1	**M**	**-**	**-**	**-**	**S**	**-**
CO2	**-**	**M**	**L**	**-**	**-**	**-**
CO3	**M**	**-**	**S**	**-**	**L**	**-**
CO4	**M**	**-**	**-**	**-**	**L**	**L**
CO5	**-**	**-**	**S**	**M**	**L**	**M**

L – LOW M- MEDIUM S-STRONG

Mapping of COs with POs

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

L – LOW M- MEDIUM S-STRONG

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**

Introduction - Data communications – Networks – Network Types**.**
Network models – Protocol Layering – TCP/IP protocol suite – The OSI Model.

Unit-II: **15 Hours**

Transmission media: Introduction - Guided Media - Unguided media.
Error detection and correction: Introduction - Block coding - Cyclic Codes - Checksum.

Unit-III: **15 Hours**

Data Link control: DLC Services – Datalink Layer Protocols.
Wired LANs: Ethernet: Ethernet Protocol-Standard Ethernet.

Unit-IV: **15 Hours**

Introduction to Network layer: Network Layer services- Network Layer Performance- IPv4 Addresses.
Unicast Routing: Routing Algorithms- Distance vector Routing & Link state Routing
Introduction to Transport layer: Introduction – Transport Layer Protocols.

Unit-V: **15 Hours**

Standard Client Server Protocols: FTP - Electronic Mail – Domain Name System (DNS).
Cryptography and Network Security: Introduction – Confidentiality – Other Aspects of Security.

Text Book

Behrouz A.Forouzan, 17th reprint 2019, Data Communications and Networking, 5th edn, McGraw Hill Publishing Company Limited.

Chapters

Unit-I: 1.1 to 1.2, 2.1 to 2.5
Unit-II: 7.1 to 7.2, 8.1, 8.4, 10.1 to 10.5
Unit-III: 11.1 to 11.5, 13.1 to 13.2
Unit-IV: 19.1, 20.1, 20.2 22.3 (Page no: 660-674).
Unit-V: 23.1 to 23.3, 25.2, 26.1 to 26.3

References

1. Andrew S.Tanenbaum, 2004, Computer Networks, 4thedn, Prentice Hall of India Pvt Ltd.
2. Prakash C.Gupta, 2006, Data Communications and Computer Networks, Prentice Hall of India Pvt Ltd.

Web Resources

https://www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
http://elearning.ascollegelive.net/studyMaterial/bca/bca_3rd_year/Networking%20Notes.pdf
http://www.di.unipi.it/~bonucce/11-Datacommunication.pdf

Course Designer

Mr.R.Chandrasekar
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 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C62	Open Source Technology	Core 15	4	-	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

This Course used to understand the difference between open-source software and commercial software. It is used for development of web application using open-source technology.

Course Outcomes

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

#	Course Outcome	Expected Proficiency(%)	Expected Outcome(%)
CO1	Understand the basic of open-source software	65	60
CO2	Elaborate Linux with essential processing	65	60
CO3	Demonstrate APACHE working process.	65	60
CO4	Learn open source MYSQL with commands	65	60
CO5	Apply PHP scripting for open source technology Processing	65	60

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

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

Blooms taxonomy:

	CA		End of Semester
	First	**Second**	
Knowledge	**40%**	**40%**	**40%**
Understand	**40%**	**40%**	**40%**
Apply	**20%**	**20%**	**20%**

Content

UNIT I **12 Hours**

INTRODUCTION:

Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions

UNIT II **12 Hours**

LINUX:

Introduction to Linux Essential Commands - Filesystem Concept - Standard Files, The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction, String Processing - Investigating and Managing Processes - Network Clients - Installing Application

UNIT III **12 Hours**

APACHE:

Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess

UNIT IV **12 Hours**

MYSQL:

Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT V **12 Hours**

PHP:

Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code - Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

Text Book

James Lee and Brent Ware ,"Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", , Dorling Kindersley(India) Pvt. Ltd, 2008.

Chapters:

Unit	Chapters
I	Chapter 1
II	Chapter 2
III	Chapter 3
IV	Chapter 5
V	Chapter 12

References

1. S.Chand, Operating Systems – A Practical Approach, 4th edn.

Web Resources:

https://www.javatpoint.com/linux-tutorial
https://www.guru99.com/apache.html
https://www.tutorialspoint.com/mysql/index.htm
https://www.w3schools.com/php/

Course Designers:

Dr. G.Rakesh
Mr J.Prakash

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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20C63	Operating Systems	Core 16	4	1	-	4

L–Lecture T– Tutorial P –Practical

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

The course facilitates the students to familiarize the basic concepts of operating systems and its functionalities, services and management policies with process, memory, file and disk.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Explain the need of operating system, its components and evolution.	70%	60%
CO2	Introduce the concept of process, operations on process and CPU scheduling.	70%	60%
CO3	Acquire the knowledge of process synchronization and deadlock concept.	70%	60%
CO4	Enrich their knowledge in memory management concept and management techniques.	70%	60%
CO5	Describe the File concepts and Disk scheduling methods	70%	60%

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

Content

Unit-I Introduction to OS and OS Structure: **15 Hours**

Introduction : OS Concepts- Batch Systems- Multi programmed Systems- Time sharing Systems- Desktop systems – Multiprocessor Systems - Distributed Systems.

System Structure: System Components- System Calls.

Unit-II Process and Scheduling: **15 Hours**

Process: Process concept- Process Scheduling- Operations on Process- Co-operating Processes- Interprocess Communication

CPU Scheduling: Basic Concepts- Scheduling Criteria-Scheduling Algorithms.

Unit-III Process Synchronization and Deadlock: **15 Hours**

Process Synchronization: Background- The Critical Section Problem. Deadlock: Deadlock characterization-Methods for handling Deadlocks -Deadlock Prevention- Deadlock Avoidance - Deadlock Detection and Recovery from Deadlock.

Unit-IV Memory Management and Virtual Memory: **15 Hours**

Memory Management: Background - Swapping - Contiguous Memory Allocation - Paging-Segmentation.

Virtual Memory: Background- Demand Paging-Page Replacement- Allocation of Frames-Thrashing.

Unit-V File System and Disk Scheduling: **15 Hours**

File System: File Concepts-Access Methods-Allocation Methods- FreeSpace Management.

Disk Scheduling: Disk Structure-Disk Scheduling- FCFS Scheduling- SSTF Scheduling-SCAN and CSCAN Scheduling- LOOK and CLOOK Scheduling.

Text book

Silberschatz, A., Galvin, P. B., Gagne, G. (2008), Operating System Concepts, 6th edn, Wiley-India (P) Ltd.,New Delhi.

Chapters (Relevant Topics only)

Unit-I	: 1.1 to 1.5, 3.1,3.3
Unit-II	: 4.1 to 4.5, 6.1 to 6.3
Unit-III	: 7.1, 7.2, 8.2 to8.7
Unit-IV	:9.1to9.5,10.1,10.2,10.4to10.6
Unit-V	: 11.1, 11.2, 12.4, 12.5, 14.1, 14.2

Reference

1. William Stallings,2000, Operating Systems,2nd edn, PHI Prentice Hall,NewDelhi
2. Achyut S Godbole, Operating systems, McGraw-Hill,3rd edn
3. Harvey M Deitel, 1984, “An Introduction to operating system” Addison Wesley Publishing Co.NewYork.

Web Resources

https://nptel.ac.in/downloads/106108101/http://
williamstallings.com/Extras/OS-
Notes/notes.html
https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdfhttps://lecturenotes.in/subject/56/operating-systems-os

Course designer:

Dr.K.Natarajan
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THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20CL61	Open Source Technology Lab	Core Lab – 8	-	-	4	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	VI	40	60	100

Preamble

This course provides the knowledge of Open source technology usage in computational process

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Learn Open-source OS installation	70	65
CO2	Acquire Database Open-source installation	70	65
CO3	Enrich Web based Open-Source installation	70	65
CO4	Illustrate Open-Source Connectivity	70	65
CO5	Understand Python Programming	70	65

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Content

1. Linux installation
2. My SQL installation
3. Apache server installation
4. Linux shell program for loop condition
5. Linux Shell Program for case condition
6. Linux shell program for function
7. Linux program for make directory
8. Linux shell program for wait and sleep command
9. Linux shell program for File processing
10. PHP and MY SQL Connectivity

References

1. S.Chand, Operating Systems – A Practical Approach, 4th edn.
2. Launa Thomson and Duke welling, PHP and MySQL web development, edition 2009.

Web Resources

https://ittutorials.net/open-source/

Course designer:

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Mr.J.Prakash

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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course Code	Course Title	Category	L	T	P	Credit
UCS20CE51/61	Data Mining and Warehousing	**Core Elective**	**5**	**-**	**-**	**5**

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	V/VI	25	75	100

Preamble

The course provides the knowledge of Database Management principles, the various Data Mining Techniques such as Association rule mining, Clustering, Decision trees and also introduces Rough set theory principles.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall some basic Database management principles and understand the concept of Data Mining and Data warehousing	80	75
CO2	Explain Data Mining Techniques Summarize the issues and Challenges in Data Mining	85	75
CO3	Describe Association rule mining technique and apply it to mine rules from some data sets	80	75
CO4	Illustrate Clustering algorithms and apply it to solve some problems	85	70
CO5	Describe Decision tree algorithms and Recall Rough set theory principles	80	75

Mapping of COs with PSOs

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

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	M	S	M	S
CO3	S	M	M	M	S	M
CO4	S	S	M	M	**S**	**M**
CO5	S	M	S	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%**

Data Mining and Warehousing

Unit I **15 Hours**

DATA WAREHOUSING: Introduction – Data Warehouse Architecture – Dimensional Modelling – Categorisation of Hierarchies – Aggregate Function – Summarisability – Fact Dimension Relationship - OLAP operations – Lattice of Cuboids – OLAP Server – ROLAP – MOLAP .

Unit II **15 Hours**

DATA MINING: Introduction - What is Data Mining? – Data Mining: Definitions – KDD vs. Data Mining – DBMS vs. DM – Other Related Areas – DM Techniques - Other Mining Problems – Issues and Challenges in DM – DM Application Areas – DM Applications –Case Studies – Conclusion.

Unit III **15 Hours**

ASSOCIATION RULES: Introduction **–** What is an Association Rule? – Methods to Discover Association Rules – Apriori Algorithm – Partition Algorithm – Pincer – Search Algorithm – Dynamic Itemset Counting Algorithm – FP- tree Growth Algorithm – Éclat and dEclat – Rapid Association Rule Mining – Discussion on Different Algorithms – Incremental Algorithm – Border Algorithm – Generalized Association Rule – Association Rules with Item Constraints - Summary.

Unit IV **15 Hours**

CLUSTERING TECHNIQUES : Introduction - Clustering Paradigms – Partitioning Algorithms – k – Medoid Algorithms – CLARA – CLARANS –Hierarchical Clustering – DBSCAN –BIRCH – CURE – Categorical Clustering Algorithms – STIRR – ROCK – CACTUS – Conclusion .

Unit V **15 Hours**

DECISION TREES: Introduction **-** What is a Decision Tree? – Tree Construction Principle – Best Split – Splitting Indices – Splitting Criteria – Decision Tree Construction Algorithms – CART – ID3 – C4.5 – CHAID – Summary

ROUGH SET THEORY : Introduction – Definitions – Example – Reduct- Propositional

Reasoning and PIAP to Compute Reducts

Text Book:

Arun K Pujari, 2017 Data Mining Techniques, 4th Edition , Universities Press Private Limited, Hydrabad

Chapters:

Unit	Chapter/Section
I	2 (2.1- 2.12)
II	3 (3.1- 3.12)
III	4 (4.1 – 4.16)
IV	5 (5.1 – 5.15)
V	6 (6.1 – 6.12) & 7 (7.1 – 7.5)

References:

1. G.K. Gupta, 2014 , Introduction to Data Mining with Case studies, Third Edition , PHI Learning Private Limited, Delhi
2. Jiawei Han , Micheline Kamber , Jian Pei , 2012, Data Mining Concepts and Techniques , Third Edition, Morgan Kaufmann Publishers, An Imprint of Elsevier , New Delhi.
3. Ian H.Witten , Eibe Frank, Mark A. Hall, Christopher J. Pal ,2016, Data Mining Practical Machine Learning Tools and Techniques, Fourth Edition, Morgan Kaufmann Publishers, Imprint of Elsevier , New Delhi.

Course Designers:

1. Dr. B. Arivazhagan
2. Mrs. S.Shanavas Parvin

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20CE51/61	Multimedia Technology	Core Elective	5	-	-	5

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V/V1	25	75	100

Preamble

This course is to understand the practical use of multimedia in delivering information and to provide knowledge for developing multimedia products by acquiring, integrating and producing the various multimedia elements.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Prepare multimedia professionals equipped with artistic expression and creativity.	60%	70%
CO2	Identify and describe the functions of the general skill sets in the multimedia industry.	60%	70%
CO3	Identify the basic component of a multimedia project.	60%	70%
CO4	Identify the basic hardware and software requirement for multimedia development and playback.	60%	70%
CO5	Learn various multimedia authoring tools.	60%	70%

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

Content

Unit-I

Introduction: **15 Hours**

Objectives – Brief History of Multimedia – What Is Multimedia? – Resources for Multimedia Developers – Types of Products – Evaluations – Operating Systems and Software – Multimedia Computer Architecture.

Unit-II

Text and Graphics: **15 Hours**

Elements of Text – Text Data Files – Using Text in Multimedia Applications –Hypertext - Elements of Graphics – Images and Color – Graphics File and Application Formats –Obtaining Images for Multimedia Use – Using Graphics in Multimedia Applications.

Unit-III

Digital Audio: **15 Hours**

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

Unit-IV

Digital Video and Animation: **15 Hours**

Background on Video – Characteristics of Digital Video – Digital Video data sizing– VideoCapture and Playback Systems – Computer Animation – Using Digital Video in MultimediaApplications.

Unit-V

Product Design and Authoring Tools: **15 Hours**

Building blocks – Classes of Products – Content Organizational Strategies – Story Boarding– Selecting the Right Authoring Paradigm.

Text Books

David Hillman, Multimedia Technology and Applications, Reprint 2013,Galgotia Publications Pvt. Ltd 1998.

Chapters

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

Reference Book:

1. Tay Vaughan, Multimedia making it work, McGraw Hill Company,Eighth Edition 2010.
2. James E.Suman, Multimedia in Action, Vikas Publishing House 1997

Web Resources:

https://www.baschools.org
https://www.slideshare.net/fareedurrahman/multimedia-technologies-introduction

Course Designer:

Dr.A.Sharmista

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20CE51/61	Artificial Intelligence	Core elective	5	-	-	5

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V/VI	25	75	100

Preamble

To learn the important features of Artificial Intelligence and expert systems, its programming predicates of knowledge based system development and problem solving systems.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	To be aware of the Important of Artificial Intelligence and Knowledge based systems.	60%	70%
CO2	To Analyse the various AI programming languages and its functionalities	60%	70%
CO3	To study in depth about the Knowledge Representation and Knowledge Organization and its techniques	60%	70%
CO4	To Implement natural language processing techniques and its pattern recognition	60%	70%
CO5	To demonstrate the detailed concepts of knowledge acquisition and machine learning principles	60%	70%

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Blooms taxonomy:

	CA		End of Semester
	First	Second	
Knowledge	40%	40%	60%
Understand	40%	40%	60%
Apply	40%	40%	60%

Content:

Unit 1: Overview of AI and General Concepts: 15 Hours

AI, Importance, History of AI, Related fields, Importance of Knowledge, Knowledge based systems, Representation of Knowledge, Knowledge Organization, Manipulation and acquisition. LISP Programming: Syntax and Numerical functions, Manipulation functions in LISP, Functions predicates and conditionals, PROLOG and other AI programming Languages.

Unit 2: Knowledge Representation: 15 Hours

Formalized symbolic Logics- Syntax and semantics for propositional logic, Syntax and semantics for FOPL, Properties of Wffs, Interference rules, Resolution principles, Dealing with Inconsistency – Truth maintenance systems, Default reasoning and closed world assumption, Predicate completion and circumscription, Modal and temporal logics.

Unit 3: Knowledge Organization and Manipulation: 15 Hours

Search and Control strategies: Primary concept, Examples of search problems, Uniformed and blind search, Informed search, Search AND OR graphs. Matching techniques: Structures used in matching, Measures of matching, Matching patterns, Partial matching, Fuzzy matching algorithm, RETE matching algorithm, Indexing and retrieval Techniques.

Unit 4: Natural Language Processing and Expert systems: 15 Hours

Overview of Linguistics, Grammars and Languages, Basic Parsing techniques, Semantic analysis and representation structures, Natural Language systems, Recognition and classification process, Learning classification patterns, Speech recognition and understanding, rule based system architectures, Non production system architecture, Knowledge system building tools.

Unit 5: Knowledge Acquisition: 15 Hours

Types of Learning, General Learning model, Performance measures, Perceptron's, Checker playing, Learning automata and genetic algorithms.

Text Book:

Introduction to Artificial Intelligence and Expert systems "DAN. W. PATTERSON", 2005-06, PRENTICE HALL OF INDIA Pvt Ltd.

Chapters:

Unit	Chapter
I	Chapters 1 to 3
II	Chapters 4 and 5
III	Chapter 9 to 11
IV	Chapters 12, 13 and 15
V	Chapters 16 and 17

References:

- Graham, (1996). ANSI Common LISP, Prentice Hall.
- Nilson N.J., (1980). Principles of Artificial Intelligence, Berlin: Springer Verlag.
- Rich, E & Knight, (2003). Artificial Intelligence, Tata McGraw Hill Publications Rolston.D.W, Principles of AI & Expert System Development, Tata MacGraw Hill Publications.

Web Resources

1. https://libguides.wilmu.edu/AI/library
2. https://libguides.mskcc.org/artificial_intelligence/libraryresources
3. https://www.researchgate.net/publication/327831852_Artificial_Intelligence_and_its_applications_in_Libraries
4. https://www.elsevier.com/connect/resource-center/artificial-intelligence

Course Designer:

Dr. N. Gnanasankaran

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 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20CE51/61	E-Commerce Technologies	Core elective	5	-	-	5

L – Lecture T – Tutorial P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
III	V/VI	25	75	100

Preamble:

The aim of the course is to introduce the students of understanding the fundamental principles of e- Business and e-commerce and the role of management, the underlying used technologies with emphasis on Internet Technologies and examines the internet security and security tools.

Course Outcomes

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

#	Description	Expected Proficiency	Expected Attainment
CO1	Characterizes basic business models on the web and scope of E-Commerce and its applications.	60%	70%
CO2	Recognize the impact of information and communication Technologies, especially of the internet in business operations.	60%	70%
CO3	Illustrate the internet security infer with the security algorithms.	60%	70%
CO4	Explain the concepts of EDI and types of electronic payment system.	60%	70%
CO5	Extend the electronic security by make use of security tools and network security	60%	70%

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

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

S-STRONG M-MEDIUM L-LOW

Bloom's 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**

An introduction to Electronic commerce: What is E-Commerce, Main activities of E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications. **E-Commerce Models** :Electronic Commerce and Electronic Business(B2B, B2C)

UNIT II **15 Hours**

The Internet: Evolution of Internet, Components of Internet world, Categories of Network, Internet Service Provider, Applications Service Providers, World Wide Web, Internet Functions. **Portals:** Electronic Commerce Portals, B2B Portals. **Building own website**: Reasons for building your own website –ideal website-Domain registration -Web promotion.

UNIT III **15 Hours**

Internet Security: Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime, Specific Threats, Attack on Computer System, Software Packages, Hacking, Encryption and Decryption, DES, Public Key Encryption, RSA, Internet Security, Firewall, Digital Signature.

UNIT IV **15 Hours**

Electronic Data Exchange: Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model. **Electronic Payment System**: Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment system.

UNIT V **15 Hours**

E-Security: Introduction–Electronic Security–Attacking Methods- Security Practices– Secure Electronic Transaction (SET) - Security Tools –Network Security – Electronic Commerce Act-Virtual Private Network.

Text Book

C.S.V.Murthy, 2017, E-Commerce Concepts –Models- Strategies, Himalaya Publishing House.

Chapters (Relevant Topics Only)

UNIT – I : 2, 3
UNIT – II : 4, 5, 9
UNIT – III 10
UNIT – IV : 20, 21
UNIT – V 22

Reference

1. Gray P. Schneider, 2011, Electronic commerce, International Student Edition.
2. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang,2011, E-Commerce, Fundamentals and Applications, Wiely Student Edition

Web Resources

https://www.tutorialspoint.com/e_commerce/
https://www.thecounty.ca/media/petcounty/documents/department/developing/a WhatisE-Commerce.pdf

Course designer

Dr.R.Sandha

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 2020)
Programme Code: UCS

Course Code	Course Title	Category	L	T	P	Credit
UCS20CE51/61	Fuzzy Logic	**Core Elective**	**5**	**-**	**-**	**5**

L - Lecture T – Tutorial P – Practical's

Year	Semester	Int. Marks	Ext. Marks	Total
III	V/VI	25	75	100

Preamble

The course provides the knowledge of Propositional Logic and Predicate Logic. It introduces the principles of Fuzzy set theory and Fuzzy logic. Fuzzy logic has been used in numerous applications such as facial pattern recognition, air conditioners, washing machines, vacuum cleaners, transmission systems and unmanned helicopters etc.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall some basic Propositional logic and Predicate logic principles and Solve some problems	80	75
CO2	Explain Fuzzy set theory principles, solve some problems based on Operations on Fuzzy sets.	75	70
CO3	Describe Operations on Fuzzy relations , Alpha cuts of a Fuzzy relation and Projections of Fuzzy relations	80	75
CO4	Demonstrate Fuzzy propositions and their interpretations in terms of Fuzzy sets and Make use of it solve some problems	80	70
CO5	Describe Fuzzy expert systems, Compare classical Control theory vs Fuzzy control and outline Fuzzy methods in decision making.	80	75

Mapping of COs with PSOs

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

PROPOSITIONAL LOGIC

Introduction – Syntax of PL(1) – Semantics of PL(1) – Certain Semantic Properties- Certain Properties Satisfied by the Connectives – Inference Rules – Derivation – Resolution

PREDICATE LOGIC

Introduction – Syntax of PL (2) – Semantics of PL (2) – Semantic Properties – Certain Properties Satisfied by the Connectives and Quantifiers – Derivations - Resolution in PL (2)

Unit II **15 Hours**

FUZZY SET THEORY

Introduction – Concept of a Fuzzy Set – Relations between Fuzzy Sets – Operations on Fuzzy Sets – Properties of the Standard Operations – Certain Numbers Associated with a Fuzzy Set – Certain Crisp Sets Associated with a Fuzzy Set – Certain Fuzzy Sets Associated with a Given Fuzzy Set-Extension Principle

Unit III **15 Hours**

FUZZY RELATIONS

Introduction – Fuzzy Relations – Operations on Fuzzy Relation - α - Cuts of a Fuzzy Relation – Composition of Fuzzy Relations – Projections of Fuzzy Relations – Cylindric Extensions – Cylindric Closure- Fuzzy Relation on a Domain

Unit IV **15 Hours**

FUZZY LOGIC

Introduction - Three –valued Logics – N valued Logics for $N \geq 4$ – Infinite valued Logics – Fuzzy Logics – Fuzzy Propositions and their Interpretations in Terms of Fuzzy sets – Fuzzy Rules and Their Interpretations in Terms of Fuzzy Relations – Fuzzy Inference or Approximate Reasoning – More on Fuzzy Inference – Generalizations of Fuzzy Logics

Unit V **15 Hours**

FUZZY METHODS IN CONTROL THEORY

Introduction – Introduction to Fuzzy Logic Controller – Fuzzy Expert Systems – Classical Control Theory vs Fuzzy Control= Illustrative examples – Working of an FLC through Examples – Details of the Components of FLC – Mathematical Formulation of an FLC – Real –life Examples

FUZZY METHODS IN DECISION MAKING

Introduction - Introduction to Decision Making – Introduction to Fuzzy Methods in Decision Making

Text Book:

Ganesh M , 2009, Introduction to Fuzzy Sets and Fuzzy Logic , PHI Learning Private Limited, New Delhi

Chapters

Unit	Chapter/Section
I	2 (2.1- 2.8) & 3 (3.1 – 3.7)
II	6 (6.1 – 6.9)
III	7(7.1 – 7.9)
IV	8 (8.1 – 8.10)
V	9 (9.1 – 9.9) & 10 (10.1 – 10. 3)

References:

1. H.J. Zimmermann , 2010, Fuzzy Set theory and its Applications , Fourth Edition, Springer International Edition , New Delhi
2. Hung T. Nguyen , Elbert A . Wlaker ,2009 A First Course in Fuzzy Logic , Third Edition Chapman & Hall/ CRC , Taylor & Fransis Group , Chennai .
3. George J. Klir/ Bo Yuan ,2002, Fuzzy Sets and Fuzzy Logic Theory and Applications , Prentice Hall of India Private Liimited , New Delhi .

Course Designers:

1. Dr. B. Arivazhagan
2. Mrs. S.Shanavas Parvin

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 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20SE51/61	Office Automation	Skill Enhanced Elective	-	-	2	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Int. marks	Ext. Marks	Total
III	V/VI	15	35	50

Preamble:

Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools.

CourseOutcomes

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

#	Description	Expected Proficiency	Expected Attainment
CO1	Identify importance of Microsoft word Accessing Features	75%	75%
CO2	Categorize basic formatting options, word operations and perform documentation.	75%	75%
CO3	Illustrate the spread sheet features to implement calculations and performance analysis	75%	75%
CO4	Explain working on basic power point utilities and tools which help them create basic power point presentation	75%	75%
CO5	Extend the power point presentation to Slide Transition, Custom Animation, Auto Rehearsing	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 Outcomes

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

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

Content :

Word

1. Using word to create project certificate. Features to be covered:-Formatting Fontsin word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders andColors, Inserting Header and Footer, Using Date and Time option in Word.
2. Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, and Paragraphs
4. Creating a Feedback form - Features to be covered- Forms, Text Fields, Insertingobjects, Mail Merge in Word.

Excel

5. Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
6. Implement calculations using:- Cell Referencing, Formulae in excel – average, St. Deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Countfunction, LOOKUP/VLOOKUP
7. Develop performance analysis using:- Split cells, freeze panes, groupand outline, Sorting, Boolean and logical operators, Conditional formatting

MS Power Point

8. Create Power point using :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
9. Create interactive Power point using: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tablesand Charts

Text Book

Steve Sagman, 2001,Microsoft Office for Windows Pearson Publications

Web Resources

https://www.w3schools.blog/ms-word-tutorial
https://www.javatpoint.com/ms-word-tutorial
https://www.w3schools.com/EXCEL/index.php

Course designer

Dr.R.Sandha

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20SE51\61	Android Programming	Skill Enhanced Elective	-	-	2	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V/VI	15	35	50

Preamble

This course enables the students to design and create Android application.

Course Outcomes:

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Design and implement the user interface using basic controls	75%	75%
CO2	Learn views and various layout of android	75%	75%
CO3	Demonstrate the dialog controls of the Android	75%	75%
CO4	To show the contacts and SMS in the mobile phones using contract provider concept	75%	75%
CO5	Demonstrate the location based services(LBS).Build program to toggle between map view and satellite view	75%	75%

Mapping of COs with PSOs

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

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

Content

1. BasicControls, Views and Layouts
   a. Write a program to change the background using button control.
   b. Write a program to createthe options menu (new window, bookmarks, refresh,windows, forward, more) in the browser.
   c. Write a program to demonstrate scroll view.
   d. Write a program to demonstrate various Layouts.
2. Dialog Controls
   a. Write a program to demonstrate alert dialog box.
   b. Write a program to demonstrate time picker dialog.
   c. Write a program to demonstrate date picker dialog.
   d. Write a program to demonstrate progress dialog with spinning wheel.
3. Contacts Contract Provider
   a. Write a program to show contacts in your phone.
   b. Write a program to show SMS in your phone.
4. AndroidLBS - GPS
   a. Write a program to view google map.
   b. Write a program to know the current location using GPS.
   c. Write a program to toggle between map view and satellite view.

Text Book

"Android Aprogrammer‟ s guide" - Jerome (J.F.) Dimarzio

Web Resources

https://developer.android.com/develop/index.html
http://www.sanfoundry.com/java-android-programing-examples/

Course Designer:

Mrs. S.M.Valli

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course Code	Course Title	Category	L	T	P	Credit
UCS20SE51/61	PHP Programming	Skill Enhanced Elective	-	-	2	2

L–Lecture T– Tutorial P –Practical

Year	Semester	Internal	External	Total
III	V/VI	15	35	50

Preamble

This course will enable the student to build real-world, dynamic webpages using PHP and MySQL.It provides a platform to create and analyze websites under web 2.0.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Build PHP scripts to understand the basic syntax, data types, decision making and looping statements.	75%	75%
CO2	Construct code to implement array operations	75%	75%
CO3	Create PHP programs that use various PHP library and user defined functions.	75%	75%
CO4	Implement cookie creation and session usage.	75%	75%
CO5	Develop and solve common web application tasks by writing PHP programs with database connectivity	75%	75%

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Content:

1. Program to demonstrate basic syntax, defining variable and constant,
2. Program to implement different data types, Operator and Expression.
3. Program to demonstrate decision making and looping statements.
4. Program to implement array operations.
5. Program to demonstrate Key and Value pairs.
6. Program to demonstrate string functions.
7. Program to implement mathematical functions.
8. Program to demonstrate user defined functions.

a. Function without input argument and no return value.

b. Function without input argument and return value.

c. Function with input argument and no return value.

d. Function with input argument and return value.

e. Function with default argument.

9. Program to find factorial of the given number using recursion.
10. Program to demonstrate Cookies and Sessions.
11. Program to develop HTML form to design a student mark database using HTML form and process using PHP script.
12. Program to demonstrate database connectivity with MySQL.

Web Resources

https://www.javatpoint.com/php-tutorial

https:/ https://phppot.com/

Course Designer:

Mrs. K. Suriya Prabha

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
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Programme Code: UCS

Course Code	Course Title	Category	L	T	P	Credit
UCS20SE51/61	Dot Net Programming	Skill Enhanced Elective	-	-	2	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V/VI	15	35	50

Preamble

The aim of this course is to bridge the gap in interoperability between services of various programming languages. It provide environment for developing various types of applications, such as Windows-based applications and Web-based applications

Course Outcomes:

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Develop GUI applications using various form controls.	65%	60%
CO2	Create backend applications using ADO.Net	65%	60%
CO3	Demonstrate string and math functions	65%	60%
CO4	Generate reports using Tree view control	65%	60%
CO5	Handle console and windows applications of VB.NET	65%	60%

Mapping of Cos with PSOs

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

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

Mapping of Cos with POs

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

S-STRONG M-MEDIUM L-LOW

Content

VB.NET

Console Applications

1. Write a program to find out whether the given number is even or odd.
2. Write a program to check whether the input is a leap year or not.
3. Write a program to find out whether the given number is a prime number.
4. Write a program to display the Fibonacci series.
5. Write a program to find the roots of the quadratic equation.

Windows Applications

1. Write a program to find the average of marks obtained by a student in three Subjects using radio and text box controls.
2. Write a program to change color in a box using scrollbar controlevent.
3. Write a program to display various mouse inputs using mouseevents.
4. Write a program to select date from list of dates or times using DateTime Picker.
5. Write a program to implement various ListBox controls to listitems.
6. Write a program to implement various ComboBox controls to list items with different styles.
7. Write a program to display Message Box and use InputBox usingfunction.
8. Write a program to implement ContextMenu and RichTextBox .
9. Write a program to implement ColorDialog Control to displayselected color.
10. Write a program to Create and display student database usingADO.NET
11. Write a program to display employee details using DataGrid view.
12. Write a program to show making Reports in VB.NET .

C#.NET

Console Applications

1. Write a program to display the reserve of the given string.
2. Write a program to determine whether a given string is apalindrome or not.
3. Write a program to find the factorial of a given number usinglooping statements.
4. Write a program to perform conversion of decimal to binary.
5. Write a program to find positive numbers from array of integers.

Text Book:

"VB.NET" by P.Radhaganesan , Scitech Publications.

Web Resources:

https://www.tutorialspoint.com/compile_vb.net_online.php
https://onecompiler.com/vb
https://www.includehelp.com/dot-net/find-positive-numbers-from-array-of-integers-using-c-sharp-program.aspx

Course Designer

Mrs G.Nalini

THIAGARAJAR COLLEGE, MADURAI - 9.
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DEPARTMENT OF COMPUTER SCIENCE
(For those joined B.Sc. Computer Science on or after June 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20SE51/61	JQuery Scripting	Skill Enhanced Elective	-	-	2	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V/VI	15	35	50

Preamble

This course provides the conceptual and technological developments in the field of front end user interface web designing.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Implement the concept of traversal functions	65%	60%
CO2	Finding element selection and filtering selections	65%	60%
CO3	JQuery CSS elements positioning and manipulations	65%	60%
CO4	Adding animation to a web page using effects and events	65%	60%
CO5	Implement AJAX functionalities with JQuery	65%	60%

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Content

1. Script to implement the concept of traversal functions.
2. Finding an element siblings
3. Filtering Selections
4. JQuery CSS Positioning elements.
5. JQuery CSS Manipulations.
6. Adding animation to a web page using effects.
7. Working with events
8. Ajax with JQuery
9. Implement JQuery get and getJson method.
10. Helper methods.

Web Resources

1. https://www.youtube.com/watch?v=Rkvn_MA04fo
2. https://www.youtube.com/watch?v=i32p6HvYC1A
3. https://www.youtube.com/watch?v=QhQ4m5g2fhA

Course Designer:

Mr.J.Prakash

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 2020)
Programme Code: UCS

Course code	Course Title	Category	L	T	P	Credit
UCS20SE51/61	XML Programming	Skill Enhanced Elective	-	-	2	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V/VI	15	35	50

Preamble

This course enables the students to create XML-based schemas and learn to apply transformations using extensible Style sheet Language (XSL). The course examines the wide range of application in XML in DTD creation, schema creation and parsing XML document.

Course Outcomes:

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Create well-formed XML documents.	65%	60%
CO2	Construct programs to import and export the XML documents in the database	65%	60%
CO3	Create XML schemas, XSTL and import, export DTD.	65%	60%
CO4	Develop XML document and parse it using DOM	65%	60%
CO5	Create XML document and parse it using SAX parser.	65%	60%

Mapping of Cos with PSOs

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

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

Mapping of Cos with POs

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

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

Content

1. XML document creation.
   a) Create XML file that contains the student assessment details (Roll no, Name and marks).
   b) Create XML file to contain the book details.
2. Internal and External DTD creation.
   Create a DTD capturing the document type.
3. XSL Transformation.
   a) Create a CSS stylesheet to display the XML data.
   b) Link the XSL Style Sheet to the XML Document
4. XML Schema creation.
5. Importing and Exporting XML document in database
   a) Import XML data as a binary byte stream
   b) Import XML data in an existing row
   c) Importing XML data from a file that contains a DTD
   d) Specifying the field terminator explicitly using a format file
6. Export XML data
7. Parsing XML document using DOM/SAX parser.

Text Book

"Web Technology" – N.P.GOPALAN, J.AKILANDESWARI

Web Resources

https://jsonformatter.org/xml-editor
https://www.tutorialspoint.com/online_xml_editor.htm
https://www.w3schools.com/xml/

Web Resources

Mrs. G.Nalini

B.Sc., Computer Science with Cognitive Systems

Programme Code - UCG

THIAGARAJAR COLLEGE (AUTONOMOUS) :: MADURAI – 09

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

DEPARTMENT OF COMPUTER SCIENCE

(For those joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

V SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Core 10	UCG20C51	Software Testing	5	5	75	25	75	100
Core 11	UCG20C52	IT Cognition and Problem Solving	5	5	75	25	75	100
Core Lab 11	UCG20CL51	Practical - Software Testing Lab	5	3	75	40	60	100
Core Elective 1	UCG20CE51	Options given	5	5	75	25	75	100
Core Elective Lab1	UCG20CEL51	Options given	5	3	75	40	60	100
SEC I	UCG20SE51	Practical- DevOps Tools Lab	5	2	75	15	35	50
Total			**30**	**23**				**550**
	UCG20IN	**Internship**		**2**		**15**	**35**	**50**

VI SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Core 12	UCG20C61	R- Programming	4	4	60	25	75	100
Core 13	UCG20C62	Digital Technology	5	5	75	25	75	100
Core lab 12	UCG20CL61	Practical- R Programming Lab	4	2	60	40	60	100
Core Elective 2	UCG20CE61	Options given	5	5	75	25	75	100
SEC II	UCG20SE61	Practical - Web Technology Lab	4	2	60	15	35	50
Project	UCG20PJ61	Project & Viva Voce	8	5	120	25	75	100
Part V				1				
Total			**30**	**24**				**550**

List of Electives

Core Elective - I

- Open Source Technology
- Cryptography and network security

Core Elective Lab - I

- Practical – Open Source Technology Lab
- Practical - Cryptography and network security Lab

Core Elective – II

- Data Mining
- Big Data Analytics

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20C51	Software Testing	Core 10	5	-	-	5

L–Lecture T– Tutorial P –Practical

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

Software testing is the process of evaluating and verifying that a software product or application does what it is supposed to do. The benefits of testing include preventing bugs, reducing development costs and improving performance.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Introduction on Automation and Selenium components.	65	60
CO2	Managing User Interface controls and Creation of Selenium Web Driver Script.	65	60
CO3	Exploring features of web drivers and introducing selenium methods.	65	60
CO4	Working with dynamic UI Objects, Selenium functions and testing methods.	65	60
CO5	Understanding Selenium Grid, Reporting and Batch Execution in Selenium.	65	60

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

Content

Unit - I **15 HOURS**

Introduction to Automation - Planning before Automation - Introduction to Selenium - Installing Selenium Components.

Unit - II **15 HOURS**

Using Selenium IDE - Managing User Interface Controls - Basics of Java- Creating First Selenium Web Driver Script.

Unit - III **15 HOURS**

Selenium Methods: Common Selenium Web Driver Methods - Verification Point in Selenium - Exploring the Features of Web Driver.

Unit - IV **15 HOURS**

Handling Pop-up Dialogs and Multiple Windows - Working with Dynamic UI Objects- Data driven testing using TestNG - Selenium Functions, Common Questions and Tips.

Unit - V **15 HOURS**

Reporting in Selenium - Batch Execution- Automation Frameworks - Understanding Selenium Grid.

Text Books

1. AdithyaGarg, Ashish Mishra "A Practitioner's Guide to Test Automation Using Selenium", Tata McGraw Hill Education, 2015.

2. NavneeshGarg, "Test Automation Using Selenium WebDriver with Java", AdactIn Group Pvt Ltd. 2014.

Chapters (Relevant Topics only)

Unit - I : 1, 3, 4, 5 (from book 2)

Unit - II : 6, 7, 8, 9 (from book 2)

Unit - III : 10, 12 (from book 2)

Unit - IV : 19 (from book 1) and 18, 19, 27 (from book 2)

Unit - V : 20 (from book 1) and 23, 24, 26 (from book 2)

Reference Books

1. SatyaAvasarala, "Selenium Web Driver Practical Guide", Packt Publishing, 2014.
2. David Burns," Selenium 1.0 Testing Tools", Packt Publishing, 2010.
3. Rex Allen Jones II, "Selenium Web Driver for Functional Automation Testing", Test 4 Success, LLC. 2016.

Web Resources

1. https://bigclasses.com/blog/features-of-selenium-webdriver
2. https://artoftesting.com/data-driven-framework-in-selenium-using-testng
3. https://blog.testproject.io/2019/11/14/data-driven-testing-with-testng/
4. https://www.guru99.com/introduction-to-selenium-grid.html

Course designer

Dr.A.Sharmista

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

B.Sc. Computer Science with Cognitive Systems

(For those who joined B.Sc. Computer Science on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20C52	IT Cognition and Problem Solving	Core 11	5	-	-	5

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

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

This Course is designed to enable the students to know the concepts of cognitive process and to endow the learners with the skills required for virtual relationship and cultural sensitivity.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Outline the concept of Cognitive Process	65	60
CO2	Overview of Perpetual Process	65	60
CO3	Classify factors affecting memory	65	60
CO4	Resolve different types of problem solving techniques	65	60
CO5	Outline different skills of thinking	65	60

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

Content

Unit - I **10 HOURS**

Introduction to Cognition: Meaning, cognitive processes, Development of cognitive psychology

Unit - II **16 HOURS**

Perceptual Processes; Attention: Divided attention, Selective Attention, Visual attention and auditory attention. Consciousness: Varieties, Subliminal Perception. Visual Perception Perceptual Organizational Processes, Multisensory interaction and Integration: Synthesis, Comparing the senses, Perception and Action.

Unit - III **16 HOURS**

Memory- Working Memory: Factors affecting the capacity of working Memory. Long Term Memory: Encoding and Retrieval in Long Term Memory, Autobiographical Memory. Memory Strategies: Practice, Mnemonics using Imagery, Mnemonics using organization. Meta cognition: Meta memory, TOT, Meta comprehension.

Unit - IV **18 HOURS**

Problem Solving, Reasoning and Decision Making: VUCA World Problem Solving, Types of problems, Factors that influence Problem Solving, creativity. Reasoning: Inductive and Deductive Reasoning. Decision Making: Heuristics in decision making, representativeness, availability and Anchoring and adjustment. The framing effect, Overconfidence in decisions, The Hindsight Bias.

Unit - V **15 HOURS**

Future Skills: Critical thinking, Adaptive thinking, Cognitive Load Management, Design thinking, Virtual Collaboration and Cultural Sensitivity

Text Books

1. Matlin M.W. (2003) 'Cognition' 5th Edition, Wiley Publication.
2. Riegler, B.R., Reigler, G.L. (2008), Cognitive Psychology – Applying the Science of Mind. 2nd Edition, Pearson Education.
3. Benjafield J G (2007). 'Cognition' 3rd Edition. Oxford University Press.
4. Goldstein B.E.(2008) 'Cognitive Psychology' 2nd Edition, Wadsworth

Web Resources

1. https://sjsu.edu/people/mark.vanselst/courses/p135/s1/Kellogg_c1_fall2013.pdf
2. https://jvapartners.com/problem-solving-and-decision-making-in-a-vuca-environment/
3. https://plato.stanford.edu/entries/critical-thinking/
4. https://www.youtube.com/watch?v=VcaAVWtP48A (Cognitive Psychology)
5. https://www.youtube.com/watch?v=lVt19m3hUCM (Reasoning and Decision Making)

Course Designer

Mr. J.Prakash

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20CL51	Practical - Software Testing Lab	Core Lab 11	-	-	5	3

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

Year	Semester	Internal	External	Total
III	V	40	60	100

Preamble

This course provides the knowledge of identifying the correctness and quality of software program using software testing methodology.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Analyze the Test cases for controls and test data in a file	70	65
CO2	Perform Manual testing process	70	65
CO3	Test a webpage	70	65
CO4	Test a HTML File	70	65
CO5	Perform Data Driven Wizard testing	70	65

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

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

Content

11. Write a test case based on controls
12. Test a data in a flat file
13. Test program to select number of students who have scored more than 60 in any one subject
14. Write and test a program to login a specific web page
15. Test a HTML File
16. Test a Program in MS Excel for Data Driven Wizard

Web Resource

https://www.softwaretestingmaterial.com/manual-testing-tutorial/

Course Designer

Dr.G.Rakesh

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20SE51	Practical - DevOps Tools Lab	SEC I	-	-	5	2

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

Year	Semester	Internal	External	Total
III	V	15	35	50

Preamble

This course provides the knowledge of various DevOps tools' usage in all the stages of Software development life cycle process in IT industry.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Push and Pull code using Git and Github	70	65
CO2	Create EC2 instance by IAAS using Terraform	70	65
CO3	Build and deploy war file using Jenkins	70	65
CO4	Create and deploy Docker image on Docker container	70	65
CO5	Deploy a war file by creating Jenkins job using Ansible and Kuberentes	70	65

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

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

Content

1. Push and Pull code using Git into Github.
2. Create an EC2 Instance using Terraform.
3. Install Jenkins on AWS EC2 instance.
4. Pull a sample Java project from GitHub and build the code using Jenkins.
5. Deploy a war file on Tomcat VM using Jenkins.
6. Create Docker Image creation and push it to the Docker Hub.
7. Deploy a Docker image on Docker container.
8. Create Jenkins job to deploy a war file on Docker using Ansible.
9. Deploy a web application using Kubernetes.

Web Resources

1. https://www.youtube.com/watch?v=RA1mNClGYJ4
2. https://www.youtube.com/watch?v=G_UCeeb5EPc
3. https://www.youtube.com/watch?v=EIHY_CY5J0k
4. https://www.youtube.com/watch?v=73GauOmOzV4
5. https://www.youtube.com/watch?v=XQNNAeyMAkk

Course Designer

Mr.J.Prakash

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20C61	R-Programming	Core 12	4	-	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

This Course demonstrate statistical programming language ability with different category of functionality in libraries.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Basics of R environment and R Commands	65	60
CO2	Demonstrate vector, set and object	65	60
CO3	Brief description about Arrays, matrices and data frames	65	60
CO4	Describe about files and functions	65	60
CO5	Gain Knowledge of using Graphical procedures and packages	65	60

Mapping of COs with PSOs

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

Mapping of COs with POs

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

Content

UNIT - I **12 HOURS**

Introduction and preliminaries - The R environment - Related software and documentation - R and statistics - Using R interactively - Getting help with functions and features - R commands, case sensitivity, etc - Executing Commands from or diverting output to a file - Data permanency and removing objects Simple manipulations - numbers and vectors - Vectors and assignment - Vector arithmetic - Generating regular sequences - Logical vectors.

UNIT – II **12 HOURS**

Missing values - Character vectors - Index vectors - selecting and modifying Subsets of a data set Objects, - their modes and attributes - Changing the length of an object - Getting and setting attributes - Ordered and unordered factors - The function apply () and ragged arrays - Ordered factors.

UNIT – III **12 HOURS**

Arrays and matrices - Array indexing. Subsections of an array - Index matrices - The array() function - Mixed vector and array arithmetic. The recycling rule-Matrix facilities - Matrix multiplication - Lists and data frames: Lists - Constructing and modifying lists - Concatenating lists - Data frames - Making data frames - attach () and detach ().

UNIT – IV **12 HOURS**

Reading data from files: The read. table () function - The scan () function Accessing built-in datasets - Loading data from other R packages - Editing data Grouping, loops and conditional

execution: Control statements: Conditional execution: if statements - Repetitive execution: for loops, - repeat and while.

UNIT – V **12 HOURS**

Graphical procedures: High-level plotting commands - The plot() function Displaying multivariate data - Display graphics - Graphics parameters list - Graphical elements - Packages - Standard packages - Contributed packages and CRAN.

Text Book

An Introduction to R, Notes on R: A programming environment for Data Analysis and Graphics Version 3.4.4(2018-03-15), W.N Venables, D.M Smith and the R Core Team

Chapters (Relevant Topics only)

Unit - I : 1 (1.1 - 1.11)

Unit - II : 2 (2.1 – 2.8)

Unit - III : 5 (5.1 - 5.10) and 6 (6.1 - 6.3.5)

Unit - IV : 7 (7.1, 7.4)

Unit - V : 12 (12.1 – 12.7) and 13 (13.1 – 13.3)

Reference Books

1. R for Beginners , Emmanuel Paradise.
2. R Programming for Data Science , Roger D peng
3. Chambers (2008). Software for Data Analysis, Springer.

Web Resources

https://www.tutorialspoint.com/r/index.htm

Course Designer

Dr. G.Rakesh

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20C62	Digital Technology	Core 13	5	-	-	5

L–Lecture T– Tutorial P –Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

The course facilitates the students to construct a digital media outcome that integrates media types and incorporates original content. The specifications for the digital media outcome, software and techniques to be used need to be determined prior to the outcome being made.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Introduction on digital primers, metaphors and Marketing. Cloud, Artificial Intelligence and big data.	65	60
CO2	Introduce the concept of marketing and manufacturing in banking and finance, insurance and health care.	65	60
CO3	Acquire the knowledge on Automatix and RPA tools.	65	60
CO4	Enrich their knowledge in Automation and Enterprise architecture.	65	60
CO5	Describe the Taskbots, MetaBots and Cognitive RPA.	65	60

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

Content

Unit - I **15 HOURS**

Digital Primer - Why is Digital Different? - Digital Metaphors On Cloud 9 - A Small Intro to Big Data - Social Media & Digital Marketing - Artificial Intelligence - Unchain the Block chain - Internet of Everything - Immersive Technology.

Unit - II **15 HOURS**

Digital for Industries - Manufacturing and Hi-tech-Banking and Financial Services - Insurance and Healthcare – Retail - Travel & Hospitality - Communications, Media & Information Services - Government.

Unit - III **15 HOURS**

Automatix – Art of RPA - Introduction - Setting the Context - RPA Prelude - RPA Demystified -RPA vs BPM RPA Implementations - RPA in Industries - RPA Tools - Automatix - Art of RPA

Unit - IV **15 HOURS**

Automation Anywhere - Getting Started with AA Enterprise - Exploring AA Enterprise - AA Enterprise – Architecture.

Unit - V **15 HOURS**

Knowing the Bots - More About TaskBots - AA Enterprise - All About Recorders – Designers -MetaBots - Cognitive RPA.

Text Books

1. Richard Murdoch, “Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant”
2. Kelly Wibbenmeyer, “The Simple Implementation Guide to Robotic Process Automation (RPA): How to Best Implement RPA in an Organization”

Web Resources

1. https://www.britannica.com/technology/artificial-intelligence
2. https://www.slideshare.net/saidmasoud4/hi-tech-banking
3. https://www.softwaretestinghelp.com/robotic-process-automation-tools/
4. https://www.coursehero.com/file/54165166/AA-contdocx/
5. https://www.cigniti.com/blog/cognitive-robotic-process-automation-crpa/

Course designer

Dr.A.Sharmista

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20CL61	Practical - R Programming Lab	Core Lab 12	-	-	4	2

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

Year	Semester	Internal	External	Total
III	VI	40	60	100

Preamble

This course provides the knowledge to Design and implement R Programming language for computation process.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Implement Vector and List Operation	70	65
CO2	Implement Matrices Computation	70	65
CO3	Create Data Frame and Factor objects	70	65
CO4	Implement File and statistical computation	70	65
CO5	Perform data visualization	70	65

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

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

Content

1. R Program for Vector Operation
2. Create a R List
3. Implement Matrices addition, subtraction and multiplication
4. Create a Data Frame
5. Create a Factor object
6. File Operations
7. Create a R Program for Mean, Median and mode
8. Draw Bar chart and Pie charts in R.

Web Resource

https://www.w3schools.com/r/

Course Designer

Dr.G.Rakesh

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20SE61	Practical - Web Technology Lab	SEC II	-	-	4	2

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

Year	Semester	Internal	External	Total
III	VI	15	35	50

Preamble

This course provides the conceptual and technological developments in the field of front end user interface web designing.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Develop HTML scripts using text formatting, table creation and frame arrangements	70	65
CO2	Design CSS Positioning and different types of style sheets	70	65
CO3	Implement DOM and validating form elements using JavaScript	70	65
CO4	Angular application development using TypeScript	70	65
CO5	User Interface development using ReactJS	70	65

Mapping of COs with PSOs

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

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

Mapping of COs with POs

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

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

Content

HTML and CSS

1. Create some links to various search engines.
2. Display various types of Lists.
3. Display content using headers, subscript and superscript tags.
4. Create table with spanning attributes.
5. Display content in web page using frames.
6. CSS Absolute and relative positioning
7. CSS different types of style sheets.

JavaScript

1. Program to perform arithmetic operations.
2. Program to print Fibonacci series.
3. Program to check whether a given number is prime or not.
4. Changing the Background Color of a Web Page Using JavaScript Dom.
5. Validating Html Form Elements Using JavaScript.

Angular TS

1. Components creation and do routing process.
2. Create Login and register page using local storage with JSON.
3. Create a form using “Angular forms.”

React JS

1. Create a program using class, arrow function, variables
2. Create a sample program using Functional Component
3. Create a sample program using Class Component
4. Create a program using Multiple class Component
5. Create a program by passing **Props** from one component to another component

6. Create a program by using **React State.**
7. Create a program by implementing the Life Cycle of React
8. Implementing the Styling Inline , Internal, External
9. Event handling implementation in ReactJS.
10. Create a program by using a **ReactJS Hooks**
11. Implementing the **Routing** concept in ReactJS
12. Create a simple Login form page using React and Routing
13. Validating the Login form

Web Resources

1. https://www.youtube.com/watch?v=QMnv3QrjZoU
2. https://www.youtube.com/watch?v=W6NZfCO5SIk
3. https://www.youtube.com/watch?v=WBPrJSw7yQA
4. https://www.youtube.com/watch?v=fSp2C7QPH8M

Course Designer

Mr.J.Prakash

THIAGARAJAR COLLEGE, MADURAI - 9.

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DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20CE51	Open Source Technology	Core Elective 1	5	-	-	5

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

This Course used to understand the difference between open-source software and commercial software. It is used for development of web application using open-source technology.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Understand the basic of open-source software	65	60
CO2	Elaborate Linux with essential processing	65	60
CO3	Demonstrate APACHE working process.	65	60
CO4	Describe about open source MYSQL with commands	65	60
CO5	Apply PHP scripting for open source technology processing	65	60

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Blooms taxonomy

	CA		
	First	Second	End of Semester
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Content

UNIT I **15 HOURS**

INTRODUCTION:

Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions

UNIT II **15 HOURS**

LINUX:

Introduction to Linux Essential Commands - Filesystem Concept - Standard Files, The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction, String Processing - Investigating and Managing Processes - Network Clients - Installing Application

UNIT III **15 HOURS**

APACHE:

Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess

UNIT IV **15 HOURS**

MYSQL:

Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT V **15 HOURS**

PHP:

Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code - Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

Text Book

James Lee and Brent Ware ,"Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", , Dorling Kindersley(India) Pvt. Ltd, 2008.

Chapters (Relevant Topics only)

Unit – I	:	Chapter 1
Unit – II	:	Chapter 2
Unit – III	:	Chapter 3
Unit – IV	:	Chapter 5
Unit – V	:	Chapter 12

Web Resources

1. https://www.javatpoint.com/linux-tutorial
2. https://www.guru99.com/apache.html
3. https://www.tutorialspoint.com/mysql/index.htm
4. https://www.w3schools.com/php/

Course Designers

1. Dr. G.Rakesh
2. Mr J.Prakash

THIAGARAJAR COLLEGE, MADURAI - 9.

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DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credits
UCG20CE51	Cryptography and network security	Core Elective 1	5	-	-	5

L-Lecture **T-Tutorial** **P-Practical**

Year	Semester	Internal	External	Total
III	V	25	75	100

Preamble

This Course focuses towards the introduction of network security using various cryptographic algorithms.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Implement classical encryption techniques.	65	60
CO2	Understand and analyze block ciphers.	65	60
CO3	Acquire knowledge on Pseudorandom number generation	65	60
CO4	Acquire knowledge about public key cryptography and Cryptographic hash functions.	65	60
CO5	Discuss the Electronic Mail Security and IP Security	65	60

Mapping of COs with PSOs

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

Content

Unit – I **15 HOURS**

Classical Encryption Techniques: Symmetric Cipher Model - Substitution Techniques: Caesar Cipher - Monoalphabetic Ciphers - Play fair Cipher - Hill Cipher - Polyalphabetic Ciphers - one-Time Pad. Transposition Techniques - Steganography.

Unit – II **15 HOURS**

Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure: Stream Ciphers and Block Ciphers - The Feistel Cipher.

Advanced Encryption Standard: AES Structure - AES Transformation Functions – An AES Example.

Unit - III **15 HOURS**

Pseudorandom Number Generation and Stream Ciphers: Principles of Pseudorandom Number Generation - Pseudorandom Number Generators - Pseudorandom Number Generation Using a Block Cipher - Stream Ciphers.

Unit - IV **15 HOURS**

Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems - The RSA Algorithm.

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions - Two Simple Hash Functions - Hash Functions Based on Cipher Block Chaining.

Unit – V **15 HOURS**

Transport-Level Security: Transport Level Security - HTTPS - Secure Shell (SSH).

Email Security: Pretty good privacy.

Text Book

William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition, 2015

Chapters (Relevant Topics only)

Unit - I : 2 (2.1 – 2.3, 2.5)
Unit - II : 3 (3.1) and 5 (5.2, 5.3, 5.5)
Unit - III : 7 (7.1 – 7.4)
Unit - IV : 9 (9.1, 9.2) and 11 (11.1, 11.2, 11.4)
Unit - V : 17 (17.3 – 17.5) and 19 (19.1)

References:

1. William Stallings , "Network Security Essentials Applications and Standards", 2nd ed., Pearson Education, 2003.
2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.

Web Resources

1. https://www.tutorialspoint.com/cryptography/index.htm
2. https://www.geeksforgeeks.org/cryptography-and-its-types/

Course Designer

Mrs.K.Vennila

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20CEL51	Open Source Technology Lab	Core Elective Lab 1	-	-	5	3

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	V	40	60	100

Preamble

This course provides the knowledge of Open source technology usage in computational process.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Open-source OS installation	70	65
CO2	Database Open-source installation	70	65
CO3	Web based Open-Source installation	70	65
CO4	Open-Source Connectivity	70	65
CO5	Shell Programming	70	65

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Content

1. Linux installation
2. My SQL installation
3. Apache server installation
4. PHP and MY SQL Connectivity
5. Shell Programming

Web Resources

https://ittutorials.net/open-source/

Course Designers

1. **Dr.G.Rakesh**
2. **J.Prakash**

THIAGARAJAR COLLEGE, MADURAI - 9.

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DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credits
UCG20CEL51	Practical - Cryptography and network security Lab	Core Elective Lab 1	-	-	5	3

L-Lecture **T-Tutorial** **P-Practical**

Year	Semester	Internal	External	Total
III	V	40	60	100

Preamble

This Course focuses towards the introduction of network security using various cryptographic algorithms.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Implement substitution encryption technique	70	65
CO2	Implement transposition encryption technique	70	65
CO3	Implement public key cryptography	70	65
CO4	Implement DES Algorithm	70	65
CO5	Implement blowfish and RSA algorithms.	70	65

Mapping of COs with PSOs

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

S - STRONG **M - MEDIUM** **L – LOW**

Mapping of COs with POs

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

S - STRONG M - MEDIUM L – LOW

Content

1. Implement Caesar cipher Encryption technique
2. Implement Hill cipher Algorithm.
3. Implement Rail fence – row & Column Transformation concept
4. Implement Playfair Cipher concept
5. Implement AES algorithm logic.
6. Implement blowfish algorithm logic.
7. Implement RSA algorithm

Web Resources

1. https://www.geeksforgeeks.org/cryptography-introduction/
2. https://japp.io/category/cryptography/

Course Designer

Mrs.K.Vennila

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20CE61	Data Mining	Core Elective 2	5	-	-	5

L - Lecture T - Tutorial P – Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

The course provides the knowledge of Database Management principles, the various Data Mining techniques such as Classification, Clustering and Association rule mining and introduces the concept of Neural Network.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall some basic Database management principles and understand the concept of Data Mining and Data warehousing	65	60
CO2	Describe the concept of classification and Decision tree algorithms.	65	60
CO3	Illustrate Clustering algorithms and apply it to solve some problems	65	60
CO4	Describe Association rule mining technique and apply it to mine rules from some data sets	65	60
CO5	Discuss the concept and working principle of Neural network, Genetic algorithm and Support Vector Machine	65	60

Mapping of COs with PSOs

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

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	M	S	M	S
CO3	S	M	M	M	S	M
CO4	S	S	M	M	**S**	M
CO5	S	M	S	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**

DATA WAREHOUSING: Introduction – What is a Data Warehouse? – Definition – OLAP operations.

DATA MINING: Introduction - What is Data Mining? – Data Mining: Definitions – KDD vs. Data Mining – DBMS vs. DM – DM Techniques - Issues and Challenges in DM – DM Applications.

Unit II **15 HOURS**

CLASSIFICATION TECHNIQUES: Decision Trees - Introduction - What is a Decision Tree? – Tree Construction Principle – Best Split – Splitting Indices – Splitting Criteria – Decision Tree Construction Algorithms – ID3-C4.5.

Unit III **15 HOURS**

CLUSTERING TECHNIQUES: Introduction - Clustering Paradigms – Partitioning Algorithms – k – Medoid Algorithms – Hierarchical Clustering – DBSCAN.

Unit IV **15 HOURS**

ASSOCIATION RULES: Introduction – What is an Association Rule? – Methods to Discover Association Rules – Apriori Algorithm - FP tree Growth Algorithm.

Unit V **15 HOURS**

OTHER TECHNIQUES: Introduction-Neural Networks-Learning in NN-Unsupervised Learning- Genetic algorithm-Support Vector Machine.

Text Book

Arun K Pujari,,2013, Data Mining Techniques, Second Edition , Universities Press

Chapters (Relevant Topics Only)

Unit - I	:	2 (2.1-2.3,2.5) & 3 (3.1-3.5,3.7,3.9,3.11)
Unit - II	:	6 (6.1- 6.7,6.9,6.10)
Unit - III	:	5 (5.1 – 5.4,5.7,5.8)
Unit - IV	:	4 (4.1 – 4.4, 4.8)
Unit - V	:	7 (7.1 – 7.4, 7.6,7.8)

References

4. K.P.Soman, Shyam Diwakar , V.Ajay, 2006 , Insight into Data Mining Theory and Practice, Prentice Hall of India Private Limited , New Delhi
5. Jiawei Han , Micheline Kamber , Jian Pei , 2011, Data Mining Concepts and Techniques , Third Edition, Morgan Kaufmann Publishers, An Imprint of Elsevier , New Delhi.
6. Ian H.Witten & Eibe Frank, 2008, Data Mining Practical Machine Learning Tools and Techniques, Second Edition, Morgan Kaufmann Publishers, Imprint of Elsevier , New Delhi.

Course Designer

Dr.B.Subashini

THIAGARAJAR COLLEGE, MADURAI - 9.

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

DEPARTMENT OF COMPUTER SCIENCE

(For those who joined B.Sc. Computer Science with Cognitive Systems on or after June 2020)

Programme Code : UCG

Course code	Course Title	Category	L	T	P	Credit
UCG20CE61	Big Data Analytics	Core Elective 2	5	-	-	5

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
III	VI	25	75	100

Preamble

This course provides an in-depth knowledge in Big Data Analytics for mining useful information from large volumes of datasets. The student will learn about fundamentals of BigData, Big Data technologies like Hadoop, MapReduce, NoSQL, MongoDB, Hbase and Cassandra.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Discuss about the overview of Big Data analytics, types of Big Data, technologies and benefits of Big Data.	65	60
CO2	Understand the concept of Hadoop Framework and its Architecture.	65	60
CO3	Outline the working principle of MapReduce and operations of MapReduce.	65	60
CO4	Examine the various database concepts such as NoSQL, MongoDB, Cassandra and Hbase used in Big Data Analytics.	65	60
CO5	Explore knowledge on JAQL, components of JAQL and JSON concept in Big Data Analytics.	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**L**	**M**	**L**	**M**

CO2	**S**	**M**	**S**	**M**	**M**
CO3	**S**	**M**	**S**	**S**	**S**
CO4	**S**	**M**	**S**	**M**	**M**
CO5	**S**	**M**	**S**	**S**	**S**

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

Content

Unit – I **15 HOURS**

Overview of Big Data: Defining Big Data - Big Data Types – Big Data Analytics – Industry Examples of Big Data - Big Data and Data Risk – Big Data Technologies – Benefits of Big Data.

Unit – II **15 HOURS**

Basics of Hadoop: Big Data and Hadoop - Hadoop Architecture - Main Components of Hadoop Framework - Analysing Big Data with Hadoop - Benefits of Distributed Applications - Hadoop Distributed File System - Advantages of Hadoop - Ten Big Hadoop Platforms.

Unit - III **15 HOURS**

MapReduce: Introduction to MapReduce - Working of MapReduce - Map operations - MapReduce User Interfaces.

Unit - IV **15 HOURS**

NoSQL Databases: NoSQL Data Management - Types of NoSQL Databases - Query Model for Big Data - Benefits of NoSQL - MongoDB - Advantages of MongoDB over RDBMS - Replication in MongoDB.

Unit - V **15 HOURS**

HBase, CASSANDRA and JAQL: Introduction to HBase - Row-oriented and Column-oriented Data Stores - HDFS vs HBase-Hbase Architecture -HBase Data Model - Introduction to Cassandra - Features of Cassandra . Introduction to JAQL- JSON- Components of JAQL.

Text Book

V.K. Jain,Big Data and Hadoop, Khanna Book Publishing, 2017

Chapters (Relevant Topics only)

Unit - I	: 1 (1.1 -1.7,1.10,1.11)
Unit - II	: 2 (2.1-2.6,2.16,2.20)
Unit - : III	: 7 (7.1-7.3,7.5)
Unit - IV	: 5 (5.1-5.6,5.10)
Unit - V	: 6 and 8 (6.1-6.5,6.8-6.9,8.1-8.3)

Web Resources

1. https://www.youtube.com/watch?v=dK4aGzeBPkk
   (Big Data Introduction)
2. https://www.youtube.com/c/edurekaIN/search?query=big%20data
   (Overview of BigData Analytics)
3. https://www.youtube.com/c/edurekaIN/search?query=hadoop
   (Hadoop Overview)
4. https://www.youtube.com/c/edurekaIN/search?query=mapreduce
   (Overview on MapReduce)
5. https://www.youtube.com/c/edurekaIN/search?query=mongodb%20nosql
   (MongoDB,NoSQL)
6. https://www.youtube.com/c/edurekaIN/search?query=hbase%20
   (Hbase)
7. https://www.youtube.com/c/edurekaIN/search?query=cassandra
   (Cassandra)
8. https://www.youtube.com/watch?v=PNwtPMQAMiw
   (JAQL)

Course Designer

Dr.B.Subashini.

B.Sc., Data Science (SF)

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)

I SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Part 1	U20P111CS	இக்காலத் தமிழும் இடைக்காலத் தமிழும;	5	3	75	25	75	100
Part 2	UCG20EN11	English I – Communication Skills	3	3	45	25	75	100
Core 1	UDS22C11	Problem solving using C Programming	4	3	60	25	75	100
Core 2	UDS22C12	Fundamentals of Data Science	3	3	45	25	75	100
Core 3	UMA22C11D	Discrete Mathematical Structures	5	4	75	25	75	100
Allied 1	UMA22GE11D	Calculus	5	5	75	25	75	100
Core Lab 1	UDS22CL11	C Programming Lab	3	2	45	40	60	100
AECC	U20ES11	Environmental Science	2	2	30	15	35	50
Total			**30**	**25**				**750**

II SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Part 1	U20P121CS	சமயத் தமிழும் செவ்வியல் தமிழும்	5	3	75	25	75	100
Part 2	UCG20EN21	English II – Campus to Corporate	3	3	45	25	75	100
Core 4	UDS22C21	Data Structures and Algorithms	4	4	60	25	75	100
Core 5	UDS22C22	Python Programming	4	4	60	25	75	100
Allied 2	UMA22GE21D	Probability and Statistics	5	5	75	25	75	100
Core Lab 2	UDS22CL21	Data Structures and Algorithms Lab	4	2	60	40	60	100
Core Lab 3	UDS22CL22	Python Programming Lab	3	2	45	40	60	100
AECC	U20VE21	Value Education	2	1	30	15	35	50
Total			**30**	**24**				**750**

III SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd .**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
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	UMA22GE31	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	NME - I	2	2	30	15	35	50
Total			**30**	**23**				**650**

IV SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd .**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
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	UMA22GE41	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	NME - II	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	UDS22C51	Machine Learning	6	5	90	25	75	100
Core 13	UDS22C52	Data Analytics	6	5	90	25	75	100
Core 14	UDS22C53	Software Engineering	5	4	75	25	75	100
Core Lab 8	UDS22CL51	Machine Learning Lab	6	2	90	40	60	100
Elective I	UDS22CE51	Elective- I	5	5	75	25	75	100
SEC I	UDS22SE51	SEC – I	2	2	30	15	35	50
Total			**30**	**23**				**550**
	UDS20IN	**Internship**		**2**		**15**	**35**	**50**

VI SEMESTER								
Course	**Code No.**	**Title of the paper**	**Hrs/ wk**	**Crd.**	**Total Hrs**	**Marks**		
						CIA	**SE**	**TOT**
Core 15	UDS22C61	Deep Learning	5	4	75	25	75	100
Core 16	UDS22C62	Reinforcement Learning	5	4	75	25	75	100
Core Lab 9	UDS22CL61	Deep Learning Lab	5	2	75	40	60	100
Elective II	UDS22CE61	Elective – II	5	5	75	25	75	100
Project	UDS22PJ61	Project	8	4	120	25	75	100
SEC II	UDS22SE61	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

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
UDS22C11	Problem Solving using C Programming	Core 1	3	1	-	3

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

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble

This Course is designed to enable the students to know the programming concepts of C language and to endow the learners with the skills required to develop both system and application development.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Illustrate the programming approaches and Introduce C language	65	60
CO2	Demonstrate the concepts of operators and expressions	65	60
CO3	Exemplify the concept of conditional branching and looping statements	65	60
CO4	Overview the concept of arrays and string	65	60
CO5	Implement the concepts of functions, pointers and file handling.	65	60

Mapping of COs with PSOs

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

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

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

Mapping of COs with POs

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

Content

Unit -I: Introduction to Programming **12 Hours**

Introduction to C- Some Simple C Program – C Character Set - Identifiers and keywords, Data types, Constants, Variables, Declarations, Expressions, Statements- Symbolic Constants

Unit - II: Operators and Expressions **10 Hours**

Arithmetic operators, Unary operators, Relational and logical operators, Assignment operators, Conditional operator – Library Functions.

Unit - III: Conditional Branching, Loops and Functions **12 Hours**

Branching, if-else statement, switch statement, goto statement, Looping, while statement, do- while statement, for statement, Nested control structures, break statement, continue statement.

Functions – Defining a Function – Accessing a Function – Function Prototypes – Passing arguments to a Function - Recursion

Unit IV: Arrays and Pointers **12 Hours**

Defining an array, processing an array, Multidimensional arrays - Arrays and Strings- Pointer Declarations – Passing pointers to functions – Pointers and one dimensional arrays – Dynamic memory allocation – Operations on pointers – Pointers and Multidimensional arrays – Arrays of pointers

Unit - V: Structures and Data Files **14 Hours**

Defining a Structure – Processing a structure – User Defined Data types – Structures and Pointers – Passing structures to functions – Self Referential Structures – Unions – Opening and Closing a Data file – Creating a Data file – Processing a Data file – Unformatted data files

Text Books

1. Byron Gottfried, “Schaum's Outline of Programming with C”, McGraw Hill Education (India), 4th edition, 2018, ISBN: 978-9353160272

Chapter (Relevant Topics Only)

Unit – I	: 1.5, 1.6, and 2.1 to 2.9
Unit – II	: 3.1 to 3.6
Unit – III	: 6.2 to 6.11 and 7.1 to 7.6
Unit – IV	: 9.1 to 9.5 and 10.1 to 10.8
UNIT – V	: 11.1 to 11.7 and 12.1 to 12.4

Web Resources

1. **https://www.youtube.com/watch?v=EjavYOFoJJ0**
2. **https://www.youtube.com/watch?v=3-7hEhXd1So**
3. **https://www.youtube.com/watch?v=MN94x_rQlvI**
4. **https://www.youtube.com/watch?v=08LWytp6PNI**
5. **https://www.youtube.com/watch?v=IuDJeGqEZ3A**

Course Designer

Mr.J.Prakash

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
UDS22C12	Fundamentals of Data Science	Core 2	3	-	-	3

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble

This Course used to understand the overview of Data Science, data analysis, building models, text mining and data visualization techniques.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Outcome (%)
CO1	Understand the basic of data.	65	60
CO2	Summarize the process of data science.	65	60
CO3	Perform the analysis of given data.	65	60
CO4	Describe about machine learning	65	60
CO5	Explore Text mining and data visualization	65	60

Mapping of COs with PSOs

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

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

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**M**	**M**	**-**	**L**

CO2	**S**	**L**	**L**	**L**	**-**	**M**
CO3	**M**	**M**	**M**	**M**	**-**	**M**
CO4	**M**	**S**	**M**	**S**	**-**	**M**
CO5	**M**	**M**	**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%

Content

UNIT I **9 HOURS**

Data science introduction – Facets of data – data science process- Big Data ecosystem and data science.

UNIT II **9 HOURS**

Overview of data science process- Defining research goals and creating a project charter- retrieving data.

UNIT III **9 HOURS**

Cleansing, integrating and transforming data -Exploratory data analysis

UNIT IV **9 HOURS**

Build the models – presenting findings and building application on top of them

UNIT V **9 HOURS**

Text mining in real world- Text mining techniques – Data visualization

Text Books

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, Manning Publications Co, 2016.

Chapters (Relevant Topics Only)

Unit I : Chapter 1
Unit II : Chapter 2
Unit III : Chapter 2
Unit IV : Chapter 2
Unit V : Chapter 8 & 9

Web Resource(s)

https://www.w3schools.com/datascience/

Course Designer

Dr. G.Rakesh

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
UMA22C11DS	Discrete Mathematical Structures	Core 3	4	1	-	4

L - Lecture T - Tutorial P – Practical

Year	Semester	Internal	External	Total
I	I	25	75	100

Preamble

The course provides an elementary introduction to Discrete mathematical structures for Data Science. It provides students with a hands-on experience of the relevancy of Mathematics in real life. Also it provides the knowledge of Propositional and predicate logic principles, Functions, Relations, Basics of Graph theory with graph models and Boolean Algebra.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Solve problems based on logic principles	75	70
CO2	Recall definitions of functions and also solve problems based on functions, sequences and summations	70	65
CO3	Summarize properties of relations and equivalence relations. Apply the concept of relations in data bases	80	75
CO4	Solve real life network problems using Graph Theory principles	85	75
CO5	Summarize Boolean identities and solve some problems in logic gates	70	65

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
	First	**Second**	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Contents

Unit I **15 Hours**

The Foundations: Logic: Propositional Logic – Applications of Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers.

Unit II **15 Hours**

Basic Structures: Functions, Sequences and Sums: Functions - Sequences and Summations – Cardinality of Sets.

Unit III **15 Hours**

Relations: Relations and Their Properties – n-ary Relations and Their Applications – Representing Relations – Closures of Relations – Equivalence Relations – Partial orderings.

Unit IV **15 Hours**

Graphs: Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Representing Graphs and Graph Isomorphism.

Unit V **15 Hours**

Boolean Algebra: Boolean Functions **–** Representing Boolean Functions – Logic Gates.

Text Book:

Kenneth H. Rosen, 2019, Discrete Mathematics and its Applications, Eighth Edition, McGraw-Hill Education, New Delhi.

Chapters (Relevant Topics Only)

Unit I : 1 (1.1 - 1.5)
Unit II : 2 (2.3 - 2.5)
Unit III : 9(9.1 - 9.6)
Unit IV : 10 (10.1 - 10.3)
Unit V : 12(12.1 - 12.3)

References:

1. J.P. Trembley, R. Manohar 2008, Discrete Mathematical Structures with Applications to Computer Science Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. Dr. M.K. Venkatraman, Dr. N. Sridharan, Dr. N. Chandrasekaran, 2009, Discrete Mathematics, The National Publishing Company 2009.
3. T. Veerarajan, 2007, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw – Hill Publishing Company Limited, New Delhi.

Course Designers:

1. Dr. B. Arivazhagan
2. Ms. P. Vanmathy

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
UMA22GE11D	Calculus	Allied 1	5	-	-	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

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

	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**

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 - 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
UDS22CL11	C Programming Lab	Core Lab 1	-	-	3	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
I	I	40	60	100

Preamble

This course helps the students in understanding a powerful, portable and flexible structured programming language which is suitable for both systems and applications programming.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Implement Conditional and looping statements	70	65
CO2	Develop sting operations	70	65
CO3	Understand and implement pointers	70	65
CO4	Develop the concept of Euler path	70	65
CO5	Implement file concepts	70	65

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

Content

1. Program to find sum and average for ten numbers.
2. Program to generate prime numbers from 1 to n.
3. Program to find the roots of a quadratic equation
4. Program to find GCD of two integers using recursive function.
5. Program to find whether given matrix is symmetric or not.
6. Program to multiply two matrices.
7. Program to find a particular word in a string.
8. Program to count a particular letter in a given string.
9. Program to insert a sub string into the given main string from given position.
10. Program that uses functions to delete n Characters from a given position in a given string.
11. Program to find largest number using pointers.
12. Program to count number of vowels and consonants in a string using pointers.
13. Program to find sum and average of n numbers using pointers.
14. Program for dynamic memory allocation using malloc() function.
15. Program to add, subtract and multiply two complex numbers using structures to function.
16. Program to find Euler path
17. Program to copy contents from one file to another.
18. Program to count occurrences of all words in a file.
19. program to count occurrences of all words in a file
20. Program to find and replace a word in file.

Web Resources

1. **https://www.youtube.com/watch?v=LgDABwcKrTw**
2. **https://www.youtube.com/watch?v=bIytlrRR-Y8**
3. **https://www.youtube.com/watch?v=FoiLXsV-bnI**
4. **https://www.youtube.com/watch?v=wVDfRzBp8iE&list=PLfVsf4Bjg79BOmLYBRTwqCIkGPiOWb7xj**

Course Designer

Mr.J.Prakash

THIAGARAJAR COLLEGE, MADURAI - 09

(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
UDS22C21	Data Structures And Algorithms	Core 4	4	-	-	4

L–Lecture T– Tutorial P –Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble

This course provides the basic concepts of various data structures and comprehend various algorithms design strategies.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Learn the fundamentals of Data Structures and working principles of Stack and Queue.	65	60
CO2	Understand the working principles of Linked Lists.	65	60
CO3	Acquire the basic knowledge on binary tree and graph.	65	60
CO4	Analyze how to break down problems into small pieces for program development applications and to utilize analytical skills using greedy algorithms.	65	60
CO5	Understand Dynamic Programming, graph search and backtracking methods.	65	60

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	L	L	L	-	L
CO2	L	L	L	L	-	L
CO3	M	S	M	M	-	M
CO4	M	S	M	M	-	M
CO5	M	S	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 **12 Hours**

INTRODUCTION: Data Structures - Data Structure Operations. STACK: Introduction - Stacks – Array Representations of Stacks - Arithmetic Expressions- Polish Notation. QUEUE: Array Representation of Queues – Circular Queue.

UNIT II **12 Hours**

LINKED LISTS: Introduction - Linked Lists - Representation of Linked List in Memory - Traversing a Linked List - Searching a Linked List – Memory Allocation: Garbage Collection - Insertion into a Linked List - Deletion from a Linked List.

UNIT III **12 Hours**

TREES: Introduction - Binary Trees - Representing Binary Tress in Memory – Traversing Binary Trees. GRAPHS: Terminology and Representations –Sequential Representation of Graphs - Adjacency Matrix, Path Matrix.

UNIT IV **12 Hours**

INTRODUCTION - What is an Algorithm? – Algorithm Specification – Performance Analysis. Divide-And-Conquer: Binary Search – Merge Sort. GREEDY METHOD: Knapsack problem - Minimum Cost Spanning Tree - Prim's Algorithm – Kruskal Algorithm.

UNIT – V **12 Hours**

DYNAMIC PROGRAMMING: all pairs shortest problem, travelling salesman problem. GRAPH SEARCH METHODS: Breadth first and depth first traversals. BACKTRACKING: The 8-Queens Problem - Graph coloring problem.

Text Books

1. Seymour Lipschutz, "Data Structures", Tata McGraw Hill Publishing Company Limited, New Delhi, 2014.
2. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition

Chapters (Relevant Topics only)

Unit I	:	1 (1.3 , 1.4) & 6 (6.1-6.3, 6.6, 6.11,6.14) from Book1
Unit II	:	5 (5.1 – 5.8) from Book 1
Unit III	:	7 (7.1 – 7.4) & 8 (8.1-8.3) from Book 1
Unit IV	:	1 (1.1 – 1.3), 3 (3.2, 3.4) , 4 (4.2 , 4.5) from Book 2
Unit V	:	5 (5.3, 5.9) , 6 (6.2) & 7 (7.2, 7.4) from Book 2

Reference Books:

1. Tannenbaum, Data Structure Using C, Pearson Education, 2003.
2. Anany Levitin, ―Introduction to Design and Analysis of Algorithms‖, Pearson Education, 2012.

Course designer

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 on or after June 2022)

Course code	Course Title	Category	L	T	P	Credit
UDS22C22	Python Programming	Core 5	4	-	-	4

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble

This course is designed to learn basic concepts of python programming and also dealt with oops concepts and Data Science using Pandas, Numpy, Matplotlib.

Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Realize the basic concepts of Python.	65%	60%
CO2	Implement application using list, tuples, and dictionaries functions and learn to build user defined functions in python.	65%	60%
CO3	Learn the Concept of OOPs, and implement data science in python using Pandas Module.	65%	60%
CO4	Acquire and apply knowledge to Numpy module and the use of Numpy module	65%	60%
CO5	Incorporate Visualization concepts using Matplotlib	65%	60%

Mapping of COs with PSOs

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

S-STRONG M –MEDIUM L-LOW

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**L**	**M**	**M**	**L**	**L**	**-**
CO2	**M**	**M**	**M**	**M**	**M**	**M**

CO3	**S**	**S**	**M**	**M**	**L**	**S**
CO4	**S**	**S**	**S**	**M**	**M**	**M**
CO5	**S**	**M**	**M**	**S**	**S**	**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%

Content

UNIT-I: **11 HOURS**

Introduction to Python: Python-Features of Python- Execution of a Python Program- Viewing the Byte Code- Python Virtual Machine (PVM) – Memory Management in Python. **Data Types in Python:** Numeric-Boolean-Sequences in python -Sets-Identifiers and Reserved words. **Operators in Python:** Membership and Identity Operators. **Input and Output:** Input Statements- Output Statements. **Control Statements:** The if statements- The if…else statements- The if..elif statements – The while Loop- The for Loop- Nested Loops- break, continue and pass statements.

UNIT-II: **12 HOURS**

Lists, Tuples -Dictionaries. **Functions:** Defining a function – Calling a function – Returning Results from a function – Returning multiple values from a function – Pass by Object Reference – Recursive function- Anonymous or Lambdas.

UNIT- III: **17 HOURS**

Classes and Objects: Creating a class – The self variable – Constructors – Types of Methods – Inner Classes. **Inheritance and Polymorphism:** The super() method – Types of Inheritance – Polymorphism – Operator overloading – Method Overloading – Method Overriding. **Data Science using Python:** Data Frame- Creating Data Frame from an Excel Spreadsheet, .csv files- Data Visualization- Bar Graph- Creating a Pie Chart- Creating Line Graph.

UNIT – IV **10 HOURS**

Introduction to Numpy: The Basic Numpy Arrays – Computation on Numpy Arrays: Universal Functions – Aggregations: Min, Max and Everything in Between – Computation on Arrays: Broadcasting – Sorting Arrays – Structured Data: Numpy's structured Arrays.

UNIT – V **10 HOURS**

Visualization with Matplotlib: General Matplotlib Tips – Simple Line Plots – Simple Scatter Plots – Visualizing Errors – Histograms, Binning and Density - Customizing plot Legends – Customizing Colorbars – Multiple Subplots – T ee Dimensional Plotting in Matplotlib – Geographic Data with Basemap.

Text Books

1. Title: Core Python Programming
   Author: Dr. R.Nageswara Rao
   Publisher: Dreamtech Press
   Edition: second

2. Jake Vandeplus,December 2016, **Python Data Science Handbook: Essential tools for working with data** 1st Edition, O'Reilly.

Chapters (Relevant Topics Only)

Unit-I	:	Chapter 1, 3,4,5,6 from Book 1
Unit-II	:	Chapter 10, 11, 19 from Book 1
Unit-III	:	Chapter 16, 13, 14 from Book 1
Unit-IV	:	Chapter 2 from Book 2
Unit-V	:	Chapter 4 from Book 2

Reference Books

6. E. Balagurusamy, "Problem Solving and Python Programming" McGraw Hill Education 2018
7. Wes McKinney, October 2012, **Python for Data Analysis** 1st Edition, O'Reilly

Course Designer

Mr. R.Chandrasekar

THIAGARAJAR COLLEGE, MADURAI - 09

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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
UMA22GE21D	Probability and Statistics	Allied 2	5	-	-	5

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
I	II	25	75	100

Preamble

This course is a foundation for probability and statistical ideas in exploratory data analysis and provides a concise and clear description of various statistical methods used for analysis.

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 probability and random experiment.	70	65
CO2	Expose to the concepts of Random variable.	75	70
CO3	Demonstrate functions of random variable.	75	65
CO4	Analyze correlation and regression and estimate standard error.	80	75
CO5	Relate and analyze the knowledge of using various distributions for statistical analysis.	85	75

Mapping of COs with PSOs

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

S-STRONG M –MEDIUM L-LOW

Mapping of COs with POs

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

Probability Theory: random experiment – Axiomatic definition of probability - Conditional probability – Independent events – theorem of total probability – Bayes' Theorem of Theorem probability of causes.

Unit II **(15 Hours)**

Random Variables: Discrete random variable – Probability function – Continuous random variable – Cumulative distribution function - Special distribution – Discrete distributions – Continuous distributions

Unit III **(12 Hours)**

Functions of Random Variables: Function of one random variable – One functions of two random variables – Two functions of two random variables.

Unit IV **(15 Hours)**

Statistical Averages: Linear correlation – Correlation coefficient - Properties of correlation coefficient – Rank correlation coefficient – Regression – Equations of the regression line of y on X – Standard error of estimate of Y

Unit V **(18 Hours)**

Some Special Probability Distributions**:** Introduction – Special discrete distributions - Binomial Distribution – Poisson Distribution – Special continuous distributions – Uniform distribution - Normal distribution.

Text Books:

T. Veerarajan, “Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks”, McGraw – Hill Education (India) Private Limited, New Delhi, 4th edition 2015.

Chapters (Relevant Topics Only)

Unit I	:	I (1.1, 1.2, 1.4-1.6, 1.14, 1.19, 1.20, 1.23)
Unit II	:	II (2.1 – 2.5, 2.20),
Unit III	:	III (3.1 – 3.6, 3.23)
Unit IV	:	IV (4.17 – 4.19, 4.21- 4.47)
Unit V	:	V (5.1 - 5.4, 5.36, 5.43, 5.54)

References:

1. Vittal. P.R., 2013, Mathematical Statistics, Margham Publications, Chennai.
2. Gupta. S.C. and Kapoor. V.K., 2007, Fundamentals of Mathematical Statistics, Eleventh edition, Sultan Chand & sons, New Delhi.
3. Gupta. S.C. and Kapoor. V.K., 2015, Elements of Mathematical Statistics, Third Edition, Sultan Chand & Sons, Educational Publishers, New Delhi.

Course Designers:

1. Mrs. V. Kanchana Devi.
2. Dr. D. Murugeswari.

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DEPARTMENT OF COMPUTER SCIENCE

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Course code	Course Title	Category	L	T	P	Credit
UDS22CL21	Data Structures and Algorithms Lab	Core Lab 2	-	-	4	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
I	II	40	60	100

Preamble

This course facilitates the students in understanding the various data structures and algorithms through implementation.

Course Outcomes

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

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Implement stack and Queue data structures	70	65
CO2	Implement linked list data structure.	70	65
CO3	Implement divide and conquer approach.	70	65
CO4	Implement greedy method and graph search methods.	70	65
CO5	Implement graph search method and backtracking.	70	65

Mapping of COs with PSOs

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

S-STRONG M-MEDIUM L-LOW

Mapping of COs with POs

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

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

Content

1. Write a program to implement Stack implementation using array
2. Write a program to implement Queue implementation using array
3. Write a program to implement Circular Queue implementation using array.
4. Write a program to implement Single linked list
5. Write a program to implement Tree Traversal
6. Write a program to implement Binary Search
7. Write a program to implement Merge Sort
8. Write a program to implement Prim's Algorithm.
9. Write a program to implement Kruskal Algorithm.
10. Write a program to implement BFS method
11. Write a program to implement DFS method.
12. Write a program to implement 8- Queens Problem.

Web Resources

1. https://www.programiz.com/c-programming
2. https://www.tutorialspoint.com/data_structures_algorithms

Course designer

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 on or after June 2022)

Course code	Course Title	Category	L	T	P	Credit
UDS22CL22	Python Programming Lab	Core Lab 3	-	-	3	2

L – Lecture T – Tutorial P – Practical

Year	Semester	Internal	External	Total
I	II	40	60	100

Preamble

This course is designed to learn basic concepts of python programming and also dealt with oops concepts and Data Science using Pandas, Numpy, Matplotlib.

Course Outcomes

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

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Realize the basic concepts of Python.	70%	65%
CO2	Implement application using list, tuples, and dictionaries functions and learn to build user defined functions in python.	70%	65%
CO3	Learn the Concept of OOPs, and implement data science in python using Pandas Module.	70%	65%
CO4	Acquire and apply knowledge to Numpy module and the use of Numpy module	70%	65%
CO5	Incorporate Visualization concepts using Matplotlib	70%	65%

Mapping of COs with PSOs

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

S-STRONG M –MEDIUM L-LOW

Mapping of COs with POs

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

S-STRONG M –MEDIUM L-LOW

Content

1. Program to demonstrate membership and Identity operators
2. Program to demonstrate Control statements.
3. Program to demonstrate built-in and user defined functions
4. Program to demonstrate list and its operations and functions.
5. Program to demonstrate Set operations
6. Program to demonstrate tuple and its operations and functions
7. Program to demonstrate dictionaries and its operations and functions.
8. Program to demonstrate Classes and Objects.
9. Program to demonstrate Constructors.
10. Program to demonstrate inner classes.
11. Program to demonstrate Single and Multiple inheritance.
12. Program to demonstrate Operator Overloading.
13. Program to demonstrate Method Overloading.
14. Program to demonstrate Method Overriding.
15. Program to demonstrate Arrays using Numpy
16. Program to demonstrate list and its operations and functions using Numpy.
17. Program to demonstrate Universal functions on Numpy Arrays.
18. Program to demonstrate Aggregations.
19. Program to demonstrate Array Broadcasting.
20. Program to demonstrate Exception Handling
21. Program to demonstrate Sorting arrays, K-Nearest Neighbors.
22. Program to demonstrate Structured Arrays.
23. Program to demonstrate Matplotlib.
24. Program to demonstrate Line plot, Scatter plot.
25. Program to demonstrate Histograms, Binnings and Density.
26. Program to demonstrate data frame and its functions.
27. Program to demonstrate Bar graph, Line graph and Pie Chart.

Course Designer

Mr.R.Chandrasekar