KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

Coimbatore - 641 029

DEPARTMENT OF COMPUTER SCIENCE WITH DATA ANALYTICS

CURRICULUM AND SCHEME OF EXAMINATIONS

(2022 - 2023 and onwards)

DEPARTMENT OF COMPUTER SCIENCE WITH DATA ANALYTICS (DA)

Vision

To emerge as a throbbing and pioneering academic and research hub of global standards to empower students in Computer Science with Data Analytics.

Mission

- To incorporate modern trends in Data Science and Analytics.
- To fuel the passion in student community to excel in all fronts like logical thinking, decision making, reliability and application based on strong theoretical foundation and extensive practical training.
- To undertake industry – institute collaborations for knowledge and technology exchange.
- To generate new knowledge by high impact research in data analytics that has significant benefits for individual, industry and society by enabling better decision making.

Programme Outcomes (POs)	
On successful completion of the B.Sc. Computer Science with Data Analytics	
PO1	Exhibit good domain knowledge and completes the assigned responsibilities Effectively and efficiently in par with the expected quality standards
PO2	Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions
PO3	Design and develop research-based solutions for complex problems with specified needs through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns
PO4	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PO5	Deliver innovative ideas to instigate new business ventures and possess the qualities of a good entrepreneur
PO6	Acquire the qualities of a good leader and engage in efficient decision-making.
PO7	Graduates will be able to undertake any responsibility as an individual/member of multidisciplinary teams and have an understanding of team leadership
PO8	Function as socially responsible individual with ethical values and accountable to ethically validate any actions or decisions before proceeding and actively contribute to the societal concerns.
PO9	Identify and address own educational needs in a changing world in ways sufficient to maintain the competence and to allow them to contribute to the advancement of knowledge
PO10	Demonstrate knowledge and understanding of management principles and apply these to one own work to manage projects and in multidisciplinary environment.

Programme Specific Outcomes (PSOs)	
After the successful completion of B.Sc. Computer Science with Data Analytics programme the students are expected to	
PSO1	Impart education with domain knowledge effectively and efficiently in par with the expected quality standards for Data analyst professional.
PSO2	Ability to apply the mathematical, technical and critical thinking skills in the discipline of Data analytics to find solutions for complex problems.
PSO3	Ability to engage in life-long learning and adopt fast changing technology to Prepare for professional development.
PSO4	Expose the students to key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics.
PSO5	Inculcate effective communication skills combined with professional & ethical Attitude.

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029

Course Name: Computer Science with Data Analytics

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2022-2023)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
I	I	22TML1A1	Language I@	6	50	50	100	3	3
	II	22ENG101	English -I	6	50	50	100	3	3
	III	22UDA101	Core Paper 1: Programming for Problem Solving using C	5	50	50	100	3	4
	III	22UDA1CL	Core Practical 1: Programming for Problem Solving using C Laboratory	5	50	50	100	3	2
	III	22UDA1A1	Allied Paper 1: Discrete Mathematics and Statistical Methods	6	50	50	100	3	5
	IV	22EVS101	Environmental Studies **	2	-	50	50	3	2
			Total	**30**	**-**	**-**	**550**	**-**	**19**
II	I	22TML2A2	Language II@	6	50	50	100	3	3
	II	22ENG202	English –II	6	50	50	100	3	3
	III	22UDA202	Core Paper 2: Object Oriented Programming in C ++	5	50	50	100	3	4
	III	22UDA2CM	Core Practical 2 : Object Oriented Programming in C ++ Laboratory	5	50	50	100	3	2
	III	22UDA2A2	Allied Paper 2 : Optimization Techniques and Linear Algebra	6	50	50	100	3	5
	IV	22VED201	Value Education: Moral and Ethics**	2	-	50	50	3	2
			Total	**30**	**-**	**-**	**550**	**-**	**19**
III	III	22UDA303	Core Paper 3: Object Oriented Programming in Java	5	50	50	100	3	4
	III	22UDA3CN	Core Practical 3: Object Oriented Programming in Java Laboratory	5	50	50	100	3	2
	III	22UDA304	Core Paper 4: Big Data Science and Data Analytics	5	50	50	100	3	4
	III	22UDA305	Core Paper 5: Data Warehousing and Data Mining	5	50	50	100	3	4
	III	22UDA3A3	Allied Paper 3: Text and Predictive Analytics	6	50	50	100	3	5
	IV	22UGC3S1	Skill Based Subject 1: Cyber Security	2	100	-	100	3	3
	IV	22TBT301/ 22TAT301/ 22UHR3N1	Basic Tamil* / Advanced Tamil**/ Non Major Elective –I Human Rights **	2	-	75	75	3	2
			Total	**30**	**-**	**-**	**675**	**-**	**24**
IV	III	22UDA406	Core Paper 6: Python Programming	5	50	50	100	3	4
	III	22UDA4CO	Core Practical 4: Python Programming Laboratory	5	50	50	100	3	2
	III	22UDA407	Core Paper 7: Relational Database Management Systems	5	50	50	100	3	5
	III	22UDA4CP	Core Practical 5: Relational Database Management Systems Laboratory	5	50	50	100	3	3
	III	22UDA4A4	Allied Paper 4: Web and Social Network Analytics	6	50	50	100	3	5
	IV	22UDA4SL	Skill Based Subject 2: Web Design Laboratory	2	50	50	100	3	3
	IV	22TBT402/ 22TAT402/ 22UWR4N2	Basic Tamil* / Advanced Tamil** / Non- Major Elective – II Women's Rights **	2	-	75	75	3	2
			Total	**30**	**-**	**-**	**675**	**-**	**24**

	III	22UDA508	Core Paper 8 - R Programming	6	50	50	100	3	4
	III	22UDA5CQ	Core Practical 6 - R Programming Laboratory	6	50	50	100	3	3
	III	22UDA509	Core Paper 9 - Cryptography and Information Security	6	50	50	100	3	4
V	III	22UDA510	Core Paper 10 - Design and Analysis of Algorithms	5	50	50	100	3	4
	III	22UDA5E1	Major Elective 1 -	5	50	50	100	3	5
	IV	-	EDC	2	100	-	100	3	3
	-	**22UDA5IT**	**Internship Training ******	Grade					
			Total	**30**	**-**	**-**	**600**	**-**	**23**

	III	22UDA611	Core Paper 11: Artificial Intelligence and its Applications	5	50	50	100	3	4
	III	22UDA6CR	Core Practical 7: Artificial Intelligence and Machine Learning Lab	5	50	50	100	3	3
	III	22UDA612	Core Paper 12: Machine Learning	5	50	50	100	3	4
VI	III	22UDA613	Core Paper 13: Database Design and Management	4	50	50	100	3	4
	III	22UDA6E2	Major Elective 2 -	5	50	50	100	3	5
	III	22UDA6Z1	Project and Viva voce*** ~	4	50	50	100	-	5
	IV	22UDA6SM	Skill Based Subject 3: Data Manipulation Using Advanced Excel Laboratory	2	50	50	100	3	3
-	-		**SWAYAM-MOOC**	-	-	-	-	-	2
			Total	**30**	**-**	**-**	**700**	**-**	**30**
V	22NCC$/NSS/YRC /PYE/ECC/RRC/ WEC101#		Co-curricular Activities*	-	50	-	50	-	1
			Grand Total	**-**	**-**	**-**	**3800**	**-**	**140**

Note:

CBCS – Choice Based Credit system
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

$ For those students who opt NCC under Cocurricular activities will be studying the prescribed syllabi of the UGC which will include Theory, Practical & Camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

@ Hindi/Malayalam/ French/ Sanskrit – 22HIN/MLM/FRN/SAN101 - 202

* - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

**- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

*** Project Report – 35 marks; Viva voce – 15 marks; Internal-50 marks

~ Not to be included in faculty workload.

**** The students shall undergo Internship training / field work for a minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the respective Faculty. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85 – 100	O
70 – 84	D
60 – 69	A
50 – 59	B
40 – 49	C
< 40	U (Reappear)

Major Elective Papers

(Two papers are to be chosen from the following SIX papers)

1. Internet of Things

2. Software Testing and Quality Assurance

3. Cloud Computing Fundamentals

4. Digital Forensics

5. Natural Language Processing

6. Deep Learning

Non-Major Elective Papers

1. Human Rights
2. Women's Rights
3. Consumer Affairs

Sub. Code & Title of the Extra Departmental Course (EDC)

22UDA5XL **-** Internet Basics and Advanced Excel Laboratory

 # List of Cocurricular Activities

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note

In core/ allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below.

Tally Table

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	200	6
2.	II	English	200	6
3.	III	Core – Theory/Practical	2000	70
	-	SWAYAM-MOOC	-	2
	III	Allied	400	20
		Electives/Project	300	15
4.	IV	Basic Tamil / Advanced Tamil/Non-Major Electives	150	4
		Skill Based subject	300	9
		EDC	100	3
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Cocurricular Activities	50	1
		Total	**3800**	**140**

- 50 % CIA is applicable to all subjects except EDC, JOC, COP and SBS1

- The students should complete a **SWAYAM-MOOC** before the completion of the 5th semester and the course-completed certificate should be submitted through the HOD to the Controller of Examinations. Two credits will be given to the candidates who have successfully completed. In case the students have completed more than one online course, the appropriate 2 extra credits shall be awarded to such candidates upon the submission of certificate through the HOD to the Controller of Examinations.

- A **Field Trip** preferably relevant to the course should be undertaken every year.

Components of Continuous Internal Assessment (50 Marks)

Components		Marks	Total
Theory			
CIA I	75	(75+75) converted to 30	50
CIA II	75		
Problem based Assignment**		10	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(50) converted to 30	50
Observation Notebook		15	
Attendance		5	
Project			
Review		45	50
Regularity		5	

* Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation. Presentation of Papers in Conferences, Quiz, Report/Content writing. Etc.

** Two Assignments to be given. (Each 5 marks).

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

(K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating)

Theory Examination – Part I, II, III

CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 20	A (Answer all)	20 x 1 = 20	MCQ-10/ Fill ups-5/ One word-5	75**
K2 – K5 Q21 to 28	B (5 out of 8)	5 x 5= 25	Short Answers	
K2 – K5 Q29 to 33	C (3 out of 5)	3 x 10 = 30	Descriptive / Detailed	

** For ESE 75 marks converted to 50 marks.

ESE Practical Examination

Option 1:

Knowledge Level	Section	Marks	Total
K3	Experiments	45	50
K4		05	
K5	Record Work		

ESE Project Viva voce

Option 1:

Knowledge Level	Section	Marks	Total
K3	Project Report	35	50
K4		15	
K5	Viva voce		

Table of Content

Programme Code: 23	**B.Sc. Computer Science with Data Analytics**

Title of the Paper : Core Paper 1 - Programming for Problem Solving using C

Batch	Hours / Week	Total Hours	Credits
2022-2023	5/15	75	4

Course Objectives
1. To introduce the concepts of Procedure Oriented Programming and the various Programming constructs of C   programming
2. To provide exposure to problem solving through programming and to develop programming skills.
3. To impart adequate knowledge of programming languages and problem solving techniques.

Course Outcomes (CO)

	CO1	Describe about the about the fundamentals of computers, history and various types of software and hardware devices.
K1 to K5	CO2	Interpret the concepts of Variables, Constant, Operators and various types of expressions.
	CO3	Apply the concept of Decision making statements and looping constructs for solving basic programs.
	CO4	Developing programs using pointer, enumerated data types, function, Union and nested structures.
	CO5	Designing programs using pointers and file concepts.

Syllabus

UNIT I   **(15 Hours)**
Fundamentals of Computers : Introduction – History of Computers - Generations of Computers - Classification of Computers - Basic Anatomy of a Computer System - Input Devices - Processor - Output Devices - Memory Management – Types of Software - Overview of Operating System- Programming Languages - Translator Programs - Problem Solving Techniques - Overview of C.

UNIT II   **(15 Hours)**
Overview of C - Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators - Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence & associativity - Mathematical functions - Reading and Writing a character - Formatted input and output.

UNIT III **(15 Hours)**

Decision Making and Branching: Introduction – if, if….else, nesting of if …else statements - else if ladder-The switch statement -The?: Operator – The goto Statement. Decision Making and Looping: Introduction-The while statement - the do statement – The for statement - Jumps in loops. Arrays – Character Arrays and Strings.

UNIT IV **(15 Hours)**

User-Defined Functions: Introduction – Need and Elements of User-Defined Functions- Definition-Return Values and their types - Function Calls – Declarations – Category of Functions - Nesting of Functions - Recursion – Passing Arrays and Strings to Functions - The Scope, Visibility and Lifetime of Variables- Multi file Programs- **Structures and Unions*.**

UNIT V **(15 Hours)**

Pointers: Introduction-Understanding pointers-Accessing the address of a variable-Declaration and Initialization of pointer Variable – Accessing a variable through its pointer-Chain of pointers- Pointer Expressions – Pointer Increments and Scale factor- Pointers and Arrays- Pointers and Strings – Array of pointers – Pointers as Function Arguments- Functions returning pointers – Pointers to Functions – Pointers and Structures. File Management in C.

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Book

1. E Balagurusamy (2008), "Computing Fundamentals & C Programming" – Tata McGraw-Hill Education Pvt. Ltd.

Reference Books

1. Ashok N Kamthane (2002),"Programming with ANSI and Turbo C", Pearson.
2. Henry Mullish& Herbert L Cooper, (1996), "The Spirit of C",Jaico Publication House.
3. P.J.Deitel and H.M.Deitel,(2008),"C How to Program" ,5th Edition, Tata McGraw Hill.
4. YeswanthKanethkar,(2007),"Let Us C", Eigth Edition - BTB Publications.

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the Paper :   Core Practical 1: Programming for Problem Solving using C Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	5/15	75	2

Course Objectives

1. To introduce C Programming concepts to develop the programming knowledge.
2. To enhance their analyzing and problem solving skills and use the same for writing programs in C.
3. To guide the candidates to explore the fundamental building blocks in the programming language.

Course Outcomes (CO)

K3 to K5	**CO1**	Learning process helps in deep understanding the concepts of C language.
	CO2	Developing programs using control statements, Arrays and Strings.
	CO3	Apply the various basic programming constructs like structures, pointers and files
	CO4	Design programs using the concept of files in C and be able to simulate operations.
	CO5	Implementing the strings and files concepts.

LIST OF PRACTICAL PROGRAMS

1. Develop various C Programs using Control Structures.

2. Develop various C programs using Switch case.

3. Develop various C program for the implementation of looping.

4. Develop various C program for the implementation of looping & Control Structures.

5. Develop a C program to illustrate recursive function.

6. Develop a C program to find the palindrome in a given sentence.

7. Develop a C program to manipulate strings using string functions.

8. Develop a C Program using Functions.

9. Develop a C program to swap two integers using pointers.

10. Develop a C program using Array of Pointers.

11. Develop a C program using the structures.

12. Develop a C program using Array of Structures.

13. Develop a C program to calculate electricity bill using files.

14. Develop a C program to encrypt and decrypt a string.

15. Develop a C program to encrypt and decrypt files.

Text Book
1. E Balagurusamy (2008), "Computing Fundamentals & C Programming" , Tata Mcgraw, Hill Education Pvt. Ltd.

Reference Books
1. Ashok N Kamthane (2002),"Programming with ANSI and Turbo C", Pearson.
2. Henry Mullish& Herbert L Cooper, (1996), "The Spirit of C",Jaico Publication House.
3. P.J.Deitel and H.M.Deitel,(2008),"C How to Program" ,5th Edition, Tata McGraw Hill.
4. Yeswanth Kanethkar,(2007),"Let Us C", Eighth Edition - BTB Publications.

Teaching Methods
Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
      1. **Record Work**: 05 Marks.
      2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

    Observation: 15 Marks
    Attendance: 5Marks
    One Model Practical: 30 Marks.

MAPPING					
PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong **H** – High **M** – Medium **L** – Low					

Programme Code: 23	B.Sc. Computer Science with Data Analytics
Title of the Paper : Core Paper 2: Object Oriented Programming in C ++	

Batch	Hours / Week	Total Hours	Credits
2022-2023	5/15	75	4

Course Objectives

1. To introduce he concepts of Object Oriented Programming Paradigm and the programming constructs of C++.
2. To develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.
3. To program using more advanced OOP's features such as objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, File I/O.

Course Outcomes (CO)

K1 to K5	CO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and object.
	CO2	Demonstrate the various basic programming constructs like decision-making statements. Looping statements and functions.
	CO3	Explain the object oriented concepts like operator overloading, inheritance & virtual base classes.
	CO4	Implementing the concepts of pointers, virtual functions and polymorphism.
	CO5	Evaluating the usage of concepts of various file stream classes, file types, usage of templates and exception handling mechanisms.

Syllabus

UNIT I **(15 Hours)**

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

UNIT II **(15 Hours)**

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

UNIT III **(15 Hours)**

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

UNIT IV **(15 Hours)**

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

UNIT V **(15 Hours)**

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

* Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

　　　Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Book
1. Ashok N Kamthane (2003),"Object-Oriented Programming with Ansi and Turbo C++", Pearson Education.
Reference Books
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2. Maria Litvin &GrayLitvin (2002)" C++ for you", Vikas publication.
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MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	S	S
CO2	S	H	S	H	M
CO3	S	H	M	H	S
CO4	S	M	S	M	H
CO5	S	H	H	H	S

S – Strong　　　　**H** – High　　　　**M** – Medium　　　　**L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Core Practical 2 : Object Oriented Programming in C ++ Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2022-2023	5/15	75	2

Course Objectives
 1. To introduce the concepts of Object Oriented Programming Paradigm and the Programming constructs of C++.
 2. To develop the ability to write a program to solve specific problems.
 3. To practice the fundamental methodology to implement file and I/O stream concepts.

Course Outcomes (CO)

K3 to K5	**CO1**	Designing programs using appropriate predefined functions and classes in C++.
	CO2	Developing applications using Friend functions, Inheritance and polymorphism.
	CO3	Illustrate the concept of virtual classes, inline functions and friend functions.
	CO4	Compare the various file stream classes, file types and exception handling mechanisms.
	CO5	Implementing stream I/O, Files and usage of the available classes to handle stream objects.

LIST OF PRACTICAL PROGRAMS

 1. Write a C++ Program to perform the following Basic programs
        a. C++ Program to Print "Hello, World!".
        b. C++ Program to Add Two Integers.
        c. C++ Program to Swap Values of Two Variables.
        d. C++ Program to Print ASCII Value.
        f. C++ Program to convert days to years,   weeks and days.

 2. Write a C++ Program to perform the following program using formulas and Operators
        a. C++ Program to to perform various Operator
        b. C++ Program to Calculate Area of Circle.
        c. C++ Program to Calculate Area of Square.
        d. C++ Program to Calculate Area of Rectangle.

 3. C++ language to perform various string and string functions operations

 4. Develop a C++ Program to perform various conditional statements

 5. Develop a C++ Program to perform various looping operations

 6. Develop a C++ Program to perform Switch Case Operations

7. Develop a C++ Program to perform a various array Operations

8. Develop a C++ Program to perform functions Operations

9. Develop a C++ Program to perform a pointer Operations

10. Develop a C++ Program to perform a various OOPS Programs

11. Develop a C++ Program to perform a various file operations.

12. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_Number, E_Name, Department, Basic, Salary, and Grade. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF depending on the grade.

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Reference Books
1. E. Balagurusamy (1998)," Object-Oriented Programming with C++", TMH.
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Teaching Methods
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Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)

1. **Record Work**: 05 Marks.
2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

    Observation: 15 Marks
    Attendance: 5Marks
    One Model Practical: 30 Marks.

MAPPING					
PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong **H** – High **M** – Medium **L** – Low					

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Paper 3: Object Oriented Programming in Java			
Batch 2022– 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To understand Object Oriented Programming concepts and basic characteristics of Java
2. To know the principles of packages, inheritance and interfaces
3. To define exceptions and use I/O streams
4. To develop a java application with threads and generics classes
5. To design and build simple Graphical User Interfaces

Course Outcomes (CO)

K1 to K5	**CO1**	Develop Java programs using OOP principles
	CO2	Develop Java programs with the concepts inheritance and interfaces
	CO3	Build Java applications using exceptions and I/O streams
	CO4	Develop Java applications with threads and generics classes
	CO5	Develop interactive Java programs using swings

Syllabus

Unit I   **(15 Hours)**

Introduction to Object Oriented Paradigm – Basic Concepts of Object Oriented Programming Java – Benefits of Object Oriented Programming – Application of Object Oriented Programming-Characteristics of Java – The Java Environment - Java Syntax - Java Comments -Java Variables -Java Data Types -Java Type Casting -Java Operators -Java Strings - Java String function - Java Math function - Java Booleans.

Unit II   **(15 Hours)**

Java If...Else - Java Switch - Java While Loop Java For Loop -Java Break/Continue - Java Arrays - Java Methods -Java Method Parameters -Java Method Overloading -Java Scope -Java Recursion- Java Classes/Objects -Java - Class Attributes -Java Class Methods -Java Constructors -Java Modifiers -Java Encapsulation -Java Packages / API -Java Inheritance -Java Polymorphism -Java Inner Classes -Java Abstraction -Java Interface- Java User Input.

Unit III   **(15 Hours)**

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Java File Handling - Java Files -Java Create/Write Files -Java Read Files -Java Delete Files

Unit IV   **(15 Hours)**

Differences between multi-threading and multitasking, ***thread life cycle,** creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. *Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

Unit V   **(15Hours)**

Graphics programming – ***Applet Programming**- AWT Classes - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - *AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

* Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books
1. Herbert Schildt (2011),"Java The complete reference", 8th Edition, McGraw Hill Education.
2. Cay S. Horstmann, Gary Cornell, (2013),"Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall.

Reference Books
1. Patrick Naughton & Hebert Schildt(1999), "The Complete Reference Java 2" 3rd Edition, TMH.
2. Paul Deitel, Harvey Deitel(2015), "Java SE 8 for programmers", 3rd Edition, Pearson.
3. Steven Holzner(2011), "Java 2 Black book", Dream tech press.
4. E. Balagurusamy (2007),"Programming with Java – A Primer",3rd Edition, TMH.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Practical 3**:** Object Oriented Programming in Java Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	5/15	75	2

Course Objectives

1. To introduce the concepts of Object Oriented Programming Paradigm and the programming constructs of JAVA.

2. To implement the Java language syntax and semantics.

3. To develop Java program using packages, inheritance and interface

4. To implement concepts such as variables, conditional and iterative execution methods.

5. To develop graphical User Interface using AWT.

6. Demonstrate event-handling mechanism.

Course Outcomes (CO)

K3 to K5	**CO1**	Applying the concepts of operators, control structures, inheritance, method overriding in Java.
	CO2	Implementing the concept of interface, packages, multithreading and applets.
	CO3	Apply the various basic programming constructs of JAVA like decision-making statements. Looping statements, overloading, inheritance, polymorphism, constructors and destructors.
	CO4	Design programs using frames, menubars, list boxes
	CO5	Evaluate programs using various file stream classes; file types, and frames.

LIST OF PRACTICAL PROGRAMS

1. Write a program to print "Hello World" on the screen and receive input from the user and Display a Given string on the Screen.

2. Java Program to perform various Arithmetic Operations on two Integer given by the User

3. Java Program to Check Whether an Alphabet is Vowel or Consonant

4. Java Program to Find the Largest Among Three Numbers

5. Java Program to Calculate Average Using Arrays

6. Java Program to Reverse a Sentence Using Recursion

7. Java Program to Sort Elements in Lexicographical Order (Dictionary Order)

8. Write a Java Applications to perform single inheritance

9. Write a Java Applications to extract a portion of a character string and print the extracted string.

10. Write a Java Program to implement the concept of multiple inheritance using Interfaces.

11. Write a Java Program to create an Exception called payout-of-bounds and throw the exception.

12. Write a Java Program to create a frame with four-text field's name, street, city and pin code with suitable tables. Also, add a button called my details. When the button is clicked, its corresponding values are to be appeared in the text fields.

13. Write a Java Program to create a frame with three text fields for name, age and qualification and a text field for multiple line for address.

14. Write a Java Program to create Menu Bars and pull down menus.

15. Write a Java Program, which open an existing file and append text to that file and display

Text Books

1. Herbert Schildt (2011),"Java The complete reference", 8th Edition, McGraw Hill Education.
2. Cay S. Horstmann, Gary cornell, (2013),"Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall,.

Reference Books

1. Patrick Naughton & Hebert Schildt(1999), "The Complete Reference Java 2" 3rd Edition, TMH.
2. Paul Deitel, Harvey Deitel(2015), "Java SE 8 for programmers", 3rd Edition, Pearson.
3. Steven Holzner(2011), "Java 2 Black book", Dream tech press.
4. E. Balagurusamy (2007),"Programming with Java – A Primer",3rd Edition, TMH.

Teaching Methods

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Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
1. **Record Work**: 05 Marks.
2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

    Observation: 15 Marks
    Attendance: 5Marks
    One Model Practical: 30 Marks.

MAPPING					
PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong **H** – High **M** – Medium **L** – Low					

Programme Code: 23	B.Sc. Computer Science with Data Analytics
Title of the paper: Core Paper 4: Big Data Science and Data Analytics	

Batch 2022 – 2023	Hours / Week 5/15	Total Hours 75	Credits 4

Course Objectives

1. To optimize business decisions and create competitive advantage with Big Data analytics
2. To explore the fundamental concepts of big data analytics
3. To learn to analyze the big data using intelligent techniques.
4. To understand the various search methods and visualization techniques.
5. To learn to use various techniques for mining data stream.
6. To understand the applications using Map Reduce Concepts.
7. To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes (CO)

	CO1	Work with big data platform and explore the big data analytics techniques business applications.
	CO2	Design efficient algorithms for mining the data from large volumes.
K1 to K5	CO3	Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
	CO4	Explore on Big Data applications Using Pig and Hive.
	CO5	Understand the fundamentals of various big data analytics technique

Syllabus

UNIT-I **(15 Hours)**

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting. Data Science Components: Data Engineering, Data Analytics-Methods and Algorithm, Data Visualization – Evolution of Big Data - Sources of Big Data. Characteristics of Big Data - 6Vs in Big Data.

UNIT-II **(15 Hours)**

Mining data streams: Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform Application - Real Time Sentiment Analysis- Stock Market Predictions. Sources of Data: Time Series – Transactional Data – Biological Data – Spatial Data – Social Network Data – Data Evolution – Data Sources Data Science: Data Science-A Discipline – Data Science vs Statistics – Data Analytics Relation: Data Science, Analytics, Big Data Analytics

UNIT-III **(15 Hours)**

History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works- * Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment.

UNIT-IV **(15 Hours)**
Frameworks: Applications on Big Data Using Pig and Hive – *** Data processing operators in Pig** – Hive services – Hive SQL – Querying Data in Hive - fundamentals of H-Base and Zookeeper - IBM Info sphere Big Insights and Streams.

UNIT-V **(15 Hours)**
Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications. Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering.

* Self Study and questions for examinations may be taken from the self-study portions also.

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Text Books
1. Michael Berthold, David J. Hand (2007) "Intelligent Data Analysis", Springer.
2. Tom White (2012) "Hadoop: The Definitive Guide" Third Edition, O'reilly Media.
3. Seema Acharya, SubhasiniChellappan (2015)"Big Data Analytics" Wiley.

Reference Books
1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos(2012), "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw-Hill Publishing.
2. Bill Franks, (2012)"Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& Sons.
3. Glenn J. Myatt (2007) "Making Sense of Data", John Wiley & Sons.
4. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, (2007)"Intelligent Data Mining", Springer.
5. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan,(2012) "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications.
6. ArshdeepBahga, Vijay Madisetti, (2016) "Big Data Science & Analytics: A Hands On Approach ",VPT.
7. Bart Baesens(2014)"Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons.

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 5: Data Warehousing and Data Mining			
Batch 2022 – 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To learn the basic concepts of data mining algorithms, methods and tools.
2. To develop and apply critical thinking, problem- solving and decision-making skills.
3. To discover interesting patterns, analyze and estimate the accuracy of algorithms.

Course Outcomes (CO)

	CO1	Knowing the data mining principles and techniques.
K1 to K5	CO2	Understanding the concepts of raw data processing using data mining algorithms.
	CO3	Learning data mining algorithms to build analytical applications.
	CO4	Gaining information to extract patterns and to solve problems.
	CO5	Knowing about the applications in warehousing.

Syllabus

Unit I **(15 Hours)**

Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery In Database – Data Mining Issues – Data Mining Metrics – Social Implications Of Data Mining – Data Mining From A Database Perspective- Data Mining Techniques – A Statistical Perspective On Data Mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithm.

Unit II **(15 Hours)**

Classification – Introduction – Statistical-Based Algorithms – Distance Based Algorithms – Decision Tree Based Algorithms – Neural Network Based Algorithms – Rule Based Algorithms – Combining Techniques. Clustering- Similarity and Distance Measures- Outliers- Partitional Algorithms-Clustering Large Database.

Unit III **(15 Hours)**

Association Rules- Large Item sets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules- Measuring the Quality of Rules.

Unit IV **(15 Hours)**

Data Warehousing: Characteristics Of A Data Warehouse – ***Data Marts** – Other Aspects Of Data Mart- Online Analytical Processing: OLTP And OLAP Systems – Data Modeling - Star Schema For Multidimensional View-Data Modeling – Multifact Star Schema Or Snow Flake Schema-OLAP Tools- State Of The Market- OLAP Tools And The Internet.

Unit V **(15 Hours)**

Developing A Data Warehouse: Building A Data Warehouse- Data Ware House Architectural Strategies And Organizational Issues-Design Considerations-Data Content-Metadata-Distribution Of Data-Tools For Data Warehousing-Performance Considerations-Crucial Decisions In Designing A Data Warehouse- ***Applications Of Data Warehousing And Data Mining In Government.**

* Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Method

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Text Books
1. MargaratH.Dunhum,S.sridhar, (2008),"Data mining- Introductory and advanced topics", Pearson Education.
2. C.S.R.Prabhu, (2008),"Data warehousing-concepts, techniques, products and applications" 2nd edition, PHI learning private limited.

Reference Books
1. Jiawei Han, Jian Pei, Micheline Kamber (2001) "Data Mining: Concepts and Techniques" Elsevier publications.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper: Allied Paper 3: Text and Predictive Analytics			
Batch 2022– 2023	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 5

Course Objectives

1. To provide an overview of common text mining and social media data analytic activities.
2. To understand the complexities of processing text and network data from different data sources.
3. It introduces theoretical foundations, algorithms, methodologies, and Applications of streaming data and provide practical knowledge for handling and analyzing streaming data
4. It introduces theoretical foundations, algorithms, methodologies for analyzing data in various domains such Retail, Finance, Risk and Healthcare.
5. To optimize business decisions and create competitive advantage with text and Predictive Data analytics

Course Outcomes (CO)

K1 to K5	**CO1**	Work with data application platform Text and Predictive analytics techniques. Interpret the terminologies, metaphors and perspectives of social media analytics.
	CO2	Apply a wide range of classification, clustering, estimation and prediction algorithms on Textual data.
	CO3	Recognize challenges in dealing with data sets in domains such as finance, risk and healthcare.
	CO4	Identify real-world applications of machine learning in domains such as finance, risk and healthcare.
	CO5	Having an ability to design and conduct experiments, as well as to analyze and interpret data

Syllabus

UNIT –I **(18 Hours)**

Introduction to Text Mining: Text Representation- tokenization, stemming, stop words, TF-IDF, Feature Vector Representation, NER, N-gram modeling. Mining Textual Data: Text Clustering, Text Classification, Topic Modeling-LDA, HDP. Recent Trends in Text, Web and Social Media Analytics. Characteristics of the data streams, Challenges in mining data streams Requirements and principles for real time processing, Concept drift Incremental learning.

UNIT –II **(18 Hours)**

Basic Streaming Methods, Counting the Number of Occurrence of the Elements in a Stream, Counting the Number of Distinct Values in a Stream, Bounds of Random Variables, Poisson Processes, Maintaining Simple Statistics from Data Streams, Sliding Windows, Data Synopsis, Change Detection: Tracking Drifting Concepts, Monitoring the Learning Process

UNIT –III **(18 Hours)**

Retail Analytics: Understanding Customer: Profiling and Segmentation, Modelling Churn. Modelling Lifetime Value, Modelling Risk, Market Basket Analysis - Risk Analytics: Risk Management and Operational Hedging: An Overview, Supply Chain Risk Management, A Bayesian Framework for Supply Chain Risk Management, Credit Scoring and Bankruptcy Prediction- Financial Data Analytics: Financial News analytics: Framework, techniques, and metrics, News events impact market sentiment, relating news analytics to stock returns.

UNIT –IV **(18 Hours)**

Financial Time Series Analytics: Financial Time Series and Their Characteristics, Common Financial Time Series models, Autoregressive models, Markov chain models, Time series models with leading indicators, Long term forecasting- Introduction Healthcare Analytics: An Introduction to Healthcare Data Analytics, Electronic Health Records, Privacy-Preserving Data Publishing Methods in Healthcare, Clinical Decision Support Systems.

UNIT –V (18 Hours)

Healthcare Data Analytics: Natural Language Processing and Data Mining for Clinical Text: Core NLP Components, ***Information Extraction and Named Entity Recognition**, Social Media Analytics for Healthcare: Tracking of Infectious Disease Outbreaks, Readmission risk Prediction. Genomic Data Analytics: Microarray Data, Microarray Data Analysis, Genomic Data Analysis for Personalized Medicine, Patient Survival Prediction from Gene Expression Data, Genome Sequence Analysis

* Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Method

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Text Books

1. BingLiu, (2011),"Web Data Mining Exploring Hyperlinks ,Contents, and Usage Data", Springer, Second Edition.
2. Reza Zafarani, Mohammad Ali Abbasi and HuanLiu, (2014)"Social Media Mining-An Introduction", Cambridge University Press.
3. Bing Liu, (2012) "Sentiment Analysis and Opinion Mining", Morgan & Claypool Publishers.
4. Nitin Indurkhya, FredJDamerau, (2010)"Handbook of Natural Language Process", 2ndEdition,CRC Press.

Reference Books

1. Matthew A. Russell, (2013) "Mining the social web", 2nd edition- O'Reilly Media.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman,(2009)"The Elements of Statistical Learning-Data Mining, Inference, and Prediction",Second Edition , Springer Verlag.
3. Joao Gama, (2010) "Knowledge Discovery from Data Streams", CRC Press.
4. David Luckham, (2002)"The Power of Events: An Introduction to Complex Event Processing in Distributed Enterprise Systems", Addison Wesley.
5. Charu C. Aggarwal, (2007) "Data Streams: Models and Algorithms", Kluwer Academic Publishers.
6. James B. Ayersm, (2006) "Handbook Of Supply Chain Management" Auerbach Publications.
7. PanosKouvelis, Lingxiu Dong, OnurBoyabatli, Rong Li, (2012) "The Handbook of Integrated Risk Management in Global Supply Chains", Wiley.
8. Chris Chapman, Elea McDonnell Feit,(2015) "R for Marketing Research and Analytics", Springer.
9. Olivia Parr Rud, (2001) "Data Mining Cookbook: Modeling Data for Marketing, Risk, and Customer Relationship Management", Wiley.
10. Chandan K. Reddy, Charu C. Aggarwal ,(2015) "Healthcare Data Analytics", CRC Press.
11. Rene Carmona, (2014) "Statistical Analysis of Financial Data in R", Springer.
12. PanosKouvelis, Lingxiu Dong, OnurBoyabatli, Rong Li,(2012) "The Handbook of Integrated Risk Management in Global Supply Chains", Wiley.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Paper 6: Python Programming			
Batch 2022 – 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To acquire programming skills in core Python and to learn and understand Python programming basics and paradigm
2. To Learn core Python scripting elements such as variables and flow control structures
3. To learn and understand python looping, control statements and string manipulations.
4. To learn how to use exception handling in Python applications for error handling.
5. To use Python data structures, lists, tuples, dictionaries.
6. To do input/output with files in Python.

Course Outcomes (CO)

K1 to K5	**CO1**	Develop algorithmic solutions to simple computational problems and Read, write, execute by hand simple Python programs
	CO2	Structure simple Python programs for solving problems
	CO3	Decompose a Python program into functions and Discover how to work with lists and sequence data
	CO4	Represent compound data using Python lists, tuples, dictionaries
	CO5	Read and write data from/to files in Python Programs.

Syllabus

Unit I **(15 Hours)**

Computer Hardware Architecture - Overview of Programming Languages - Overview of Programming Languages - Introduction to Python - Python Overview – Comments in Python - Python Identifiers - Reserved Keywords – Variables - Standard Data Types - Python Casting.

Unit II **(15 Hours)**

Python Operators – Types of Operators - Statement and Expressions - String Operations: Creating String in Python - Strings indexing and splitting - Reassigning Strings- Deleting the String - String Operators - Multiline Strings- Built-in String Methods-Boolean Expressions – Python List – Various List Operation – Loop List - List Methods.

Unit III **(15 Hours)**

Python Tuples – Various Tuples Operations – Loop Tuples -Tuple Methods – Python Set – Various Set Operations – Loop Set – Set Methods – Python Dictionaries – Various Dictionaries Operations –Nested Dictionaries – Dictionary Methods - Python Dates- Python Conditions and Python IF Statement- Python IF ELIF ELSE Statements - Python nested IF statements- The pass Statement.

Unit IV **(15 Hours)**

Python Loops - Python while Loop Statements-Infinite Loop- for Loop Statements- Iterating by Sequence Index - Python nested loops- Python Numbers- Mathematical Functions- Random Number Functions- Python Functions - Calling a Function - Pass by reference vs value - Function Arguments - The return Statement -Python Lambda functions.

Unit V **(15 Hours)**

Scope of Variables - Local Scope- Global Scope- Python Exceptions Handling - Assertions in Python - Handling an exception - Python String Formatting - Python User Input- Python Files I/O - File Handling- File Open- Read Only Parts of the File- Read Lines- Close Files- Python File Write- Create a New File -Delete File- Delete Folder- Python Matplotlib.

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Teaching Methods

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Text Books

1. Allen B. Downey, (2016) "Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers. (http://greenteapress.com/wp/think/python/)
2. Guido van Rossum and Fred L. Drake Jr,(2011) "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd.

Reference Books

1. John V Guttag, (2013) "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, (2016) "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.
3. Timothy A. Budd, (2015) "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.
4. Kenneth A. Lambert, (2012) "Fundamentals of Python: First Programs", CENGAGE Learning.
5. Charles Dierbach, (2013) "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition.
6. Paul Gries, Jennifer Campbell and Jason Montojo, (2013) "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC.

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CO1	H	M	S	H	H
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CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong **H** – High **M** – Medium **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Practical 4: Python Programming Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	5/15	75	2

Course Objectives

1. Write, test, and debug simple Python programs.
2. Implement Python programs with conditionals and loops.
3. Develop Python programs step-wise by defining functions and calling them.
4. Use Python lists, tuples, dictionaries for representing compound data.
5. Read and write data from/to files in Python.
6. Learn Syntax and Semantics and create Functions in Python

Course Outcomes (CO)

	CO1	To develop proficiency in creating based applications using the Python Programming Language.
K3 to K5	CO2	To be able to understand the various data structures available in Python programming language and apply them in solving computational problems.
	CO3	To be able to do testing and debugging of code written in Python and To be able to draw various kinds of plots using PyLab.
	CO4	To be able to do text filtering with regular expressions in Python
	CO5	To be able to create socket applications in Python and to create GUI applications in Python

LIST OF PRACTICAL PROGRAMS

1. Develop programs to understand the control structures of python
2. Find the maximum of a list of numbers
3. Develop programs to learn different types of structures (list, dictionary, tuples) in python
4. Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing)
5. Write a python program to implement List methods (Add, Append, Extend & Delete)
6. Develop programs to understand working of exception handling and assertions.
7. Develop programs for data structure algorithms using python – searching, sorting and hash tables.
8. Develop programs to learn regular expressions using python.
9. Develop chat room application using multithreading.
10. Write a python program to implement simple Chabot with minimum TEN conversations

11. Write a python program to plot different types of graphs using PyPlot.
12. Implement classical ciphers using python.
13. Draw graphics using Turtle.
14. Develop programs to learn GUI programming using Tkinter.
15. Find the most frequent words in a text read from a file

Text Books
1. Allen B. Downey, (2016) "Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers. (http://greenteapress.com/wp/think/python/)
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CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong **H** – High **M** – Medium **L** – Low					

Programme Code : 23	B. Sc Computer Science with Data Analytics
Title of the paper : Core Paper 7: Relational Database Management System	

Batch 2022-2023	Hours / Week 5/15	Total Hours 75	Credits 5

Course Objectives

1. To develop the knowledge in various Database concepts, queries, normalization and reports.
2. To study the basics of PL/SQL and apply with different concepts.
3. To learn procedural interfaces using SQL queries and to gain knowledge about databases.
4. To Describe stored procedures and functions
5. Use PL/SQL programming constructs and conditionally control code flow (loops, control structures, and explicit cursors

Course Outcomes (CO)

	CO1	Understanding the concepts of Database and RDBMS and applying types of SQL commands.
	CO2	Understanding the concepts of Normalization and ER Models.
K1 to K5	**CO3**	Analyzing Queries, joins, triggers, synonym and views using PL/SQL statements.
	CO4	Applying various types of database management systems for developing the program.
	CO5	Analyzing types of Databases.

Syllabus

UNIT   I   **(15 Hours)**

Introduction to Database Management Systems: Introduction-History of Information-Quality of Information-Information Processing-Database-Characteristics of data in database-DBMS-types of DBMS. Relational Database Management systems (RDBMS)-RDBMS Terminology-Relational Data Structure-Relational Data Integrity-Relational Data Manipulation-Codd's Rules. History of SQL-Characteristics of SQL-Types of SQL commands-DDL-DML-DQL-DCL-DAS-TCS. Arithmetic, Comparison and Logical Operators

UNIT II   **(15 Hours)**

Data Normalization: 1NF, 2NF, 3NF, BCNF and 4NF. ER Modeling: Introduction- Components of ER Model-.ER Diagrams. Relational Data Integrity and Database Constraints-Transforming ER Models to relations-Foreign Keys-Mapping ER Model-Mapping Relationships- Aggregate Functions

UNIT III   **(15 Hours)**

Queries and Sub queries- Joins: Theta joins- Equijoins and Non-equi joins-Where clause-Natural Joins-Self Join.

UNIT IV   **(15 Hours)**

Basics of PL/SQL –Usage of Stored Functions and Procedures- Packages. Exception handling. Triggers-Types of Triggers-Combination of Triggers-Replacing and Dropping Triggers-Views-Synonyms.

UNIT V   **(15 Hours)**
Introduction to Modern Databases: Distributes Database-Object Oriented DB-Object Relational DB-Active DB-Deductive DB-Multidimensional DB-Parallel DB-Temporal DB-Spatial DB-Multimedia DB-Web DB. Distributed DB-Components of distributed DB. SQL Database and ***NoSQL Database.**

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books

1. Alexis Leon,Mathews Leon,(2009) " Fundamentals of Database Management Systems", Vijay Nicole Pvt Ltd.
2. Alexis Leon,Mathews Leon,(1999) " SQL A Complete Reference", Tata McGraw Hill Publications.
3. Scot Urman,Ron Hardman, Michael McLaughlin,(2004)"Oracle Database 10g -PL/SQL Programming", Tata McGraw Hill Publications.

Reference Books

1. Arun Majumdar and Pritimoy Bhattacharya, (2007), "Database Management System" TMH.

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code : 23	B. Sc Computer Science with Data Analytics

Title of the Paper : Core Practical 5: Relational Database Management Systems Laboratory

Batch 2022-2023	Hours / Week 5/15	Total Hours 75	Credits 3

Course Objectives

1. To understand the use of Structured Query Language (SQL) and its syntax.

2. To understand and apply the principles of data modeling using Entity Relationship and develop a good database design.

3. To study the concepts and techniques relating query processing using SQL engines.

Course Outcomes (CO)

	CO1	Designing the basic concepts of Database.
	CO2	Implementing data Integrity constraints in Database.
K3 to K5	**CO3**	Validating the various fundamental tasks to perform data Modeling.
	CO4	Implementing functions, packages, stored procedures and user defined exception.
	CO5	Applying various types of database management systems for developing the program.

LIST OF PRACTICAL PROGRAMS

1. Creating Tables and writing simple queries using

   a) Comparison Operators

   b) Arithmetic Operators

   c) Set Operators

2. Use SQL commands to implement the concept of built in functions.

3. Implement the concept of Updating and altering tables using SQL Queries.

4. Design a PL/SQL block to prepare the Electricity Bill.

5. Implement the concepts of Joined relations to Database.

6. Create a Database Trigger to check the data validity of Record.

7. Implement the concept of Recursive function

8. Use SQL queries to manage Views, Sequences and Synonyms.

9. Create a Database Trigger to implement the Master - Detail Relationship.

10. Implement the concept of Stored Procedure with Parameters using SQL queries.

11. Implement the concept of Packages using Procedure and Function.

12. Design a PL/SQL program to handle User defined exception

Text Books

1. Alexis Leon,Mathews Leon,(2009) " Fundamentals of Database Management Systems", Vijay Nicole Pvt Ltd.
2. Alexis Leon,Mathews Leon,(1999) " SQL A Complete Reference",Tata McGraw Hill Publications.
3. Scot Urman,Ron Hardman, Michael McLaughlin,(2004)"Oracle Database 10g -PL/SQL Programming", Tata McGraw Hill Publications.

Reference Books

1. Arun Majumdar&Pritimoy Bhattacharya, (2007), "Database Management System" TMH.
2. Sharad Maheshwari & Ruchin Jain,(2006),"Database Management Systems" Complete Practical Approach", Second Edition.
3. Gerardus Blokdyk, (2020) "RDBMS Relational Database Management System A Complete Guide", Second Edition.

Teaching Methods

Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
- 1. **Record Work**: 05 Marks.
- 2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

Observation: 15 Marks
Attendance: 5Marks
One Model Practical: 30 Marks.

MAPPING					
PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong		**H** – High		**M** – Medium	**L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics
Title of the paper: Allied Paper 4 - Web and Social Network Analytics	

Batch 2022 – 2023	Hours / Week 6/15	Total Hours 90	Credits 5

Course Objectives

1. To optimize business decisions and create competitive advantage with web and social network Data analytics
2. To provide an overview of common text mining and social media data analytic activities.
3. To learn to analyze the data using intelligent techniques.
4. To understand the various search methods and visualization techniques for web and social network analytics.
5. To learn to use various techniques for data Analytics stream.
6. To Provide solutions to the emerging problems with social media such as behavior analytics and Recommendation systems.

Course Outcomes (CO)

K1 to K5	**CO1**	Familiarize the learners with the concept of social media analytics and understand its significance
	CO2	Familiarize the learners with the tools of social media analytics.
	CO3	Analyze technologies associated with big data with web and social networks analytics.
	CO4	Enable the learners to develop skills required for analyzing the effectiveness of social media for business purposes
	CO5	Apply state of the art web mining tools and libraries on realistic data sets as a basis for business decisions and applications.

Syllabus

UNIT I (18 Hours)

Introduction: Definition, Process, Key terms: Site references, Keywords and Key phrases; building block terms: Visit characterization terms, Content characterization terms, Conversion metrics; Categories: Offsite web, On site web; Web analytics platform, Web analytics evolution, Need for web analytics, Advantages, Limitations. Data Collection: Click stream Data: Web logs, Web Beacons, JavaScript tags, Packet Sniffing; Outcomes Data: E-commerce, Lead generation, Brand/Advocacy and Support; Research data: Mindset, Organizational structure, Timing; Competitive Data: Panel-Based measurement, ISP-based measurement, Search Engine data.

UNIT II (18 Hours)

Qualitative Analysis: Heuristic evaluations: Conducting a heuristic evaluation, Benefits of heuristic evaluations; Site Visits: Conducting a site visit, Benefits of site visits; Surveys: Website surveys, Post-visit surveys, creating and running a survey, Benefits of surveys. Web Analytic fundamentals: Capturing data: Web logs or JavaScript's tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool, Understanding click stream data quality, Identifying unique page definition, Using cookies, Link coding issues.

UNIT III (18 Hours)

Web Metrics: Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non-e-commerce sites): Improving bounce rates, Optimizing ad words campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI. Relevant Technologies: Internet & TCP/IP, Client / Server Computing, HTTP (Hypertext Transfer Protocol), Server Log Files & Cookies, Web Bugs.

UNIT IV (18 Hours)

Introduction to Social Media Analytics (SMA): Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization. Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools: Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. *Natural Language Processing Techniques for Micro-text Analysis.

UNIT V (18 Hours)

Facebook Analytics: Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc. Google analytics. Introduction. (Websites) Google Analytics: Brief introduction and working, Adwords, Benchmarking, and Categories of traffic: Organic traffic, Paid traffic; Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues. Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration.

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books
1. Matthew Ganis, AvinashKohirkar, (2016) "Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media" Pearson.
2. Jim Sterne , (2010)Social Media Metrics: "How to Measure and Optimize Your Marketing Investment", Wiley, Latest edition.
3. Oliver Blanchard,(2011) Social Media ROI: "Managing and Measuring Social Media Efforts in Your Organization" (Que Biz-Tech), Que Publishing, Latest edition.

Reference Books
1. Marshall Sponder, (2011)" Social Media Analytics", McGraw Hill, Latest edition.
2. Tracy L. Tuten, Michael R. Solomon, (2017)"Social Media Marketing", Sage, Latest edition.
3. Clifton B., (2012),"Advanced Web Metrics with Google Analytics", Wiley Publishing, Inc. 2nd edition.
4. Kaushik A., (2009)"Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity", Wiley Publishing, Inc. 1st edition.
5. Sterne J. , (2002)"Web Metrics: Proven methods for measuring web site success", John Wiley and Sons.

6. Michael Beasley, (2013) "Practical Web Analytics for User Experience: How Analytics can help you Understand your Users", Morgan Kaufmann.
7. Bing Liu, (2011) "Web Data Mining: Exploring Hyperlinks, Content, and Usage Data", 2nd Edition, Springer.
8. Justin Cutroni, (2016) "Google Analytics", O'Reilly, 2010. 6. Eric Fettman, Shiraz Asif, FerasAlhlou , "Google Analytics Breakthrough", John Wiley & sons.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 8: R Programming			
Batch 2022 – 2023	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 4

Course Objectives:
1. To expose the student to learn the fundamental concepts of R Programming
2. This course is to equip the students to visualize and analyses the data using R and to communicate statistical results in correct manner.

Course Outcomes (CO)

K1 to K5	**CO1**	Establish an efficient scientific computing environment
	CO2	Understand the basics in R programming in terms of constructs, control statements, string functions
	CO3	Create reports using R design and write efficient programs using R (and similar high-level languages) to perform routine and specialized data manipulation/management and analysis tasks
	CO4	Document analytical workflow using R, markdown languages, and version control
	CO5	Apply probability and statistics in real life problems and Draw scientific inference from data using R

Syllabus

Unit I **(18Hours)**

Introducing to R – R Data Structures – Help Functions in R – Vectors – Scalars – Declarations – Recycling – Common Vector Operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Victoriesed if-then else – Vector Element names

Unit II **(18 Hours)**

Creating matrices – Matrix Operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns - Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.

Unit III **(18 Hours)**

Creating Data Frames – Matrix-like operations in frames – merging Data frames – Applying functions to Data Frames – Factors and Tables – Factors and levels – Common Functions used with factors – Working with tables – Other factors and table related functions – Control statements – Arithmetic and Boolean operators and values – Default Values for arguments – Returning Boolean Values – Functions are objects – Environment and scope issues – Writing Upstairs – Recursion – Replacement functions – Tools for Composing function code – ***Math and Simulation in R.**

Unit IV **(18 Hours)**

 S3 Classes – S4 Classes – Managing your objects – Input/output – accessing keyboard and monitor – reading and writing files – accessing the internet – String Manipulation – Graphics – Creating Graphs – Customizing Graphs – Saving Graphs to files – Creating Three-Dimensional plots.

Unit V **(18 Hours)**

Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear Models – Time Series and Auto-Correlation – Clustering

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books

1. Norman Matloff, (2011) "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press.
2. Jared P. Lander, (2013) "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series.

Reference Books

1. Grolemund G, (2014) "Hands-on programming with R: write your own functions and simulations", O' Reilly Media Inc.
2. James G., Witten D, Hastie T., &Tibshirani R,(2013) " An introduction to statistical learning: with Applications in R", Springer.
3. Mark Gardner, (2013) "Beginning R – The Statistical Programming Language", Wiley.
4. Robert Knell (2013), "Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and programming in R", Amazon Digital South Asia Services Inc. Richard Cotton , (2013). Learning R, O' Reilly Media.
5. Gupta S. C, & Kapoor V. K, (2018) "Fundamental of Mathematical Statistics", Sultan Chand & Sons.
6. Teetor P,R cookbook(2011):" Proven recipes for data analysis, statistics, and graphics", O' Reilly Media Inc.
7. Crawley M. J, (2011) "The R book", John Wiley & Sons.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Practical 6: R Programming Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	6/15	90	3

Course Objectives

1. Perform analytics using R programming.
2. Manipulate data within R and to create simple graphs and charts used in introductory statistics
3. Perform and interpret different distribution using R
4. Use R Graphics and Tables to visualize results of various statistical operations on data

Course Outcomes (CO)

<table>
<tr><td rowspan="5">K3 to K5</td><td>CO1</td><td>Understand the basics in R programming in terms of constructs, control statements, string functions</td></tr>
<tr><td>CO2</td><td>To be able to understand the various data structures available in R programming language and apply them in solving computational problems.</td></tr>
<tr><td>CO3</td><td>Understand the use of R for Big Data analytics.</td></tr>
<tr><td>CO4</td><td>Extract data from files and other sources and perform various data manipulation tasks on them.</td></tr>
<tr><td>CO5</td><td>Apply the R programming from a statistical perspective</td></tr>
</table>

LIST OF PRACTICAL PROGRAMS

1. Create a vector in R and perform operations on it.

2. Create integer, complex, logical, character data type objects in R and print their values and their class using print and class functions.

3. Write code in R to demonstrate sum(), min(), max() and seq() functions.

4. Write code in R to manipulate text in R using grep(), toupper(), tolower() and substr() functions.

5. Grouping, loops and conditional execution, Functions Exploratory data analysis

6. Range, summary, mean, variance, median, standard deviation, histogram, box plot, scatterplot

7. Expressions and Data Structures

8. Manipulation of vectors and matrix

9. Operators on Factors in R

10. Data Frames in R

11. Lists and Operators

12. Graphs in R

13. 3D plots in R

14. Building tables with aggregate

15. Reading and Writing different types of Datasets

Textbooks

1. Field, A, J. Miles, and Z. Field. 2012. Discovering Statistics using R. Sage Publications Ltd, London.

2. Michael, W. Trosset. 2009. An Introduction to Statistical Inference and its Application with R. A Chapman & Hall Book, CRC Press. Boca Raton, Florida.

3. Muenchen, R. A. 2011. R for SAS and SPSS Users. 2nd Edition. Springers, New York.

4. William N. Venables, D. M. Smith, and the R Development Core Team. 2009. An Introduction to R. 2nd edition. Network Theory, Ltd.

Reference Books

1. Mark Gardner, "Beginning R – The Statistical Programming Language", Wiley, 2013.

2. Robert Knell, "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and programming in R", Amazon Digital South Asia Services Inc, 2013. Richard Cotton(2013). Learning R, O'Reilly Media.

3. Garret Grolemund (2014). Hands-on Programming with R. O'Reilly Media, Inc.

4. Roger D.Peng (2018). R Programming for Data Science. Lean Publishing.

5. Hothorn, T. and B. S. Everitt. 2014. A handbook of statistical analysis using R. 3rd edition. CRC Press, Boca Raton, Florida.

Teaching Methods
Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
  1. **Record Work**: 05 Marks.
  2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

    Observation: 15 Marks
    Attendance: 5Marks
    One Model Practical: 30 Marks.

MAPPING					
PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong		**H** – High		**M** – Medium	**L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics
Title of the paper : Core Paper 9: Cryptography and Information Security	

Batch 2022-2023	Hours / Week 6/15	Total Hours 90	Credits 4

Course Objectives

1. To provide deeper understanding into cryptography, its application to network security, Threats/vulnerabilities to networks and countermeasures.
2. To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To familiarize Digital Signature Standard and provide solutions for their issues.
4. To familiarize with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message

Course Outcomes (CO)

K1 to K5	**CO1**	Identify basic security attacks and services
	CO2	Use symmetric and asymmetric key algorithms for cryptography
	CO3	Design a security solution for a given application
	CO4	Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works.
	CO5	To examine the issues and structure of Authentication Service and Electronic Mail Security

Syllabus

Unit I (18Hours)

INTRODUCTION: Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security. CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, Rotor Machines, Stenography.

Unit II (18 Hours)

BLOCK CIPHER AND DATA ENCRYPTION STANDARDS: Block Cipher Principles, Data Encryption Standards, the Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles. ADVANCED ENCRYPTION STANDARDS: Evaluation Criteria for AES, the AES Cipher. MORE ON SYMMETRIC CIPHERS: Multiple Encryption, Triple DES, Block Cipher Modes of Operation, Stream Cipher and RC4. INTRODUCTION TO NUMBER THEORY: Prime Numbers, Fermat's and Euler's Theorem, Testing for Primality, The Chinese Remainder Theorem, Discrete logarithms.

Unit III (18 Hours)

PUBLIC KEY CRYPTOGRAPHY AND RSA: Principles Public key crypto Systems, Diffie Hellman Key Exchange, the RSA algorithm, Key Management, , Elliptic Curve Arithmetic, Elliptic Curve Cryptography. MESSAGE AUTHENTICATION AND HASH FUNCTIONS: Authentication Requirement, Authentication Function, Message Authentication Code, Hash Function, Security of Hash Function and MACs. HASH AND MAC ALGORITHM: Secure Hash Algorithm, Whirlpool, HMAC, CMAC. DIGITAL SIGNATURE: Digital Signature, Authentication Protocol, Digital Signature Standard.

Unit IV   **(18 Hours)**
AUTHENTICATION APPLICATION: Kerberos, X.509 Authentication Service, Public Key Infrastructure. EMAIL SECURITY: Pretty Good Privacy (PGP) and S/MIME. IP SECURITY: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Unit V   **(18 Hours)**
WEB SECURITY: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. FIREWALL: ***Firewall Design principles,** Trusted Systems

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods
        Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class.

Text Books
1. William Stallings (2006), "Cryptography and Network Security: Principles and Practice", 4th edition, Pearson Education, India.
2. William Stallings (2000), "Network Security Essentials (Applications and Standards)", Pearson Education, India.

Reference Books
1. Charlie Kaufman (2002), "Network Security: Private Communication in a Public World", 2nd edition, Prentice Hall of India, New Delhi.
2. AtulKahate (2008),"Cryptography and Network Security", 2nd edition, Tata Mc Grawhill, India.
3. Robert Bragg, Mark Rhodes (2004), "Network Security: The complete reference", Tata Mc Grawhill, India.

MAPPING

PSO⟍CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Paper 10: Design and Analysis of Algorithms			
Batch 2022 – 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To understand and apply the algorithm analysis techniques.
2. To critically analyze the efficiency of alternative algorithmic solutions for the same problem
3. To understand and implement different algorithm design techniques.
4. To understand the limitations of Algorithmic power

Course Outcomes (CO)

	CO1	Design algorithms for various computing problems.
	CO2	Analyze the time and space complexity of algorithms.
K1 to K5	**CO3**	Critically analyze the different algorithm design techniques for a given problem.
	CO4	Modify existing algorithms to improve efficiency
	CO5	Ability to implement techniques in solving real time problems

Syllabus

Unit I **(15 Hours)**

Introduction and Analysis: Fundamentals of algorithmic Problem solving – Important problem types; Recursive algorithms, - Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework -Asymptotic notations and basic complexity classes – recurrences.

Unit II **(15 Hours)**

Divide and Conquer strategy -- Merge sort - Quicksort -- Multiplication of large integers and Strassen's matrix multiplication – closest pairs Greedy strategy – Huffman coding – ***shortest paths algorithms** – minimum-cost spanning tree algorithms –disjoint sets

Unit III **(15 Hours)**

Dynamic Programming: Computing binomial coefficient – Knapsack problem and memory functions – ordering of matrix multiplications -Marshall's and Floyd's algorithm State-space approach – exhaustive search: DFS, BFS, Iterative deepening

Unit IV **(15 Hours)**

Backtracking and permutations – N-queens problem – Hamilton circuits – best-first search -- Iterative Improvement: Stable marriage - Maximum matching in bipartite graphs – maximum flow - Branch and Bound: Knapsack problem - ***Traveling salesman problem**

Unit V **(15 Hours)**

Introduction to intractability -- Polynomial reductions – SAT and 3-SAT – NP-complete and NP Hard problems -- Approximation algorithms: Traveling salesman problem -- Knapsack problem – Introduction to randomized and parallel algorithms

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk, Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Seminar, Quiz, Audio and Video

Text Books
1. Anany Levitin , (2012) "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education.
2. Jon Kleinberg and Eva Tardos , (2006) "Algorithm Design'', Pearson Education.

Reference Books
1. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, (2012) "Introduction to Algorithms", 3rd Edition, PHI Learning Private Limited.
2. Steven S Skiena, (2008) "The Algorithm Design Manual", 2nd Edition, Springer.
3. S Dasgupta , C H Papadimitriou, U V Vazirani, (2017) "Algorithms",1st Edition, McGraw Hill Education.
4. S. Sridhar, (2015) "Design and Analysis of Algorithms", Oxford University Press.
5. Sara Baase and Allen Van Gelder ,(2000) "Computer Algorithms", Third Edition, Pearson Education.
6. Dexter C. Kozen ,(1992) " The Design and Analysis of Algorithms", Springer-Verlag.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Paper 11: Artificial Intelligence and its Applications			
Batch 2022 – 2023	Hours / Week 5/15	Total Hours 75	Credits 4

Course Objectives
1.   To learn the concepts of Artificial Intelligence.
2.   Create awareness of informed search and exploration methods.
3.   To demonstrate AI techniques for knowledge representation, planning and uncertainty Management.
4.   Develop general-purpose problem solving agents, logical reasoning agents, and agents that reason under uncertainty
5.   Choose appropriate algorithms for solving given AI problems

Course Outcomes (CO)

	CO1	Understanding the concept of AI
	CO2	Analyzing and evaluate informed search and exploration methods.
K1 to K5	**CO3**	Applying AI techniques for knowledge representation, planning and uncertainty Management.
	CO4	Analyzing and developing knowledge of decision making and learning methods for real time application
	CO5	Employ AI techniques to solve some of today's real world problems.

Syllabus

UNIT I   **(15 Hours)**
Introduction to Artificial Intelligence: What Is AI? -The Foundations of Artificial Intelligence -The History of Artificial Intelligence - The State of the Art - Intelligent Agents: Agents and Environments-Good Behavior: The Concept of Rationality-The Nature of Environments - The Structure of Agents.

UNIT II   **(15 Hours)**
Problem-solving :Solving Problems by Searching Problem-Solving Agents - Example Problems: Toy problems- * 8-Puzzle- Sliding-block- 8-Queens problem- Real-world problems: route-finding - touring problem - traveling salesperson problem - Searching for Solutions - Uninformed Search Strategies - Informed (Heuristic) Search Strategies - Heuristic Functions - Beyond Classical Search - Local Search Algorithms and Optimization Problems -Local Search in Continuous Spaces - Searching with Nondeterministic Actions - Searching with Partial Observations -Online Search Agents and Unknown Environments.

UNIT III   (15 Hours)

Adversarial Search: Games : Optimal Decisions in Games - Alpha–Beta Pruning -Imperfect Real-Time Decisions - Stochastic Games - Partially Observable Games - State-of-the-Art Game Programs - Alternative Approaches - Constraint Satisfaction Problems - Defining Constraint Satisfaction Problems - Constraint Propagation: Inference in CSPs - Backtracking Search for CSPs - Local Search for CSPs -The Structure of Problems

UNIT IV   (15 Hours)

Knowledge, reasoning, and planning:- Logical Agents - Knowledge-Based Agents - The Wumpus World - Logic - Propositional Logic: A Very Simple Logic -Propositional Theorem Proving -Effective Propositional Model Checking -Agents Based on Propositional Logic -
First-Order Logic: Representation Revisited -Syntax and Semantics of First-Order Logic -Using First-Order Logic -Knowledge Engineering in First-Order Logic - Inference in First-Order Logic: Propositional vs. First-Order Inference -Unification and Lifting - Forward Chaining - Backward Chaining

UNIT V   (15 Hours)

Robotics: Introduction- Robot Hardware-Robotic Perception -Planning to Move - Planning Uncertain Movements -Moving - ***Robotic Software Architectures** -Application Domains

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Book
1. Stuart Russell, Peter Norvig, (2009) "Artificial Intelligence – A Modern Approach", Third Edition, Pearson Education / Prentice Hall of India.

2. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, (2009) "Artificial Intelligence", Tata Mc Graw Hill Publishing Company Limited. Third Edition.

Reference Books
1. Nils J. Nilsson,(2000) "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd.

2. George F. Luger, (2002) "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI.

3. Patrick H. Winston, (2006) "Artificial Intelligence", Third edition, Pearson Edition.

4. Deepak Khemani, (2013) "Artificial Intelligence", Tata McGraw Hill Education.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Practical 7: Artificial Intelligence and Machine Learning Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	5/15	75	3

Course Objectives

1. To design and implement different techniques to develop simple autonomous agents that make effective decisions in fully informed, and observable, settings.
2. To apply appropriate algorithms for solving given AI problems.
3. To Design and implement logical reasoning agents
4. To understand the theoretical and practical aspects of probabilistic graphical models.
5. To get practical knowledge on implementing machine learning algorithms in real time problem for getting solutions

Course Outcomes (CO)

K3 to K5	**CO1**	Implement simple PEAS descriptions for given AI tasks
	CO2	Ability to Implement simple reasoning systems using either backward or forward inference mechanisms
	CO3	Understand the implementation procedures for the machine learning algorithms.
	CO4	Design C/C++/Java/Python/R programs for various Learning algorithms.
	CO5	Identify and apply Machine Learning algorithms to solve real world problems.

LIST OF PRACTICAL PROGRAMS

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, and type of EB connection (i.e. domestic or commercial). Compute the bill amount using the following tariff.
   If the type of the EB connection is domestic, calculate the amount to be paid as follows:
   - First 100 units - Rs. 1 per unit
   - 101-200 units - Rs. 2.50 per unit
   - 201 -500 units - Rs. 4 per unit
   - 501 units - Rs. 6 per unit
   If the type of the EB connection is commercial, calculate the amount to be paid as follows:
   - First 100 units - Rs. 2 per unit
   - 101-200 units - Rs. 4.50 per unit
   - 201 -500 units - Rs. 6 per unit
   - > 501 units - Rs. 7 per unit

2. Develop and Implement backtracking algorithms for CSP

3. Develop and Implement local search algorithms for CSP

4. Develop and Implement basic search strategies for selected AI applications

5. Develop and Implement classical planning algorithms

6. Write and execute word count, word search and pattern search problems from large text files

7. Write Python Program to find the most frequent words in a text read from a file

8. Implementation of divide-and-conquer sorting algorithms

9. Detecting Spam mails using Support vector machine

10. Develop and Implement best machine learning algorithm to implement online fraud detection

Text Books
1. Anany Levitin, (2012) "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education.
2. SebastainRaschka, (2019)"Python Machine Learning", Packet publishing (open source).

3. EthemAlpaydin, (2020) "Introduction to Machine Learning", MIT Press, Fourth Edition.

4. Stuart Russel and Peter Norvig, (2020) "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education.

Reference Books
1. Allen B. Downey, (2016) "Think Python: How to Think like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers. (http://greenteapress.com/wp/think.python/)

2. Guido van Rossum and Fred L. Drake Jr, (2011) "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.

Tools: C, C++, JAVA, Python and R Programming with ML and AL Packages

Teaching Methods
Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
         1. **Record Work**: 05 Marks.
         2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

Observation: 15 Marks
Attendance: 5Marks
One Model Practical: 30 Marks.

MAPPING					
PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong		**H** – High		**M** – Medium	**L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Paper 12: Machine Learning			
Batch 2022 – 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To understand the basics of Machine Learning (ML)
2. To understand the methods of Machine Learning
3. To know about the implementation aspects of machine learning
4. To understand the concepts of Data Analytics and Machine Learning
5. To understand and implement use cases of ML

Course Outcomes (CO)

	CO1	Understand the basics of ML
	CO2	Understand various Machine Learning methods and its application
K1 to K5	**CO3**	Demonstrate various ML techniques using standard packages.
	CO4	Explore knowledge on Machine learning and Data Analytics
	CO5	Apply ML to various real time examples

Syllabus

Unit I **(15 Hours)**

Machine Learning Basics : Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

Unit II **(15 Hours)**

Machine Learning Methods: Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Futurization

Unit III **(15Hours)**

Machine L Earning in Practice: Ranking – Recommendation System - Designing and Tuning model pipelines-Performance measurement – Azure Machine Learning – Open-source Machine learning libraries – Amazon's Machine Learning Tool Kit: Sage maker

Unit IV **(15 Hours)**

Machine Learning and Data Analytics: Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics

Unit V **(15 Hours)**

Applications of Machine Learning: Image Recognition – Speech Recognition – ***Email spam and Malware Filtering** – Online fraud detection – Medical Diagnosis

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

　　Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books

1. Ameet V Joshi, (2020) "Machine Learning and Artificial Intelligence", Springer Publications.
2. John D. Kelleher, Brain Mac Namee, Aoife D' Arcy, (2015) "Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examples and case studies", MIT press.
3. Tom M. Mitchell, (2013) "Machine Learning", McGraw-Hill Education.
4. AurelienGeron, (2019) "Hands-on Machine Learning with Scikit-Learn &TensorFlow" , O'Reilly, Shroff Publishers and Distributors Pvt.Ltd.

Reference Books

1. Christopher M. Bishop,(2011) "Pattern Recognition and Machine Learning", Springer Publications.
2. Stuart Jonathan Russell, Peter Norvig, John Canny, (2020) "Artificial Intelligence: A Modern Approach", Prentice Hall.
3. John Paul Muller, Luca Massaron (2021) "Machine Learning Dummies",Wiley Publications.
4.EthemAlpaydin,(2013) "Introduction to Machine Learning", PHI Learning Pvt. Ltd, 2nd Edition.
5. T. Hastie, R. Tibshirani, J. H. Friedman, (2001) "The Elements of Statistical Learning", Springer, 1st edition.
6. Manaranjan Pradhan, U Dinesh kumar, (2019) "Machine Learning using Python" Wiley.
7. SaikatDutt, Subramanian Chandramouli, Amit Kumar Das,(2020) "Machine Learning", Pearson.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong　　　　　**H** – High　　　　　**M** – Medium　　　　　**L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Core Paper 13: Database Design and Management			
Batch 2022 – 2023	**Hours / Week** 4/15	**Total Hours** 60	**Credits** 4

Course Objectives
1. To introduce database development life cycle and conceptual modelling
2. To learn SQL for data definition, manipulation and querying a database
3. To learn relational database design using conceptual mapping and normalization
4. To learn transaction concepts and serializability of schedules
5. To learn data model and querying in object-relational and No-SQL databases

Course Outcomes (CO)

K1 to K5	**CO1**	Understand the database development life cycle and apply conceptual modeling
	CO2	Apply SQL and programming in SQL to create, manipulate and query the database
	CO3	Apply the conceptual-to-relational mapping and normalization to design relational database
	CO4	Determine the serializability of any non-serial schedule using concurrency techniques
	CO5	Apply the data model and querying in Object-relational and No-SQL databases

Syllabus

Unit I   **(12 Hours)**
CONCEPTUAL DATA MODELING: Database environment – Database system development lifecycle – Requirements collection – Database design - Entity-Relationship model – Enhanced-ER model – UML class diagrams.

Unit II   **(12 Hours)**
RELATIONAL MODEL AND SQL: Relational model concepts - Integrity constraints - SQL Data manipulation – SQL Data definition – Views - SQL programming.

Unit III   **(12 Hours)**
RELATIONAL DATABASE DESIGN AND NORMALIZATION: ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – ***Inference rules** – Minimal cover – Properties of relational decomposition – Normalization (up to BCNF).

Unit IV   **(12 Hours)**
        TRANSACTION MANAGEMENT: Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two phase locking techniques.

Unit V   **(12 Hours)**
        OBJECT RELATIONAL AND NO-SQL DATABASES : Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – User-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods
Chalk and Talk, Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Seminar, Quiz, Audio and Video

Textbooks
1. Thomas M. Connolly, Carolyn E. Begg , (2015) "Database Systems – A Practical Approach to Design, Implementation, and Management", Sixth Edition, Global Edition, Pearson Education.
2. RamezElmasri, Shamkant B. Navathe,(2007)" Fundamental of Database Systems", 7th Edition.

Reference Books
1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish , (2011) "DATABASE MODELING AND DESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers.
2. Carlos Coronel, Steven Morris, and Peter Rob, (2012) "Database Systems: Design, Implementation, and Management", Ninth Edition, Cengage learning.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan ,(2011) "Database System Concepts", 6th Edition, Tata Mc Graw Hill.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom,(2009) "Database Systems:The Complete Book", 2nd edition, Pearson.
5. S Sumathi, S Esakkirajan ,(2007) " Fundamentals of Relational Database Management Systems ", (Studies in Computational Intelligence), Springer-Verlag.
6. Raghu Ramakrishnan ,(2010) "Database Management Systems", 4th Edition, Tata Mc Graw Hill.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Project & Viva voce			

Batch 2022 – 2023	Hours / Week 4/15	Total Hours 60	Credits 5

Course Objectives

1. To acquire the knowledge about selecting the task based on their course skills.

2. To get the knowledge about analytical skill for solving the selected task.

3. To get confidence by implementing the task in a real time projects.

Course Outcomes (CO)

	CO1	Applying programming skill for solving the project.
K3 to K5	CO2	Analyzing the task and to collect the necessary information and software development
	CO3	Evaluating and Testing the task based on the software.
	CO4	Implementing the software for getting the Report.
	CO5	Implementing and analyzing real time project

Guidelines to the Distribution of Marks

CIA	Project Review	45	50
	Regularity	5	
ESE	Project Report	35	50
	Viva – Voce	15	
Grand Total			**100**

Teaching Methods: Power Point Presentation/Project Demo/ Discussion

MAPPING					
PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong	**H** – High	**M** – Medium	**L** – Low		

Major Elective Papers I & II

Programme Code:23	B.Sc. Computer Science with Data Analytics

Title of the paper : Major Elective: Internet of Things			
Batch 2022 – 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

Course Objectives
1. To Study Fundamental Concepts of Iot.
2. To Understand Roles of Sensors In Iot
3. To Learn Different Protocols Used For Iot Design
4. Understand The Role of Iot In Various Domains Of Industry.

Course Outcomes (CO)

K1 to K5	**CO1**	Understand The Various Concepts, Terminologies and Architecture of Iot Systems
	CO2	Use Sensors and Actuators for Design of Iot.
	CO3	Understand and Apply Various Protocols for Design Of Iot Systems
	CO4	Use Various Techniques of Data Storage And Analytics In Iot
	CO5	Understand Various Applications of Iot

Syllabus

Unit I   **(15 Hours)**
Fundamentals of Iot: Introduction, Definitions & Characteristics of Iot, Iot Architectures, Physical & Logical Design of Iot, Enabling Technologies In Iot, ***History of Iot**, About Things In Iot, The Identifiers In Iot, About The Internet In Iot, Iot Frameworks, Iot And M2m.

Unit II   **(15 Hours)**
Sensors Networks: Definition, Types of Sensors, Types of Actuators, Examples and Working, Iot Development Boards: Arduino IDE and Board Types, Raspberripi Development Kit, RFID Principles and Components, Wireless Sensor Networks: History and Context, The Node, Connecting Nodes, Networking Nodes, WSN And Iot.

Unit III   **(15 Hours)**
Wireless Technologies for Iot: Wpan Technologies for Iot: IEEE 802.15.4, Zigbee, Hart, Nfc, Z-Wave, Ble, Bacnet, Modbus. IP Based Protocols for Iot Ipv6, 6lowpan, Rpl, Rest, Ampq, Coap, Mqtt. Edge Connectivity and Protocols

Unit IV   **(15 Hours)**
Data Handling& Analytics: Introduction, Big data, Types of Data, Characteristics of Big Data, Data Handling Technologies, Flow of Data, Data Acquisition, Data Storage, Introduction to Hadoop. Introduction to Data Analytics, Types Of Data Analytics, Local Analytics, Cloud Analytics and Applications

Unit V   **(15 Hours)**

        Applications of Iot: Home Automation, ***Smart Cities**, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial Iot, Legal Challenges, Iot Design Ethics, Iot in Environmental Protection.

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

        Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books

1. HakimaChaouchi, (2010) "The Internet of Things Connecting Objects to the Web" ISBN: 978-1-84821-140-7, Wiley Publications.
2. Olivier Hersent, David Boswarthick, and Omar Elloumi(2012) ― "The Internet Of Things: Key Applications And Protocols", Wiley publications.
3. Vijay Madisetti and Arshdeepbahga , (2014) ― "Internet of Things (A Hands-On-Approach)", 1 st Edition.
4. J. Biron and J. Follett, (2016) "Foundational Elements of an Iot Solution", O"Reilly Media.

Reference Books

1. Pethuru Raj AndAnupama C. Raman,(2017) "The Internet Of Things: Enabling Technologies, Platforms, And Use Cases", Crc Press.
2. Keysight Technologies, (2016) "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note.

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Major Elective: Software Testing and Quality Assurance			
Batch 2022 – 2023	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

Course Objectives

1. To understand the basics of testing, test planning &design and test team organization
2. To study the various types of test in the life cycle of the software product.
3. To build design concepts for system testing and execution
4. To learn the software quality assurance , metrics, defect prevention techniques

Course Outcomes (CO)

K1 to K5	**CO1**	Perform functional and non-functional tests in the life cycle of the software product.
	CO2	Understand system testing and test execution process.
	CO3	Identify defect prevention techniques and software quality assurance metrics.
	CO4	To learn the techniques for quality assurance and applying for applications.
	CO5	Apply techniques of quality assurance for typical applications.

Syllabus

Unit I   **(15 Hours)**

Role of Testing- Verification and Validation-Failure, Error, Fault and Defect – Objectives of Testing-What is a test case? –Expected outcome –Concept of Complete Testing – Central issue in testing –Testing Activities – Test levels – Sources of information for test case selection.

Unit II   **(15 Hours)**

White Box and Black Box testing –Test planning and Design – Monitoring and Measuring Test Execution – Test tools and Automation – Concept of Unit Testing- Static Unit Testing- Defect Prevention-Dynamic Unit Testing-Debugging.

Unit III   **(15 Hours)**

System Integration Testing: Concept of Integration Testing- Different types of Interfaces and Interface Errors-System Integration Techniques-Basic Tests-Functionality tests- Robustness Tests:-Boundary value tests –Performance Tests**-*Scalability Tests.**

Unit IV   **(15 Hours)**

The Software Quality challenge :The Uniqueness of Software Quality Assurance –The Environments for which SQA methods are developed – Software Quality Definition- Software quality assurance : definition and Objectives - The SQA system – an SQA architecture- Software project life cycle components-Management ***SQA components**- SQA standards, system certification, and assessment components.

Unit V   **(15 Hours)**
Software quality metrics: Objectives of quality measurement- Classification of software quality metrics-Process metrics- Product metrics- Limitations of software metrics- Objectives of cost of software quality metrics- The classic model of cost of software quality - Problems in the application of cost of software quality metrics-Top management's quality assurance activities-Department management responsibilities for quality assurance-Project management responsibilities for quality assurance.

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods
      Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books
   1. KshirsagarNaik and Priyadarshi Tripathy, (2008) "Software Testing & Quality Assurance Theory and Practice", Wiley Student edition.
   2. Daniel Galin, (2004) "Software Quality Assurance From theory to implementation", Pearson Publication.

Reference Books

   1. Jeff Tian, John Wiley & Sons, Inc., (2005) "Software Quality Engineering: Testing, Quality, Assurance , and Quantifiable Improvement" Hoboken, New Jersey.
   2. MilindLimaye ,(2011) " Software Quality Assurance", TMH , New Delhi.
   3. Kshirasagar Naik, Priyadarshi Tripathy, (2008) "Software Testing and Quality Assurance-Theory and Practice" John Wiley & Sons Inc.
   4. Daniel Galin, (2004) "Software Quality Assurance - From Theory to Implementation", Pearson Education Ltd UK.

MAPPING

PSO \ CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

       S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Major Elective: Cloud Computing Fundamentals

Batch 2022 – 2023	Hours / Week 5/15	Total Hours 75	Credits 5

Course Objectives

1. To define Cloud Computing
2. To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
3. To motivate students to do programming and experiment with the various cloud computing environments
4. To shed light on the Security issues in Cloud Computing
5. To introduce about the Cloud Standards

Course Outcomes (CO)

K1 to K5	CO1	Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
	CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
	CO3	Explain the core issues of cloud computing such as security, privacy, and interoperability.
	CO4	Provide the appropriate cloud computing solutions and recommendations according to the applications used.
	CO5	Collaboratively research and write a research paper, and present the research online.

Syllabus

Unit I   (15 Hours)

Introduction: Defining a Cloud- A closer look –The Cloud Computing Reference Model –Characteristics and benefits of Cloud Computing –Challenges. 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.

Unit II   15 (Hours)

Cloud Computing Architecture: Introduction - The cloud reference model- Architecture- Infrastructure- and 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.

Unit III   (15 Hours)

Exploring Cloud Infrastructures: Managing the Cloud - Administrating the Clouds- Cloud Management Products- *Understanding Cloud Security- Securing the Cloud - Securing Data- Moving Applications to the Cloud- Applications in the Clouds.

Unit IV   **(15 Hours)**

High-Throughput Computing: Task computing- Task-based application models. Data-Intensive Computing: What is data-intensive computing? - Characterizing data-intensive computations- Challenges ahead-Historical perspective- ***Technologies for data-intensive computing**- Storage systems- Programming platforms

Unit V   **(15 Hours)**

Cloud Platforms in Industry: Amazon web Services -compute services, Storage Services, Communication Services, Google App Engine- Architecture and core concepts, Application Life Cycle, cost model, Microsoft Azure core concepts, ***SQL Azure**, Windows Azure platform appliance

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods

Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, (2013) "Mastering Cloud Computing: Foundations and applications programming" , Elsevier Morgan Kaufmann.

Reference Books

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, (2012) "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier.
2. Barrie Sosinsky,(2010) " Cloud Computing Bible" John Wiley & Sons.
3. Tim Mather, Subra Kumaraswamy, and Shahed Latif, (2009) "Cloud Security and Privacy an Enterprise Perspective on Risks and Compliance", O'Reilly.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Major Elective: Digital Forensics

Batch 2022 – 2023	Hours / Week 5/15	Total Hours 75	Credits 5

Course Objectives

• To introduce the principle and concepts of digital forensic
• To detail about the various investigation procedures like data acquisition and evidence gathering
• To understand the basics of digital forensics and the techniques for conducting the forensic examination on different digital devices.
• To understand how to examine digital evidences such as the data acquisition, identification analysis.
• To understand the various categories of tools and procedures used in the digital forensic process

Course Outcomes (CO)

K1 to K5	**CO1**	Analysing the digital evidences and arriving at conclusions
	CO2	Examine the Volatile and Non-volatile Digital Evidence
	CO3	Apply various techniques of digital forensics for the systematic crime investigation
	CO4	Apply the cyber-crime techniques to data acquisition and evidence collection
	CO5	Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.

Syllabus

Unit I   **(15 Hours)**

Basics of Digital Forensics: Digital Forensics- Introduction, Objective and Methodology, Rules of Digital Forensics, Good Forensic Practices, Daubert's Standards, Principles of Digital Evidence. Overview of types of Computer Forensics – Network Forensics, Mobile Forensics, Social Media Forensics and E-mail Forensics. Services offered by Digital Forensics. First Responder – Role, Toolkit and Do's and Don'ts

Unit II   **(15 Hours)**

Cyber Crime Investigation : Introduction to Cyber Crime Investigation, Procedure for Search and seizure of digital evidences in cyber-crime incident- Forensics Investigation Process- Pre search consideration, Acquisition, Duplication & Preservation of evidences, Examination and Analysis of evidences, Storing of Evidences, Documentation and Reporting, Maintaining the Chain of Custody.

Unit III   **(15 Hours)**

Data Acquisition and Evidence Gathering: Data Acquisition of live system, Shutdown Systems and Remote systems, servers. E-mail Investigations, Password Cracking. Seizing and preserving mobile devices. Methods of data acquisition of evidence from mobile devices. Data Acquisition and Evidence Gathering from Social Media. Performing Data Acquisition of encrypted systems. ***Challenges and issues in cyber-crime investigation.**

Unit IV   **(15 Hours)**

Analysis of Digital Evidences: Search and Seizure of Volatile and Non-volatile Digital Evidence, Imaging and Hashing of Digital Evidences, Introduction to Deleted File Recovery, Steganography and Steg analysis, Data Recovery Tools and Procedures, Duplication and Preservation of Digital Evidences, Recover Internet Usage Data, Recover Swap files/Temporary Files/Cache Files. Software and Hardware tools used in cyber-crime investigation – Open Source and Proprietary tools. Importance of Log Analysis in forensic analysis. Understanding Storage Formats for Digital Evidences – Raw Format, Proprietary Formats, ***Advanced Forensic Formats.**

Unit V   **(15 Hours)**

Windows and Linux Forensics: Windows Systems Artifacts: File Systems, Registry, Event logs, Shortcut files, Executables. Alternate Data Streams (ADS), Hidden files, Slack Space, Disk Encryption, Windows registry, startup tasks, jump lists, Volume Shadow, shell bags, LNK files, Recycle Bin Forensics (INFO, $i, $r files). Forensic Analysis of the Registry – Use of registry viewers, Regedit. Extracting USB related artifacts and examination of protected storages. Linux System Artifact: Ownership and Permissions, Hidden files, User Accounts and Logs.

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods
Chalk and Talk, Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Seminar, Quiz, Audio and Video

Text Books
1. Nina Godbole and Sunit Belapore; (2011) "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publications.
2. Bill Nelson, Amelia Phillips and Christopher Steuart,(2010 BBS) "Guide to Computer Forensics and Investigations" – 3rd Edition, Cengage.
3. Shon Harris,(2013) "All in One CISSP Guide, Exam Guide Sixth Edition", McGraw Hill.

Reference Books
1. Peter Hipson,(2002) "Mastering Windows XP Registry", Sybex.
2. Harlan Carvey,(2012) "Windows Forensic Analysis Toolkit", Syngress.
3. Anthony Reyes, Jack Wiles,(2007) "The Best Damn Cybercrime and DigitalForensic Book",Syngress, USA.
4. Warren G. Kruse II and Jay G. Heiser,(2002) "Computer Forensics: Incident Response Essentials", Addison Wesley.
5. Bill Nelson, Amelia Phillips, F.Enfinger and Christopher Stuart,(2006) "Guide to Computer Forensics and Investigations", 2nd edition. Thomson Course Technology.
6. John R. Vacca, Computer Forensics,(2005) "Computer Crime Scene Investigation",2nd Ed, Charles River Media.
7. Bill Nelson, Amelia Phillips, F.Enfinger and Christopher Stuart, (2010) "Guide to Computer Forensics and Investigations, 4th ed., Thomson Course Technology.
8. Anthony T. S. Ho and Shujun Li,(2015) "Handbook of Digital forensics of Multimedia Data and Devices", IEEE Press, John Wiley & Sons.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Major Elective: Natural Language Processing

Batch 2022 – 2023	Hours / Week 5/15	Total Hours 75	Credits 5

Course Objectives

1. To learn the fundamentals of natural language processing
2. To understand the use of CFG and PCFG in NLP
3. To understand the role of semantics of sentences and pragmatics
4. To apply the NLP techniques to IR applications

Course Outcomes (CO)

	CO1	To tag a given text with basic Language features
	CO2	To design an innovative application using NLP components
K1 to K5	**CO3**	To implement a rule based system to tackle morphology/syntax of a language
	CO4	To design a tag set to be used for statistical processing for real-time applications
	CO5	To compare and contrast the use of different statistical approaches for different types of NLP applications.

Syllabus

Unit I **(15 Hours)**

Introduction - Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance- Applications of NLP .

Unit II **(15 Hours)**

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models. Advantages of NLP - Disadvantages of NLP -Components of NLP - How to build an NLP pipeline- Phases of NLP -Why NLP is Difficult- NLP APIs - NLP Libraries - ***Difference between Natural language and Computer language**

Unit III **(15 Hours)**

Syntactic Analysis : Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

Unit IV (15 Hours)

Semantics and Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, sectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

Unit V (15 Hours)

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, ***Multilingual and Cross lingual Language Modeling**

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.
Teaching Methods
     Chalk and Talk/ Power point presentation/ Google Class Rooms/ Smart Class Rooms /Seminar / Quiz / Discussion / Assignment/ Demonstration/ Video presentation /Podcast /Materials from NDLI/ Class blended learning/ Flipped class

Text Books
1. Daniel Jurafsky, James H. Martin,(2014) "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication.
2. Steven Bird, Ewan Klein and Edward Loper, (2009) "Natural Language Processing with Python", First Edition, O"Reilly Media.
3. Breck Baldwin,(2015) "Language Processing with Java and LingPipe Cookbook", Atlantic Publisher.
4. Richard M Reese, (2015) "Natural Language Processing with Java", OReilly Media.
5. Nitin Indurkhya and Fred J. Damerau, (2010) "Handbook of Natural Language Processing", Second Edition, Chapman and Hall/CRC Press.

Reference Books
1. Daniel M. Bikel and ImedZitouni (2012)"Multilingual natural Language Processing Applications: From Theory to Practice ", Pearson Publication.
2. Daniel Jurafsky& James H Martin (2000),"Speech and Natural Language Processing" Pearson Publications.
3. Tanveer Siddiqui, U.S. Tiwary, (2008) "Natural Language Processing and Information Retrieva", Oxford University Press.

MAPPING

PSO \ CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Major Elective: Deep Learning			

Batch 2022 – 2023	Hours / Week 5/15	Total Hours 75	Credits 5

Course Objectives

1. To introduce students to the basic concepts and techniques of deep Learning.
2. To get the knowledge about deep learning skill for solving the selected task.
3. To learn the fundamentals of reinforcement learning.

Course Outcomes (CO)

K1 to K5	CO1	Understand the basic concepts and techniques of Deep Learning
	CO2	To understand and apply the Machine learning principles
	CO3	To study the deep learning architectures
	CO4	Examine the foundations of neural networks
	CO5	Explore and create deep learning applications with tensor flow

Syllabus

Unit I (15 Hours)

Basics of Neural Network: The Neural Network – Limits of Traditional Computing – Machine Learning – Neuron – FF Neural Networks – Types of Neurons – Softmax output layers. Variables & Operations - Tensor flow – Variables – Operations – Placeholders – Sessions – Sharing Variables – Graphs – Visualization

Unit II (15 Hours)

CNN: Convolution Neural Network – Feature Selection – Max Pooling – Filters and Feature Maps – Convolution Layer –*Applications. RNN: Recurrent Neural Network – Memory cells – sequence analysis – word2vec- LSTM - Memory augmented Neural Networks – NTM– *Applications.

Unit III (15 Hours)

Reinforcement Learning: Reinforcement Learning – MDP – Q Learning – ***Applications**

Unit IV (15 Hours)

Deep Learning Algorithms For AI : Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Backpropagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Autoencoders - Deep Back prop Networks- Auto encoders.

Unit V (15 Hours)

Data Science and Deep Learning Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and futurization - How to work with data variables and data science tools - How to visualize the data **-*How to work with machine learning algorithms and Artificial Neural Networks.**

* Denotes Self Study and questions for examinations may be taken from the self-study portions also.

Teaching Methods
Chalk and Talk, Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Seminar, Quiz, Audio and Video

Text Books
1. Nikhil Buduma, Nicholas Locascio, (2017) "Fundamentals of Deep Learning: Designing Next Generation Machine Intelligence Algorithms", O'Reilly Media.
2. Ian Good fellow, Yoshua Bengio, Aaron Courville, (2017) "Deep Learning (Adaptive computation and Machine Learning series", MIT Press.

Reference Books
1. Ian Good fellow, Yoshua Bengio, Aaron Courville, (2016) "Deep Learning", MIT Press.
2. Stone, James. (2019). "Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning", Sebtel Press, United States.
3. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), (2021)"Deep Learning Applications", Volume 3,Springer Publications.
4. Charu C. Aggarwal, (2018) "Neural Networks and Deep Learning: A Textbook", Springer International Publishing.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	S	H	H
CO2	M	H	S	S	H
CO3	H	M	S	S	S
CO4	M	M	S	S	S
CO5	H	H	M	M	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Environmental Studies

Programme Code: 23	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students		
Title of the Paper : PART IV – Environmental Studies			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2022-2023	2/15	30	2

COURSE OBJECTIVES

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences

2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.

3. To shape students into good "Eco citizens" thereby catering to global environmental needs.

4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil

5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT   (6 HOURS)

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS   (6 HOURS)

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem –Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION   (6HOURS)

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – *Insitu* Conservation of Biodiversity – *Exsitu* Conservation of Biodiversity

UNIT IV ENVIRONMENTAL POLLUTION   (6 HOURS)

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT   (6 HOURS)

Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

Text Book
1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

References
1.Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.
2.Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.
3.J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001

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Question Paper Pattern for General papers
Environmental Studies

22EVS101

Question Paper Pattern
(External only)

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Duration: 3 hours   **Total Marks :**   50

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Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

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Value Education

Programme Code: 23	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students
Title of the Paper : Value Education - MORAL AND ETHICS	

Batch	Hours / Week	Total Hours	Credits
2022-2023	2/15	30	2

Course Objectives

1. To impart Value Education in every walk of life.
2. To help the students to reach excellence and reap success.
3. To impart the right attitude by practicing self-introspection.
4. To portray the life and messages of Great Leaders.
5. To insist the need for universal brotherhood, patience and tolerance.
6. To help the students to keep them fit.
7. To educate the importance of Yoga and Meditation.

Course Outcomes (CO)
After completing the course the students:

K1 to K5	CO1	Will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	Will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	Can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	Will be able to Analyze the Practical outcome of practicing Moral values in real life situation
	CO5	Could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

Syllabus

UNIT I: **4 Hours**
     Moral and Ethics: Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

UNIT II: **6 Hours**
     Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

UNIT III: **4 Hours**
     Warriors of our Nation: Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

UNIT IV: **8 Hours**
     Physical Fitness and Mental Harmony: Simplified Physical Exercise – Hand Exercises – Leg Exercises – Neuro Muscular Breathing Exercises – Eye Exercises – Kabalabathi – Maharasana A & B – Massage - Acupressure – Relaxation – Kayakalpa Yogam - LifeForce – Aim & Objectives – Principle – Methods. Introspection – Analysis of Thoughts – Moralization of Desires – Neutralization of Anger – Eradication of Worries

UNIT V: **8 Hours**

Yoga and Meditation – The Asset of India: Yogasanam – Rules & Regulations – Surya Namaskar – Asanas –Sitting – Stanging – Prone - Supine - Pranayama – Naadi Sudhi – Ujjayi – Seethali – Sithkari - Benefits. Meditation – Thanduvasudhi - Agna – Shanthi – Thuriyam – Benefits.

Text Books:

Value Based Education – Moral and Ethics – compiled by Kongunadu Arts and Science College (Autonomous), 2nd Edition (2021).

Reference Books:

1. Swami Vivekananda – A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition (2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication(2000).
5. Yoga Practices - 1 – The World Community Service Centre – Vethathiri Publications,Sixth Edition (2017),Erode.
6. Yoga Practices - 2 – The World Community Service Centre – Vethathiri Publications – Eighth Edition (2017),Erode.

MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	S
CO2	S	S	S	H	H
CO3	S	H	S	H	H
CO4	S	H	S	H	H
CO5	S	H	H	S	S

S – Strong   **H** – High   **M** – Medium   **L** – Low

Value Education – Moral & Ethics

22VED201

Question Paper Pattern
(External only)

Duration: 3 hours   **Total Marks:** 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

Non Major Elective Papers

Programme Code: 23	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students		
Title of the Paper :	PART IV -NON MAJOR ELECTIVE –I HUMAN RIGHTS		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2022-2023	2	30	2

Course Objectives

1. To prepare for responsible citizenship with awareness of the relationship between HumanRights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)

	CO1	To understand the hidden truth of Human Rights by studying various theories
	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission (UNO).
K1toK5	**CO3**	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and State Human Right Commission (UNHCR).
	CO4	To get habits of how to treat aged person, others and positive social responsibilities.
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

UNIT – I
Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

UNIT – II
United Nations Charter and Human Rights - U.N. Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT – III
Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

UNIT – IV
Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights -Social Awareness and Responsibilities of Individuals.

UNIT – V

Rights of Women, Child, Refugees and Minorities –Social media and Human Rights - NGO's in protection of Human Rights - Right to Election

Books for Study:

1. Human Rights (2019) Compiled by Kongunadu Arts and Science College, Coimbatore –29.

Book for Reference:
1.Human Rights,(2018), Jaganathan,MA.,MBA.,MMM.,ML.,ML., Humanitarian Law and J.P.Arjun Proprietor,Usha Jaganathan Refugee Law law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.

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NON-MAJOR ELECTIVES I – HUMAN RIGHTS

22UHR3N1

QUESTION PAPER PATTERN
(External only)

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Duration: 3 Hours   **Max. Marks: 75**

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Answer <u>ALL</u> Questions

<u>SECTION A</u>   (5 x 5 = 25 marks)

</div>

Short answers, either or type, one question from each unit.

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<u>SECTION B</u>   (5 x 10 = 50 marks)

</div>

Essay type questions, either or type, one question from each unit.

Programme Code: 23	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students		
Title of the Paper :	Part IV -Non- Major Elective – II Women's Rights		
Batch 2022-2023	**Hours / Week** 2/15	**Total Hours** 30	**Credits** 2

Course Objectives

1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women's rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women's rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

Course Outcomes (CO)

K1toK5	**CO1**	Understand the importance of Women's Studies and incorporate Women's Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Study the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	To be Aware of Government Developmental schemes for women and to create Awareness on modernization and impact of technology on Women.

Syllabus

Unit I (6 Hours)

Women's Studies:
Basic concepts of Women's studies in Higher education, Women's studies perspectives- Socialization- Patriarchy- Women's studies as an academic discipline- Growth and development of Women's studies as a discipline internationally and in India.

Unit II (6 Hours)

Socio-Economic Development of Women:
Family welfare measures, role of Women in economic development, representation of Women in media, status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

Unit III (6 Hours)

Women's Rights – Access to Justice:
Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

Unit IV (6 Hours)

Women Protective acts:
Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

Unit V   **(6 Hours)**
Women and Child welfare:
Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

Teaching Methods

Smart Class Room / Power point Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book

1. **Women's Rights** (2021), compiled by Kongunadu Arts & Science College, Coimbatore – 641 029.

Reference Books

1. **"Rights of Indian Women"** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
2. **"Women's security and Indian law"** by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
3. **"Women's Property Rights in India"** by Kalpaz publications, 2016.

NON-MAJOR ELECTIVES I – WOMEN'S RIGHTS

22UWR4N2

QUESTION PAPER PATTERN
(External only)

Duration: 3 Hours   **Max. Marks: 75**

Answer <u>ALL</u> Questions

<u>SECTION A</u>   (5 x 5 = 25 marks)

Short answers, either or type, one question from each unit.

<u>SECTION B</u>   (5 x 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		

Title of the Paper : Non- Major Elective 3: Consumer Affairs

Batch	Hours / Week	Total Hours	Credits
2022-2023	2	30	2

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.

2. To understand the procedure of redress of consumer complaints.

3. To know more about decisions on Leading Cases by Consumer Protection Act.

4. To get more knowledge about Organizational set-up under the Consumer Protection Act.

5. To impart awareness about the Role of Industry Regulators in Consumer Protection.

6. To understand Contemporary Issues in Consumer Affairs.

Course Outcomes (CO)

K1 to K5	**CO1**	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Apply the role of different agencies in establishing product and service standards.
	CO4	Analyze to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

SYLLABUS

UNIT I   **6 Hours**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite.

UNIT II   6 Hours

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT III   6 Hours

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV   6 Hours

Role of Industry Regulators in Consumer Protection

  i.   Banking: RBI and Banking Ombudsman
 ii.   Insurance: IRDA and Insurance Ombudsman
iii.   Telecommunication: TRAI
 iv.   Food Products: FSSAI
  v.   Electricity Supply: Electricity Regulatory Commission
 vi.   Real Estate Regulatory Authority

UNIT V   6 Hours

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing,

Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.

Teaching Methods

Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class

Suggested Readings

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.

2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.

3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, RegalPublications

4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, NewDelhi

5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company

6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.

7. E-books :-www.consumereducation.in

8. Empowering Consumers e-book:- www.consumeraffairs.nic.in

9. ebook,www.bis.org

10.   The Consumer Protection Act, 2086 and its later versions.
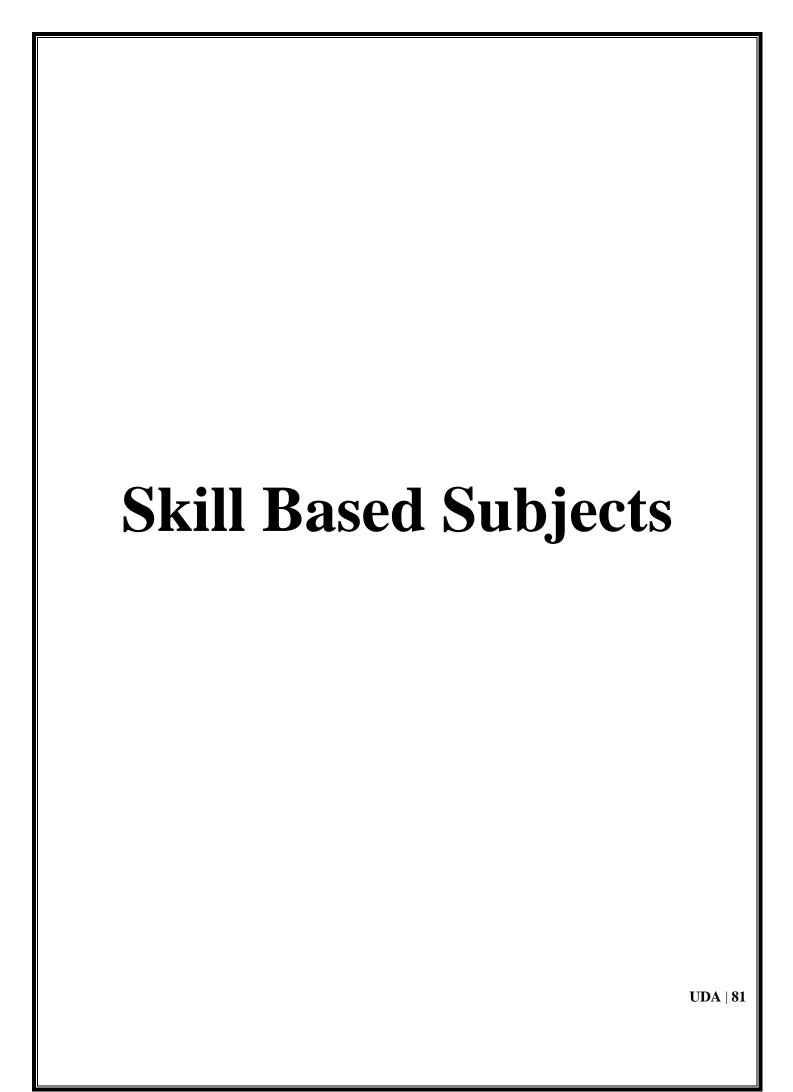
Question Paper Pattern

(External only)

Duration: 3 hours   **Max: 75 marks**

Section A   **(5X5=25)**

Short notes
Either – Or/ Type - Question from each unit

Section B   **(5X10=50)**

Essay type Either – Or/ Type - Question from each unit

Skill Based Subjects

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the paper : Skill Based Subject 1: Cyber Security

Batch 2022 – 2023	Hours / Week 2/15	Total Hours 30	Credits 3

Course Objectives
1. The course introduces the basic concepts of Cyber Security
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. To understand about the Cyber Legal laws and Punishments

Course Outcomes (CO)

K1	CO1	To Understand the Concepts of Cybercrime and Cyber Frauds
K2	CO2	To Know about Cyber Terrorism and its preventive measures
K3	CO3	To Analyze about the Internet, Mobile Phone and E-commerce security issues
K4	CO4	To Understand about E-mail and Social Media Issues
K5	CO5	To Describe about various legal responses to Cybercrime

Syllabus

Unit I   **6 Hours**

Introduction to Cyber Security: Definition of Cyber Security- Why is Cyber Security important?. Layers of Cyber Security- Evolution of Cyber Security. Cyber hacking - Cyber fraud: Definition- Different modes of cyber fraud - Cyber fraud in India. Cyber pornography.

Unit II   **6 Hours**

Cyber Terrorism: Modes of cyber terrorism. Cybercrime: What is Cybercrime? Cybercrime preventive methods - Preventive steps for individuals & organizations - Kinds of cybercrime - Malware and its types – Cyber-attacks.

Unit III   **5 Hours**

Internet Mobile Phone and E-commerce Security issues: Data theft - Punishment of data theft- Theft of internet hours - Internet safety tips for children & parents. Mobile phone privacy-   E-Commerce security issues.

Unit IV   **6 Hours**

Email and Social media issues: Aspects of Social Media - The Vicious Cycle of unhealthy social media use- Modifying social media use to improve mental health. Computer Virus - Antivirus – Firewalls.

Unit V   **7 Hours**

Cyber Forensics and Digital Evidence: What does Digital Footprint Mean? - Web Browsing and Digital Footprints- Digital Footprint examples – How to Protect Your Digital Footprints? - How to erase your Footprints? - Browser Extensions and Search Engine Deletion - Cyber Crime and Cyber Laws - Common Cyber Crimes and Applicable Legal Provisions: A Snapshot - Cyber Law (IT Law) in India – The Information Technology Act of India 2000 - Cyber Law and Punishments in India - Cyber Crime Prevention guide to users – Regulatory Authorities.

Teaching Methods: Chalk and Talk, Presentation, Seminar, Quiz, Discussion & Assignment

Text Book

1. "Cyber Security", Text Book compiled by "Kongunadu Arts and Science College", Coimbatore -29, 2022.

Reference Books

1. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security", BPB Publications, 1st Edition, 2017.

2. Anand Shinde, "Introduction to Cyber Security-Guide to the world of Cyber Security", Notion Press,2021.

3. Paul Grishman, "Cyber Terrorism- The use of the Internet for Terrorist Purpose", Axis Publication,1st Edition 2010.

4. Shilpa Bhatnagar, "Encyclopaedia of Cyber and Computer Hacking", Anmol Publications, 1st Edition 2009.

Web References:

1. http://deity.gov.in/ - Department of Electronics and Information Technology,
2. Govt. of India
3. http://cybercellmumbai.gov.in/ - Cybercrime investigation cell
4. http://ncrb.gov.in/ - National Crime Records Bureau
5. http://catindia.gov.in/Default.aspx - Cyber Appellate Tribunal
6. http://www.cert-in.org.in/ - Indian Computer Emergency Response Team
7. http://cca.gov.in/rw/pages/index.en.do - Controller of Certifying Authorities
8. www.safescrypt.com - Safescrypt
9. www.nic.in – National Informatics Centre
10. https://www.kaspersky.com/resource-center/definitions/what-is-a-digital-footprint
11. https://geekflare.com/digital-footprint/

Mapping

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	S	H	S
CO3	M	H	M	S	H
CO4	S	H	H	M	H
CO5	H	S	S	H	S

S – Strong **H** – High **M** – Medium **L** – Low

Programme Code: 23	Bachelor of Computer Science with Data Analytics

Title of the Paper :	Skill Based Subject 2: Web Design Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	2/15	30	3

Course Objectives
1. To design and develop websites using fundamental web languages, technologies, and tools.
2. To implement the concepts in visual design and content structuring
3. To develop an ability to design and implement static and dynamic website
4. To develop skills in analyzing the usability of a web site.
5. To demonstrate the role of languages like HTML, CSS, JavaScript, PHP and protocols in the workings of the web and web applications.

Course Outcomes (CO)

K3 to K5	**CO1**	Understanding the use of HTML tags.
	CO2	Create web pages using HTML and Cascading Stylesheets and Develop dynamic web pages using JavaScript.
	CO3	Use cascading style sheets to design web pages
	CO4	Use JavaScript and HTML to create web pages with advanced interactivity
	CO5	Understand, analyze and build web applications using PHP and Integrate HTML forms to PHP scripts.

LIST OF PRACTICAL PROGRAMS

1. Design a page having suitable background colour and text colour with title "My First Web Page" using all the attributes of the Font tag and Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.

2. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.

3. Write HTML code to create a Web Page that contains an Image at its center and description of the image.

4. Use table tag to format web page and also create the Time Table of your class using table

5. Create your profile page i.e. educational details, Hobbies, Achievement, My Ideals etc.

6. Develop and demonstrate the usage of inline, internal and external style sheet using CSS

7. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

8. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit the site" message, where should be replaced with the entered name. Otherwise, it should send "Welcome to this site" message.

9. Design a web page for your Department.

10. Design the following static web pages required for an online bookstore web site.

    1) HOME PAGE: The static home page must contain three frames.
    2) LOGIN PAGE
    3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
    4) REGISTRATION PAGE

11. Write JavaScript to validate the following fields of the Registration page.
    1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
    2. Password (Password should not be less than 6 characters length).
    3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
    4. Mobile Number (Phone number should contain 10 digits only).
    5. Last Name and Address (should not be Empty).

12. Write PHP program to upload registration form into database and Display the Registration form from the database.

Text Books

1. Jon Duckett (2000) – "Beginning Web Programming With HTML, XHTML AND CSS", –
Second Edition, Wiley India Pvt Ltd .
2. Bootstrap for Quick Start: A Beginner's Guide to Building Responsive Layouts with Bootstrap.

Reference Books

1. Thomas A. Powell, "The Complete Reference HTML", – Second Edition Tata McGraw Hill Publication.
2.Chris Bates - "Web Programming Building Internet Applications", Second Edition, John Wiley & Sons, Ltd.

Teaching Methods
Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
1. **Record Work**: 05 Marks.
2. **Algorithm, Program, Typing and Execution:** 45 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing	15	10
Typing and Execution	5	5

Internal Mark Split up for 50 Marks:

> **Observation:** 15 Marks
> **Attendance:** 5Marks
> **One Model Practical:** 30 Marks.

MAPPING					
PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong		**H** – High		**M** – Medium	**L** – Low

Programme Code: 23	B.Sc. Computer Science with Data Analytics

Title of the Paper : Skill Based Subject 3: Data Manipulation Using Advanced Excel Laboratory

Batch	Hours / Week	Total Hours	Credits
2022-2023	2/15	30	3

Course Objectives

Provide high level of understanding and practical hands on experience using basic and advanced Excel capabilities, from standard usage, cell formatting, function, charts, and pivot tables and up to the basic usage of Macros.

Course Outcomes (CO)

	CO1	Microsoft Excel provides you with the ability to easily search and filter the required information
	CO2	Uses effective tips, techniques and formulas to the individuals that will effectively help them to make the best use of Excel in their organization.
K3 to K5	CO3	Acquiring in-depth knowledge of working with Microsoft Excel functions and formulas will enable us to use Excel efficiently in their daily work life
	CO4	Using advanced formulas to crunch data and analyse it to get simpler answers. Automating repetitive task
	CO5	Interpretation and Analysis of Data and Visual Reporting

LIST OF PRACTICAL PROGRAMS

1. Perform the following basic operations in Worksheet, Row, Column Moving on Worksheet, Enter Data, Select Data, Delete Data ,Move Data, Copy Paste Data, Spell Check ,Insert Symbols

2. Perform the various Excel Fill Handle in Excel

3. Create a Excel program to Perform various Arithmetic Operations

4. Create a Excel program to Perform Data Validation in Excel like Filters, Grouping, Sorting

5. Create a Excel program to Perform Various Excel Formulas.

6. Create a Excel program to Perform Various built in functions in Excel

7. To Perform IF and Nested Functions in Excel

8. To Perform AND, OR & NOT Logical

9. Create Sheet and Charts in Excel to analysis Student Mark of your Class

10. Import XML to Excel File and do basic Operations

11. To perform Excel VLOOKUP basic Operations

12. Find and Remove duplicates value in Excel

13. To perform Excel to add or remove Hyperlink in Excel of Multiple Sheets

14. Use different Freeze panes in Excel

15. To Perform Mail merge from Excel to Word

16. To Perform Various Separate text Operations in Excel

17. To compute various Excel Substring formula

18. To compute add/remove Password from Excel

19. To compute Convert Columns to Rows in Excel

20. To perform various Conditional formatting in Excel

Teaching Methods

Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for practical Examinations

Two questions will be given for each student (3 Hours / 25 Marks)

1. Record Work – 05 Marks

2. Program, Typing and Execution: 20 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	5	5
Program Writing		
Typing and Execution	5	5

Internal Mark Split-up for 25 Marks:

Observation- 05 Marks
Attendance- 5 Marks and
One Model Practical-15 Marks.

MAPPING					
PSO \ CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong		**H** – High		**M** – Medium	**L** – Low

Extra Departmental Course

Programme Code:23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : EDC: Internet Basics and Advanced Excel Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2022-2023	2/15	30	3

Course Objectives

1. Introduce the fundamentals of Internet and the Web functions.

2. Impart knowledge and essential skills necessary to use the internet and its various components.

3. Find, evaluate, and use online information resources.

4. Use Google Apps for education effectively and to Create and develop various forms in Google

5. To understand the concepts MS-Excel in advance

Course Outcomes (CO)

	CO1	Understand features of Internet and email
K3 to K5	CO2	Understanding and remember various menus in office automation
	CO3	Implementing the concepts of Internet techniques
	CO4	Using advanced formulas to crunch data and analyses it to get simpler answers.
	CO5	Interpretation and Analysis of Data and Visual Reporting

LIST OF PRACTICAL LIST

1. Create an email account in Gmail. Using the account created compose a mail to invite other college students for your college fest, enclose the invitation as attachment and send the mail to at least 50 recipients. Use CC and BCC options accordingly.

2. Create and share a folder in Google Drive using "share a link" option and set the permission to access that folder by your friends only.

3. Create a registration form for your Department Seminar or Conference using Google Forms.

4. Create a online quiz with multiple-choice types of questions for a subject of your choice, using Google Forms.

5. Create student's mark statement and share the Google sheets via link.

6. Create a Excel program to Perform Data Validation in Excel like Filters, Grouping, Sorting

7. Create a Excel program to Perform Various built in functions in Excel

8. To Perform IF and Nested Functions in Excel

9. To Perform AND, OR & NOT Logical operations using Ms- Excel

10. Create Sheet and Charts in Excel to analysis Student Mark of your Class

11. Create a mail merge using MS-Word.

12. Payroll calculation using MS-Excel.

Teaching Methods

Smart Classroom, PowerPoint Presentations, Discussions, Flipped Class, Assignment, Video Lectures

Guidelines to the distribution of marks for internal practical Examinations

Two questions will be given for each student (**3 Hours / 50 Marks**)
1. **Record Work**: 20 Marks.
2. **Algorithm, Program, Typing and Execution:** 70 Marks.

Particulars	Program I (Marks)	Program II (Marks)
Algorithm	10	10
Program Writing	20	20
Typing and Execution	5	5

Internal Mark Split up for 100 Marks

    Observation: 20 Marks
    Attendance: 10 Marks
    Internal Practical: 70 Marks.

MAPPING					
PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	H	M
CO2	S	S	M	H	H
CO3	S	H	H	S	M
CO4	H	S	M	H	M
CO5	S	H	H	S	S
S – Strong		**H** – High		**M** – Medium	**L** – Low

Programme Code:23	B.Sc. Computer Science with Data Analytics			
Course code: 22UDA5IT	Internship Training			
Batch: 2022-2023	**Semester** -	**Hours / Week** -	**Total Hours** -	**Grade**

Course objective

1. To provide an opportunity to work in industry/institute under the mentorship of an industrialpersonnel
2. To develop key skill sets that are industry relevant for future placements
3. To have a flavor of corporate life in an industry sector
4. To build strength, sprit of team work and self confidence
5. To prepare the students to comprehend industrial problem

Working Instructions

- The tutor of the respective class shall identify a list of industries/institutes at the beginning of the fourth semester and the same shall be approved by the HoD
- The tutor shall prepare a letter of request with the name of the student who will be placed in a particular industry and send the same or concurrence from the industry
- The class tutor shall ensure not more than four students allotted to a particular industry or institute
- The class tutor shall ensure that a daily log book provided to all the students while they leave for the internship during the summer vacation (The format of the log book will be available with the HoD)
- The tutor shall also ensure that the following documents are received from the students before they leave for the internship
    i. The letter of undertaking from the concerned student
    ii. A letter of undertaking from a parent/guardian indicating the willingness for permittingfor his/her ward to the internship either in Coimbatore or other places
    iii. During the internship the student must be in contact with the tutor and shall send weeklyreport
    iv. After the internship is completed the log books have to be submitted to the tutor whichhas to be verified

The tutor shall arrange for an evaluation in consultation with the HoD and grades be allotted.

Mark breakup for Evaluation

Component	Marks
Log book submission	20
Report	50
Review & Evaluation	30
Total	**100**

The students shall undergo Internship training / field work for a minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the respective Faculty. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85 – 100	O
70 – 84	D
60 – 69	A
50 – 59	B
40 – 49	C
< 40	U (Reappear)