

**E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.**

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

(Re –accredited (3<sup>rd</sup> cycle) with Grade A<sup>+</sup> and CGPA 3.51 by NAAC)**TANSCHÉ - CBCS with OBE****DEPARTMENT OF COMPUTER SCIENCE (Data Science and Analytics) - UG****COURSE STRUCTURE**

(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Title of the Course	Teaching hrs. (per week)	Duration of Exam (hrs.)	Marks Allotted			
						CIA	SE	Total	Credits
III	I	23OU1TA3	Tamil	6	3	25	75	100	3
	II	23OU2EN3	General English III	6	3	25	75	100	3
	III	23OUCSD31	<b>Core Course 5:</b> Data Science	5	3	25	75	100	5
		23OUCSD3P	<b>Core Course 6:</b> Data Science Lab	5	3	40	60	100	5
		23OUCSDGEMA3	<b>GEC 3 :</b> Mathematics – III Discrete Mathematics – I	4	3	25	75	100	3
	IV	23OUCSDSEC31	<b>SEC 4:</b> E-Commerce	2	3	25	75	100	2
		23OUCSDSEC32	<b>SEC 5:</b> Software Testing	1	3	25	75	100	1
			<b>Environmental Studies</b>	1	-	-	-	-	-
			<b>TOTAL</b>	<b>30</b>					<b>22</b>
IV	I	23OU1TA4	Tamil	6	3	25	75	100	3
	II	23OU2EN4	General English IV	6	3	25	75	100	3
	III	23OUCSD41	<b>Core Course 7 :</b> Object Oriented Programming with Java	5	3	25	75	100	5
		23OUCSD4P	<b>Core Course 8:</b> Object Oriented Programming with Java Lab	5	3	40	60	100	5
		23OUCSDGEMA4	<b>GEC 4:</b> Mathematics – IV Discrete Mathematics – II	4	3	25	75	100	3
	IV	23OUCSDSEC41	<b>SEC 6 :</b> Data Mining and Warehousing	2	3	25	75	100	2
		23OUCSDSEC42	<b>SEC 7 :</b> Robotics and its Applications	1	3	25	75	100	1
		23OU4EV4	<b>Environmental Studies</b>	1	3	25	75	100	2
			<b>TOTAL</b>	<b>30</b>					<b>24</b>

**GEC-** Generic Elective Course**SEC-** Skill Enhancement Course**DSEC-** Generic /Discipline Specific

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/Week	CIA	External Exam	Total
III	Core	23OUCSD31	Data Science	5	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

### Course Objectives:

1. To understand the basic concepts of Data Science
2. To understand the principles of Inferential Statistics
3. To test the solid foundation in sample distribution.
4. To analysis the variance in Data Science
5. To understand and handle database and visualize.

### Course Content:

#### Unit – I

**Introduction to Data Science:** Need for data science – benefits and uses – facets of data – data science process – setting the research goal –retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models –presenting and building applications.

#### Unit – II

**Inferential Statistics:** Populations – samples – random sampling – probability and statistics Sampling distribution – creating a sampling distribution – mean of all sample means – standard error of the mean – other sampling Distributions-Hypothesis testing – z-test – z-test procedure – statement of the problem – null hypothesis – alternate hypotheses – decision rule – calculations – decisions – interpretations, Why hypothesis tests? – Strong or weak decisions – one-tailed and two-tailed tests – case studies Influence of sample size – power and sample size, Estimation – point estimate – confidence interval – level of confidence – effect of sample size.

#### Unit – III

**T-TEST:** t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies t-test for two independent samples – statistical hypotheses – sampling distribution – test procedure – p-value – statistical significance – estimating effect size – meta analysis t-test for two related samples

**Unit – IV**

**Analysis of Variance:** F-test – ANOVA – estimating effect size – multiple comparisons – case studies Analysis of variance with repeated measures Two-factor experiments – three f-tests – two-factor ANOVA – other types of ANOVA Introduction to chi-square tests

**Unit – V**

**Predictive Analytics:** Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy - Time series analysis – moving averages – missing values – serial correlation – autocorrelation

**Text Books**

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali(2016), “*Introducing Data Science*”, Manning Publications.

**Chapters:**

**Unit I** : 1, 2

2. Robert S. Witte and John S. Witte(2017), “*Statistics*”, Eleventh Edition, Wiley Publications.

**Chapters:**

**Unit II** : 8,9,10,11,12.

**Unit III** : 13,14,15.

**Unit IV** : 16,17,18,19.

3. Allen B. Downey(2014), “*Think Stats: Exploratory Data Analysis in Python*”, Green Tea Press.

**Chapters:**

**Unit V** : 10,11,12.

**Books for Reference:**

1. Seema Acharya, SubhasiniChellappan, Wiley(2019) , “*Big Data Analytics*”, Second Edition.
2. Jake Vanderplas(2016),” *Python Data Science Handbook : Essential Tools for Working with Data* “First Edition.
3. John V Guttag(2012),” *Introduction to Computation and Programming Using Python* “ Third Edition.

**Web Resources / E.Books:**

1. <https://www.oreilly.com/library/view/doing-data-science/9781449363871/>
2. <https://www.amazon.in/Taming-Python-Programming-Jeeva-Jose/dp/9386173344>
3. <https://www.amazon.in/Analytics-Subhashini-Chellappan-Seema-Acharya/dp/812657951X>

**Pedagogy:**

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

**Rationale for nature of Course:**

**Knowledge and Skill:** To make the students to know the basic concepts of Data science and analytics.

**Activities to be given:** students will demonstrate proficiency with statistical analysis of data.

**Course learning Outcomes (CLO's):**

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand the basic of data.	K1 to K3
CLO2	Summarize the process of data science.	K1 to K3
CLO3	Perform the analysis of given data.	K1 to K4
CLO4	Describe about machine learning	K1 to K3
CLO5	Explore Text mining and data visualization	K1 to K4

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)**

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	3	2	3	2	1
CLO2	3	3	3	2	2	1
CLO3	2	3	2	2	1	2
CLO4	3	3	2	1	3	2
CLO5	3	3	1	2	2	1

**1-Basic Level**

**2- Intermediate Level**

**3- Advanced Level**

## LESSON PLAN: TOTAL HOURS (75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	<b>Introduction To Data Science:</b> Need for data science – benefits and uses – facets of data – data science process – setting the research goal –retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models –presenting and building applications.	15	Chalk and Talk, PPT, quiz, on the spot test
II	<b>Inferential Statistics:</b> Populations – samples – random sampling – probability and statistics Sampling distribution – creating a sampling distribution – mean of all sample means – standard error of the mean – other sampling Distributions- Hypothesis testing – z-test – z-test procedure – statement of the problem – null hypothesis – alternate hypotheses – decision rule – calculations – decisions – interpretations, Why hypothesis tests? – Strong or weak decisions – one-tailed and two-tailed tests – case studies Influence of sample size – power and sample size, Estimation – point estimate – confidence interval – level of confidence – effect of sample size.	15	Chalk and Talk, quiz, on the spot test
III	<b>T-TEST :</b> t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies t-test for two independent samples – statistical hypotheses – sampling distribution – test procedure – p-value – statistical significance – estimating effect size – meta analysis t-test for two related samples	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	<b>Analysis Of Variance :</b> F-test – ANOVA – estimating effect size – multiple comparisons – case studies Analysis of variance with repeated measures Two-factor experiments – three f-tests – two-factor ANOVA – other types of ANOVA Introduction to chi-square tests	15	Chalk and Talk, PPT, quiz
V	<b>Predictive Analytics :</b> Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling Regression using Stats Models – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy - Time series analysis – moving averages – missing values – serial correlation – autocorrelation	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Mrs.S.Revathy

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	External Exam	Total
III	Core	23OUCSD3P	Data Science Lab	5	5	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

### PROGRAM LIST

#### Course Objectives:

1. To build websites and software, automate tasks, and conduct data analysis Open Source and Community Development.
2. To understand the python libraries for data science.
3. To understand the basic Statistical and Probability measures for data science.
4. To learn descriptive analytics on the benchmark data sets.
5. To apply correlation and regression analytics on standard data sets.

#### List of Exercises:

1. Demonstrate the working of “id” and “type” functions.
2. Find all prime numbers within a given range.
3. Print n terms of Fibonacci series using iteration.
4. Demonstrate use of slicing in string.
5. Compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
6. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Demonstrate use of list & related functions.
8. Demonstrate use of Dictionary & related functions.
9. Demonstrate use of tuple & related functions.
10. Implement stack using list.
11. Implement queue using list.
12. Read and write from a file.
13. Copy a file.
14. Demonstrate working of classes and objects.
15. Demonstrate class method & static method.
16. Demonstrate constructors.
17. Demonstrate inheritance.

18. Demonstrate aggregation/composition.
19. Create a small GUI application for insert, update and delete in a table.
20. Bar charts, histograms and pie charts

#### Books for Reference:

1. Hadley Wickham and Garrett Grolemund(2016),”*R for Data Science*”,First edition.
2. Peter Bruce&Andrew Bruce(2017),” *Practical Statistics for Dta Scientists*”, First edition.
3. Prabhanjan Tattar(2017), ”*Practical Data Science Cookbook*”,Second edition.

#### Web Resources / E.Books:

1. <https://digitallibrary.tsu.ge/book/2019/september/books/R-for-Data-Science.pdf>
2. <https://www.amazon.in/Practical-Statistics-Scientists-Peter-Bruce/dp/1491952962>
3. <https://www.amazon.in/Practical-Data-Science-Cookbook/dp/1787129624>

#### Pedagogy

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

#### Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Analyze the need and importance of Calculus to a data scientist Understand basic mathematical concepts like calculus and linear algebra .	K1 to K3
CLO2	Derive the probability mass and density functions of transformation of random variables	K1 to K3
CLO3	Apply the mathematical and probabilistic foundations of statistical inference in computing	K1 to K4
CLO4	Interpret the results of Regression and Correlation Analysis, for forecasting , perform analysis of variance	K1 to K3
CLO5	Solve classification problems using concept learning and multiclass classification	K1 to K4

**LESSON PLAN FOR PRACTICAL: TOTAL HOURS (75HRS)**

<b>Cycle</b>	<b>Description</b>	<b>Hrs</b>	<b>Mode</b>
<b>1</b>	1. Demonstrate the working of “id” and “type” functions. 2. Find all prime numbers within a given range. 3. Print n terms of Fibonacci series using iteration. 4. Demonstrate use of slicing in string.	15	Writing and executing the program in a system
<b>2</b>	5. Compute the frequency of the words from the input. The output should output after sorting the key alphanumerically. 6. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically. 7. Demonstrate use of list & related functions. 8. Demonstrate use of Dictionary & related functions.	15	Writing and executing the program in a system
<b>3</b>	9. Demonstrate use of tuple & related functions. 10. Implement stack using list. 11. Implement queue using list. 12. Read and write from a file.	15	Writing and executing the program in a system
<b>4</b>	13. Copy a file. 14. Demonstrate working of classes and objects. 15. Demonstrate class method & static method. 16. Demonstrate constructors.	15	Writing and executing the program in a system
<b>5</b>	17. Demonstrate inheritance. 18. Demonstrate aggregation/composition. 19. Create a small GUI application for insert, update and delete in a table. 20. Bar charts, histograms and pie charts	15	Writing and executing the program in a system

**Course Designer****Mrs.S.Revathy**

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	SE	Total
III	Skill Enhancement Course	23OUCSDSEC31	E-Commerce	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

### Course Objectives:

1. Understanding of the foundations and importance of E-commerce
2. Understanding of retailing in E-commerce by in terms of branding and pricing strategies and determining the effectiveness of market research.
3. Assess the Internet trading relationships including Business to Consumer, Business- to-Business, Intra-organizational.
4. Knowing key features of Internet, Intranets and Extranets and how they relate to each other.
5. Understanding legal issues and privacy in E-Commerce.

### Course Content:

#### Unit –I

**E-Commerce:** E-Commerce Framework – E-Commerce and Media Convergence – The anatomy of E-commerce applications - E-Commerce Consumer Applications - E- Commerce Organization Applications.

#### Unit –II

**The Internet:** The Internet Terminology – NSFNET – Architecture and Components– National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization: Telco/Cable/Online companies - National Independent ISPs – Regional level ISPs – Local level ISPs.

#### Unit – III

**E-Commerce and the World Wide Web:** Architectural Framework for E-commerce – WWW as the architecture – Technology behind the web – Security and the web.

#### Unit – IV

**Electronic Payment Systems:** Types of Electronic Payment Systems– Digital token Electronic Payment Systems – Credit Card Based Electronic Payment Systems – Risk and

Electronic Payment Systems. Electronic Data Interchange: Legal, Security and Privacy issues.

## Unit – V

**Advertising and Marketing on the Internet:** E-Commerce Catalogs– Information Filtering – Consumer Data Interface – Emerging tools. Software Agents: Characteristics and Properties of Software Agents – Technology behind Software Agents - Applets, Browsers, and Software Agents.

### Book for Study:

1. EfraimTurvanJ.Lee, David Kug and Chung(2015), “*Electronic Commerce*”, Pearson Education, Asia, Eight edition.

### Chapters:

- Unit I** : 1.1 - 1.5.  
**Unit II** : 3.1, 3.3, 3.4, 3.6, 3.7, 4.1 - 4.4.  
**Unit III** : 6.1, 6.2, 6.4, 6.5.  
**Unit IV** : 8.1, 8.2, 8.4, 8.5,9.3.  
**Unit V** : 14.3-14.5, 16.2, 16.3, 16.6.

### Books for Reference:

1. EfraimTurban, Judy whiteside, David king andjon outland(2017), “*Introduction To Electronic Commerce*”, Springer international Publishing ,Fourth edition.
2. Mamta Bhusry(2005), “*E- Commerce*”, Firewall media,First Edition.
3. Manlyn Greenstein and Miklos(2002), “*Electronic Commerce*”, TMH,Second Edition

### Web Resources / E.Books:

1. <https://www.academia.edu/11706168/>
2. <https://archive.org/details/electroniccommer0000gree>
3. <https://en.wikipedia.org/wiki/E-commerce>

### Pedagogy

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

### Rationale for nature of Course:

### Knowledge and Skill:

- Acquire the knowledge of E-Commerce Frameworks.
- Able to use the E-Commerce Networks and Research Networks, Analyze the Internet Commercialization.

**Activities to be given:** To practice the students with E-Commerce how incorporate the Internet, Construct the Web Security.

**Course learning Outcomes (CLOs):**

CLO	Course Outcomes Statement	Knowledge (According to Bloom's Taxonomy)
CLO1	Demonstrate E-Commerce Frameworks. Distinguish E-Commerce and media Convergence. Illustrate E-Commerce Applications.	K1 to K3
CLO2	Describe the E-Commerce Networks and Research Networks, Analyze the Internet Commercialization	K1 to K3
CLO3	Evaluate the E-Commerce how incorporate the Internet, Construct the Web Security	K1 to K3
CLO4	Distinguish the different payment system. Illustrate the data interchange	K1 to K3
CLO5	Understanding the Advertising and Marketing on the Internet, Describe Software Agents	K1 to K3

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)  
(SCIENCE)**

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	1	3	1	2	1
CLO2	2	3	3	1	2	1
CLO3	2	3	3	2	1	1
CLO4	2	1	3	2	1	1
CLO5	3	3	1	2	1	1

**1-Basic Level      2- Intermediate Level      3- Advanced Level**

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (ARTS)**

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	3	1	2	3	2
CLO2	3	3	2	3	3	2
CLO3	3	3	1	2	2	1
CLO4	3	2	2	1	1	2
CLO5	3	3	1	2	3	1

**1-Basic Level      2- Intermediate Level      3- Advanced Level**

**LESSON PLAN FOR PRACTICAL: TOTAL HOURS (30HRS)**

<b>UNIT</b>	<b>DESCRIPTION</b>	<b>HRS</b>	<b>MODE</b>
I	<b>E-Commerce:</b> E-Commerce Framework – E-Commerce and Media Convergence – The anatomy of E-commerce applications - E-Commerce Consumer Applications - E-Commerce Organization Applications.	6	Chalk and Talk, PPT, quiz, on the spot test
II	<b>The Internet:</b> The Internet Terminology – NSFNET – Architecture and Components– National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization: Telco/Cable/Online companies - National Independent ISPs – Regional level ISPs – Local level ISPs.	6	Chalk and Talk, quiz, on the spot test
III	<b>E-Commerce and the World Wide Web:</b> Architectural Framework for E-commerce – WWW as the architecture – Technology behind the web – Security and the web.	6	Chalk and Talk, PPT, group discussion and You tube Links
IV	<b>Electronic Payment Systems:</b> Types of Electronic Payment Systems – Digital token Electronic Payment Systems – Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems. Electronic Data Interchange: Legal, Security and Privacy issues.	6	Chalk and Talk, PPT, quiz
V	<b>Advertising and Marketing on the Internet:</b> E-Commerce Catalogs – Information Filtering – Consumer Data Interface – Emerging tools. Software Agents: Characteristics and Properties of Software Agents – Technology behind Software Agents - Applets, Browsers, and Software Agents.	6	Chalk and Talk, PPT, group discussion, quiz, open book test

**Course Designer**  
**Mrs.M.Backiya Lakshmi**

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	SE	Total
III	Skill Enhancement Course	23OUCSDSEC32	Software Testing	1	1	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

**Unit –I:** Introduction: Purpose–Productivity and Quality in Software Testing Vs Debugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.

**Unit –II** Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction Flow Testing Techniques.

**Unit –III** Data Flow Testing Strategies – Domain Testing: Domains and Paths – Domains and Interface Testing.

**Unit –IV** Linguistic –Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing–Formats–Test Cases.

**Unit –V** Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, State Testing.

**Books for Study:**

1. B.Beizer,“*SoftwareTestingTechniques*”,IIEdn.,DreamTechIndia,NewDelhi, 2003.

**Books for Reference:**

1. I.Burnstein,2003,“*Practical Software Testing*”,Springer International Edn.
2. E. Kit, 1995, “*Software Testing in the Real World: Improving the Process*”, Pearson Education,Delhi.
3. R. Rajani,and P.P.Oak,2004,“*SoftwareTesting*”,TataMcgrawHill,New Delhi.

**Chapters:**

**Unit – I** : 1,2

**Unit – II** : 3,4

**Unit – III** : 5,6,7

**Unit – IV** : 8,9

**Unit – V** : 10,11

### Web Resources / E.Books:

Open source digital libraries: PHP Programming

<https://www.geeksforgeeks.org/software-testing-basics/>

<https://www.javatpoint.com/software-testing-tutorial>

<https://www.globalapptesting.com/blog/software-testing>

### Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

### Rationale for nature of Course:

**Knowledge and Skill:** To make the students to know the basic concepts of programming language.

**Activities to be given:** students shall be practiced with different programming concepts.

### Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Students learn to apply software testing knowledge and engineering methods	K1 to K3
CLO2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	K1 to K3
CLO3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	K1 to K4
CLO4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	K1 to K3
CLO5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	K1 to K4

### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
<b>CLO1</b>	3	2	1	2	1	2
<b>CLO2</b>	3	3	2	2	3	3
<b>CLO3</b>	3	3	2	3	3	2
<b>CLO4</b>	3	2	3	2	2	3
<b>CLO5</b>	3	2	2	2	3	3

**1-Basic Level          2- Intermediate Level          3- Advanced Level**

**LESSON PLAN FOR PRACTICAL: TOTAL HOURS (30 HRS)**

<b>Cycle</b>	<b>Description</b>	<b>Hrs</b>	<b>Mode</b>
<b>1</b>	Introduction: Purpose–Productivity and Quality in Software Testing Vs Debugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6	Chalk and Talk, PPT, group discussion and quiz.
<b>2</b>	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction Flow Testing Techniques.	6	Chalk and Talk, PPT, group discussion and quiz.
<b>3</b>	Data Flow Testing Strategies – Domain Testing: Domains and Paths – Domains and Interface Testing.	6	Chalk and Talk, PPT, group discussion and quiz.
<b>4</b>	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing– Formats–Test Cases.	6	Chalk and Talk, PPT, group discussion and quiz.
<b>5</b>	Logic Based Testing–Decision Tables– Transition Testing–States, State Graph, State Testing.	6	Chalk and Talk, PPT, group discussion and quiz.

**Course Designer  
Mrs.V.Jayavani**

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	SE	Total
IV	Core	23OUCSD41	Object Oriented Programming with Java	5	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

### Course Objectives:

1. Understand the Object Oriented Programming with Java.
2. To apply the OOPs concept in JAVA programming.
3. To become proficient programmers through the java programming language.
4. To give insight into real world applications.
5. To get the attentions of users in user interface using graphics

### Course Content:

#### Unit- I

**An Overview of Java: Object** oriented programming – A first simple program – A second short program – Two control statements – Using blocks of code – Lexical issues – The Java class libraries – **Data types, Variables and Arrays:** Java is a strongly typed language – The primitive types – Integers – Floating point types – characters – Booleans – A closer look at literals – variables – Type conversation and casting – Automatic type promotion in expression – Arrays

#### Unit- II

**Operators:** Arithmetic operators – The bitwise operators – relational operator – Boolean logical operators- **Control Statements:** Java’s selection statement - Iteration statement – Jump statement – **Inheritance: Inheritance** basics – Using super – Creating a multilevel hierarchy – When construct are called – Method overriding – Dynamic method dispatch – Using abstract classes – Using final with inheritance –The object classes

#### Unit- III

**Packages and Interfaces:** Packages – Access protection – Importing packages – Interfaces - **Exception Handling:** Exception – Handling fundamentals – Exception types – Uncaught exceptions – Using try and catch – Multiple catch clauses – Nested try statement – Throw – Throws

- Finally – java’s built-in exception – Creating your own exception subclasses – chained exceptions
- Using exceptions

#### **Unit-IV**

**Multithreaded Programming:** The java thread model – The main thread – Creating a thread – Creating multiple thread – Using is alive() and join() – Thread priorities – synchronization – Interthread communication – Suspending, resuming, and stopping threads – Using multithreading

**I/Applets ,and Other Topics:** I/O basics – Reading console input – Writing console output – The Print Writer class – Reading and writing files – Applet fundamentals – The transient and volatile modifiers – Using instance of – strictfp – Native methods – Using asserts – Static import – Invoking overloaded constructors through this()

#### **Unit- V**

**Networking:** Networking basics – The networking classes and interfaces – InetAddress – Inet4 address and Inet6 address – TCP/IP client sockets – URL – URL connection – Http URL connection – The URL class – Cookies – TCP/IP server sockets – Datagrams

**-Introducing The AWT: Working With Windows ,Graphics, And Text:** AWT classes – Window fundamentals – Working with frame windows – Creating a frame window in an Applet – creating a windowed program – Displaying Information within a window – Working with graphics – Working with color – Setting the paint mode – Working with fonts – Managing text output Using FontMetrics

#### **Books for study:**

1. P.Naughton and H.Schildt(1999), “*Java 2 (The Complete Reference)*”, Seventh Edition, Tata McGraw Hill Edition.

#### **Chapters:**

- Unit I** : 2,3.
- Unit II** : 4,5,8 .
- Unit III** : 9,10 .
- Unit IV** : 11,13 .
- Unit V** : 20,23 .

#### **Books for Reference:**

- 1.K.K. Aggarwal &Yogesh Sing(2008), “*Software Engineering*”, Revised Third Edition, New Age International Publishers.
- 2.Cay S. Horstmann, Gary Cornell(2012), “*Core Java 2 Volume I*”, Fundamentals- Ninth Edition Addison Wesley.

3.K.Arnold and J.Gosling(1996), “*The Java Programming Language*”- Second Edition, ACM Press/Addison- Wesley Publishing Co. New York.

### Web Resources / E.Books:

1. <https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/>
2. <https://www.javatpoint.com/java-oops-concepts>
3. <https://www.coursera.org/learn/object-oriented-java>

### Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

### Rationale for nature of Course:

**Knowledge and Skill:** To make the students to know the basic concepts of programming language.

**Activities to be given:** Students shall be practiced with different programming concepts.

### Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge (According to Bloom's Taxonomy)
CLO1	Use the syntax and semantics of java programming language and basic concepts of OOP.	K1 to K3
CLO2	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages	K1 to K3
CLO3	Apply the concepts of Multithreading and Exception handling to Develop efficient and error free codes.	K1 to K4
CLO4	Design event driven GUI and web related applications which mimic the real word scenario	K1 to K3
CLO5	Build the internet-based dynamic applications using the concept of applets	K1 to K4

### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	2	3	2	2	1
CLO2	2	3	3	2	2	2
CLO3	1	2	3	2	3	2
CLO4	3	3	2	2	3	2
CLO5	2	3	3	2	3	2

**1-Basic Level**

**2- Intermediate Level**

**3- Advanced Level**

## LESSON PLAN : TOTAL HOURS (75HRS)

UNIT	DESCRIPTION	HRS	MODE
I	<b>An Overview of Java :</b> Object oriented programming – A first simple program – A second short program – Two control statements – Using blocks of code – Lexical issues – The Java class libraries – <b>Data types,Variables,and Arrays:</b> Java is a strongly typed language – The primitive types – Integers – Floating point types – characters – Booleans – A closer look at literals – variables – Type conversation and casting – Automatic type promotion in expression – Arrays	15	Chalk and Talk, PPT, quiz, on the spot test
II	<b>Operators:</b> Arithmetic operators – The bitwise operators – relational operator – Boolean logical operators- <b>Control Statements:</b> Java's selection statement - Iteration statement – Jump statement – <b>Inheritance :</b> Inheritance basics – Using super – Creating a multilevel hierarchy – When construct are called – Method overriding – Dynamic method dispatch – Using abstract classes – Using final with inheritance –The object classes	15	Chalk and Talk, quiz, on the spot test
III	<b>Packages and Interfaces:</b> Packages – Access protection – Importing packages – Interfaces - <b>Exception Handling:</b> Exception – Handling fundamentals – Exception types – Uncaught exceptions – Using try and catch – Multiple catch clauses – Nested try statement – Throw – Throws – Finally – java's built-in exception – Creating your own exception subclasses – chained exceptions – Using exceptions	15	Chalk and Talk, PPT, group discussion, and You tube Links
IV	<b>Multithreaded Programming:</b> The java thread model – The main thread – Creating a thread – Creating multiple thread – Using is alive( )and join( ) – Thread priorities – synchronization – Interthread communication – Suspending,resuming,and stopping threads – <b>Using multithreading I/O,Applets,and Other Topics:</b> I/O basics – Reading console input – Writing console output – The PrintWriter class – Reading and writing files – Applet fundamentals – The transient and volatile modifiers – Using instanceof – strictfp – Native methods – Using asserts – Static import – Invoking overloaded constructors through this( )	15	Chalk and Talk, PPT, quiz.
V	<b>Networking:</b> Networking basics – The networking classes and interfaces – InetAddress – Inet4 address and Inet6 address – TCP/IP client sockets – URL – URL connection – Http URL	15	Chalk and Talk, PPT, group discussion , quiz, open book test

	connection – The URL class – Cookies – TCP/IP server sockets – Datagrams - <b>Introducing The AWT:Working With Windows ,Graphics, And Text:</b> AWT classes – Window fundamentals – Working with frame windows – Creating a frame window in an Applet – creating a windowed program – Displaying Information within a window – Working with graphics – Working with color – Setting the paint mode – Working with fonts – Managing text output Using FontMetrics		
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**Course designer  
Mrs.N.Kavitha**

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	SE	Total
IV	Core	23OUCSD4P	Object Oriented Programming with Java Lab	5	5	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

**List of Programs:**

1. Program using Class and Object.
2. Program using Constructors.
3. Program using Command-Line Arguments.
4. Program using Random Class.
5. Program using Vectors.
6. Program using String Tokenizer Class.
7. Program using Interface.
8. Program using all forms of Inheritance.
9. Program using String class.
10. Program using String Buffer class.
11. Program using Exception Handling.
12. Implementing Thread based applications
13. Program using Packages.
14. Program using Files.
15. Program using Methods.

**Applets:**

16. Working with Colors and Fonts.
17. Parameter passing technique.
18. Drawing various shapes using Graphical statements.
19. Usage of AWT components and Listener in suitable applications.
20. Opening a link from an applet in java

**Books for Reference:**

1. Cay S. Horstmann, Gary Cornell(2012), “*Core Java 2 Volume I*”, Addison Wesley, Fundamentals- Ninth Edition.
2. K.Arnold and J.Gosling(1998), “*The Java Programming Language*”, ACM Press/Addison- Wesley Publishing Co. New York, Second Edition.

**Web Resources / E.Books:**

1. <https://books.google.com/books?id=A8wnDwAAQBAJ&printsec=copyright>
2. <https://freecomputerbooks.com/Object-Oriented-Programming-in-Java-by-Rick-Halterman.html>
3. <https://www.amazon.in/Object-Oriented-Programming-Java-Somashekara/dp/8120352874>

**Pedagogy:** Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

**Course learning Outcomes (CLO's):**

CLO	Course Outcomes Statement	Knowledge (According to Bloom's Taxonomy)
CLO1	Able to solve real world problems using OOP techniques.	K1 to K3
CLO2	Able to understand the use of abstract classes.	K1 to K3
CLO3	Able to solve problems using java collection framework and I/o classes.	K1 to K4
CLO4	Able to develop multithreaded applications with synchronization.	K1 to K3
CLO5	Able to develop applets for web applications and design GUI based applications.	K1 to K4

**LESSON PLAN FOR PRACTICAL: TOTAL HOURS (75HRS)**

Cycle	Description	Hrs	Mode
1	Program using Class and Object. Program using Constructors. Program using Command-Line Arguments. Program using Random Class.	15	Writing and executing the program in a system

2	Program using Vectors. Program using String Tokenizer Class. Program using Interface. Program using all forms of Inheritance.	15	Writing and executing the program in a system
3	Program using String class. Program using String Buffer class. Program using Exception Handling. Implementing Thread based applications	15	Writing and executing the program in a system
4	Program using Packages. Program using Files. Program using Methods. Working with Colors and Fonts.	15	Writing and executing the program in a system
5	Parameter passing technique. Drawing various shapes using Graphical statements. Usage of AWT components and Listener in suitable applications. Opening a link from an applet in java.	15	Writing and executing the program in a system

**Course Designer**  
**Mrs.N.Kavitha**

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	SE	Total
III	Skill Enhancement Course	23OUCSDSEC41	Data Mining and Warehousing	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

### Course Objectives:

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis
- To study a set of typical clustering methodologies, algorithms and applications.

### Course Content:

#### Unit –I

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

#### Unit –II

Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data Mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization.

#### Unit – III

Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules from Transaction Databases, Multilevel Association Rules from transaction databases.

#### Unit – IV

Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation.

#### Unit – V

Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning

Methods – Hierarchical Methods-Density Based Methods.

**Book for Study:**

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

**Chapters:**

- Unit I** : 1.1 - 1.5.  
**Unit II** : 3.1, 3.3, 3.4, 3.6, 3.7, 4.1 - 4.4.  
**Unit III** : 6.1, 6.2, 6.4, 6.5.  
**Unit IV** : 8.1, 8.2, 8.4, 8.5,9.3.  
**Unit V** : 14.3-14.5, 16.2, 16.3, 16.6.

**Books for Reference:**

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

**Web Resources / E.Books:**

<https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing>

<https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/>

<https://herovired.com/learning-hub/blogs/data-warehousing-and-data-mining/>

**Pedagogy**

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

**Rationale for nature of Course:**

**Knowledge and Skill:**

- Acquire the knowledge of E-Commerce Frameworks.
- Able to use the E-Commerce Networks and Research Networks, Analyze the Internet Commercialization.

**Activities to be given:** To practice the students with E-Commerce how incorporate the Internet, Construct the Web Security.

**Course learning Outcomes (CLOs):**

<b>CLO</b>	<b>Course Outcomes Statement</b>	<b>Knowledge (According to Bloom's Taxonomy)</b>
CLO1	To understand the basic concepts and the functionality of the various data mining and data warehousing component	K1 to K3
CLO2	To know the concepts of Data mining system architectures.	K1 to K3
CLO3	To analyze the principles of association rules	K1 to K3
CLO4	To get analytical idea on Classification and prediction methods.	K1 to K3
CLO5	To Gain knowledge on Cluster analysis and its methods.	K1 to K3

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)  
(SCIENCE)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>CLO1</b>	2	1	3	1	2	1
<b>CLO2</b>	2	3	3	1	2	1
<b>CLO3</b>	2	3	3	2	1	1
<b>CLO4</b>	2	1	3	2	1	1
<b>CLO5</b>	3	3	1	2	1	1

**1-Basic Level      2- Intermediate Level      3- Advanced Level**

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (ARTS)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>CLO1</b>	2	3	1	2	3	2
<b>CLO2</b>	3	3	2	3	3	2
<b>CLO3</b>	3	3	1	2	2	1
<b>CLO4</b>	3	2	2	1	1	2
<b>CLO5</b>	3	3	1	2	3	1

**1-Basic Level      2- Intermediate Level      3- Advanced Level**

**LESSON PLAN FOR PRACTICAL: TOTAL HOURS (30HRS)**

<b>UNIT</b>	<b>DESCRIPTION</b>	<b>HRS</b>	<b>MODE</b>
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction.	6	Chalk and Talk, PPT, quiz, on the spot test
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization.	6	Chalk and Talk, quiz, on the spot test
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases.	6	Chalk and Talk, PPT, group discussion and You tube Links
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation.	6	Chalk and Talk, PPT, quiz
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning Methods – Hierarchical Methods-Density Based Methods	6	Chalk and Talk, PPT, group discussion, quiz, open book test

**Course Designer**  
**Mrs.R.Keerthana**

Department of Computer Science (Data Science and Analytics)				Class: II B.Sc CS (DS)				
Sem	Category	Course Code	Course Title	Credits	Hours/ Week	CIA	SE	Total
III	Skill Enhancement Course	23OUCSDSEC42	Robotics and its Applications	1	1	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓	✓	

### Course Objectives:

- To make the students familiar with the various drive systems of robots, sensors and their applications in robot.
- To introduce the parts of robots, basic working concepts and types of robots

### Course Content:

#### Unit –I

Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.

#### Unit –II

Actuators and sensors: Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers.

#### Unit – III

Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.

#### Unit – IV

Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies

#### Unit – V

Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications- nuclear applications-space applications

**Book for Study:**

1. Richard D.Klafter. Thomas Achmielewski and Mickael Negin, “*Robotic Engineering and Integrated Approach*”, Prentice Hall India-Newdelhi-2001.

**Chapters:**

- Unit I** : 1.1 - 1.5.  
**Unit II** : 3.1, 3.3, 3.4, 3.6, 3.7, 4.1 - 4.4.  
**Unit III** : 6.1, 6.2, 6.4, 6.5.  
**Unit IV** : 8.1, 8.2, 8.4, 8.5,9.3.  
**Unit V** : 14.3-14.5, 16.2, 16.3, 16.6.

**Books for Reference:**

1. M.P.Groover , “*Industrial robotic technology-programming and application*” et.al, McGrawhill2008.
2. S.R.Deb , *Robotics technology and flexible automation*, THH-2009
3. Saeed B.Nikku, “Introduction to robotics, analysis, control and applications”, Wiley-India, 2nd edition 2011

**Web Resources / E.Books:**

<https://www.electronicsforu.com/tech-zone/tech-of-robotics/robotics-types-applications>

<https://www.britannica.com/technology/robotics>

<https://www.intel.com/content/www/us/en/robotics/types-and-applications.html>

**Pedagogy**

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

**Rationale for nature of Course:****Knowledge and Skill:**

- Acquire the knowledge of E-Commerce Frameworks.
- Able to use the E-Commerce Networks and Research Networks, Analyze the Internet Commercialization.

**Activities to be given:** To practice the students with E-Commerce how incorporate the Internet, Construct the Web Security.

**Course learning Outcomes (CLOs):**

<b>CLO</b>	<b>Course Outcomes Statement</b>	<b>Knowledge (According to Bloom's Taxonomy)</b>
CLO1	To understand the basic concepts and the functionality of the various data mining and data warehousing component	K1 to K3
CLO2	To know the concepts of Data mining system architectures.	K1 to K3
CLO3	To analyze the principles of association rules	K1 to K3
CLO4	To get analytical idea on Classification and prediction methods.	K1 to K3
CLO5	To Gain knowledge on Cluster analysis and its methods.	K1 to K3

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)  
(SCIENCE)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>CLO1</b>	2	1	3	1	2	1
<b>CLO2</b>	2	3	3	1	2	1
<b>CLO3</b>	2	3	3	2	1	1
<b>CLO4</b>	2	1	3	2	1	1
<b>CLO5</b>	3	3	1	2	1	1

**1-Basic Level      2- Intermediate Level      3- Advanced Level**

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (ARTS)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>CLO1</b>	2	3	1	2	3	2
<b>CLO2</b>	3	3	2	3	3	2
<b>CLO3</b>	3	3	1	2	2	1
<b>CLO4</b>	3	2	2	1	1	2
<b>CLO5</b>	3	3	1	2	3	1

**1-Basic Level      2- Intermediate Level      3- Advanced Level**

**LESSON PLAN FOR PRACTICAL: TOTAL HOURS (30HRS)**

<b>UNIT</b>	<b>DESCRIPTION</b>	<b>HRS</b>	<b>MODE</b>
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	6	Chalk and Talk, PPT, quiz, on the spot test
II	Actuators and sensors :Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers	6	Chalk and Talk, quiz, on the spot test
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.	6	Chalk and Talk, PPT, group discussion and You tube Links
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies	6	Chalk and Talk, PPT, quiz
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications- nuclear applications-space applications	6	Chalk and Talk, PPT, group discussion, quiz, open book test

**Course Designer**  
**Mrs. M.Backiya Lakshmi**