MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE
(Autonomous)
A UNIT OF VANETRA GROUP
Learn. Lead

ESTD-1994

DEGREE OF BACHELOR OF SCIENCE

Learning Outcomes - Based Curriculum Framework

- Choice Based Credit System

Syllabus for B.Sc., Data Science

(Semester Pattern)

(For Candidates admitted from the academic year 2023-2024 and onwards)

Regulation and Syllabus for B.Sc., Data Science

(With effect from the Academic Year 2023-24)

Vision:

To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, Knowledgeable and socially responsible citizens.

Mission:

* To Ensure State of the world learning experience
* To Espouse value based Education
* To Empower rural education
* To Instill the sprite of entrepreneurship and enterprise
* To create a resource pool of socially responsible world citizens

QUALITY POLICY

To Seek – To Strive – To Achieve greater heights in Arts and Science, Engineering, Technological and Management Education without compromising on the Quality of Education.

DEPARTMENTOFCOMPUTER APPLICATION

Vision:

* To attain global recognition in computer science and applications, research and training to meet the growing needs of an Industry and Society.

Mission:

* To impart quality education
* To develop Industry-Academia relationship
* To provide State-of-art research facility
* To train various technologies in the thrust areas of computer science and applications

PREAMBLE

Bachelor of Science – Data Science (B.Sc., Data Science) is a 3 – Year under Graduate Programme Spread over six semesters. The Course is designed to bridge the gap between IT industries and Academic institutes by incorporating the latest development, into the Curriculum and to give students a complete understanding within a structured framework. D*ata Science* studies all principles and techniques of collecting, storing, managing, preparing, processing, analyzing, and visualizing data. Data Science comprises advanced theories, algorithms, and methods from contemporary areas of DS for collecting data and creating models, and for processing, managing, evaluating data and models and their relation for understanding, using, and developing engineering solutions that can support and enhance the human intellect. Contemporary areas of DS are Data Engineering and Management, Algorithmic Data Analysis, Statistics, Visual Analytics and Process Mining, Data Mining and Machine Learning, and Artificial Intelligence and Machine Learning.

PROGRAMME LEARNING OUTCOME

i) To design, implement, and evaluate computer-based system, process, component, or program to meet desired needs by critical understanding, analysis and synthesis.
ii) Identify applications of Computer Science in other fields in the real world to enhance the career prospects.
iii) Realize the requirement of lifelong learning through continued education and research.
iv) Use the concepts of best practices and standards to develop user interactive and abstract application.
v) Understand the professional, ethical, legal, security, social issues and responsibilities.

NATURE AND EXTENT OF THE PROGRAMME

The undergraduate programme in Data Science is the first level of college or university degree in the country as in several other parts of the world. After obtaining this degree, a Computer technician may enter into the job market or opt

for undertaking further higher studies in the subject. After graduation the students may join IT industry, BPO Sector, or Banking Sector and play their role as Software Engineer in a useful manner contributing their knowledge to the welfare of the society. Thus the undergraduate level degree in Data Science must prepare the students for all these objectives. The LOCF curriculum has been developed encompassing all the diversified aspects of Computer Application with reasonable depth of knowledge and skills as to specialize them in the various aspects of the subject. It also equips them with the expected professional expertise.

AIM OF THE PROGRAMME

The aim of the undergraduate degree in Data Science is to make students knowledgeable about the various basic concepts in a wide ranging context which involve the use of knowledge and skills of Computer Application. Their understanding, knowledge and skills in Computer field needs to be developed through a thorough teaching learning process in the class, practical skills through the laboratory work, their presentation and articulation skills, exposure to industry and interaction with industry experts.

GRADUATE ATTRIBUTES

Graduate attributes in data science encompass a multifaceted skill set essential for navigating the complexities of the field. Graduates are equipped with technical proficiency in programming languages such as Python and R, alongside a robust understanding of statistical methods and machine learning algorithms. They possess adeptness in data handling—from collection to preprocessing—and are skilled in database management and big data technologies. Their ability to create insightful visualizations using tools like Tableau and to interpret these visualizations effectively underscores their proficiency. Moreover, graduates demonstrate a solid grasp of domain-specific knowledge, coupled with strong problem-solving and analytical thinking capabilities. Ethical awareness in data collection and a commitment to professional responsibility highlight their integrity, complemented by effective communication skills for both technical and non-technical audiences. Emphasizing lifelong learning, they exhibit adaptability to new technologies and a dedication to continuous improvement, positioning them as valuable contributors in leveraging data for informed decision-making across

industries.

GA1AnalyticalReasoning

GA2CriticalThinking

GA3ProblemSolvingSkills

GA4CommunicationSkills

GA 5LeadershipQuality

GA 6Teamwork

GA 7 Lifelong Learning

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Graduates will be able to promote learning environment to meet the industry Expectation

PEO2: Graduates will be incorporated the critical thinking with Good Communication and Leadership skills to become a self-employed

PEO3: Graduates will be up hold the human values and environmental sustenance for the betterment of the society.

PROGRAMME OUTCOMES (POs):

PO1: Graduates will acquire dynamic skills through proper perception of the course Objectives that leads to scientific and analytical comprehension of the concepts.

PO2: Graduates will focus on sustainable goals that might bring about spherical Developments

PO3: Graduates will infuse a spirit converging on bricking a team work, interpersonal and administrative skills to think critically and execute Effectively

PO4: Graduates will apply reasoning appropriately to scale the humps in learning and solute them to the core.

PO5: Graduates will engage the skills obtained in independent and collaborative Learning as a perennial process.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO-1: To equip students with the ability to apply fundamental data analytics concepts and theories to real-life situations and decision-making processes.

PSO-2: To expertise design, develop, implement and apply Analytical skills related to Real-world problems.

PSO-3: To pursue a career in the corporate sector with a focus on leveraging opportunities in the IT industry.

PSO-4: To initiate a stable platform and enhance skills for employment, higher studies, and research in computer applications and data science, while upholding ethical values.

PSO-5: To Build the student Career in Public sector, Government organizations and Educational Sectors.

REGULATIONS (2023-24)

1. DURATION OF THE PROGRAME

1.1. Three years(six semesters)

1.2. Each academic year shall be divided into two semesters. The odd semesters shall consist of the period from June to November of each year and the even semesters from December to May of each year.

1.3. There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

2.1. Candidate for admission to the first year of B.Sc. Degree Course in Data Science shall be required to have passed the Higher Secondary Examination with Computer Science / Mathematics / Information Technology / Business Mathematics / statistics / Computer Application (Academic/Vocational Stream) as per norms set by the Government of Tamil Nadu or an Examination Accepted as equivalent there to by the syndicate.

3. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

3.1. A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than three academic years and passed the examinations of all the Six Semesters prescribed earning a minimum of 140 credits as per the distribution given in Regulation for Part I, II, III, IV & V and also fulfilled such other conditions as have been prescribed there of.

4. COURSEOFSTUDY,CREDITSANDSCHEMEOFEXAMINATION

4.1. The Course Components and Credit Distribution shall consist of the following: (Minimum Number of Credits to be obtained)

Part Wise Distribution	Study Components	Credit Distribution
PART I	Tamil or Other Languages	12
PARTII	English	12
PARTIII	Core, Allied, Elective and Project Courses	91
PART IV	i. Basic Tamil/Advanced Tamil / NME	04
	ii. Soft Skill Courses/SBEC	10
	iii. Environmental Studies	02
	iv. Value Education	02
	v. Internship	02
	vi. Foundation Course	02
	vii. Professional Competency Skills	02
PARTV	Extension Activity	01
Total Credits		140

4.2 DETAILS OF COURSE OF STUDY OF PARTS I - V

4.2.1 PARTI: Tamil and Other Languages Hindi or French at the option of candidates and according to the syllabus and text-books prescribed from time to time.

4.2.2 PART II: English: According to the syllabus and text-books prescribed from time to time.

4.2.3 PARTIII: Core, Allied Project and Elective Courses: As prescribed by the concerned Board of Studies.

4.2.4 PARTIV:

i. Basic Tamil / Advanced Tamil / NME:

a. Students who have not studied Tamil up to XII STD and have taken any Language other than Tamil in Part I shall take Basic Tamil comprising of Two

Courses (level will be at 6th Standard).

b. Students who have studied Tamil up to XII STD and have taken any Language other than Tamil in Part – I shall take Advanced Tamil comprising of Two Courses.

c. Students who have studied Tamil up to XII STD and also have taken Tamil in Part–I shall take Non-Major Elective comprising of Two Courses.

   i. Soft Skill Courses/SBEC
   ii. Environmental Studies
   iii. Value Education
   iv. Internship
   v. Foundation Course
   vi. Professional Competency Skills(Online)

4.2.5 PART V: Extension Activity:

Students shall be awarded a maximum of 1 Credit for Compulsory Extension Service. All the Students shall have to enroll for NSS /NCC/ NSO (Sports & Games) Retract / Youth Red Cross or any other Service Organizations in the College and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the College before 31st March in a year. If a student lacks 40 hours attendance in the first year, he or she shall have to compensate the same during the sub sequent years.

Those students who complete minimum attendance of 40 hours in one year will get 'half-a- credit and those who complete the attendance of 80 or more hours in Two Years will get 'one credit'. Literacy and Population Education and Field Work shall be compulsory components in the above extension service activities.

4.3. Inclusion of the Massive Open Online Courses (MOOCs) available on SWAYAM and NPTEL

4.3.1 Students can choose the MOOC Course Available on SWAYAM and NPTEL under Core, Elective or Soft skill category. He/ she will be awarded degree only after producing valid certificate of the MOOC course for credit Mobility

5. REQUIREMENTSFORPROCEEDINGTOSUBSEQUENTSEMESTER

5.1 Eligibility: Students shall be eligible to go to subsequent semester only if the

yearn sufficient attendance as prescribed by the Periyar University.

5.2. Attendance: All Students must earn 75% and above of attendance for appearing for the End Semester Examination.(Theory/Practical)

5.3. Condonation of shortage of attendance: If a Student fails to earn the minimum attendance (Percentage stipulated), the Principals shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than75%) after collecting the prescribed fee for Theory / Practical examination separately, towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

5.4. Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65% but more than 50% of attendance are NOTELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program and they may be permitted to take next University examination by paying the prescribed condonation fee.

5.5. Detained students for want of attendance: Students who have earned less than 50% of attendance shall not be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, bypayingthefeeforthebreakofstudyasprescribedbytheCollegefromtimetotime.

5.6. Condonation of shortage of attendance for married women students: In respect of married women students undergoing UG programs, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed as 55%instead of 65% if they conceive during their academic career. Medical certificate from the Doctor (D.G.O) from the Government Hospital and the prescribed fee along with attendance details shall be forwarded to the college to consider the condonation of attendance mentioning the category.

5.7. Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the College/University immediately to rejoin the program.

5.8 Transfer of Students and Credits: The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities by obtaining necessary permission from the university.

5.8.1 Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature.

Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested.

Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

5.8.2 The marks obtained in the courses will be converted and grades will be assigned as per the College norms.

5.8.3 The transfer students are eligible for classification.

5.8.4 The transfer students are not eligible for Ranking, Prizes and Medals.

5.8.5 Students who want to go to foreign Universities up to two semesters or Project Work with the prior approval of the Departmental/College Committee are allowed to get transfer of credits and marks which will be converted in to Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

5.9 Students are exempted from attendance requirements for online courses of the College and MOOC's.

6. EXAMINATION AND EVALUATION

6.1. Register for all subjects: Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

6.2. Marks for Internal and End Semester Examinations for PART I, II, III,and IV

Category	Theory	Practical
Internal Assessment	25	40
End semester Examination	75	60

6.3. Procedure for Awarding Internal

Marks Internal Examination

Marks – Theory

Components	Marks
CIA I& II	15
Attendance	5
Assignment / Quiz	5
Total	25

6.4 Awarding Marks for Attendance (out of 5)

Percentage of Attendance	Marks
Below 60%	0 marks
60% to 75%	3 marks
75% to 90%	4 marks
Above 90%	5 marks

6.5 Components for Practical CIA.

Components	Marks
CIA-I	15
CIA- II	15
Observation Note	05
Attendance	5
Total	40

6.6 Components for Practical ESE.

Components	Marks
Completion of Experiments	50
Record	05
Viva voce	05
Total	60

6.7 Guidelines for Value Education Yoga and Environmental Studies (Part IV)

6.7.1. The Course Value Education Yoga is to be treated as 100% CIA course which is offered in V Semester for I year UG students.

6.7.2. The Course Environmental Studies is to be treated as 100% CIA course which is offered in IV Semester for I year UG students.

6.7.3 Total Marks for the Course =100

Components	Marks
Two Tests (2 x 30)	**60**
Field visit and report (10+10)	**20**
Two assignments (2 x 10)	**20**
Total	**100**

The passing minimum for this course is 40%

6.7.4 Incase, the candidate fails to secure 40% passing minimum, he / she may have to reappear for the same in the subsequent odd /even semesters.

6.8 Internship/Industrial Training, Mini Project and Major Project Work

Internship/Industrial Training		Mini Project	Major Project Work		
Components	**Marks**	**Marks**	**Components**		Marks
CIA*2			**CIA** a) Attendance b) Review /Work Diary*1	10 Marks 30 Marks	40
Work Diary	25	-			
Report	50	50			
Viva - voce	25	50			
Examination					
Total	**100**	**100**	**ESE*2**		
			a) Final Report - 40Marks b)Viva – voce - 20Marks		60
			Total		
					100

*1.Review is for Individual Project and Work Diary is for Group Projects (Group consisting of minimum 3 and maximum 5)

*2. Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

6.9 Guidelines for Professional Competency Skill – Online Mode(Part IV)- Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100 * 1 =100 Marks	**100**

Objective type Questions from Question Bank.

- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he/she may have to reappear for the same in the subsequent semesters.

QUESTION PAPER PATTERN FOR CIA I, II AND ESE	
(3 HOURS)	**MAXIMUM: 75 Marks**
SECTION - A (Objective Type) **Answer ALL Questions** ALL Questions Carry EQUAL Marks	(10 x 1 = 10 marks)
SECTION - B (Either or Type) **Answer ALL Questions** ALL Questions Carry EQUAL Marks	(5 x 5 = 25 marks)
SECTION - C (Either or Type) **Answer ALL Questions** ALL Questions Carry EQUAL Marks	(5 x 8 = 40 marks)
(Syllabus for CIA – I 2.5 Unit, Syllabus for CIA – II All 5 Unit)	

6.10. PASSING MINIMUM

6.10.1 There shall be no passing minimum for Internal.

6.10.2 For external examination, passing minimum shall be 40% [Forty Percentage] of the maximum marks prescribed for the course for each Course/Practical/Project and Viva-Voce.

6.10.3 In the aggregate [External/Internal] the passing minimum shall be of 40%.

6.10.4 He / She shall be declared to have passed the whole examination, if he / she passes in all the Courses and Practical wherever prescribed as per the scheme of the examinations by earning 140 CREDITS in Part I, II, III, IV& V. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 credit to qualify for the Degree.

6.11. SUPPLIMENTARY EXAMINATION:

Supplementary Examinations is conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

6.11.1. Eligibility: A Student who is having arrear of only one theory course in any of the semester or two theory course in the Final semester of the UG degree programme alone is eligible for Supplementary Examinations.

6.11.2 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

6.12. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

6.12.1. Re-totaling: All UG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

6.12.2. Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

6.12.3. Photo copy of the answer scripts: Students who have applied for revaluation can apply for the Photocopy of answer scripts by paying prescribed fee.

7. CLASSIFICATION OF SUCCESSFUL STUDENTS

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	**ABSENT**

7.1 Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average (CGPA) and Classification

GPA for a Semester:=∑iCiGi,∑iCi

That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

CGPA for the entire programme: = ∑n∑iCniGni ,∑n∑iCni That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Where,

Ci = Credits earned for course in any semester,

Gi = Grade Points obtained for course in any semester = Semester in which such courses were credited.

7.2 Letter Grade and Classification

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5 -10.0	O+	First Class - Exemplary*
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
4.5 and above but below 5.0	C+	Third Class
4.0 and above but below 4.5	C	
0.0 and above but below 4.0	U	Re - appear

*The Students who have passed in the first appearance and within the prescribed semester of the UG Programme (Major, Allied and Elective courses only)are eligible.

8. RANKING

Students who pass all the examinations prescribed for the Program in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking I, II and III.

9. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAM TO QUALIFY FOR ADEGREE

9.1 A Student who for whatever reasons is not able to complete the program within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the back log to be qualified for the degree.(Time Span=N+2 years for the completion of programme.)

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B.Sc., DATA SCIENCE abstract under LOCF-CBCS Pattern with effect from 2023-2024 Onwards
Structure of Credit Distribution as per the TANSCHE / UGC Guidelines

S.No	Study Components	Part	Sem I		Sem II		Sem III		Sem IV		Sem V		Sem VI		No. of Courses	Total Credit
			No.of Course	Credit	No.of Course	Credit	No.of Course	Credit	No.of Course	Credit	No.of Course	Credit	No.of Course	Credit		
1	LANGUAGE – I	I	1	3	1	3	1	3	1	3					4	12
2	LANGUAGE – II	II	1	3	1	3	1	3	1	3					4	12
3	DISCIPLINE SPECIFIC COURSE(DSC)-THEORY	III	1	5	1	5	1	6	1	6	2	8	2	10	8	40
4	DSC - PRACTICAL	III	1	3	1	2	1	3	1	3	2	4	1	2	7	17
5	GENERIC ELECTIVE COURSES(GEC)- THEORY	III	1	3	1	3	1	3	1	3					4	12
6	GEC PRACTICAL	III													0	0
7	DISCIPLINE SPECIFIC COURSES(DSE)	III									2	8	2	10	4	18
8	PROJECT WORK	III											1	4	1	4
9	INTERNSHIP	IV									1	2			1	2
10	ONLINE – COMPETITIVE EXAMINATION	IV											1	4	1	4
11	FOUNDATION COURSE	IV	1	2											1	2
12	SKILL ENHANCEMENT COURSES(SEC)-SBEC	IV			1	2	1	2	2	4					4	8
13	NON MAJOR ELECTIVE COURSES(NMEC)	IV	1	2	1	2									2	4
14	ABILITY ENHANCEMENT COMPULSORY COURSES(AECC)-EVS	IV							1	2					1	2
15	ABILITY ENHANCEMENT COMPULSORY COURSES(AECC)- VALUE EDUCATION – YOGA	IV									1	2			1	2
16	EXTENSION ACTIVITY	V											1	1	1	1
Cumulative Credits			**7**	**21**	**7**	**20**	**6**	**20**	**8**	**24**	**8**	**24**	**8**	**31**	**44**	**140**

Total No.of Subjects	44
Marks	4300

PART	No.of Credits
PART – I	12
PART – II	12
PART – III	91
PART – IV	24
PART – V	1
Grand Total	140

Extra Credit(2+2)	4
	144

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Scheme of Examinations LOCF-CBCS Pattern
(for the Students Admitted from the Academic Year:2023-2024 Onwards)
Programme : B.Sc Data Science

S.No	PART	STUDY COMPONENTS	COURSE CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
					Lect	Lab		CIA	ESE	TOTAL
SEMESTER - I										
1	I	LANGUAGE-I	23M1UFTA01	TAMIL I	6	-	3	25	75	100
2	II	LANGUAGE-II	23M1UFEN01	ENGLISH - I	6	-	3	25	75	100
3	III	DSC THEORY - I	23M1UDSC01	PYTHON PROGRAMMING	5	-	5	25	75	100
4	III	DSC PRACTICAL - I	23M1UDSP01	PRACTICAL :PYTHON PROGRAMMING	-	5	3	40	60	100
5	III	GEC THEORY - I	23M1UMAA03	DISCRETE MATHEMATICS - I	4	-	3	25	75	100
6	IV	NMEC - I			2	-	2	25	75	100
7	IV	FC-I	23M1UDSFC1	PROBLEM SOLVING TECHNIQUES	2	-	2	25	75	100
				TOTAL	**25**	**5**	**21**	**190**	**510**	**700**
SEMESTER - II										
1	I	LANGUAGE - I	23M2UFTA02	TAMIL - II	6	-	3	25	75	100
2	II	LANGUAGE - II	23M2UFEN02	ENGLISH - II	6	-	3	25	75	100
3	III	DSC THEORY - II	23M2UDSC02	DATA STRUCTURES AND ALGORITHMS	5	-	5	25	75	100
4	III	DSC PRACTICAL - II	23M2UDSP02	PRACTICAL : DATA STRUCTURES USING PYTHON	-	5	2	40	60	100
5	III	GEC THEORY - II	23M2UMAA04 / 23M2UMAA08	DISCRETE MATHEMATICS - II / NUMERICAL METHODS	4	-	3	25	75	100
6	IV	NMEC - II			2	-	2	25	75	100
7	IV	SEC THEORY - I			2	-	2	25	75	100
				TOTAL	**25**	**5**	**20**	**190**	**510**	**700**

SEMESTER - III										
1	I	LANGUAGE - I	23M3UFTA03	TAMIL - III	6	-	3	25	75	100
2	II	LANGUAGE - II	23M3UFEN03	ENGLISH - III	6	-	3	25	75	100
3	III	DSC THEORY - III	23M3UDSC03	INTRODUCTION TO DATA SCIENCE	6	-	6	25	75	100
4	III	DSC PRACTICAL - III	23M3UDSP03	PRACTICAL : DATA SCIENCE PROGRAMMING	-	5	3	40	60	100
5	III	GEC THEORY - III	23M3USTA08	STATISTICAL METHODS AND ITS APPLICATIONS - I	5	-	3	25	75	100
6	IV	SEC THEORY - II			2	-	2	25	75	100
				TOTAL	**25**	**5**	**20**	**165**	**435**	**600**
SEMESTER - IV										
1	I	LANGUAGE - I	23M4UFTA04	TAMIL - IV	6	-	3	25	75	100
2	II	LANGUAGE - II	23M4UFEN04	ENGLISH - IV	6	-	3	25	75	100
3	III	DSC THEORY - IV	23M4UDSC04	OBJECT ORIENTED PROGRAMMING IN JAVA	6	-	6	25	75	100
4	III	DSC PRACTICAL - IV	23M4UDSP04	PRACTICAL : JAVA PROGRAMMING	-	4	3	40	60	100
5	III	GEC THEORY - IV	23M4USTA09	STATISTICAL METHODS AND ITS APPLICATIONS -II	4	-	3	25	75	100
6	IV	SEC THEORY - III			2	-	2	25	75	100
7	IV	SEC THEORY - IV			2	-	2	25	75	100
8	IV	AECC - ENVIRONMENTAL STUDIES*	23M4UEVS01	ENVIRONMENTAL STUDIES	-	-	2	100	-	100
		***SELF STUDY**		**TOTAL**	**26**	**4**	**24**	**290**	**510**	**800**

SEMESTER - V										
1	III	DSC THEORY – V	23M5UDSC05	RELATIONAL DATABASE MANAGEMENT SYSTEM	5	-	4	25	75	100
2	III	DSC PRACTICAL – V	23M5UDSP05	PRACTICAL : RDBMS USING ORACLE	-	4	2	40	60	100
3	III	DSC THEORY – VI	23M5UDSC06	MACHINE LEARNING	5	-	4	25	75	100
4	III	DSC PRACTICAL – VI	23M5UDSP06	PRACTICAL : MACHINE LEARNING LAB	-	4	2	40	60	100
5	III	DSE THEORY – I		ELECTIVE I	5	-	4	25	75	100
6	III	DSE THEORY – II		ELECTIVE - II	5	-	4	25	75	100
7	IV	AECC - VALUE EDUCATION	23M5UVED01	YOGA	2	-	2	100	-	100
8	IV	INTERNSHIP	23M5UDSIS1	INTERNSHIP	-	-	2	100	-	100
				TOTAL	**22**	**8**	**24**	**380**	**420**	**800**
SEMESTER - VI										
1	III	DSC THEORY – VII	23M6UDSC07	IOT AND CLOUD TECHNOLOGIES	6	-	5	25	75	100
2	III	DSC - PRACTICAL VI	23M6UDSP07	PRACTICAL : PROGRAMMING IN IOT		5	2	40	60	100
3	III	DSC THEORY – VIII	23M6UDSC08	ARTIFICIAL INTELLIGENCE	5	-	5	25	75	100
4	III	DSE THEORY – III		ELECTIVE III	5	-	5	25	75	100
5	III	DSE THEORY – IV		ELECTIVE IV	5	-	5	25	75	100
6	III	PROJECT WORK	23M6UDSPR1	PROJECT WORK	4	-	4	40	60	100
7	IV	PROFESSIONAL COMPETENCY SKILL	23M6UDSOE1	DATA SCIENCE FOR COMPETITIVE EXAMINATION	-	-	4	100	-	100
8	V	EXTENSION ACTIVITY	23M6EXA01	EXTENSION ACTIVITY	-	-	1	-	-	-
				TOTAL	**25**	**5**	**31**	**280**	**420**	**700**
				OVERALL TOTAL	**148**	**32**	**140**	**1495**	**2805**	**4300**
		EXTRA		EXTRA CREDIT SWAYAM/MOOC ONLINE	-	-	2	-	-	-
				VALUE ADDED COURSE	-	-	2	-	-	-

HOD **MEMBER SECRETARY** **ACADEMIC COUNCIL** **PRINCIPAL**

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UDSC01	**PYTHON PROGRAMMING**	**DSC THEORY – I**	**I**	**5**	**5**	**-**	**-**	**5**
Objective	Students learnt the concepts of Python programming and apply the OOPs concept, impart the knowledge on Demand.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.	K1	12
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elsif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements	K2	12
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules	K3	12
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries	K4	12
V	**Python File Handling**: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions-Renaming and deleting files.	K4	12
Course Outcome	**CO1:** Recall the concepts of Python Programming.	K1	
	CO2: Illustrate OOPs concept in PYTHON programming.	K2	
	CO3: Impart knowledge on demand and supply concepts	K3	
	CO4: Develop the PYTHON programs.	K4	
	CO5: Design files in python, Concept of reading and writing files, creating programs using files.	K4	

Learning Resources				
Text Books	1. Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press. 2. Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.			
Reference Books	1. VamsiKurama, “Python Programming: A Modern Approach”, Pearson Education. 2. Mark Lutz, ”Learning Python”, Orielly 3. Adam Stewarts, “Python Programming”, Online. 4. Fabio Nelli, “Python Data Analytics”, APress. 5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication.			
Website Link	1. https://www.programiz.com/python-programming 2. https://www.guru99.com/python-tutorials.html			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
RASIPURAM - 637408.

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M1UDSC01	**PYTHON PROGRAMMING**	**DSC THEORY - I**	**I**	**5**	**5**	**-**	**-**	**5**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.V.Krishnaveni	HOD – Dr.V.Vijayadeepa	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UDSP01	**PYTHON PROGRAMMING**	**DSC PRACTICAL - I**	**I**	**5**	**-**	**-**	**5**	**3**
Objective	Students to learn and impart Practical Training in basic python statements, Familiarize with control flow tools, Strings, Exception and string handling.							

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	Program using variables, constants, I/O statements in Python.	K1	3
2	Program using Operators in Python.	K1	3
3	Program using Conditional Statements.	K1	3
4	Program using Loops.	K2	3
5	Program using Functions.	K2	3
6	Program using Recursion.	K3	3
7	Program using Arrays.	K3	3
8	Program using Strings.	K4	3
9	Program using Lists	K4	3
10	Program using Tuples.	K3	3
11	Program using Dictionaries	K3	3
12	Program for File Handling.	K4	3
Course Outcome	**CO1:** Recall the syntax and semantics of python.	K1	
	CO2: Sketch the problem and solve using PYTHON programming techniques.	K2	
	CO3: Identify suitable programming constructs for problem solving.	K3	
	CO4: Analyze various concepts of PYTHON language to solve the problem in an efficient way	K3	
	CO5: Develop a PYTHON program for a given problem and test for its correctness	K4	

Learning Resources				
Text Books	1. Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press. 2. Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.			
Reference Books	1. VamsiKurama, “Python Programming: A Modern Approach”, Pearson Education. 2. Mark Lutz, ”Learning Python”, Orielly 3. Adam Stewarts, “Python Programming”, Online. 4. Fabio Nelli, “Python Data Analytics”, APress. 5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication.			
Website Link	1. https://www.programiz.com/python-programming 2. https://www.guru99.com/python-tutorials.html			
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Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M1UDSP01	**PYTHON PROGRAMMING**	**DSC PRACTICAL - I**	**I**	**5**	**-**	**-**	**5**	**3**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	L	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Dr.V.Vijayadeepa	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UDSC02	**DATA STRUCTURES AND ALGORITHMS**	**DSC THEORY - II**	**II**	**5**	**5**	**-**	**-**	**5**
Objective	Students will learn basic concept of algorithms and introduce the various data structures and their implementations and also evaluate the performance of various sorting algorithms.							

Unit	Course Content	Knowledge Levels	Sessions
I	Arrays and ordered Lists Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks –Queues – Circular Queues – Evaluation of expressions.	K1	12
II	Trees and Graphs Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs.	K1	12
III	Searching and Sorting Sorting – Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Selection Sort. Searching – Linear search, Binary search.	K2	12
IV	Greedy Method and Dynamic programming Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components.	K3	12
V	Backtracking General Method – 8-Queen‟s – Sum Of Subsets – Graph Colouring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem.	K4	12
Course Outcome	**CO1:** Recall concepts of Linked List, Stack and Queue	K1	
	CO2: Relate the Concepts of Trees and Graphs	K1	
	CO3: Describe searching and sorting techniques	K2	
	CO4: Execute the concept of Greedy Methods	K3	
	CO5: Organize File handling concepts in python.	K4	

Learning Resources	
Text Books	1.Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGraw Hill publications. 2.Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd. Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and

	Python Programming(2018)			
Reference Books	1. Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore. 2. A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication. 3. Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd.			
Website Link	1. www.freetechbooks.com/a-practical-introduction-to-data-structures-and algorithm-analysis-thirdedition-c-version-t804.html 2. http://www.nptel.ac.in/courses/106101060/ 3. http://www.nptel.ac.in/courses/106104019/			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UDSC02	**DATA STRUCTURES AND ALGORITHMS**	**DSC THEORY - II**	**II**	**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

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B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UDSP02	**DATA STRUCTURES USING PYTHON**	**DSC PRACTICAL - II**	**II**	**5**	**-**	**-**	**5**	**2**
Objective	Students can impart Practical Training in DDL and DML Commands with build queries with SQL Commands and Provide knowledge on working with big tables.							

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	Perform stack operations	K1	6
2	Perform queue operations	K1	6
3	Search an element in an array using binary search	K1	6
4	Sort the given set of elements using Merge Sort.	K2	6
5	Sort the given set of elements using Quick sort.	K2	6
6	Search the Kth smallest element using Selection Sort	K2	6
7	Find the Optimal solution for the given Knapsack Problem using Greedy Method.	K3	6
8	Find all pairs shortest path for the given Graph using Dynamic Programming method.	K3	6
9	Find all possible solution for an N Queen problem using backtracking method	K4	6
10	Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method	K4	6
Course Outcome	**CO1:** Remember the concepts of Linked List, Stack and Queue.	K1	
	CO2: Analysis the concept of Trees and Graphs. Perform traversal operations on Trees and Graphs.	K2	
	CO3: Apply searching and sorting techniques	K3	
	CO4: Organize the concepts of Greedy Method To apply searching techniques.	K4	
	CO5: Design the File handling methods in python.	K4	

Learning Resources				
Text Books	1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press. 2. E. Horowitz, S. Sahni and S. Raja sekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press.			
Reference Books	1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum‟s outline series in computers, Tata McGraw Hill. 2. R.Krishna moorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008. 3. A.K.Sharma, Data Structures using C , Pearson Education India,2011. 4. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997. 5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of Computer Algorithms", Addison Wesley, Boston, 1974 7. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009 8. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani, Algorithms , Tata McGraw-Hill, 2008.			
Website Link	https://mrcet.com/pdf/Lab%20Manuals/CSE/DATA%20STRUCTURES%20LAB.pdf https://wptripura.nic.in/Data%20Structure%20Lab.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2UDSP02	**DATA STRUCTURES USING PYTHON**	**DSC PRACTICAL - II**	**II**	**5**	**-**	**-**	**5**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	L	M	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Dr.V.Vijayadeepa	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3UDSC03	**INTRODUCTION TO DATA SCIENCE**	**DSC THEORY - III**	**III**	**6**	**6**	**-**	**-**	**6**
Objective	Students can acquire solid foundation of Data science concepts, utilize Python libraries for data visualization and develop skills in handling databases.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Data Science:** Introduction - Big Data and Data Science hype – getting past the hype - Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA – Applications of Data Science - Data Science in Business - Business Intelligence vs Data Science – Data Analytics Life Cycle - Machine Learning.	K1	14
II	**Introduction to Python and Operations**: Applications of Python - How to Run Python - Python Virtual Machine - Memory management in python - Identifiers and Variables – Multi Line Statements - Input, Output and Import Functions - Operators. **Data Types and Operations:** Numbers - Strings - List - Tuple - Set - Dictionary - Mutable and Immutable Objects. **Flow Control:** Control Statements - Loops - Nested Loops - Types of Loops - List Comprehensions - Set Comprehensions - Dictionary Comprehensions - Nested Dictionaries.	K2	15
III	**Functions:** Function Definition - Function Calling - Function Arguments - Anonymous Functions (Lambda Functions) - Recursive Functions. **Modules and Packages**: Built-in Modules - Creating Modules - import Statement- Namespaces and Scope - The dir() function - The reload() function -Packages in Python - Date and Time Modules – Numpy Libraries and Data Manipulation Using Pandas	K3	14

IV	**File Handling and Object Oriented Programming:** Opening a File - Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python. Regular Expressions. Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python - Encapsulation - Data Hiding – Inheritance-Method Overriding – Polymorphism - Exception Handling	K4	14
V	**Database Programming and Visualizations:** Connecting to a Database - Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control -Disconnecting from a Database - Exception Handling in Databases - GUI Programming - CGI Programming- Data Visualizations using Matplotlib – histograms, bar charts, pie charts. **Current Trends - * Predictive Model using Python Framework.***	K5	15
	…… Self Study.		
Course Outcome	**CO1:** Recall fundamental ideas behind data science.	K1	
	CO2: Remember the essential concepts of control and looping statements to building a strong foundation in python.	K2	
	CO3: Build the concept NumPy libraries and manipulation of data using Pandas within Python programming	K3	
	CO4: Design Python programs incorporating file handling and exception handling techniques for robustness and reliability.	K4	
	CO5: Create Data Visualization program using Mat plot lib.	K5	

Learning Resources	
Text Books	1. Cathy O'Neil and Rachel Schutt, “Doing Data Science, Straight Talk From The Frontline”, 1st Edition, O'Reilly Media, 2014. 2. Seema Acharya and Subhasini Chellappan, “Big Data Analytics”, Paperback 2nd Edition, Wiley, 2019. 3. Jake Vanderplas, “Python Data Science Handbook: Essential Tools for Working with Data” 1st Edition, O'Reilly.
Reference Books	1. Davy Cielen, Arno D.B. Meysman, Mohmed Ali , “Introduction Data Science”, Dreamlech Press, 2016. 2. Murtaza Haider, “Getting Started with Data Science”, 1st Edition, Pearson, 2016. 3. Kenneth A. Lambert, “Fundamentals of Python: First Programs, C engage Learning”, 2012.
Website Link	1. https://www.programiz.com/python-programming 2. https://www.guru99.com/python-tutorials.html

Self-Study Material	1. https://marutitech.com/how-to-build-predictive-model-in-python/ 2. https://www.geeksforgeeks.org/step-by-step-predictive-analysis-machine-learning/ 3. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5419744&query=building+predictive+models+in+python#			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Title	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3UDSC03	**INTRODUCTION TO DATA SCIENCE**		**DSC THEORY - III**		**III**	**6**	**6**	**-**	**-**	**6**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3UDSP03	**DATA SCIENCE PROGRAMMING**	**DSC PRACTICAL - III**	**III**	**5**	**-**	**-**	**5**	**3**
Objective	Students can develop websites and software, automate tasks, and analyze data while engaging in open-source projects and community development.							

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	Demonstrate the working of “id” and “type” functions.	K1	2
2	Find all prime numbers within a given range.	K1	3
3	Print n terms of Fibonacci series using iteration.	K1	2
4	Demonstrate use of slicing in string.	K2	3
5	Compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.	K2	3
6	Build a code using list & related functions.	K3	3
7	Demonstrate use of Dictionary & related functions.	K3	3
8	Demonstrate use of tuple & related functions.	K4	3
9	Implement stack using list.	K4	2
10	Implement queue using list.	K3	3
11	Read and write from a file.	K3	3
12	Demonstrate working of classes and objects.	K4	3
13	Demonstrate class method &static method.	K4	3
14	Construct code for constructors.	K4	3
15	Develop a program for Inheritance.	K5	3
Course Outcome	**CO1:** Recognize the concepts of strings, lists, and dictionaries in Python.	K1	
	CO2: Sketch the concepts of classes, objects, constructors, and file handling in Python.	K2	
	CO3: Apply Big Data analytics for manipulating large datasets in R.	K3	

	CO4: Analyze various concepts of Python language to devise efficient solutions for problem-solving.	K4	
	CO5: Design GUI application for updating databases, demonstrating proficiency in database management.	K5	

Learning Resources	
Text Books	1. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", 1st Edition, O'Reilly Media, 2014. 2. Seema Acharya and Subhasini Chellappan, "Big Data Analytics", Paperback 2nd Edition, Wiley, 2019. 3. Jake Vanderplas, "Python Data Science Handbook: Essential Tools for Working with Data" 1st Edition, O'Reilly.
Reference Books	1. Davy Cielen, Arno D.B. Meysman, Mohmed Ali, "Introduction Data Science", Dreamlech Press, 2016. 2. Murtaza Haider, "Getting Started with Data Science", 1st Edition, Pearson, 2016. 3. Kenneth A. Lambert, "Fundamentals of Python: First Programs, C engage Learning", 2012.
Website Link	1. https://www.programiz.com/python-programming 2. https://www.guru99.com/python-tutorials.html

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M3UDSP03	**DATA SCIENCE PROGRAMMING**	**DSC PRACTICAL - III**	**III**	**5**	**-**	**-**	**5**	**3**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	L	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4UDSC04	**OBJECT ORIENTED PROGRAMMING IN JAVA**	**DSC THEORY - IV**	**IV**	**6**	**6**	**-**	**-**	**6**
Objective	Students understand the concepts of OOPs in Java Programming to become proficient programmers and get the attentions of users in graphics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction**: Introduction to Java - Features of Java - Object Oriented Concepts - Software Evolution – Software Development, SDLC Models – SDLC steps – Software Testing – Software Quality – Lexical Issues - Data Types – Variables – Arrays – Operators – Control Statements – Classes – Objects –Constructors – Overloading method – Access control – static and fixed methods – Inner classes – Inheritance - Overriding Methods - Using super - Abstract class.	K1	15
II	**Packages & Threads:** Packages - Access Protection Importing Packages – Interfaces - Exception Handling - Throw and Throws – Thread – Synchronization – Messaging - Runnable Interface -Inter thread communication – Deadlock - suspending, resuming and stopping threads - Multithreading.	K2	15
III	**Input / Output & Collection API:** I/O Streams - File Streams String Objects - String Buffer - Char Array – Java Utilities Collections interface – Collection classes - Enumeration – Vector – Stack – Hash tables – String class.	K3	15
IV	**Networking:** Networking – Networking basics – java and the Net – Inet Address- TCP/IP Client Sockets – URL - URL Connection – TCP/IP Server Sockets – Datagrams.	K4	15
V	**Graphical User Interface in Java**: Working with windows using AWT Classes – Class Hierarchy of Window and Panel – AWT controls – Layout Managers – Menus- Menu bars - Dialog Boxes- File Dialog- Applets-Lifecycle of Applet-Types of Applets-Event handling-Applet tags - JDBC and connecting to Databases – CRUD operations. **Current Trends: *Spring Boot ***	K5	15
	…….. Self Study		
Course Outcome	**CO1:** Recite the syntax and semantics of java programming Language and basic concepts of OOP.	K1	
	CO2: Contrast reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.	K2	

	CO3: Sketch the concepts of Multithreading and Exception handling to develop efficient and error free codes.	K3	
	CO4: Design event driven GUI and web related applications which mimic the real word scenario.	K4	
	CO5: Build the internet-based dynamic applications using the concepts of applet.	K5	

Learning Resources				
Text Books	1. P.Naughton and H.Schildt (1999), Java 2 (The Complete Reference), Third Edition, Tata McGraw Hill Edition.			
Reference Books	1. K.Arnold and J.Gosling, The Java Programming Language- Second Edition, ACM Press/Addison Wesley Publishing Co. New York 2. Cay S. Horstmann, Gary Cornell (2012), Core Java 2 Volume I, Fundamentals- Ninth Edition Addision Wesley.			
Website Link	1.https://www.w3schools.com/java/java_oop.asp#:~:text=OOP%20provides%20a%20clear%20structure,code%20and%20shorter%20development%20time 2. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/ 3. https://www.javatpoint.com/java-oops-concepts			
Self-Study Material	https://spring.io/projects/spring-boot			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4UDSC04	**OBJECT ORIENTED PROGRAMMING IN JAVA**		**DSC THEORY - IV**		**IV**	**6**	**6**	**-**	**-**	**6**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S
CO3	M	M	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	M	M	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.N.Padmapriya	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4UDSP04	**JAVA PROGRAMMING**	**DSC PRACTICAL - IV**	**IV**	**4**	**-**	**-**	**4**	**3**

Objective	Students can develop simple object-oriented Java programs to solve real-world problems and create an application using files and Applets.

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	Program using Class and Object.	K1	3
2	Program using Constructors.	K2	3
3	Program using Command Line Arguments.	K1	3
4	Program using Vectors.	K2	4
5	Program using Interface.	K3	3
6	Program using all forms of Inheritance.	K4	3
7	Program using String Class.	K4	3
8	Program using Exception Handling.	K3	4
9	Implementing Thread based applications.	K4	4
10	Program using Packages.	K4	4
11	Program using files.	K4	4
12	Applets: Working with colors and fonts.	K4	4

Course Outcome	**CO1:** Recall the OOPs Concepts to write the Java Programs.	K1
	CO2: Identify the Concepts of Constructor and Vectors.	K2
	CO3: Apply the string and Exception Mechanism.	K3
	CO4: Categorize the various Methods of Solving a Problem using Packages.	K3
	CO5: Develop an Applet with AWT Components.	K4

Learning Resources				
Text Books	1. P.Naughton and H.Schildt (1999), Java 2 (The Complete Reference), Third Edition, Tata MCGraw Hill Edition.			
Reference Books	1. K.Arnold and J.Gosling, The Java Programming Language- Second Edition, ACM Press/AddisonWesley Publishing Co. New York 2. Cay S. Horstmann, Gary Cornell (2012), Core Java 2 Volume I, Fundamentals-Ninth Edition Addision Wesley .			
Website Link	1.https://www.w3schools.com/java/java_oop.asp#:~:text=OOP%20provides%20a%20clear%20structure,code%20and%20shorter%20development%20time 2. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/ 3. https://www.javatpoint.com/java-oops-concepts 4. https://www.coursera.org/learn/object-oriented-java 5. https://docs.oracle.com/javase/tutorial/java/concepts/index.html			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M4UDSP04	**JAVA PROGRAMMING**	**DSC PRACTICAL - IV**	**IV**	**4**	**-**	**-**	**4**	**3**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	S	M	M	M	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.N.Padmapriya	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UDSC05	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**DSC THEORY - V**	**V**	**5**	**3**	**2**	**-**	**4**
Objective	Students acquire comprehensive knowledge of database designs, database modelling principles and various models including relational, hierarchical, and network models.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Database System - Characteristics of Database Management Systems - Architecture of Database Management Systems - Database Models - System Development Life Cycle - Entity Relationship Model.	K1	12
II	**Relational Database Model:** Structure of Relational Model - Types of keys. **Relational Algebra:** Unary operations - Set operations - Join operations. **Normalization:** Functional Dependency - First Normal form - Second Normal Form - Third Normal form - Boyce-Codd Normal Form - Fourth Normal Form.	K2	12
III	**SQL:** Introduction. Data Definition Language: Create, alter, drop, rename and truncate statements. **Data Manipulation Language:** Insert, Update and Delete Statements. Data Retrieval Language: Select statement. Transaction Control Language: Commit, Rollback and Save point statements. **Single row functions using dual:** Date, Numeric and Character functions. **Group/Aggregate functions:** count, max, min, avg and sum functions. **Set Functions:** Union, union all, intersect and minus. Subquery: Scalar, Multiple and Correlated subquery. **Joins:** Inner and Outer joins. Defining Constraints: Primary Key, Foreign Key, Unique, Check, Not Null.	K3	12
IV	**PL/SQL:** Introduction - PL/SQL Basic - Character Set - PL/SQL Structure - SQL Cursor – Subprograms - Functions Procedures.	K4	12
V	**Exception Handling:** Introduction - Predefined Exception User Defined Exception – Triggers - Implicit and Explicit Cursors - Loops in Explicit Cursor. **Current Trends- *Machine Learning Integration with SQL***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Identify characteristics of Database models and database System Development Life Cycle and E-R Model.	K1	

	CO2: Illustrate the the concepts of keys, Relational Algebra and impart the applications of various Normal Forms.	K2	
	CO3: Relate different types of Functions and Joins to the applications.	K3	
	CO4: Examine the Representation of PL-SQL Structure.	K4	
	CO5: Estimate the Concept of Exception, Triggers, Implicit and Explicit Cursors.	K5	

Learning Resources	
Text Book	1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System Concepts", Seventh Edition, TMH. 2.Alexis Leon & Mathews Leon, —Fundamentals of DBMS, 2nd Edition, Vijay Nicole Publications, 2014. 3. Pranab Kumar Das Gupta and P. Radha Krishnan, "Database Management System Oracle SQL and PL/SQL", Second Edition, 2013, PHI Learning Private Limited.
Reference Books	1. RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Publications. 2. Alexis Leon &Mathews Leon, —Essential of DBMS, 2nd reprint, Vijay Nicole Publications, 2009.
Website Link	https://www.javatpoint.com/dbms-tutorial
Self-Study Material	https://medium.com/@amb39305/how-to-integrate-machine-learning-models-with-sql-databases-using-python-and-tensorflow-b47f6f528bd7

	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
RASIPURAM - 637408.

B.Sc Data Science LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M5UDSC05	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**DSC THEORY - V**	**V**	**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	S	S	S	S	L	M	S	M	S
CO2	S	M	M	S	S	S	M	S	M	S
CO3	M	S	M	S	S	M	M	S	M	S
CO4	S	S	S	M	S	M	M	S	M	S
CO5	M	M	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.K.Vijayakumar	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UDSP05	**RDBMS USING ORACLE**	**DSC PRACTICAL - V**	**V**	**4**	**-**	**-**	**4**	**2**

Objective	Students can Develop the database concepts, applications and demonstrate the use of constraints, relational algebra operations, construct queries using SQL.

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	**SQL:** Implement the Program using DDL commands.	K1	3
2	Specifying constraints-Primary Key, Foreign Key, Unique, Check, Not Null.	K2	4
3	Construct a code using DML commands.	K1	3
4	Develop a Program using Set Operations.	K2	4
5	Develop a Program using Joins.	K3	3
6	Construct a code for Sub-queries.	K3	4
7	**PL/SQL:** Write the code for Control Constructs.	K1	3
8	Develop a program using Exception Handlers.	K2	4
9	Construct a code for Implicit Cursor.	K3	3
10	Write the code for Procedures.	K3	3
11	Construct a code for Triggers.	K4	4
12	Implement a program using TCL Commands usage (Commit, Rollback, Savepoint).	K4	4
Course Outcome	**CO1:** Recall the concepts of database.	K1	
	CO2: Summarize the concepts of Relational Algebra and various Normal Forms.	K2	
	CO3: Solve the different types of Functions and Joins Views, Sequence, Index and Procedure.	K3	
	CO4: Inspect the Representation of PL-SQL Structure.	K3	
	CO5: Interpret the representation of Exception and point out the Importance of Triggers, Implicit and Explicit Cursors.	K4	

Learning Resources				
Text Books	1. Abraham Silberschatz, Henry Korth, S. Sudarshan, “Database System Concepts”, Seventh Edition, TMH. Pranab Kumar Das Gupta and P. 2. Radha Krishnan, “Database Management System Oracle SQL and PL/SQL”, Second Edition, 2013, PHI Learning Private Limited.			
Reference Book	RamezElmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Publications.			
Website Link	https://www.javatpoint.com/dbms-tutorial			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

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B.Sc Data Science LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M5UDSP05	**RDBMS USING ORACLE**	**DSC PRACTICAL - V**	**V**	**4**	**-**	**-**	**4**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	M	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mr.K.Vijayakumar	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UDSC06	**MACHINE LEARNING**	**DSC THEORY-VI**	**V**	**5**	**3**	**2**	**-**	**4**
Objective	Students learn about Machine Intelligence applications, apply machine learning algorithms to real-world applications, create instant based learning and advanced learning.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines.	K1	12
II	**Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptions – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	K2	12
III	**Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	K3	12
IV	**Instant based learning** K- Nearest Neighbor Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	K4	12
V	**Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning	K5	12

	Current Trends - * Tiny ML*		
	…… Self Study.		
Course Outcome	**CO1:** Recall the importance of visualization in the data analytics solution	K1	
	CO2: Apply structured thinking to unstructured problems	K2	
	CO3: Sketch very broad collection of machine learning algorithms and problems	K3	
	CO4: Categorize the algorithmic topics of machine learning and mathematically deep enough to introduce the required theories.	K4	
	CO5: Develop an appreciation for what is involved in learning from data.	K5	

Learning Resources				
Text Books	1. Tom M. Mitchell, - Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. 2. Bengio, Yoshua, Ian J. Good fellow, and Aaron Courville. "Deep learning" 2015, MIT Press			
Reference Books	1. EthemAlpaydin, - Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004. 2. Stephen Marsland, - Machine Learning: An Algorithmic Perspective, CRC Press, 2009.			
Website Link	1. https://www.analytixlabs.co.in/blog/machine-learning-trends/ 2. https://www.ibm.com/topics/machine-learning			
Self-Study Material	1. https://www.datac amp.com/blog/what-is-tinyml-tiny-machine-learning 2. https://towardsdatascience.com/an-introduction-to-tinyml-4617f314aa79			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M5UDSC06	**MACHINE LEARNING**	**DSC THEORY-VI**	**V**	**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG
Tutorial Schedule	Group Discussion, Quiz program, Model preparation		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		

Designed By	**Verified By**	**Approved By**
Mr.A.Raja	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UDSP06	**MACHINE LEARNING LAB**	**DSC PRACTICAL - VI**	**V**	**4**	**-**	**-**	**4**	**2**
Objective	Students can apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text and numeric data							

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	Solving Regression & Classification using Decision Trees	K1	6
2	Root Node Attribute Selection for Decision Trees using Information Gain.	K1	6
3	Bayesian Inference in Gene Expression Analysis	K1	6
4	Pattern Recognition Application using Bayesian Inference	K2	6
5	Bagging in Classification	K2	6
6	Bagging, Boosting applications using Regression Trees	K3	6
7	Data & Text Classification using Neural Networks	K3	6
8	Using Weka tool for SVM classification for chosen domain application	K4	6
9	Data & Text Clustering using K-means algorithm	K4	6
10	Data & Text Clustering using Gaussian Mixture Models	K3	6

Course Outcome	**CO1:R**ecall the various machine learning tools	K1
	CO2: Apply the procedures for machine learning algorithms	K2
	CO3: Design Python programs for various machine learning algorithms	K3
	CO4: Analyze the appropriate datasets to the Machine Learning algorithms	K4
	CO5: Develop the graphical outcomes of learning algorithms with specific datasets	K5

Learning Resources				
Text Books	1 Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. 2 Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press			
Reference Books	1.Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004. 2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.			
Website Link	1. https://professional.mit.edu/course-catalog/professional-certificate- program-machine-learning-artificial-intelligence-0 2. https://www.edx.org/learn/machine-learning			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M5UDSP06	**MACHINE LEARNING LAB**	**DSC PRACTICAL – VI**	**V**	**4**	**-**	**-**	**4**	**2**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	L	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.K.Gayathri	HOD - Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSC07	**IOT AND CLOUD TECHNOLOGIES**	**DSC THEORY - VII**	**VI**	**6**	**4**	**2**	**-**	**5**
Objective	Students Learn basic concepts of Cloud Computing and get an overview of Map Reduce Concepts, infrastructure security, Data Security and Privacy.							

Unit	Course Content	Knowledge Levels	Sessions
I	**IoT Introduction:** Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU - Protocols for IoT.	K1	14
II	**Introduction to Cloud Computing:** Definition – SPI Framework – Software Model – Cloud Services Delivery Model – Deployment Models – Key drivers – Impact on Users – Governance in the cloud – Barriers to Cloud Computing Adoption in the enterprise. Examples of Cloud Service Providers: Amazon Web services – Google – Microsoft Azure Services Platform – Sun Open Cloud Platform.	K2	14
III	**Virtual Machines Provisioning and Migration Services:** Introduction and Inspiration -Background and Related Work- Virtual Machines Provisioning and Manageability- Virtual Machine Migration Services VM Provisioning and Migration in Action -Provisioning in the Cloud Context - Future Research Directions- The Anatomy of Cloud Infrastructures -Distributed Management of Virtual Infrastructures Scheduling Techniques for Advance Reservation of Capacity- Capacity Management to meet SLA Commitments.	K3	15
IV	**Data Security, Identity and Access Management Data security and storage:** Aspects of Data Security -Data Security Mitigation -Provider Data and Its Security. Identity and Access Management: Trust Boundaries and IAM -Why IAM? - IAM Challenges- IAM Definitions IAM Architecture and Practice-Getting Ready for the Cloud – Relevant IAM Standards and Protocols for Cloud Services - IAM Practices in the Cloud-Cloud Authorization Management- Cloud Service Provider IAM Practice.	K4	14

V	**Security and Privacy Security Management:** Standards – Security Management in the Cloud – Availability Management – Access Control. Privacy: What is Privacy– Data Life Cycle – Key Privacy Concerns – Who is responsible for protecting Privacy – Privacy Risk Management – Legal and Regulatory Implications. IoT and Cloud Integration: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment.***Current Technologies – Data Security-Multi and Hybrid Cloud Deployment-Edge computing*.**	K5	15
	*……*Self Study.		
Course Outcome	**CO1:** Remember an IoT system with cloud infrastructure.	K1	
	CO2: Relate M2M Communication protocols in a prototype	K2	
	CO3: Analyze the basic concepts of the main sensors used in electromechanical systems	K3	
	CO4: Evaluate the computer models of common engineering information types.	K4	
	CO5: Compare the storage mechanisms / analysis algorithms for data management in distributed & data intensive applications	K5	

Learning Resources	
Text Books	1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by CRC Press. 2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013. 3. Tim Mather, Subra Kumaraswamy, ShahedLatif, Cloud Security and Privacy, OREILLY Media, 2010. 4. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles and Paradigms, John Wiley & Sons, Inc., Hoboken, New Jersey,2011.
Reference Books	Ronald L. Krutz and Russell Dean Vines, Cloud Security, Wiley – India, 2010
Website Link	https://www.geeksforgeeks.org/iot-and-cloud-computing/
Self-Study Material	https://www.geeksforgeeks.org/cloud-computing-trends/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M6UDSC07	**IOT AND CLOUD TECHNOLOGIES**	**DSC THEORY - VII**	**VI**	**6**	**4**	**2**	**-**	**5**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	M	S
CO2	L	M	L	S	M	S	S	M	S	S
CO3	M	S	S	M	S	S	S	S	M	S
CO4	S	M	M	S	S	S	M	M	S	M
CO5	S	S	M	M	M	S	S	S	S	S
Level of Correlation Between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.S.Shahana	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSP07	**IOT AND CLOUDTECHNOLOGIES LAB**	**DSC PRACTICAL - VII**	**VI**	**4**	**-**	**-**	**4**	**4**
Objective	Students learn the efficiency and bringing important information to the surface more quickly than a system depending on human intervention, provide easy, scalable access to computing resources and IT services.							

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	FamiliarizationwithArduino/RaspberryPiandperformnecessarysoftware installation.	K1	3
2	To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2seconds.	K1	3
3	To interface Pushbutton / Digital sensor(IR/LDR)with Arduino /Raspberry Pi and write a program to turn ONLED when push button is pressed or at sensor detection.	K1	3
4	TointerfaceDHT11sensorwithArduino/Raspberry Piand write a program to print temperature and humidity readings.	K2	3
5	To interface motor using relay with Arduino/RaspberryPi and write a program to turn ON motor when pushbutton is pressed.	K2	3
6	To interface Bluetooth with Arduino/Raspberry Pi andwrite aprogram to send sensor datato smart phoneusing Bluetooth.	K3	3
7	To interface Bluetooth with Arduino/Raspberry Pi andwrite a program to turn LED ON/OFF when “1”/”0” isreceived fromsmartphoneusing Bluetooth.	K4	3
9	Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thing speak cloud	K4	3
10	To install MySQL database on Raspberry Piand perform basic SQL queries.	K4	3

11	Write a program on Arduino/Raspberry Pito publish temperature data to MQTT broker.	K4	3
12	Write a program on Arduino/Raspberry Pito subscribe to MQTT broker for temperature data and print it.	K4	3
COURSE OUTCOME	**CO1:** Recognize an IoT system with cloud infrastructure.	K1	
	CO2: Extract M2M Communication protocols in a prototype.	K2	
	CO3: Sketch the basic concepts of the main sensors used in electro mechanical systems.	K3	
	CO4: Design computer model of common engineering information types.	K4	
	CO5: Create storage mechanisms/analysis algorithms for data management in distributed & data intensive applications	K5	

Learning Resources

Text Books	1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by CRC Press. 2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013. 3. Tim Mather, Subra Kumaraswamy, ShahedLatif, Cloud Security and Privacy, OREILLY Media, 2010. 4. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles and Paradigms, John Wiley & Sons, Inc., Hoboken, New Jersey,2011.
Reference Books	Ronald L. Krutz and Russell Dean Vines, Cloud Security, Wiley – India, 2010
Website Link	https://www.nitttrchd.ac.in/imee/Labmanuals/manual%20Internet%20of%20Things% 20I.pdf

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Title	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSP07	**IOT AND CLOUDTECHNOLOGIES LAB**		**DSC PRACTICAL - VII**		**VI**	**4**	**-**	**-**	**4**	**4**

CO-PO Mapping										
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	S	M	S	S	L	M	S	M	S
CO2	L	M	L	S	M	S	S	M	S	S
CO3	M	S	S	M	S	S	S	S	M	S
CO4	S	M	M	S	S	S	M	M	S	M
CO5	S	S	M	M	M	S	S	S	S	S

Level of Correlation Between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	**Verified By**	**Approved By**
Mrs.S.Shahana	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSC08	**ARTIFICIAL INTELLIGENCE**	**DSC THEORY - VIII**	**VI**	**5**	**5**	**-**	**-**	**5**
Objective	Students learn the method of solving problems using Artificial Intelligence, concept of Expert system, Fuzzy logic and operating system.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Artificial Intelligence:** What is Artificial Intelligence? AI Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics – Issues in the design of search programs, Heuristic Search Techniques - Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means-End Analysis.	K1	12
II	**Knowledge Representation Approaches and issues in knowledge representation:** Using Predicate Logic – Representing simple facts in logic – Representing Instance and ISA relationship – Computable functions and predicates – resolution – Natural deduction - Representing knowledge using rules –Procedural versus declarative knowledge – Logic programming - Forward versus backward reasoning – Matching – Control Knowledge - Symbolic reasoning under uncertainty - Logics for Non monotonic reasoning – Implementation Issues – Augmenting a problem solver – Implementation: Depth first search, Breadth first search	K2	12
III	**Statistical Reasoning** Probability and Bayes‟ Theorem - Certainty factors and rule-based systems- Bayesian networks – Dempster - Shafer Theory - Weak slot-filler structure - Semantic nets – frames. Strong slot-filler structure- Conceptual dependency – Scripts – CYC – Syntatic – Semantic spectrum of Representation – Logic and slot-and-filler structure – Other representational Techniques	K3	12
IV	Game Playing, Planning & NLP Mini max search procedure-Adding alpha-beta cut offs- Additional Refinements – Iterative Deepening – Reference on specific games Planning - Components of a Planning	K4	12

	system – Goal stack planning – Nonlinear planning using constraint posting Hierarchical planning – Reactive systems. Natural Language Processing - Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing – Statistical Natural Language processing.		
V	**Learning & Advanced Topics in AI:** What is learning? – Rote learning – Learning by taking advice – Learning in problem solving – Learning from examples: Induction – Explanation based learning – Discovery – Analogy – Formal learning theory - Neural Net learning and Genetic learning - Expert System: Representation-Expert System shells-Knowledge Acquisition. Fuzzy logic system – Crisp sets – Fuzzy sets – Fuzzy terminology – Fuzzy logic control – Sugeno style of Fuzzy inference processing – Fuzzy Hedges – Neuro Fuzzy systems. **Current Trends:* Neural Network market future growth***	K5	12
	***……* Self Study.**		
Course Outcome	**CO1**: Describe user interfaces to improve human–AI interaction and real time decision-making.	K1	
	CO2: Discuss the basic principles of AI solutions for problem solving, inference, perception, knowledge representation, and learning.	K2	
	CO3: Apply the various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.	K3	
	CO4: Analyze the natural language processing (NLP) using stemming, n-grams, POS tagging, and parsing techniques.	K4	
	CO5: Create a robotics process automation to manage business processes and to increase and monitor their efficiency and effectiveness.	K5	

Learning Resources	
Text Books	1.Elaine Rich, Kevin Knight, Shivsankar B Nair, Artificial Intelligence, Third Edition, Tata McGraw Hill Publication (2008).
Reference Books	1. Russel S, Norvig P Artificial Intelligence A Modern approach, Third Edition, Pearson Education(2010). 2. Dan W Patterson Introduction to Artificial Intelligence and Expert System, Second Edition, Pearson Education Inc (2007). 3. Jones M, Artificial Intelligence application Programming, Second Edition, Dreamtech Press (2006). 4. Nilsson, Artificial Intelligence A new synthesis, Nils J Harcourt Asia PTE Ltd (2000).

Website Link	1. https://www.simplilearn.com			
Self-Study Material	1.https://www.linkedin.com/pulse/neural-network-market-2024-trends-future-growth-z02xe			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M6UDSC08	**ARTIFICIAL INTELLIGENCE**	**DSC THEORY-VIII**	**VI**	**5**	**5**	**-**	**-**	**5**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	S	S	S	S
CO2	L	M	L	S	M	S	M	S	S	S
CO3	M	S	S	M	S	S	S	M	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	S	M	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs. R. Suguna	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

List of Foundation Course (FC) offered by the B.Sc., Data Science
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	I	**23M1UDSFC1**	**PROBLEM SOLVING TECHNIQUES**

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UDSFC1	**PROBLEM SOLVING TECHNIQUES**	**FC - I**	**I**	**2**	**2**	**-**	**-**	**2**
Objective	Students can understand the different programming concepts, Decomposition of problems into functions, Use of data flow diagram, Pseudo code to implement solutions through algorithms.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction**: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. Programming Languages: Machine language, Assembly language, High level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	K1	5
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).Structured Programming: Algorithm: Features of good algorithm, Benefits and drawbacks of algorithm. Flowcharts: Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. Pseudocode: Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors.Program design: Modular Programming	K1	4
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. Repetition Structures: Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	K2	5
IV	**Data:** Numeric Data and Character Based Data. Arrays: One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	K3	5
V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. Program Modules: Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. Files: File Basics-Creating and reading a sequential file- Modifying Sequential Files.	K4	5

Course Outcome	**CO1:** Describe the basic knowledge of Computers. Analyze the programming languages.		K1	
	CO2: Understand data types and arithmetic operations.		K2	
	CO3: Implement the various operators.		K3	
	CO4: Compare Numeric data and character-based data.		K3	
	CO5: Develop file system.		K4	
Learning Resources				
Text Books	1. Stewart Venit, "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.			
Website Link	1. https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm 2. https://www.hugedomains.com/domain_profile.cfm?d=utubersity.com			
Self-Study Material	1. https://www.mindomo.com/blog/problem-solving-strategies/ 2. https://geniusrevive.com/en/the-kipling-method-5w1h/			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1UDSFC1	**PROBLEM SOLVING TECHNIQUES**	**FC - I**	**I**	**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG
Tutorial Schedule	Group Discussion, Quiz program, Model preparation		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Dr.V.Vijayadeepa	Member Secretary – Dr.S.Shahitha

List of Elective Course (DSE) Details for B.Sc., Data Science SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards			
S.No.	**SEM**	**COURSE_CODE**	**TITLE OF THE COURSE**
1		23M_UDSE01	Analytics for Service Industry
2		23M_UDSE02	Natural Language Processing
3		23M_UDSE03	Financial Analytics
4		23M_UDSE04	Marketing Analytics
5		23M_UDSE05	Data Communication And Computer Networks
6		23M_UDSE06	Big Data Analytics
7		23M_UDSE07	Computer Networks
8		23M_UDSE08	Cryptography
9		23M_UDSE09	Operating System
10		23M_UDSE10	Artificial Neural Networks
11		23M_UDSE11	Software Engineering
12		23M_UDSE12	Software Quality Assurance
13		23M_UDSE13	Organizational Behaviour
14		23M_UDSE14	Agile Project Management
16		23M_UDSE15	Computing Intelligence
17		23M_UDSE16	Information Security
18		23M_UDSE17	Grid Computing

19		23M_UDSC_	Programming in C
20		23M_UDSP_	C Programming Lab
21		23M_UDSC_	Object Oriented Programming Using C++
22		23M_UDSP_	C++ Programming Lab
23		23M_UDSC_	Software Metrics
24		23M5UDSCP_	Machine Learning Lab
25		23M_UDSC_	Mobile Application Development
26		23M_UDSP_	Mobile Application Development Lab
27		23M_UDSC_	Software Project Management
28		23M_UDSP_	Software Engineering Lab

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE01	**ANALYTICS FOR SERVICE INDUSTRY**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**
Objective	Students recognize challenges in dealing with datasets in service industry and Identify appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Healthcare Analytics:** Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR-Coding Systems-Benefits of EHR-Barrier to Adopting HER Challenges - Pheno typing Algorithms. Biomedical Image Analysis and Signal Analysis –Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.	K1	12
II	**Healthcare Analytics Applications:** Applications and Practical Systems for Healthcare – Data Analytics for Pervasive Health-Fraud Detection in Healthcare – Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems – Computer – Assisted Medical Image Analysis Systems-Mobile Imaging and Analytics for Biomedical Data.	K2	12
III	**HR Analytics:** Evolution of HR Analytics ,HR information systems and data sources, HR Metric and HR Analytics, Evolution of HR Analytics; HR Metrics and HR Analytics; Intuition versus analytical thinking; HRMS/HRIS and data sources; Analytics frame works like LAMP, HCM:21(r) Model.	K3	12
IV	**Performance Analysis:** Predicting employee performance, training requirements, evaluating training and development, Optimizing selection and promotion decisions.	K4	12
V	**Tourism and Hospitality Analytics:** Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing –optimized disruption management –Fraud detection in payments. **Current Trends-*Business Analytics in Manufacturing***	K5	12

	*……*Self Study.		
Course Outcome	**CO1:** Remember the concepts and methods of business analytics.	K1	
	CO2: Outline a model and solve decision problems in Different settings.	K2	
	CO3:Plan appropriate courses of action for agiven Managerial situation whether a problem or an opportunity.	K3	
	CO4: Discover viable solutions to decision making problems.	K4	
	CO5:Measure a sense of commitment to the long-run Welfare of both organizations and the communities they serve.	K5	

Learning Resources				
Text Books	1. ChandanK.ReddyandCharuCAggarwal,"Healthcaredataanalytics",Taylor& Francis,2015. 2. EdwardsMartinR,EdwardsKirsten(2016),"PredictiveHRAnalytics:Mastering theHRMetric",KoganPage Publishers,ISBN-0749473924 3. Fitz-enzJac(2010), "The new HR analytics: predicting the economic value of your company's human capital investments", AMACOM, ISBN-13:978-0-8144-1643-3 4. Rajendra Sahu, Manoj Dashand AnilKumar. Applying Predictive Analytics Withinthe Service Sector.			
Reference Books	1.HuiYangandEvaK.Lee,"HealthcareAnalytics:FromDatatoKnowledgetoHealthcareImprovement,Wiley,2016 2. Fitz-enzJac, MattoxIIJohn(2014), "Predictive Analytics for Human Resources", Wiley,ISBN-1118940709.			
Website Link	https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php			
Self-Study Material	https://www.sciencedirect.com/science/article/pii/S2214716019300934			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE01	**ANALYTICS FOR SERVICE INDUSTRY**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO 4	PSO5
CO1	S	S	S	M	M	S	S	S	M	S
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	M	S	S	M	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Purusothaman	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE02	**NATURAL LANGUAGE PROCESSING**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**
Objective	Students can grasp basic algorithms, exploring discourse, generating dialogue and summaries, understanding language levels algorithmic descriptions and comprehending statistical methods in machine translation.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.	K1	12
II	**Word level and Syntactic Analysis:** Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. **Syntactic Analysis:** Context-free Grammar-Constituency Parsing-Probabilistic Parsing.	K2	12
III	**Semantic analysis and Discourse Processing: Semantic Analysis:** Meaning Representation-Lexical Semantics-Ambiguity-Word Sense Disambiguation. **Discourse Processing:** cohesion-Reference Resolution Discourse Coherence and Structure	K3	12
IV	**Natural Language Generation:** Architecture of NLG Systems Generation Tasks and Representations-Application of NLG. **Machine Translation:** Problems in Machine Translation. Characteristics of Indian Languages - Machine Translation Approaches-Translation involving Indian Languages.	K4	12
V	**Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical and Alternative Models of Information Retrieval – valuation Lexical Resources-WorldNet-Frame Net Stemmers- POS Tagger- Research Corpora SSAS. **Current Trends- * Language Transformers***	K5	12
	…… Self Study.		

Course Outcome	**CO1:** Recall the main ideas and methods of natural language processing, and discuss the advantages and disadvantages of different NLP technologies in various business situations.	K1	
	CO2: Remember the differences among NLP techniques by looking at their assumptions, strengths, and weaknesses. Use NLP technologies to analyze and understand text data thoroughly.	K2	
	CO3: Utilize descriptive language, visual aids, and statistical insights to effectively convey issues and their resolutions. Employ NLP methods to assess sentiment within a textual document.	K3	
	CO4: Examine extensive text datasets derived from various real-world applications. Employ NLP techniques to conduct topic modeling.	K4	
	CO5: Develop automation systems to improve business processes, making them more efficient. Set up a structure for integrating AI and IoT, covering interactions with people, business operations, and the environment.	K5	

Learning Resources	
Text Books	1. Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications. 2. Allen, James. Natural language understanding. Pearson, 1995.
Reference Books	1. Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog", Springer.
Website Link	1.https://en.wikipedia.org/wiki/Natural_language_processing 2. https://www.techtarget.com/searchenterpriseai/definition/natural-languageprocessing
Self-Study Material	https://www.startus-insights.com/innovators-guide/natural-language-processing-trends/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE02	**NATURAL LANGUAGE PROCESSING**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO 4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.E.Natarajan	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE03	**FINANCIAL ANALYTICS**	**SEC THEORY**		**5**	**3**	**2**	**-**	**4**
Objective	Students can focus on financial optimization, risk management, stakeholder value creation, strategic planning, analysis, communication, collaboration, transparency, compliance and ethics all essential aspects of financial management.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Financial Analytics**: Introduction: Meaning-Importance of Financial Analytics uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability. Financial Securities: Bond and Stock investments - Housing and Euro crisis - Securities Datasets and Visualization - Plotting multiple series	K1	12
II	**Descriptive Analytics**: Data Exploration, Dimension Reduction and Data Clustering Geographical Mapping, Market Basket Analysis. Predictive Analytics, Fraud Detection, Churn Analysis, Crime Mapping, Content Analytics, Sentiment Analysis. Analyzing financial data and implement financial models. Process of Data analytics: obtaining publicly available data, refining such data, implement the models and generate typical output, Prices and individual security returns, Portfolio returns, Risks, Factor Models.	K2	12
III	**Forecasting Analytics**: Estimating Demand Curves and Optimize Price, Price Bundling, Non Linear Pricing and Price Skimming, Forecasting, Simple Regression and Correlation Multiple Regression to forecast sales. Modelling Trend and Seasonality Ratio to Moving Average Method, Winters Method.	K2-K3	12
IV	**Business Intelligence &Tableau**: Definition of BI – A Brief History of BI – The Architecture of BI. The origin and Drivers of BI. Successful BI Implementation – Analytics Overview – Descriptive, Predictive and Perspective Analytics. Business reporting and Visualization – components - A brief history of data visualization – Different types of charts and graphs – The emergence of data visualization and visual analytics – Performance dashboards Dashboard design – Best practices in dashboard design – Business performance management – Balanced Scorecards – Six sigma as a performance	K4	12

	measurement system		
V	**Visualizations**: Using Tableau to Summarize Data, Slicing and Dicing Financial Data, Charts to Summarize Marketing Data. Functions to Summarize Data, Pricing Analytics, Risk based pricing, Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing **Current Trends**-*Data-driven decision-making*	K5	12
	…… Self Study.		
Course Outcome	CO1:Remember Interpret and discuss the outputs of given financial models and create their own models	K1	
	CO2: Relate Design and create visualizations that clearly communicate financial data insights.	K2	
	CO3: Apply Gain essential knowledge and hands-on experience in the data analysis process, including data scraping, manipulation, and exploratory data analysis.	K3	
	CO4: Analyze prepared for more advanced applied financial modelling courses.	K4	
	CO5: Create Improve leadership, teamwork and critical thinking skills for financial decision making	K5	

Learning Resources	
Text Books	1. Analysis of Economic Data, Gary Koop, (4th Edition), Wiley. 2. Statistics and Data Analysis for Financial Engineering: with R examples; David Ruppert, David S. Matteson, Springers
Reference Books	1. Analyzing Financial Data and Implementing Financial Models Using „R", Ang Clifford, Springers. 2. Microsoft Excel 2013: Data Analysis and Business Modeling, Wayne L. Winston, Microsoft Publishin2. AlexisLeon&MathewsLeon,—FundamentalsofDBMS‖,VijayNicolePublications 2014,2ndEdition.
Website Link	https://www.gartner.com/en/finance/trends/top-4-data-analytics-trends-finance
Self-Study Material	https://www.javatpoint.com/account-analysis

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE03	**FINANCIAL ANALYTICS**	**SEC THEORY**		**5**	**3**	**2**	**-**	**4**

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.V.Vengadesh	HOD – Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE04	**MARKETING ANALYTICS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**
Objective	Students to learn significance of marketing analytics in allocating marketing resources, construct predictive marketing dashboards for organizational insights, and dealing with challenge data sets in marketing.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Marketing Analytics:** Introduction to marketing research, Research design setup, Qualitative research, Quantitative research, Concept development, scale development, Exploring Data, Descriptive Statistics. Product analytics-features, attributes, benefits, Price analytics, Promotion analytics, Channel analytics, Multiple Discriminate analysis.	K1	12
II	**Customer Analytics:** Customer Analytics, Analyzing customer satisfaction, Prospecting and Targeting the Right Customers, Covariance and Correlation analysis, Developing Customers, Retaining Customers, Customer lifetime value case, Factor analysis. Market Segmentation & Cluster Analysis, Scatterplots & Correlation Analysis, Linear Regression, Model Validation & Assessment, Positioning analytics, Cross tabulation.	K2	12
III	**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.	K3	12
IV	**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. 9 (LinkedIn,	K4	12

	Instagram, YouTube Twitter etc. Google analytics. Introduction. (Websites)		
V	**Web Analytics and 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. **Current Trends – *Mobile Market Analytics. ***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Recognize importance of marketing frameworks and use them to address marketing challenges.	K1	
	CO2: Review company's internal and external marketing environment in order to rank suitable marketing strategies.	K2	
	CO3: Impart critical thinking skills by engaging with current marketing literature and new trends in the marketing landscape.	K3	
	CO4: Analyze effectiveness of marketing strategies in driving organizational success and assess impact of marketing functions.	K4	
	CO5: Create strategies of address ethical and environmental considerations within marketing practices, and responsible business operations.	K5	
Learning Resources			
Text Books	1. Chuck Hemann & Ken Burbary, "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World" , Pearson, ISBN 9780789750303 2. Eric Siege, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", 1st Edition, Pearson. 3. Dave Jacobs, "Marketing Analytics: Optimize Your Business with Data Science in R, Python, and SQL", 4. Matthew Ganis and Avinash Kohirkar, "Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media", Pearson 2016 5. Jim Sterne. "Social Media Metrics: How to Measure and Optimize Your Marketing Investment",Wiley, 2020.		
Reference Books	1. Mike Grigsby, "Marketing Analytics: A practical guide to real marketing science", Kogen Page, ISBN 9780749474171. 2. Raj Kumar Venkatesan, "Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Hands on Learning", Paul Farris, Ronald T. Wilcox 3. Bendle, Farris, Pferfery and Reibstein, "Marketing Metrices", 3rd Edition, Pearson Education India		

Website Link	1. https://www.coursera.org/learn/uva-darden-market-analytics 2. https://www.wrike.com/marketing-guide/marketing-analytics/			
Self-Study Material	1. https://www.tutorialspoint.com/mobile_marketing/index.htm 2. https://mixpanel.com/blog/what-is-mobile-analytics/ 3. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=918223&query=Prioritizing+Data+Privacy+and+Security+in+market+analytics#			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSE04	**MARKETING ANALYTICS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	M	S	M	S	S	S	S	S	S	S
CO2	M	S	S	M	S	M	S	S	S	M
CO3	S	M	S	S	M	S	S	S	S	M
CO4	S	S	M	S	M	S	S	M	S	M
CO5	M	S	L	L	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE05	**DATA COMMUNICATION AND COMPUTER NETWORKS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

Objective	Students learn about basics of network and exchange of data between any two points in the world.

Unit	Course Content	Knowledge Levels	Sessions
I	**Data Communications:** Introduction– Networks – The Internet – Protocols and Standards- Network Models: OSI model – TCP/IP protocol suite – Transmission Media: Guided media – Unguided Media.	K1	12
II	**Data Link Layer:** Error Detection and Correction: Introduction- Block coding – Linear block codes – Cyclic Codes – Checksum. Framing – Flow and Error Control: Protocols –Noiseless Channels: Stop- and –Wait – Noisy Channel: Stop-and Wait Automatic Repeat Request-Go-Back –N.	K2	12
III	**Medium Access and Network Layer:** Multiple Access: Random Access – Controlled access- Channelization. Network Layer Logical addressing: IPv4 addresses – IPv6 addresses. Transport Layer: Process to Process delivery: UDP – TCP. Congestion Control – Quality of Service	K4	12
IV	**Application Layer:** Domain Naming System: Name Space - Domain Name Space - Distribution of Name Space - DNS in the INTERNET - Resolution–Remote logging – E-mail – FTP.	K4	12
V	Wireless Networks: Wireless Communications – Principles and Fundamentals. WLANs – WPAN- Satellite Networks - Ad-hoc Networks. **Current Trends:** SD-WAN - AI based network management	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Recall the basics of data communication, networking, internet and their importance.	K1	
	CO2: Compare wired and wireless computer networks.	K2	
	CO3: Sketch the services and features of various protocol layers in data networks.	K3	
	CO4: Illustrate TCP/IP and their protocols.	K4	

	CO5: Appraise the different internet devices and their functions.		K5	

Learning Resources				
Text Books	1. Forouzan, A. Behrouz. (2006), Data Communications & Networking, Fourth Edition, Tata McGraw Hill Education.			
Reference Books	Fred Halsall(1996), Data Communications Computer Networks and Open Systems, Fourth Edition, Addison Wesley.			
Website Link	1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm 2. https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/			
Self-Study Material	https://www.enterprisenetworkingplanet.com/management/top-networking-trends/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE05	**DATA COMMUNICATION AND COMPUTER NETWORKS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	S	S	S	M	S	S	M	M	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.N.Hyrunnisha	HOD – Mr.G.Selvakumar	Member Secretary-Dr.S.Shahitha

B.sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE06	**BIG DATA ANALYTICS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**
Objective	Students comprehend Big data and its analytics in practical contexts, and to formulate algorithms for addressing data-intensive challenges through the map reduce paradigm.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Big data Introduction:** Big Data introduction - definition and taxonomy - Big data value for the enterprise - The Hadoop ecosystem - Introduction to Distributed computing- Hadoop ecosystem – Hadoop Distributed File System (HDFS) Architecture - HDFS commands for loading/getting data - Accessing HDFS through Java program.	K1	12
II	**Map reduce:** Introduction to Map Reduce frame work - Basic Map Reduce Programming: - Advanced Map Reduce programming: Basic template of the Map Reduce program, Word count problem- Streaming in Hadoop- Improving the performance using combiners- Chaining Map Reduce jobs- Joining data from different sources.	K2	12
III	**Pig and Hive:** Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – Hive QL – Querying Data in Hive - Fundamentals of HBase and Zoo Keeper.	K3	12
IV	**Mongo DB :** No SQL databases: Mongo DB: Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import – Mongo Export.	K4	12
V	**Cassandra:** Introduction – Features - Data types – CQLSH - Key spaces - CRUD operations – Collections – Counter – TTL - Alter commands - Import and Export - Querying System tables. ***Current Trends - Artificial Intelligence and Machine Learning.***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Recall the concept of Big Data and its analytics in the real world	K1	
	CO2: Remember the Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.	K2	
	CO3: Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.	K3	
	CO4: Design and Implementation of Big Data Analytics using	K4	

	pig and spark to solve data intensive problems and to generate analytics.		
	CO5: Develop the Big Data Activities using Hive. quality	K5	

Learning Resources				
Text Books	1 JSeema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015. 2 Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence, Pearson Education Services (2018)Pvt Ltd.			
Reference Books	1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013. 2. Tom White, "Hadoop: The Definitive Guide", O"Reilly Publications, 2011. 3. Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012. 4. Russell Bradberry, Eric Blow, "Practical Cassandra A developers Approach", Pearson Education, 2014.			
Website Link	1. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics 2. https://www.coursera.org/articles/big-data-analytics			
Self-Study Material	1. https://www.ksolves.com/blog/big-data/exploring-the-6-vital-trends-in-big-data-analytics. 2. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=1588997			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE06	**BIG DATA ANALYTICS**		**DSE THEORY**			**5**	**3**	**2**	**-**	**4**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	L	S	S	S	S	L
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.K.Gayathri	HOD - Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE07	**COMPUTER NETWORKS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

Objective	Students can understand the hardware Software concepts of Network and to analyze the different network models to establish Network connection.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introduction:** Uses of Computer Networks – Network Hardware- Network Software- OSI Reference Model – TCP/IP Reference Model.	K1	12
II	**Physical Layer**: Guided Transmission media – Wireless Transmission – Public Switched Telephone Network – Local Loop – Trunks – Multiplexing- Switching.	K2	12
III	**Data Link Layer**: Design Issues - Error Detection and Correction - Simplex Stop and Wait Protocol - Sliding Window Protocol.	K2	12
IV	**Network Layer**: Design Issues – Routing Algorithm - IP Protocol – IP Addresses - Internet Control Protocols.	K3	12
V	**Transport Layer:** Addressing - Connection Establishment Connection Release. Internet Transport Protocol: UDP-TCP. Application Layer: DNS - Electronic Mail -World Wide Web. **Current Trends: *Computer networks recent trends ***	K3	12
	…… Self Study.		
Course Outcome	**CO1:** Recite computer networks and describe the functions of each layer in OSI and TCP/IP model.	K1	
	CO2: Summarize the Physical layer and apply them in real time applications and Techniques in multiplex switching.	K2	
	CO3: Identify the Data link layer and deduction of errors and correction Flow control using protocols.	K3	
	CO4: Construct the Network layers and generate IP address to find out the route through Routing algorithms.	K4	
	CO5: Design the transport layer and protocols needed for End–End delivery of packets role of Application layer in real time applications.	K5	

Learning Resources	
Text Books	1. A. S. Tanenbaum, “Computer Networks”, Prentice-Hall of India 2008, 4th Edition.

Reference Books	1. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill 2007, 4th Edition. 2. Stallings, "Data and Computer Communications", Pearson Education 2012, 7th Edition. 3. F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education 2008. 4. D. Bertsekas and R. Gallagher, "Data Networks", PHI 2008, 2nd Edition.5. Lamarca, "Communication Networks", Tata McGraw Hill 2002.
Website Link	1. https://www.geeksforgeeks.org/basics-computer-networking/ 2. https://en.wikipedia.org/wiki/Computer_network 3.https://www.tutorialspoint.com/computer_fundamentals/computer_networking.html 4.https://www.javatpoint.com/computer-network-tutorial5
Self-Study Material	1. https://www.youtube.com/watch?v=ZSiXZxVpVhs

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE07	**COMPUTER NETWORKS**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	M	S	S	S	M	S
CO2	S	S	S	S	M	S	M	S	S	S
CO3	S	M	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Ravi	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.SC Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE08	**CRYPTOGRAPHY**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

Objective	Students will learn the fundamentals of Cryptography, various key distribution and management schemes, deploy encryption techniques		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	K1	12
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Mono alphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography.	K2	12
III	**Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES –**RSA:** The RSA algorithm.	K3	12
IV	**Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.	K4	12
V	Intruders – Malicious software – Firewalls. **Current Trends - *Quantum Cryptography ***	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	K1	
	CO2: Relate the different cryptographic operations of symmetric cryptographic algorithms	K2	
	CO3: Sketch the different cryptographic operations of public key cryptography	K3	
	CO4: Categorize the various Authentication schemes to simulate different applications.	K4	
	CO5: Create various Security practices and System security standards	K5	

Learning Resources	
Text Books	1. **William Stallings,** "Cryptography and Network Security Principles and Practices".
Reference Books	**1. Behrouz A. Foruzan,** "Cryptography and Network Security", Tata McGraw-Hill, 2007.

	2. AtulKahate, "Cryptography and Network Security", Second Edition, 2003, TMH. **3. M.V. Arun Kumar**, "Network Security", 2011, First Edition, USP.			
Website Link	1.https://www.tutorialspoint.com/cryptography/ 2.https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography			
Self-Study Material	1.https://www.intechopen.com/online-first/87633 2.https://www.techtarget.com/searchsecurity/definition/quantum-cryptography			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.SC Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE08	**CRYPTOGRAPHY**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	M	S
CO2	S	S	S	S	S	S	M	S	M	S
CO3	S	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	M	S	S	S	M
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr. A. Raja	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE09	**OPERATING SYSTEM**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**
Objective	Students learn the concepts of Process management, Memory management, I/O management, File management algorithms and to analyze the resource management techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction**: Views and goals - Operating System Services - User and Operating System interface - System Call - Types of System Calls - Operating System Design and Implementation - Operating System Structure. **Process Management**: Process Concept - Process Scheduling - Operations on Processes- Inter process Communication**. Threads**: Types of threads.	K1	12
II	**Process Scheduling**: Basic Concepts - Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization**: The Critical - Section Problem Synchronization Hardware – Semaphores - Classic Problem of Synchronization.	K2	12
III	**Deadlocks**: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.	K3	12
IV	**Memory-Management Strategies**: Swapping - Contiguous Memory Allocation Segmentation- Paging - Structure of the Page Table. **Virtual-Memory Management**: Demand Paging - Page Replacement - Allocation of Frames –Thrashing.	K4	12
V	**Storage Management**: File System - File Concept - Access Methods - Directory and Disk Structure - File Sharing- Protection. **Allocation Methods** – Free - Space Management - Efficiency and Performance – Recovery. **Current Trends**: ***Operating Systems: Trends and Innovations in 2023.***	K5	12
	…….. Self Study		
Course Outcome	**CO1:** Recall the basic concepts of operating system using process scheduling algorithm and inter process communication.	K1	
	CO2: Remember the allocation of process through scheduling algorithms, critical section problems and Prevention of multiple process executing through the concept of semaphores**.**	K2	
	CO3: Sketch the concept of Mutual exclusion, Deadlock	K3	

	detection and agreement protocols for deadlock prevention and its avoidance.		
	CO4: Examine the strategies of Memory management schemes, the usage of Virtual memory and Replacement algorithms to avoid thrashing.	K4	
	CO5: Create the methods to allocate files for proper protection with storage management.	K5	

Learning Resources				
Text Books	2. A. Silberschatz P.B.Galvin, Gange. "Operating System Concepts", Ninth Edition, 2013, Addison WesleyPublishing Co.			
Reference Books	3. Anderw S Tanenbaum, Albert S. Woodhull, " Operating System Design and Implementation", prentice-Hall India Publication. 4. William Stallings, "Operating Systems Internals and Design Principles", Pearson, 2018, 9th Edition. 5. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition. 6. Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley.			
Website Link	https://www.guru99.com/operating-system-tutorial.html https://en.wikipedia.org/wiki/Operating_system https://www.geeksforgeeks.org/what-is-an-operating-system/			
Self-Study Material	https://www.mindstick.com/articles/332551/operating-systems-trends-and-innovations-in-2023			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSE09	**OPERATING SYSTEM**	**DSE THEORY**		**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S
CO3	M	M	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	M	M	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.N.Padmapriya	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE10	**ARTIFICIAL NEURAL NETWORKS**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students acquire a foundational understanding of artificial neural networks, including the learning process and the architecture of single-layer and multi-layer perceptron networks.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Artificial Neural Model**: Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms- Error correction - Gradient Descent Rules, Perceptron Learning Algorithm, Perceptron Convergence Theorem.	K1	12
II	**Introduction of Learning:** Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.	K2	12
III	**Single layer Perception:** Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, learning in continuous perception, Limitation of Perception.	K3	12
IV	**Multi-Layer Perceptron Networks:** Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm.	K4	12
V	**Deep learning:** Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neo cognitron, Deep Convolutional Neural	K5	12

	Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzmann Machines, Training of DNN and Applications. **Current Trends- *Neuroscience Based Deep Learning***		
	…… Self Study.		
Course Outcome	**CO1:** Identify the basics of artificial neural networks and its architecture.	K1	
	CO2: Relate the various learning algorithms and their applications.	K2	
	CO3: Sketch the neural network models to Single &Multi layer Perceptron networks.	K3	
	CO4: Assume the Deep Learning Techniques.	K4	
	CO5: Estimate the performance of the RNN Networks and Its Applications.	K5	

Learning Resources	
Text Books	1. Satish Kumar, "Neural Networks A Classroom Approach", McGraw Hill-Second Edition. 2. Simon Haykins , "Neural Network- A Comprehensive Foundation", Pearson Prentice Hall, 2nd Edition, 1999.
Reference Books	B. Yegnanarayana , "Artificial Neural Networks", PHI, New Delhi 1998.
Website Link	https://www.javatpoint.com/artificial-neural-network
Self-Study Material	https://www.nature.com/articles/s41593-019-0520-2

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSE10	**ARTIFICIAL NEURAL NETWORKS**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.K.Vijayakumar	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE11	**SOFTWARE ENGINEERING**	**DSETHEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students learn to the software engineering concepts and to create a system model in real life applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Not able changes in software development practices, computer systems engineering	K1	12
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification(SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object-oriented vs function-oriented design	K2	12
III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams(DFD‟s),structured design, detailed design.	K3	12
IV	**Coding and Testing:** Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing.	K4	12
V	**Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.***Current Trends-Integration of AI and Machine Learning ***	K5	12
	*……*Self Study.		
Course	CO1: Remember the Concept of Gain basic knowledge of analysis and design of systems	K1	
	CO2: Relate to apply software engineering principles and techniques	K2	
	CO3: Complete the Model a reliable and cost-effective software system	K3	

Outcome	CO4: Compare to design an effective model of the System	K4	
	CO5: Evaluate to Perform Testing at various levels and produce an efficient system.	K5	

Learning Resources				
Text Books	1.RajibMall,Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018.			
Reference Books	1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997. 2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill. 3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.			
Website Link	https://www.simplilearn.com			
Self-Study Material	https://www.simplilearn.com/software-development-trends-article			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Title	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE11	**SOFTWARE ENGINEERING**		**DSE THEORY**			**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	M	S
CO2	L	M	L	S	M	S	S	M	S	S
CO3	M	S	S	M	S	S	S	S	M	S
CO4	S	M	M	S	S	S	M	M	S	M
CO5	S	S	M	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.S.Shahana	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE12	**SOFTWARE QUALITY ASSURANCE**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**

Objective	Students learn various concepts of Software Quality Assurance and to create an impact of developing a software with quality assurance in a commercial environment.

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Quality and the quality system – standards and procedures technical activities. Software tasks – management responsibility – quality system – contract review – design control – document control – purchasing product identification and traceability.	K1	12
II	**Process control:** Checking– identification of testing tools– control of nonconforming product –corrective action.	K2	12
III	**Handling, storage, packing and delivery:** Quality records-internal quality audits –training –servicing –statistical techniques.	K3	12
IV	**QA and new technologies**: QA and Human–computer interface process modeling–standards and procedures.	K4	12
V	**ISO-9001**: ElementsofISO9001- improving quality system– Case study. **Current Trends:*statistical techniques***	K4	12
	***……* Self Study.**		
Course Outcome	**CO1:** Interpret the role of Quality Assurance in Software Engineering.	K1	
	CO2: Remember the role of automation in software quality assurance and gain practical experience in using automated testing tools.	K2	
	CO3: Sketch the concepts in preparing the quality plan & documents.	K3	
	CO4: Analyze and execute software testing plans, test cases, and test scripts.	K4	
	CO5: Design and executing software test plans, test cases, and test scripts.	K4	

Learning Resources	
Text Books	1.Darrel Ince “An introduction to software quality assurance and it implementation”, MGH 1994.

	2.Darrel Ince “ISO 9001 software quality assurance”, MGH 1994			
Reference Books	1.Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997. 2. Mordechai Ben-Menachem “Software Quality: Producing Practical Consistent Software”, International Thompson Computer Press, 1997.			
Website Link	NPTEL & MOOC courses titled Software Quality Assurance 1.https://www.linkedin.com/learning/topics/software-quality			
Self-Study Material	1.https://radixweb.com/blog/software-testing-statistics.			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE12	**SOFTWARE QUALITY ASSURANCE**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	M	L	M	M
CO2	L	M	L	S	M	S	L	S	M	M
CO3	M	S	S	M	S	M	S	M	S	S
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	S	M	M	M	M	M	M	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.R.Suguna	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE13	**ORGANIZATIONAL BEHAVIOUR**	**DSETHEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students gain the knowledge on scope of OB to create the awareness of individual behavior among students and enhance the understanding of group behavior.							

Unit	Course Content	Knowledge Levels	Sessions
I	**INTRODUCTION :** Concept of Organizational Behaviour (OB): Nature, Scope and Role of OB: Disciplines that contribute to OB; Opportunities for OB (Globalization, Indian workforce diversity, customer service, innovation and change, networked organizations, work-life balance, people skills, Positive work environment, ethics)	K1	12
II	**INDIVIDUAL BEHAVIOUR:** 1. Learning, attitude and Job satisfaction: Concept of learning, conditioning, shaping and reinforcement. Concept of attitude, components, behaviour and attitude. Job satisfaction: causation; impact of satisfied employees on workplace. 2. Motivation: Concept; Theories (Hierarchy of needs, X and Y, Two factor, McClelland, Goal setting, Self-efficacy, Equity theory); Job characteristics model; Redesigning jobs, 3. Personality and Values: Concept of personality; Myers Briggs Type Indicator (MBTI); Big Five model. Relevance of values; Linking personality and values to the workplace (person-job fit, person-organization fit) 4. Perception, Decision Making: Perception and Judgment Factors; Linking perception to individual decision making.	K2	12
III	**GROUPBEHAVIOUR:** 1.GroupsandWorkTeams:Concept: Five Stage model of group development; Group norms, cohesiveness; Group think and shift; Teams; types of teams; Creating team players from individuals and team based Work (TBW)2. Leadership: Concept, Traittheories, Behavioural theories (Ohio and Michigan studies) - Contingency theories (Fiedler, Hersey and Blanchard, Path Goal).	K3	12
IV	**ORGANISATIONAL CULTURE AND STRUCTURE:** Concept of culture; Impact (functions and liability); Creating and sustaining culture: Concept of structure, Prevalent organizational designs: New design options	K4	12

V	**ORGANISATIONAL CHANGE, CONFLICT AND POWER:** Forces Of change; Planned change; Resistance; Approaches(Lewin's model, Organisational development). Concept of conflict, Conflict process; Types, Functional/ Dysfunctional. Introduction to power and politics. **Current Trends- *organizational behavior trends and Decision making***	K5	12
	*……*Self Study.		
Course Outcome	**CO1:**Define Organizational Behavior, Understand the Opportunity through OB.	K1	
	CO2:Infer self-awareness,motivation,leadershipand Learning theories at workplace.	K2	
	CO3: Identify the complexities and solutions of group behavior.	K3	
	CO4: Impact and bring positive change in the culture of the organization.	K4	
	CO5: Create a congenial climate in the organization.	K5	

Learning Resources	
Text Books	1. Neharika Vohra Stephen P.Robbins, Timothy A.Judge, Organizational Behaviour, Pearson Education, 18th Edition, 2022. 2. FredLuthans, Organizational Behaviour,TataMcGrawHill,2017. 3. Ray French, Charlotte Rayner, Gary Rees & Sally Rumbles, Organizational Behaviour, John Wiley & Sons, 2011 4.LouisBevoc, AllisonShearsett, RachaelCollinson, Organizational Behaviour Reference, Nutri Niche System LLC(28April2017) 5. Dr.Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, Organizational Behaviour: A Skill-Building Approach, SAGE Publications Inc, 2nd edition (29 November 2018).
Reference Books	1. Uma Sekaran, Organizational Behaviour Text & cases, 2nd edition, Tata McGraw Hill Publishing CO. Ltd 2. Gangadhar Rao, Narayana, V.S.P Rao, Organizational Behaviour 1987, Reprint 2000, Konark Publishers Pvt. Ltd, 1st edition 3. S.S.Khanka, Organizational Behaviour, S.Chand & Co, New Delhi 4. J.Jayasankar,OrganizationalBehaviour,MarghamPublications,Chennai,2017 5. John Newstrom, Organizational Behaviour, Huma Behaviour at Work, McGraw Hill Education; 12th edition (1 July 2017)

Website Link	https://www.iedunote.com/organizational-behavior			
Self-Study Material	https://www.researchgate.net/profile/C-K-Gomathy/publication/371838511_ORGANIZATIONAL_BEHAVIOUR_TRENDS_AND_DECISION-MAKING/links/64ae2fcac41fb852dd6aea4b/ORGANIZATIONAL-BEHAVIOUR-TRENDS-AND-DECISION-MAKING.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE13	**ORGANIZATIONAL BEHAVIOUR**	**DSETHEORY**		**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PS04	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	M	S	M	S	M	M	M
CO3	M	S	M	S	S	S	S	S	S	S
CO4	M	M	S	M	S	M	M	M	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Purusothaman	HOD - Mr.G.Selvakumar	MemberSecretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE14	**AGILEPROJECT MANAGEMENT**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students gain the basic concepts of software design, technologies and API's and also to demonstrate Agile development, planning, execution and testing techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Modernizing Project Management: Project Management Needed a Makeover –Introducing Agile Project Management. **Applying the Agile Manifesto and Principles:** Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches be a this to rical approaches?–Why people like being Agile?	K1	12
II	**Being Agile:** Agile Approaches: Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming –Summary. **Agile Environments in Action:** Creating the physical environment –Low tech communicating–High –tech communicating–Choosing tools. **Agile Behaviors in Action:** Establishing Agile roles–Establishing new values–Changing team Philosophy.	K3	12
III	**Agile Planning and Execution:** Defining the Product Vision and Roadmap: Agile planning–Defining the product vision–Creating a product roadmap Completing the product backlog. **Planning Releases and Sprints:** Refining requirements and estimates–Release planning –Sprint Planning.	K3	11

	Working Throughout the Day: Planning your day–Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. **Showcasing Work, Inspecting and Adapting:** The sprint review – The sprint retrospective. **Preparing for Release:** Preparing the product for deployment (the release sprint) –Preparing the operational support – Preparing the organization for product deployment- Preparing the market place for Product deployment.		
IV	**Agile Management Managing Scope and Procurement:** What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. **Managing Time and Cost:** What's different about Agile time management – Managing Agile schedules – What's different about Agile cost management –Managing Agile budgets. **Managing Team Dynamics and Communication:** What's different about Agile team dynamics – Managing Agile team dynamics –What's different about Agile communication–Managing Agile communication. **Managing Quality and Risk:** What's different about Agile quality–Managing Agile quality–What's different about Agile risk management–Managing Agile risk.	K4	13
V	**Implementing Agile Building a Foundation:** Organizational and individual commitment – Choosing the right pilot team members–Creating and environment that enables Agility–Support Agility initially and over time. **Being a Change Agent:** Becoming Agile requires change–why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls –Signs your changes are slipping. **Benefits, Factors for Success and Metrics:** Tenkey benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations. **Current Trends:*AI and Automation***	K5	12
	*……*Self Study.		
	CO1: Recall software design, one must understand the intricacies of software architecture and development processes.	K1	

Course Outcome	**CO2:**To Extract Agile development and testing Techniques.	K3
	CO3: Relate the steps of Agile Planning and Execution Using Sprint.	K3
	CO4: Analyze Agile Management Design, scope, Procurement, managing Time and Cost and Quality Check.	K4
	CO5: Design Agile testing techniques, factors for success and metrics.	K5

Learning Resources	
Text Books	1. Mark C. Layton, Steven J. Ostermiller, "Agile Project Management for Dummies",2nd Edition, Wiley India Pvt.Ltd., 2018. 2. Jeff Sutherland, Scrum–The Art of Doing Twice the Work in Half the Time, Penguin,2014
Reference Books	1. Mark C.Layton, David Morrow, Scrum for Dummies, 2nd Edition, Wiley India Pvt.Ltd., 2018. 2. Mike Cohn, Succeeding with Agile–Software Development using Scrum, Addison–WesleySignatureSeries,2010 3. AlexMoore,AgileProjectManagement,2020 4. AlexMoore,Scrum,2020 5. Andrew Stell man and Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, Shroff/O'Reilly,FirstEdition,2014
Website Link	1.www.agilealliance.org/resources
Self-Study Material	1. https://innovify.com/insights/top-agile-trends/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE14	**AGILEPROJECT MANAGEMENT**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	M	S	M	M	M
CO2	S	S	M	M	M	S	M	M	M	S
CO3	M	M	M	S	M	S	M	M	S	S
CO4	M	M	M	S	S	S	M	S	M	S
CO5	L	M	S	S	S	M	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.E.Natarajan	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF –CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE15	**COMPUTING INTELLIGENCE**	**SECTHEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students can learn foundation on fundamental concepts in Computing Intelligence and apply basic principles of Artificial Intelligence and solutions that require problem solving, influence, perception, knowledge representation and learning							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to AI**: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First–Travelling Sales man Problem– Heuristic search techniques: Generate and Test–Types of Hill Climbing.	K1	12
II	**Fuzzy Logic Systems**: Notion of fuzziness–Operations on fuzzysets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference –FuzzyRuleBasedSystems–SchemesofFuzzification– Inferencing–Defuzzification–FuzzyClustering–fuzzyrule-Based classifier	K2	12
III	**Neural Networks**: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Back propagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.	K3	12
IV	**Artificial Neural Networks**: Fundamental Concepts–Basic Models of Artificial Neural Networks–Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	K4	12
V	**Genetic Algorithm**: Introduction – Biological Background –Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm– Operators in Genetic Algorithm **Current Trends-*MACHINE LEARNING***	K5	12
	*……*Self Study.		
Course	CO1: Recognize basic concepts of AI.	K1	
	CO2: Remember the Fuzzy Logic Systems.	K2	
	CO3: Sketch the Neural Networks.	K3	

Outcome	CO4: Analyze Fundamental Concepts	K4
	CO5: Create Genetic Algorithm.	K5

Learning Resources	
Text Books	1. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing",2ndEdition, Wiley India Pvt. Ltd. 2. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach",2nd Edition, Pearson Education in Asia. 3. S.Raja sekaran, G.A.Vijaya lakshmi,"Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis& Applications", PHI.
Reference Books	1. F. Martin, Mcneill, and Ellen Thro, "Fuzzy Logic: A Practical approach", AP Professional, 2000.Chin TengLin, C. S.GeorgeLee,"Neuro-Fuzzy Systems", PHI. 2.ChinTengLin, C. S. GeorgeLee," Neuro – Fuzzy Systems", PHI.
Website Link	https://www.geeksforgeeks.org/plsql-introduction/
Self-Study Material	https://www.mdpi.com/journal/mca/special_issues/CI_Appl

	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
RASIPURAM - 637408.

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE15	**COMPUTING INTELLIGENCE**	**SECTHEORY**		**5**	**5**	**-**	**-**	**5**

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.V.Vengadesh	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE16	**INFORMATION SECURITY**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students learn about the concept of information security, its importance and its various applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Information Security :** Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.	K1	12
II	**The Security Problem in Computing:** The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption	K2	12
III	**Symmetric and Asymmetric Cryptographic Techniques:** DES, AES, RSA algorithms .Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos	K3	12
IV	**Program Security:** Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of use Errors, Viruses, Trapdoors, Salami attack, Man-in-the middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security policies, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples	K4	12
V	**Security in Networks:** Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction. **Current Trends:* Security in Networks***	K5	12
	***……* Self Study.**		
Course Outcome	**CO1:** Summarize the network security threats, security services, and counter measures	K1	

	CO2: Understand vulnerability analysis of network security	K2	
	CO3: Acquire the background knowledge on hash functions; authentication; firewalls; intrusion detection techniques.	K3	
	CO4: Discover hands-on experience with programming and simulation techniques for security protocols.	K4	
	CO5: Apply methods for authentication, access control, intrusion detection and prevention.	K5	

Learning Resources				
Text Books	Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education 2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson			
Reference Books	Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, lst Edition. 2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2"d Edition. 3. Information Security, Principles and Practice: Mark Stamp, Wiley India. 4. Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH			
Website Link	1.https://www.tutorialspoint.com/what-is-information-security			
Self-Study Material	https://www.enterprise networking planet.com/data-center/enterprise-networking-security-trends/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE16	**INFORMATION SECURITY**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	S	S	M	S
CO2	L	M	L	S	M	S	M	S	M	S
CO3	M	S	S	M	S	S	S	S	M	S
CO4	S	M	M	S	S	S	S	S	S	M
CO5	S	S	M	M	M	S	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs. R. Suguna	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE17	**GRID COMPUTING**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**
Objective	Students gain the knowledge on the basic construction and use of Grid computing and Understand the grid computing applications, assess the efficiency of the grid computing in solving large scale scientific problems.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid 12Infrastructures.	K1	12
II	**Grid Computing organization and their Roles:** Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework#, Organization and building and using grid based solutions to solve computing, Commercial organization building and Grid Based solutions.	K2	12
III	**Grid Computing Anatomy:** The Grid Problem, The conceptual of virtual organizations, #Grid Architecture# and relationship to other distributed technology.	K3	12
IV	**The Grid Computing Road Map:** Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, #Semantic Grids#.	K4	12
V	**Merging the Grid services Architecture with the Web Services Architecture:** Service-Oriented Architecture, WebServiceArchitecture,#XMLmessagesandEnveloping#,Servicemessagedescription Mechanisms,Relationshipbetween WebServicesandGridServices,Webservices Interoperability and the role of the WS-I Organization. **Current Trends - *.NET-based Enterprise Grid Computing System***	K5	12

	*……*Self Study.		
Course Outcome	**CO1:**Name the activity related to Grid computing Infrastructure.	K1	
	CO2: Show Grid computing tool kits and Framework.	K2	
	CO3:Construct a concepts of Virtualization for an Organization	K3	
	CO4: Functions of service oriented architecture to road map.	K4	
	CO5: Evaluate the knowledge on grid and web service architecture.	K5	

Learning Resources				
Text Books	1. Joshy Joseph and Craig Fellen stein, Grid computing, Pearson/ IBMPress, PTR-2004.			
Reference Books	1.Ahmer Abbas and Grain computing, A Practical Guide to technology and applications, Charles River Media - 2003.			
Website Link	1.https://www.javatpoint.com/robotics-tutorial			
Self-Study Material	1.https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=7e901269607b552c3168d486b69c03764d605e59			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSE17	**GRID COMPUTING**	**DSE THEORY**		**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Purusothaman	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**PROGRAMMING IN C**			**5**	**5**	**-**	**-**	**5**
Objective	Students can understand code organization and functional hierarchical decomposition with using complex data type.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Studying Concepts of Programming Languages**- Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments- Overview of C: History of C- Importance of C- Basic Structure of C Programs-Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations.	K1	14
II	**Decision Making and Branching:** Decision Making and Looping - Arrays - Character Arrays and Strings.	K2	11
III	**User Defined Functions:** Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion.	K3	11
IV	**Structures and Unions:** Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.	K4	12
V	**Pointers:** Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions- File Management in C. **Current Trends:** Embedded systems.	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Recall the fundamental concepts of C programming languages, and its features.	K1	

	CO2: Remember programming methodology.	K2	
	CO3: Identify the suitable programming constructs for problem solving.	K3	
	CO4: Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.	K4	
	CO5: Evaluate the program performance by fixing the errors.	K5	

Learning Resources				
Text Books	1. Robert W. Sebesta, (2012), —Concepts of Programming Languages, Fourth Edition, Addison Wesley (Unit I : Chapter – 1) 2. E. Balaguruswamy, (2010), —Programming in ANSI C, Fifth Edition, Tata McGraw Hill Publications.			
Reference Books	1. Ashok Kamthane, (2009), —Programming with ANSI & Turbo C, Pearson Education 2. Byron Gottfried, (2010), —Programming with C, Schaums Outline Series, Tata McGraw Hill Publications.			
Website Link	1.https://www.javatpoint.com/c-programming-language-tutorial 2. http://www.cprogramming.com/			
Self-Study Material	https://www.toptal.com/c/after-all-these-years-the-world-is-still-powered-by-c-programming			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc., Data Science .,Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**PROGRAMMING IN C**			**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	M	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	M	S	M	S
CO4	S	S	S	M	S	M	S	S	S	S
CO5	M	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.N.Hyrunnisha	HOD – Mr.G.Selvakumar	Member Secretary- Dr.S.Shahitha

B.Sc.,Data Science., Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**C PROGRAMMING LAB**			**4**	**-**	**-**	**4**	**2**
Objective	Students can expose problem-solving concept through C programming.							

S.No.	**List of Experiments / Programmes**	**Knowledge Levels**	**Sessions**
1	Programs using Input/ Output functions	K3	4
2	Programs on conditional structures	K3	4
3	Program implementing Command Line Arguments	K4	5
4	Programs using Arrays	K3	5
5	Program for Manipulation of strings.	K4	5
6	Programs using Functions	K3	5
7	Program using Recursive Functions	K3	5
8	Programs using Pointers	K4	5
9	Program implementing Files.	K4	5
10	Programs using Structures & Unions	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Recall syntax and semantics of C programs.	K2	
	CO2: Relate the problem and solve using C programming techniques.	K2	
	CO3: Sketch suitable programming constructs for problem solving	K3	
	CO4: Analyze various concepts of C language to solve the problem in an efficient way.	K4	
	CO5: Evaluate program for a given problem and test for its correctness.	K5	

Learning Resources	
Text Books	1. Ashok Kamthane, (2009), —Programming with ANSI & Turbo C, Pearson Education. 2. E. Balaguruswamy, (2010), —Programming in ANSI C, Fifth Edition, Tata McGraw Hill Publications .

Reference Books	1.Byron Gottfried, (2010), —Programming with C, Schaums Outline Series, Tata McGraw Hill Publications.			
Website Link	http://www.tutorialspoint.com/cprogramming. http://www.cprogramming.com/			
Self-Study Material	http://www.programmingsimplified.com/c-program-examples.			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc.,Data Science., Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**C PROGRAMMING LAB**			**4**	**-**	**-**	**4**	**2**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	S	S	S	M	S	S	M	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.N.Hyrunnisha	HOD – Mr.G.Selvakumar	Member Secretary-Dr.S.Shahitha

B.Sc. Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**OBJECT ORIENTED PROGRAMMING USING C++**			**5**	**5**	**-**	**-**	**5**

Objective	Students inculcate knowledge on OOPs using C++ and demonstrate the use of various OOPs concepts with the help of programs.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**OOP Paradigm:** Concepts of OOP – Benefits of OOP - Object Oriented Languages – Applications of OOP – OOP Design: Using UML as a Design Tool Beginning with C++	K1	12
II	**Expressions and Control Structures: - Tokens, Functions in C++ :** Function Prototyping –Call by Reference – Return by Reference – Inline Function – Default Arguments – Const Arguments – Recursion – Function Overloading – Classes and Objects	K2	12
III	**Constructors and Destructors:** Constructors – Parameterized Constructors – Multiple Constructors – Constructor with default Arguments – Copy Constructors – Dynamic Constructor – Destructors – Operator Overloading and Type Conversions: Operator Overloading – Overloading Unary Operators – Overloading Binary operators –Rules for Operator Overloading – Type Conversions	K3	12
IV	**Inheritance:** Introduction – Types of Inheritance – Virtual Base Classes – Abstract Classes – Pointers - Virtual Function – Polymorphism	K3	12
V	**Templates:** Class Templates – Function Templates – Overloading of template Function – Exception Handling Current Trends-***Trends in Object-Oriented Programming***	K4	12
	*……*Self Study.		
Course Outcome	**CO1**: Outline the C++ programming fundamentals and the concepts of object-oriented programming like object and class, Encapsulation, inheritance and polymorphism.	K1	
	CO2: Relate the control structures, types of constructors, inheritance and different type conversion mechanisms.	K2	
	CO3: Discover the importance of object oriented programming features like polymorphism, reusability, generic programming, data abstraction and the usage of exception handling.	K3	

	CO4: Determine the use of object oriented features such as classes, inheritance and templates to develop C++ programs for complex problems.	K3
	CO5: Create a program in C++ by implementing the concepts of object-oriented programming.	K4

Learning Resources				
Text Books	E. Balaguruswamy, "Object Oriented Programming using C++", 6th Edition, Tata McGraw Hill, 2013.			
Reference Books	1.BjarneStroustrup, "The C++ Programming Language", Fourth Edition, Pearson Education. 2.Hilbert Schildt, "C++ - The Complete Reference", 4th Edition, Tata McGrawHill, 2009.			
Website Link	1.http:/fahad.cprogramming.blogspot.com/p/c-simple-examples.html 2.http://www.sitesbay.com/cpp/cpp-polymorphism			
Self-Study Material	https://www.studypool.com/documents/37903995/-emerging-trends-in-object-oriented- programming-c-			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc. Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**OBJECT ORIENTED PROGRAMMING USING C++**			**5**	**5**	**-**	**-**	**5**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.P.Mohankumar	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc. Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**C++ PROGRAMMING LAB**			**4**	**-**	**-**	**4**	**2**

Objective	Students Inculcate knowledge on OOPs using C++ and demonstrate the use of various OOPs concepts with the help of programs.

S.No.	List of Experiments/Programmes	Knowledge Levels	Sessions
1	Working with Classes and Objects	K1	4
2	Program Using Constructors and Destructors	K2	4
3	Program Using Function Overloading	K2	5
4	Program Using Operator Overloading	K2	5
5	Program Using Type Conversions	K3	5
6	Program Using Inheritance	K4	5
7	Program Using Polymorphism	K4	5
8	Program Using Console I/O	K4	5
9	Program Using Templates	K4	5
10	Program Using Exceptions	K4	5

Course Outcome	**CO1:** Recall and the fundamentals of C++ programming structure	K1
	CO2: Identify the basic features of OOPS such as classes, objects, polymorphism, inheritance	K2
	CO3: Analyze the concept of inheritance with the early and late binding, usage of exception handling, generic programming and type conversions	K3
	CO4: Determine the use of various data structures such as stacks, queues and lists to solve various computing problems in C++ by incorporating OOPS concepts.	K3
	CO5: Develop a program in C++ with the concepts of object oriented programming to solve real-world problems.	K4

Learning Resources				
Text Books	E. Balaguruswamy, “Object Oriented Programming using C++”, 6th Edition, Tata McGraw Hill, 2013.			
Reference Books	1.Bjarne Stroustrup, “The C++ Programming Language”, Fourth Edition, Pearson Education. 2.Hilbert Schildt, “C++ - The Complete Reference”, 4th Edition, Tata Mc GrawHill, 2009.			
Website Link	1.http:/fahad.cprogramming.blogspot.com/p/c-simple-examples.html 2.http://www.sitesbay.com/cpp/cpp-polymorphism			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc. Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**C++ PROGRAMMING LAB**			**4**	**-**	**-**	**4**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	S	M	M	M	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mr.P.Mohankumar	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**SOFTWARE METRICS**			**5**	**5**	**-**	**-**	**5**
Objective	Students can study the essential concepts of measurement and software metrics and to apply suitable analytical methods to interpret software metrics data and extract valuable insights.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Fundamentals of Measurement:** Need for Measurement: Measurement in Software Engineering, Scope of Software Metrics, The Basics of measurement: The representational theory of measurement, Measurement and models, Measurement scales and scale types, meaningfulness in measurement	K1	12
II	**A Goal-Based Framework For Software Measurement:** Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing Software Measurement Validation **Empirical investigation:** Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies	K2	12
III	**Software Metrics Data Collection:** Defining good data, Data collection for incident reports, How to collect data, Reliability of data collection Procedures **Analyzing software measurement data:** Statistical distributions and hypothesis testing, Classical data analysis techniques, Examples of simple analysis techniques	K3	12
IV	**Measuring internal product attributes:** Size Properties of Software Size, Code size, Design size, Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures **Measuring internal product attributes:** Structure: Aspects of Structural Measures, Control flow structure of program units, Design	K4	12

	level Attributes, Object-oriented Structural attributes and measures		
V	**Measuring External Product Attributes:** Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures **Software Reliability:** Measurement and Prediction: Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy**.*Current Trends -Agile process metrics – Test Metrics*.**	K5	12
	…… Self Study.		
Course Outcome	**CO1:** Recall the various fundamentals of measurement and software metrics	K1	
	CO2: Identify frame work and analysis techniques for software measurement	K2	
	CO3: Apply internal and external attributes of software product for effort estimation	K3	
	CO4: Use appropriate analytical techniques to interpret software metrics data and derive meaningful insights	K4	
	CO5: Recommend reliability models for predicting software quality	K5	

Learning Resources				
Text Books	1. Norman Fenton, James Bieman ,Software Metrics A Rigorous and Practical Approach, Third Edition, 2014			
Reference Books	1.Norman E, Fenton and Shari Lawrence Pfleeger ,Software metrics, , International Thomson Computer Press, 1997 2. Stephen H.Kan ,Metric and models in software quality engineering, , Second edition, 2002, Addison Wesley Professional 3. Robert B.Grady, Practical Software Metrics for Project Management and Process Improvement, 1992, Prentice Hall.			
Website Link	1. https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-thesemetrics/ 2. https://stackify.com/track-software-metrics/			
Self-Study Material	1.https://www.sealights.io/software-development-metrics/top-5-software-metrics-to-manage-development-projects-effectively/ 2.https://link.springer.com/book/10.1007/978-3-540-68255-4			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSC_	**SOFTWARE METRICS**			**5**	**5**	**-**	**-**	**5**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	S	S	S	S
CO2	M	S	S	M	S	M	S	S	S	M
CO3	S	M	S	S	M	S	S	S	S	M
CO4	S	S	M	S	M	S	S	M	S	M
CO5	M	S	L	L	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.K.Gayathri	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**MACHINE LEARNING LAB**			**4**	**-**	**-**	**4**	**2**

Objective	Students can apply the concepts of machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text & numeric data

S.No.	**List of Experiments / Programmes**	**Knowledge Levels**	**Sessions**
1	Solving Regression & Classification using Decision Trees	K1	4
2	Root Node Attribute Selection for Decision Trees using Information Gain.	K1	4
3	Bayesian Inference in Gene Expression Analysis	K1	5
4	Pattern Recognition Application using Bayesian Inference	K2	5
5	Bagging in Classification	K2	5
6	Bagging, Boosting applications using Regression Trees	K3	5
7	Data & Text Classification using Neural Networks	K3	5
8	Using Weka tool for SVM classification for chosen domain application	K4	5
9	Data & Text Clustering using K-means algorithm	K4	5
10	Data & Text Clustering using Gaussian Mixture Models	K3	5

Course Outcome	**CO1:**Recall the various machine learning tools	K1
	CO2: Remember the procedures for machine learning algorithms	K2
	CO3: Sketch Python programs for various machine learning algorithms	K3
	CO4: Analyze the appropriate datasets to the Machine Learning algorithms	K4
	CO5: Develop the graphical outcomes of learning algorithms with specific datasets	K5

Learning Resources				
Text Books	1 Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. 2 Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press			
Reference Books	1.Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004. 2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.			
Website Link	3. https://professional.mit.edu/course-catalog/professional-certificate-program-machine-learning-artificial-intelligence-0 4. https://www.edx.org/learn/machine-learning			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSP_	**MACHINE LEARNING LAB**			**4**	**-**	**-**	**4**	**2**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	L	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mrs.K.Gayathri	HOD - Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**MOBILE APPLICATION DEVELOPMENT**			**5**	**5**	**-**	**-**	**5**
Objective	Students learn about the architecture and features of Android options available in views, file handling concepts and thereby enabling to manage data efficiently.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Android Fundamentals:** Android overview and Versions –Features of Android – Architecture of Android - Setting up Android Environment (Eclipse/Android Studio, SDK, AVD)- Anatomy of an Android Application - Simple Android Application Development.	K1	12
II	**Android User Interface:** Layouts: Linear, Relative, Frame and Scroll view- Managing changes to Screen Orientation. Views: Text View, Button, Image Button, Edit Text, Check Box, Radio Button, Radio Group, Progress Bar, Auto Complete Text View, List Views and Web View.	K2	12
III	**Data Persistence:** Saving and Loading User Preferences. File Handling: File System-Internal and External Storage-Permissions-File Manipulation - Managing Data using Sqlite: Creation of database-Insertion, Retrieval and Updation of records.	K3	12
IV	**SMS Messaging:** Sending and Receiving messages - Sending E-mail–Networking: Downloading Binary Data – Downloading Text Files.	K4	12
V	**Location Based Services:** Displaying maps - Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-coding Publishing Android Applications: Preparing for publishing-Deploying APK Files. **Current Trends - * Artificial Intelligence in Mobile Application Development***	K4	12

	…… Self Study.		
Course Outcome	**CO1:** Acquire the importance of visualization in the data analytics solution		
	CO2: Relate structured thinking to unstructured problems		
	CO3: Discover very broad collection of machine learning algorithms and problems		
	CO4: Analyze algorithmic topics of machine learning and mathematically deep enough to introduce the required theory		
	CO5: Develop an appreciation for what is involved in learning from data.		

Learning Resources				
Text Books	1. Wei Meng,"Beginning Android Application Development", WroxPublications (John Wiley, New York), 2012			
Reference Books	1. Ed Burnette, "Hello Android: Introducing Google's Mobile Development Platform", 3rd edition, 2010, The Pragmatic Publishers. 2. Reto Meier, "Professional Android 4 Application Development", 2012, Wrox Publications (John Wiley, New York).			
Website Link	1. https://www.tutorialspoint.com/mobile_development_tutorials.htm 2. https://www.tutorialspoint.com › Android › Android - Home 3. https://en.wikipedia.org/wiki/Mobile_app_development			
Self-Study Material	1. https://www.spaceotechnologies.com/blog/artificial-intelligence-in-mobile-app-development/			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Title	**Course Title**			**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**MOBILE APPLICATION DEVELOPMENT**						**5**	**5**	**-**	**-**	**5**

CO-PO Mapping										
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	S	M	S	S	L	M	S	S	S
CO2	S	S	S	S	S	S	M	S	M	S
CO3	S	M	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	S	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.T.Prabhu	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**MOBILE APPLICATION DEVELOPMENT LAB**			**4**	**-**	**-**	**4**	**2**
Objective	Students learn about user defined functions and class concept, Students demonstrate the creation of cookies and sessions.							

S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions
1	Develop an application for Simple Counter.	K1	3
2	Develop an application to display your personal details using GUI Components.	K2	3
3	Develop a Simple Calculator that uses radio buttons and text view.	K1	4
4	Develop an application that uses Intent and Activity.	K2	3
5	Develop an application that uses Dialog Boxes.	K3	4
6	Develop an application to display a Splash Screen.	K4	3
7	Develop an application that uses Layout Managers.	K4	4
8	Develop an application that uses different types of Menus.	K3	3
9	Develop an application that uses to send messages from one mobile to another mobile.	K4	4
10	Develop an application that uses to send E-mail. Develop an application that plays Audio and Video.	K4	3
11	Develop an application that uses Local File Storage.	K4	4
12	Develop an application for Simple Animation	K4	3
13	Develop an application for Login Page using Sqlite.	K4	4
14	Develop an application for Student Marksheet processing using Sqlite.	K4	3
Course Outcome	**CO1:** Recall the concepts of counters and dialogs.	K1	
	CO2: Remember the concepts of Layout Managers. Perform sending email on audio and video.	K2	
	CO3: Sketch the local File Storage and Development of files.	K3	

	CO4: Determine the concepts of Simple Animation To apply searching pages.	K3
	CO5: Evaluate the usage of Student mark sheet-preparation in MAD. Concepts of processing Sqlite are implemented.	K4

Learning Resources				
Text Books	1. Wei Meng,"Beginning Android Application Development", WroxPublications (John Wiley, New York), 2012			
Reference Books	1. Ed Burnette, "Hello Android: Introducing Google's Mobile Development Platform", 3rd edition, 2010, The Pragmatic Publishers. 2. Reto Meier, "Professional Android 4 Application Development", 2012, Wrox Publications (John Wiley, New York).			
Website Link	1. https://www.tutorialspoint.com/mobile_development_tutorials.htm 2. https://www.tutorialspoint.com › Android › Android - Home 3.https://en.wikipedia.org/wiki/Mobile_app_development			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**MOBILE APPLICATION DEVELOPMENT LAB**			**4**	**-**	**-**	**4**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	M
CO3	S	M	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	S	M	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assesment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mr.T.Prabhu	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**SOFTWARE PROJECT MANAGEMENT**			**5**	**5**	**-**	**-**	**4**
Objective	Students learn to the importance of software project management and to apply software testing techniques for understanding students in a commercial environment.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Competencies:** Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	K1	12
II	**Managing Domain Processes:** Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	K2	12
III	**Tasks and Activities**: Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	K3	12
IV	**Project Management Resource Activities:** Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain.	K3	12
V	**Quality**: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools -	K4	12

	Benefits - Legal Issues in Software - Case Study. **Current Trends : * Project Management Trends in 2022 ***		
	…… Self Study.		
Course Outcome	**CO1:** Recognize the principles and concepts of project management.	K1	
	CO2: Relate Knowledge gained to train software project managers.	K2	
	CO3: Sketch software project management methodologies.	K3	
	CO4: Analyze to create comprehensive project plans.	K3	
	CO5: Evaluate and mitigate risks associated with the software development process.	K4	

Learning Resources	
Text Books	1. Robert T. Futrel, Donald F. Shafer, Linda I. Safer, "Quality Software Project Management", Pearson Education Asia 2002.
Reference Books	1. PankajJalote, "Software Project Management in Practice", Addison Wesley 2002. 2. Hughes, "Software Project Management", Tata McGraw Hill 2004, 3rd Edition.
Website Link	1. NPTEL & MOOC courses titled Software Project Management.www.smartworld.com/notes/software-project-management
Self-Study Material	1. https://www.youtube.com/watch?v=3UH2j5dXB9k

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**		**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSC_	**SOFTWARE PROJECT MANAGEMENT**						**5**	**5**	**-**	**-**	**4**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	M	S	M	M
CO2	S	M	S	S	M	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	S	M	S	S	S	S	S	S
CO5	S	S	S	M	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.M.Ravi	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc., Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**SOFTWARE ENGINEERING LAB**			**4**	**-**	**-**	**4**	**2**

Objective	Students implement the different methods of Software testing and to write test cases using different testing techniques.		
	List of Exercises	**Knowledge Levels**	**Sessions**
1	To find the problem statement.	K1	4
2	To Prepare a Software Requirement Specification Document.	K1	4
3	To demonstrate the Software Configuration Management and Risk Management related documents.	K2	5
4	To show the entity relationship diagram.	K2	5
5	To apply the data flow diagrams at level 0 and level 1.	K3	5
6	To simplify the use case diagram.	K4	5
7	To Implement the activity diagram of all use cases.	K4	5
8	To Performing the Design by using any Design phase CASE tools.	K5	5
9	To Justify the test cases for unit testing and integration testing.	K5	5
10	To Compare the test cases for various white box and black box testing techniques.	K5	5
Course Outcome	**CO1:** Recite the methodology and tools necessary for engineering practice.	K1	
	CO2: Relate to elicit, analyze and specify software requirements.	K2	
	CO3: Sketch translate specifications into a design.	K3	
	CO4: Analyze derive test cases for different testing.	K3	
	CO5: Create solutions to modern problems in the software engineering perspective through requirement analysis, software design and construction, verification, and validation.	K4	

Learning Resources				
Text Books	1.Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018.			
Reference Books	1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997. 2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill. 3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.			
Website Link	1. https://kgr.ac.in/storage/2021/08/SE-LAB-Manual.pdf.			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSP_	**SOFTWARE ENGINEERING LAB**			**4**	**-**	**-**	**4**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	S
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	M	S	S	M	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Sample programs to related topic
Teaching and Learning Methods	Handling practical session through projector
Assessment Methods	Observation, Model practical's

Designed By	Verified By	Approved By
Mr.M.Ravi	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

List of Skill Based Elective Course (SEC) for B.Sc., Data Science SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards		
S.No.	**COURSE_CODE**	**TITLE OF THE COURSE**
1	23M_UDSS01	Introduction To Html
2	23M_UDSS02	Office Automation
3	23M_UDSS03	Qualitative Aptitude
4	23M_UDSS04	Cyber Forensics
5	23M_UDSS05	Multimedia Systems
6	23M_UDSS06	Software Testing
7	23M_UDSS07	Data Mining And Warehousing
8	23M_UDSS08	Bio Metrics
9	23M_UDSS09	Enterprise Resource Planning
10	23M_UDSS10	Robotics And Applications
11	23M_UDSS11	Simulation And Modeling
12	23M_UDSS12	Pattern Recognition
13	23M_UDSS13	Advanced Excel
14	23M_UDSS14	Open Source Software Technologies
15	23M_UDSS15	PHP Programming
16	23M_UDSS16	Web Technology
17	23M_UDSS17	Network Security
18	23M_UDSS18	Image Processing

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS01	**INTRODUCTION TO HTML**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to comprehend a webpage with graphics, links, tables, headings, lists, and other HTML elements.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Web Basics: What is Internet – Web browsers – What is Web page. **HTML Basics:** Understanding tags.	K1	5
II	T**ags for Document structure (HTML, Head, and Body Tag). Block level text elements:** Headings paragraph (<p>tag) – Font Style elements: (bold, italic, font, small, strong, strike, big tags).	K2	5
III	**Lists & Types of lists:** Ordered, Unordered – Nesting Lists – Other tags: Marquee, HR, and BR-Using Images – Creating Hyperlinks.	K3	4
IV	**Tables:** Creating basic able, Table elements, Caption – Table and cell alignment – Row span, Cols pan – Cell padding.	K4	5
V	**Frames:** Frame set – Targeted Links – No frame –forms: Input, Text area, Select, Option. ***Current Trends-Use of AI-Powered Chabot's*.**	K5	5
	…… Self Study.		

Course Outcome	**CO1:** Recall the basic concepts of HTML and the notion of resources within HTML.	K1	
	CO2: Relate the concept of metadata, as well as comprehends file-saving procedures.	K2	
	CO3: Apply the page formatting and the concept of lists in HTML.	K3	
	CO4: Analyze links in HTML and grasps linking to email addresses.	K4	
	CO5: Create images and tables in HTML.	K5	

Learning Resources				
Text Books	1. Mastering HTML5 and CSS3 Made Easy ‖, Teach U Comp Inc., 2014. 2. Thomas Michaud, "Foundations of Web Design : Introduction to HTML & CSS"			
Reference Books	1. Kenneth R Castleman, Digital image processing: Pearson Education,2/e,2003			
Website Link	1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf 2. https://www.w3schools.com/html/default.asp			
Self-Study Material	1. https://www.lambdatest.com/blog/web-development-trends/			
	L-Lecture	T-Tutorial	P-Practical	L-Lecture

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
RASIPURAM - 637408.

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS01	**INTRODUCTION TO HTML**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.E.Natarajan	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS02	**OFFICE AUTOMATION**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

Objective	Students understand the Microsoft Office which has different components like MS Word, MS Excel and Power point.

Unit	Course Content	Knowledge Levels	Sessions
I	Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems &its features: DOS– UNIX–Windows. Introduction to Programming Languages	K1	5
II	Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.	K2	4
III	Spreadsheets: Excel-opening, entering extend data, formatting, navigating; Formulas–entering, handling and copying; Charts–creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics	K3	5
IV	Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive application sin query language	K4	5
V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects, audio inclusion, timers. **Current Trends - * Cloud-Based Office Automation Solutions***	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Recall the basics of computer systems and its components.	K1	
	CO2: Relate the basic concepts of a word processing package.	K2	
	CO3: Sketch the basic concepts of electronic spreadsheet application	K3	

	CO4: Analyze the database management system.	K4	
	CO5: To create a presentation using PowerPoint tool.	K5	

Learning Resources				
Text Books	1. Peter Norton, "Introduction to Computers"–Tata McGraw-Hill			
Reference Books	1. JenniferAckermanKettel,GuyHat-Davis,CurtSimmons,"Microsoft2003",TataMcGraw Hill.			
Website Link	https://www.w3schools.com/sql https://www.tutorialspoint.com/sql			
Self-Study Material	1. https://start.docuware.com/glossary/cloud-office-automation 2. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1449748&query=Cloud-Based+Office+Automation+Solutions			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS02	**OFFICE AUTOMATION**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS03	**QUANTITATIVE APTITUDE**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students are understand the basic concepts of numbers and apply the concept of percentage, profit & loss, time and work							

Unit	Course Content	Knowledge Levels	Sessions
I	**Numbers:** HCF and LCM of numbers - Decimal fractions - Simplification - Square Root and cube roots - Average-problems on Numbers.	K1	5
II	**Problems on Ages:** Surds and Indices - percentage - profits and loss - ratio and proportion-partnership Chain rule.	K2	5
III	**Time and work**: Pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.	K3	5
IV	**Permutation and combination**: Probability-True Discount-Bankers Discount – Height and Distances Oddmanout& Series.	K4	4
V	**Calendar:** Clocks - stocks and shares - Data representation - Tabulation – BarGraphs – Piecharts - Linegraphs. . **Current Trends -* Mixture and Alligation ***	k5	5
	…… Self Study	k2	
Course Outcome	**CO1:** Remember the concepts, application and the problems of numbers	K1	
	CO2: Relate basic knowledge and understanding about percentage, profit & loss related processing.	K2	
	CO3: Apply the concepts of time and work	K3	
	CO4: Analyze about the concepts of probability, discount	K4	
	CO5: Create the concept of problem solving involved in stocks & shares, graphs	K5	

Learning Resources	
Text Books	R.S.Aggarwal, Quantitative Aptitude, S.Chand & Company Ltd
Reference Books	Vikas Experts, Quantitative Aptitude for Competitive Examination, S.Chand & Company Ltd

Website Link	1. https://www.javatpoint.com/aptitude/quantitative 2. https://www.toppr.com/guides/quantitative-aptitude/			
Self-Study Material	1. https://www.geeksforgeeks.org/alligation-or-mixture-aptitude-questions/ 2. https://www.indiabix.com/aptitude/alligation-or-mixture/			
	L-Lecture	**T-Tutorial**	**P-Practical**	**C-Credit**

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS03	**QUANTITATIVE APTITUDE**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	PO1	PO2	PO 3	PO4	PO5	PSO 1	PSO 2	PSO3	PSO 4	PSO5
CO1	S	M	M	M	L	S	M	M	M	L
CO2	M	S	L	M	M	S	M	M	M	L
CO3	M	M	S	S	M	M	M	M	M	M
CO4	S	M	M	S	S	M	M	M	M	M
CO5	L	M	S	S	S	L	M	M	M	S

Level of Correlation between CO and PO	L-LOW	M- MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.V.Vengadesh	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS04	**CYBER FORENSICS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students can learn to correctly define and cite appropriate instances for the application of computer forensics, collect and analyze computer forensic evidence and data seizure.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Overview of Computer Forensics Technology:** Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer - Forensics in Law Enforcement, Computer Forensics Assistance to Human - Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional - Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer. - Forensics Technology: Types of Business Computer Forensic, Technology.	K1	5
II	**Computer Forensics Evidence and capture:** Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence. **Collection and Data Seizure:** - Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps. **Controlling Contamination:** The chain of custody.	K2	5
III	**Duplication and Preservation of Digital Evidence:** Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. **Computer image Verification and Authentication**: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	K3	5
IV	**Computer Forensics Analysis:** Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. **Identification of Data:** Time Travel, Forensic Identification and Analysis of Technical	K4	5

	Surveillance Devices.		
V	**Reconstructing Past Events:** How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. **Networks:** Network Forensics Scenario, a technical approach, Destruction Of E–Mail, Damaging Computer Evidence, Documenting The Intrusion on Destruction of Data, System Testing. **Current Trends-* Cloud Forensics***	K5	4
	…… Self Study.		
Course Outcome	**CO1:** Recite the definition of computer forensics fundamentals.	K1	
	CO2: Remember the different types of computer forensics technology.	K2	
	CO3: Sketch various computer forensics systems.	K3	
	CO4: Analyze the methods for data recovery, evidence collection and data seizure.	K4	
	CO5: Design knowledge of duplication and preservation of digital evidence.	K5	

Learning Resources				
Text Books	1.John R. Vacca, “Computer Forensics: Computer Crime Investigation”, 3/E, Firewall Media, New Delhi, 2002.			
Reference Books	1.Nelson, Phillips Enfinger, Steuart, “Computer Forensics and Investigations” Enfinger, Steuart, CENGAGE Learning, 2004 2.AnthonySammes and Brian Jenkinson, ”Forensic Computing: A Practitioner's Guide”,Second Edition, Springer–Verlag London Limited, 2007. 3.RobertM.Slade,” Software Forensics Collecting Evidence from the Scene of a DigitalCrime”, TMH 2005.			
Website Link	1.https://www.geeksforgeeks.org/cyber-forensics/ 2.https://www.coursera.org/articles/computer-forensics			
Self-Study Material	1.https://oxygenforensics.com/en/resources/cloud-forensics/ 2. https://www.eccouncil.org/cybersecurity-exchange/computer-forensics/what-is-cloud-forensics/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS04	**CYBER FORENSICS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	M	M
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	M	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.A.Raja	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS05	**MULTIMEDIA SYSTEMS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students can learn to critical thinkers and creative producers of multiple modes of media, including communication, film/video, and graphic design, journalism, and sports communication.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Multimedia Definition**- Use Of Multimedia-Delivering Multimedia- Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text – Font Editing and Design Tools-Hypermedia and Hypertext.	K1	4
II	**Images:** Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -Digital Audio-Midi Audio-Midivs.	K2	5
III	**Animation:** The Power of Motion- Principles of Animation – Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays- Digital Video Containers- Obtaining Video Clips - Shooting and Editing Video.	K3	5
IV	**Making Multimedia:** The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs – An Authoring System Needs- Multimedia Production Team.	K4	5
V	**Planning and Costing:** The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content-Ownership of Content Created for Project-Acquiring Talent. **Current Trends:** Short-Form Videos, User Generated Content.	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Recalling the basics of Multimedia.	K1	
	CO2: Understanding the tools.	K2	
	CO3: Apply the tools and creating animation.	K3	
	CO4: Analyze the software and hardware needs.	K4	

	CO5: Evaluate the cost and planning.		K5	

Learning Resources				
Text Books	1. Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw- Hill, 2001.			
Reference Books	RalfSteinmetz & KlaraNahrstedt "Multimedia Computing, Communication & Applications", Pearson Education,2012.			
Website Link	https://www.gacwrmd.in/learning/Computer/7MCE3E3-Multimedia%20System.pdf			
Self-Study Material	Trends:https://www.medialocate.com/2021/06/top-7-multimedia-marketing-trends/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS05	**MULTIMEDIA SYSTEMS**			**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO - PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	S	S	S	M	S	S	M	S	M	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs. N.Hyrunnisha	HOD – Mr.G.Selvakumar	Member Secretary-Dr.S.Shahitha

B.sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS06	**SOFTWARE TESTING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to comprehend the fundamental principles of functional software testing and to articulate the mission and relay the status of testing effectively to the project team							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Purpose–Productivity and Quality in Software– Testing Vs Debugging– Model for Testing– Bugs– Types of Bugs – Testing and Design Style.	K1	5
II	**Flow / Graphs and Path Testing** – Achievable paths – Path instrumentation – Application– Transaction Flow Testing Techniques	K2	4
III	**Data Flow Testing Strategies** - Domain Testing: Domains and Paths – Domains and Interface Testing	K3	5
IV	**Linguistic**–Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing– Formats–Test Cases.	K4	5
V	**Logic Based Testing** – Decision Tables– Transition Testing– States, State Graph, State Testing.***Current Trends - Robotic Process Automation *.**	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Recall the basic concepts of functional (black box) software testing.	K1	
	CO2: Describe the basic application of techniques used to identify useful ideas for tests.	K2	
	CO3:Determine the mission and communicate the status of your testing with the rest of your project team	K3	
	CO4: Characterize a good bug report, peer-review the reports of your colleagues, and improve your own report writing	K4	
	CO5: Design testing concepts within the context of unified processes.	K5	

Learning Resources				
Text Books	1. B.Beizer,"Software Testing Techniques",IIEdn., Dream Tech India, NewDelhi, 2003. 2. K.V.K.Prasad, "Software Testing Tools",DreamTech. India, NewDelhi, 2005.			
Reference Books	1. Burnstein, 2003,"PracticalSoftwareTesting",SpringerInternationalEdn. 2. . Kit, 1995, "Software Testing in the Real World: Improving the Process", Pearson Education, Delhi. 3. R.RajaniandP, P.Oak, 2004, "SoftwareTesting", TataMcgrawHill, NewDelhi			
Website Link	1. https://www.techtarget.com/whatis/definition/software-testing 2.https://www.testim.io/blog/software-testing-basics/			
Self-Study Material	1.https://www.testingxperts.com/knowledge-center/latest-trends/ 2.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=5332142			
	L-Lecture	T-Tutorial	P-Practical	C- Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSS06	**SOFTWARE TESTING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.K.Gayathri	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS07	**DATA MINING AND WAREHOUSING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to understand the knowledge on Data Mining and Warehousing concepts and clustering methodologies, algorithms and applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction**: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Prepossessing: Pr-processing the Data – Data cleaning – Data Integration and Transformation – Data Reduction.	K1	4
II	**Basics :** Data Mining – Primitives -Languages and System Architecture : Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description - Data Generalization and Summarization.	K2	5
III	**Mining Association Rules**: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases - Multilevel Association Rules from transaction databases.	K2	5
IV	**Classification and Prediction:** Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation.	K3	5
V	**Cluster Analysis:** Introduction – Types of Data in Cluster Analysis - Petitioning Methods – Hierarchical Methods-Density Based Methods. **Current Trends : * Data mining and warehousing recent trends ***	K3	5
	…… Self Study.		
Course Outcome	**CO1:** Define the basic concepts and the functionality of the various data mining and data warehousing component.	K1	
	CO2: Construct the concepts of Data mining system architectures.	K2	
	CO3: Sketch the principles of association rules.	K3	
	CO4: Apply the idea on Classification and prediction	K3	

	methods.		
	CO5: Design the knowledge on Cluster analysis and its methods.	K5	

Learning Resources				
Text Books	1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.			
Reference Books	1. K.P. Soman, ShyamDiwakar, V. Ajay "Insight into Data Mining Theory and Practice ", Prentice Hall of India Pvt. Ltd, New Delhi. 2. Parteek Bhatia, „Data Mining and Data Warehousing: Principles and Practical Techniques", Cambridge University Press, 2019.			
Website Link	1. https://www.youtube.com/watch?v=xEmrFePGjEg&list=PLmAmHQ-_5ySxFoIGmY1MJao-XYvYGxxgj.			
Self-Study Material	1. https://www.youtube.com/watch?v=_c8PrEKXDOM.			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS07	**DATA MINING AND WAREHOUSING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	S	S	S	M	M	M	S	S	S	M
CO2	S	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	M	S	S	S	S	S	S
CO5	S	S	S	M	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Ravi	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS08	**BIOMETRICS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to understand biometric technologies and their functionalities , role of biometrics , computational methods , context of Biometric Applications							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction**: What is Biometrics - History - Types of biometric Traits - General architecture of biometric systems - Basic working of biometric matching. **Face Biometrics:** Introduction - Background of Face Recognition - Design of Face Recognition System.	K1	5
II	**Retina and Iris Biometrics:** Introduction - Performance of Biometrics - Design of Retina Biometrics - Design of Iris Recognition System - Iris Segmentation Method - Determination of Iris Region - Determination of Iris Region	K2	5
III	**Privacy Enhancement Using Biometrics:** Introduction - Privacy Concerns Associated with Biometric Deployments - Identity and Privacy - Privacy Concerns - Biometrics with Privacy Enhancement - Comparison of Various Biometrics in Terms of Privacy - Soft Biometrics.	K3	4
IV	**Watermarking Techniques:** Introduction - Data Hiding Methods - Basic Framework of Watermarking - Classification of Watermarking - Applications of Watermarking - Attacks on Watermarks - Performance Evaluation - Characteristics of Watermarks - General Watermarking Process.	K4	5
V	**Scope and Future:** Scope and Future Market of Biometrics - Biometric Technologies - Applications of Biometrics - Biometrics and Information Technology Infrastructure - Role of Biometrics in Enterprise Security - Role of Biometrics in Border Security - Smart Card Technology and Biometrics. **Current Trends-*Contactless Biometrics ***	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Identify the various biometric technologies	K1	
	CO2: Relate of biometric recognition.	K2	
	CO3: Sketch simple applications for privacy.	K3	
	CO4: Connect the need of biometric in the society.	K4	
	CO5: Design the scope of biometric techniques	K5	

Learning Resources				
Text Books	Biometrics: Concepts and Applications by G.R Sinha and Sandeep B.Patil , Wiley, 2013			
Reference Books	1.Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009 2.Introduction to Biometrics by Anil k. Jain, Arun A. Ross, KarthikNandakumar 3.Hand book of Biometrics by Anil K. Jain, Patrick Flynn, ArunA.Ross			
Website Link	1.https://en.wikipedia.org/wiki/Biometrics 2.https://www.techtarget.com/searchsecurity/definition/biometrics			
Self-Study Material	1.https://www.neurotechnology.com/contactless-biometrics.html 2.https://vilmate.com/blog/contactless-biometric-identification/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

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RASIPURAM - 637408.

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS08	**BIOMETRICS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	M	M	M	S
CO4	S	S	S	S	S	S	M	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion - Quiz program - Model preparation
Teaching and Learning Methods	Audio Video lecture - Chalk and Board class - Assignment - PPT Presentation and Video presentation
Assessment Methods	Class Test - Unit Test - Assignment - CIA-I - CIA-II and ESE

Designed By	Verified By	Approved By
Mr.A.Raja	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS09	**ENTERPRISE RESOURCE PLANNING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

Objective	Students learn the basic concepts of ERP, key terms, marketing dynamics and consoli functional data to ensure the real-time access to information for stakeholders and employees.

Unit	Course Content	Knowledge Levels	Sessions
I	**ERP Introduction**: Benefits – Origin - Evolution and Structure - Conceptual Model of ERP - the Evolution of ERP - the Structure of ERP - Components and needs of ERP - ERP Vendors - Benefits & Limitations of ERP Packages.	**6** K1	5
II	**Need to focus on Enterprise Integration/ERP:** Information mapping - Role of common shared Enterprise database - System Integration - Logical vs. Physical System Integration - Benefits & limitations of System Integration.	K2	5
III	**ERP Marketplace and Marketplace Dynamics**: Market Overview - Marketplace Dynamics - the Changing ERP Market. **ERP Functional Modules**: Introduction - Functional Modules of ERP Software - Integration of ERP - Supply chain.	K3	4
IV	**ERP Implementation**: Basics - ERP implementation Strategy - ERP Implementation Life Cycle - Pre- Implementation task - Role of SDLC/SSAD - Object Oriented Architecture – Consultants - Vendors and Employees.	K4	5
V	**ERP & E-Commerce:** Future Directives - in ERP - ERP and Internet - Critical success and failure factors - Integrating ERP into organizational culture. **Using ERP tool**: either SAP or ORACLE format to case study. **Current Trends: *8 ERP Trends for 2023**.*	K5	5
	…….. Self Study.		
Course Outcome	**CO1:** Remember the basic concepts of ERP.	K1	
	CO2: Identify the different technologies used in ERP.	K2	
	CO3: Apply the concepts of ERP Manufacturing perspective and ERP Modules.	K3	
	CO4: Access the Life cycle models.	K4	

	CO5: Interpret the different tools used in ERP to the Future Directives.	K5	

Learning Resources	
Text Books	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.
Reference Books	1. Enterprise Resource Planning – Diversified by Alexis Leon, TMH. 2. Enterprise Resource Planning – Ravi Shankar & S. Jaiswal, Galgotia.
Website Link	1. https://www.investopedia.com/terms/e/erp.asp 2. https://praxisinfosolutions.com/blog/erp-modules-business-benefits/
Self-Study Material	1. https://www.netsuite.com/portal/resource/articles/erp/erp-trends.shtml

	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSS09	**ENTERPRISE RESOURCE PLANNING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	S	S	M	M
CO2	M	S	S	S	S	M	S	S	S	S
CO3	M	M	S	S	S	M	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	M	M	S	S	S	S	S	S	S
Level of Correlation between CO and PO				L-LOW			M-MEDIUM			S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.N.Padmapriya	HOD - Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS10	**ROBOTICS AND APPLICATIONS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to Develop a comprehensive understanding of robot drive systems, explore sensors and their diverse applications in robotics and gain familiarity with robot components.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction:** Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	K1	5
II	**Actuators and sensors** :Types of actuators, stepper-DC servo-and brushless motors- model of a DC servo motor types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers	K2	5
III	**Localization:** Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based Localizations – Ultrasonic based localizations - GPS localization systems.	K3	5
IV	**Path Planning:** Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies.	K4	4
V	**Application:** Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications. **Current Trends- * Soft Robotics - Cognitive Robotics***	K4	5
	…… Self Study.		
Course Outcome	**CO1:** Recite the different physical forms of robot architectures.	K1	
	CO2: Illustrate the Concept of Actuators and sensors.	K2	

	CO3: Utilize the models of robot system.	K3	
	CO4: Categorize the manipulation and navigation problems of AI in Robotics.	K4	
	CO5: Determine the performance of the Nuclear and Space Applications of Robotics.	K4	

Learning Resources				
Text Books	1. RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, "Robotic Engineering and Integrated Approach", Prentice Hall India-Newdelhi-2001. 2. SaeedB.Nikku, "Introduction to robotics, analysis, control and applications", WileyIndia, 2nd edition 2011.			
Reference Books	1. M.P.Groover, "Industrial robotic technology-programming and application", McGraw hill 2008. 2. S.R.Deb, "Robotics technology and flexible automation", THH-2009.			
Website Link	https://www.javatpoint.com/robotics-tutorial			
Self-Study Material	https://www.elveflow.com/microfluidic-reviews/general-microfluidics/soft-robot/ https://neura-robotics.com/cognitive-robots-the-new-era-of-true-collaboration			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSS10	**ROBOTICS AND APPLICATIONS**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.K.Vijayakumar	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS11	**SIMULATION AND MODELING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to the concepts of modeling and simulation methodologies and tools for simulation and modeling of a real time problem/ mathematical model.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction To Modeling & Simulation:** What is Modeling and Simulation? – Complexity Types – Model Types – Simulation Types – M&S Terms and Definitions Input Data Analysis – Simulation Input Modeling.	K1	5
II	**Random Variate Generation:** Random Numbers – Random Number Generators – General principles – Inverse Transform Method –Acceptance Rejection Method – Composition Method –Relocate and Rescale Method - Specific distributions-Output Data Analysis.	K2	4
III	**Comparing Systems via Simulation**: Introduction – Comparison Problems - Comparing Two Systems - Screening Problems - Selecting the Best - Comparison with a Standard - Comparison with a Fixed Performance Discrete Event Simulations – Introduction - Next-Event Time Advance.	K3	5
IV	**Entity Modeling:** Entity Body Modeling – Entity Body Visualization – Entity Body Animation – Entity Interaction Modeling – Building Modeling Distributed Simulation – High Level Architecture (HLA).	K4	5
V	**Optimization Algorithms:** Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.***Current Trends – Additive Manufacturing and generative Design*.**	K5	5
	…… Self Study.		

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Title	**Course Title**		**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS11	**SIMULATION AND MODELING**		**SEC THEORY**			**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	M	S
CO2	L	M	L	S	M	S	S	M	S	S
CO3	M	S	S	M	S	S	S	S	M	S
CO4	S	M	M	S	S	S	M	M	S	M
CO5	S	S	M	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L- LOW	M-MEDIUM	S-STRONG
Tutorial Schedule	Group Discussion, Quiz program, Model preparation		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		

Designed By	**Verified By**	**Approved By**
Mrs.S.Shahana	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS12	**PATTERN RECOGNITION**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to study the Pattern Recognition techniques and its applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**PATTERN RECOGNITION OVERVIEW:** Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches.	K1	5
II	**STATISTICAL PATTERN RECOGNITION:** Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.	K2	5
III	**LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING:** Introduction-Discrete and binary Classification Problems Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised learning and classification.	K3	4
IV	**SYNTACTIC PATTERN RECOGNITION:** Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference.	K4	5
V	**NEURAL PATTERN RECOGNITION:** Introduction to Neural Networks-Feed forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR. Current Trends:*Feed forward Networks and training by Back Propagation*	K4	5
	***……* Self Study.**		
Course Outcome	**CO1:** Recall the fundamentals of Pattern Recognition techniques and countermeasures	K1	
	CO2: Remember the various Statistical Pattern recognition techniques	K2	
	CO3: Apply the linear discriminant functions ind unsupervised learning and clustering	K3	
	CO4: Classify the various Syntactic Pattern recognition techniques	K4	
	CO5: Categorize the Neural Pattern recognition techniques	K4	

Learning Resources				
Text Books	1.Robert Schalkoff, “Pattern Recognition: Statistical Structural and Neural Approaches”, John wiley & sons.			
Reference Books	Earl Gose, Richard Johnson baugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India, Pvt Ltd, New Delhi. 2. Duda R.O., P.E.Hart & D.G Stork, “ Pattern Classification”, 2nd Edition, J.Wiley.3. Duda R.O.& Hart P.E., “Pattern Classification and Scene Analysis”, J.wiley. 4. Bishop C.M., “Neural Networks for Pattern Recognition”, Oxford University Press.			
Website Link	1.https://www.javatpoint.com/pattern-recognition-in-machine-learning			
Self-Study Material	1.https://www.coursera.org/articles/feedforward-neural-network			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Title	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS12	**PATTERN RECOGNITION**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	M	S	S	M
CO2	L	M	L	S	M	M	S	S	S	S
CO3	M	S	S	M	S	S	M	S	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	S	M	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mrs.R.Suguna	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS13	**ADVANCED EXCEL**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students Handle the large amounts of data, validation of data with Excel functions. Create a pivot tables to consolidate data from multiple files Presenting data in the form of charts and Graphs							

Unit	Course Content	Knowledge Levels	Sessions
I	**Basics of Excel :** Customizing common options - Absolute and relative cells-Protecting and un-protecting worksheets and cells - Working with Functions - Writing conditional expressions – logical functions-look up and reference functions-HLookUP with Exact Match , Approximate Match-Nested HLookUP with Exact Match - HLookUP with Tables, Dynamic Ranges-Nested HLookUP with Exact Match-Using HLookUP to consolidate Data From Multiple Sheets.	K1	4
II	**Data Validations:** Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of templates for standardization of worksheets-Sorting and Filtering Data-Sorting tables.	K2	5
III	**Pivot tables:** Creating Pivot tables Formatting and customizing Pivot tables advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables-external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field-Viewing Subtotal Under Pivot-Creating Slicers.	K3	5
	More Functions: Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for		

IV	worksheets- Using conditional formatting option forrows, columns and cells-WhatIf Analysis-Goal Seek- Data Tables- Data connection-Scenario manager.	K4	5
V	**Charts:** Creation of charts - Formatting Charts- 3D Graphs- Bar and Line Chart together-Secondary Axis in Graphs- Sharing Charts with PowerPoint/MSWord, Dynamically-New Features Of Excel Sparklines – Macros - Indexing- Overview of all the new features. **Current Trends - *Conditional Formatting ***	K5	5
	*……*Self Study.		
Course Outcome	**CO1:** Recall the functions to handle large amounts of data in Excel.	K1	
	CO2: Summarize the template for validating a data	K2	
	CO3: Sketch a pivot table to consolidate data from multiple files.	K3	
	CO4: Inspect a spread sheet using advanced functions in Excel.	K4	
	CO5:Design a data in the form of charts and graphs	K5	

Learning Resources				
Text Books	1. Excel 2019 All 2. Microsoft Excel 2019 Pivot Table Data Crunching			
Reference Books	1. RituArora-MasteringAdvancedExcelPaperback–21July2023			
Website Link	1. https://www.tutorialspoint.com/advanced_excel/index.htm 2. https://www.w3schools.com/EXCEL/index.php			
Self-Study Material	1. https://www.w3schools.com/excel/excel_conditional_formatting.php			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSS13	**ADVANCED EXCEL**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	M	M	M	L	S
CO2	S	S	M	M	M	S	M	M	L	L
CO3	M	M	M	S	S	S	M	L	M	L
CO4	M	M	M	S	S	S	S	M	M	M
CO5	M	M	S	M	M	S	M	L	S	L

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Purusothaman	HOD - Mr.G.Selvakumar	Member Secretary-Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS14	**OPEN SOURCE SOFTWARE TECHNOLOGIES**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to comprehend the applications of OOPS concepts and analyze overriding and packages through java programs and identify the significance and application of Classes, arrays and Interfaces and analyzing java arrays.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to Open Source:** open source vs. commercial software – What is Linux? – Free Software – Where I can use Linux? - Linux kernel – Linux distributions.	K1	5
II	Introduction Linux Essential Commands – File System concept – Standard Files –The Linux Security Model – Introduction to Unix – Unix Components Unix Files.	K2	5
III	Introduction - Apache Explained – Starting, Stopping and Restarting Apache –Modifying the Default configuration – securing Apache – Set user and Group.	K3	4
IV	**MySQL:** Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table.	K4	5
V	**Introduction to PHP:** PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records. **Current Trends- * Open Source Software for Sustainability*.**	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Recall the basic concepts in Java, application of OOPS concepts.	K1	
	CO2: Acquire knowledge about operators and decision making statements.	K2	
	CO3: Identify significance and application of Classes, arrays and interfaces and analyzing java arrays.	K3	
	CO4: Analyze applications of OOPS concepts and analyze overriding and packages through java programs.	K4	
	CO5: Create window-based programming using applet and graphics programming.	K5	

Learning Resources				
Text Books	1. James Lee and Brent Ware "Open Source Web Development with LAMP Using. 2. LINUX, Apache, MySQL, Perl and PHP", Dorling Kindersley (India) Pvt. Ltd, 2008.			
Reference Books	1. Eric Rosebrock, Eric Filson, "Setting up LAMP: Getting Linux, Apache, MySQL and PHP and working together", John Wiley and Sons, 2004. 2. Anthony Butcher , "Teach Yourself MySQL in 21 days", 2nd Edition, Sams Publication. 3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska , "Apache Administrator‟s Handbook", Sams Publication. 4. Tammy Fox, "RedHat Enterprise Linux 5 Administration Unleashed", Sams Publication. 5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press,"Beginning PHP5, Apache, MySQL Web Development", 2005.			
Website Link	1. Introduction to Open-Source and its benefits - GeeksforGeeks 2. https://www.bing.com/			
Self-Study Material	https://www.openlogic.com/blog/open-source-trends#open-source-software-for-sustainability			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS14	**OPEN SOURCE SOFTWARE TECHNOLOGIES**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	PO1	PO2	PO 3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.E.Natarajan	HOD – Mr.G.Selvakumar	Member Secretary Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS15	**PHP PROGRAMMING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

Objective	Students learn the fundamentals of PHP programming, object-oriented programming (OOP), file handling, database interactions, web development concepts, frameworks, and best practices for building robust and scalable web applications.

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction to PHP:** Basic Knowledge of websites Introduction of Dynamic Website- Introduction to PHP-Scope of PHP XAMPP and WAMP Installation.	K1	5
II	**PHP Programming Basics:** Syntax of PHP-Embedding PHP in HTML Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types – Using Operators -Using Conditional Statements –If (), else if() and else if condition Statement.	K2	5
III	**Control Statements:** Switch () Statements-Using the while()Loop Using the for()Loop PHP Functions. PHP Functions –Creating an Array- Modifying Array Elements Processing Arrays with Loops- Grouping Form Selections with Arrays-Using Array Functions.	K3	4
IV	**PHP Advanced Concepts**: Reading and Writing Files - Reading Data from a File.	K4	5
V	**Managing Sessions:** Session Variables-Destroying a Session to ring Data in Cookies- Setting. **Current Trends**-* Artificial Intelligence In Databases*	K5	5
	…… Self Study.		

Course Outcome	CO1: Remembering basic concepts of data base system	K1
	CO2: Understand a Data model and Schemas in RDBMS	K2
	CO3: Apply Competent in use of SQL	K3
	CO4: Analyze functional dependencies for designing robust Database	K4
	CO5: Creating basic Concepts of database system	K5

Learning Resources

Text Books	1.S.Sumathi, S.Esakkirajan,—FundamentalsofRelationalDatabaseManagement System‖,SpringerInternationalEdition2007.			
Reference Books	1.AbrahamSilberchatz,HenryF.Korth,S.Sudarshan,—DatabaseSystemConcepts‖, McGrawHill2019,7thEdition 2. AlexisLeon&MathewsLeon,—FundamentalsofDBMS‖,VijayNicolePublications 2014,2ndEdition.			
Website Link	https://www.geeksforgeeks.org/plsql-introduction/			
Self-Study Material	https://www.datamation.com/cloud/current-database-trends/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDS15	**PHP PROGRAMMING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mr.V.Vengadesh	HOD – G.Selvakumar	Member Secretary Dr. S.Shahitha

B.sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS16	**WEB TECHNOLOGY**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**
Objective	Students learn to study the concept of Hypertext Markup Language (HTML) and create websites using client-side web programming languages such as HTML, DHTML, CSS, XML, JavaScript, and AJAX.							

Unit	Course Content	Knowledge Levels	Sessions
I	**HTML:** HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment- links-tables frames	K1	5
II	**Forms & Images Using Html:** Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page	K2	5
III	**XML & DHTML:** Cascading style sheet (CSS)-what is CSS-Why we use CSS adding CSS to your web pages-Grouping styles-extensible markup language (XML).	K3	4
IV	**JavaScript:** Client side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.	K4	5
V	**Ajax:** Introduction, advantages & disadvantages, Purpose of it, ajax based web application, alternatives of ajax Java Script & AJAX: Introduction to array operators, making statements-date & time-mathematics- strings-Event handling form properties. AJAX. Introduction to jQuery and AngularJS. ***Current Trends - AI-Powered Chatbots*.**	K5	5
	…… Self Study.		
Course Outcome	**CO1:** Recall and publish Web pages using Hypertext Markup Language (HTML).	K1	
	CO2: Relate the page styles and layout with Cascading Style Sheets (CSS).	K2	
	CO3: Analyze and apply the role of languages to create a capstone	K3	

	CO4: Design Website using client-side web programming languages like HTML, DHTML, CSS, XML, JavaScript, and AJAX	K4	
	CO5: Create a program using jQuery and AngularJS	K5	

Learning Resources	
Text Books	1. Pankaj Sharma, "Web Technology", SkKataria & SonsBangalore, 2011.(UNIT I, II, III &IV). 2. Achyut S Godbole&AtulKahate, "Web Technologies", 2002, 2nd Edition. (UNIT V:AJAX)
Reference Books	1. Laura Lemay, RafeColburn , Jennifer Kyrnin, "Mastering HTML, CSS & Java script Web Publishing",2016. 2. DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2ndEdition.
Website Link	1.https://www.techtarget.com/whatis/definition/XML-Extensible-Markup-Language 2.https://www.codecademy.com/catalog/language/javascript
Self-Study Material	1.https://www.globalmediainsight.com/blog/web-development-trends/ 2.https://link.springer.com/book/10.1007/978-1-84628-666-7

	L-Lecture	T-Tutorial	P-Practical	C- Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
RASIPURAM - 637408.

B.sc Data ScienceSyllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M_UDSS16	**WEB TECHNOLOGY**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	L	M	S	S	S
CO2	M	S	S	S	S	S	M	S	S	S
CO3	M	M	S	S	L	S	M	M	S	L
CO4	M	S	M	S	S	S	M	S	S	S
CO5	M	S	M	L	L	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	**Verified By**	**Approved By**
Mrs.K.Gayathri	HOD - Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS17	**NETWORK SECURITY**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

Objective	Students learn to the concepts of network security and cryptography authentication and to design and develop algorithms for network security.

Unit	Course Content	Knowledge Levels	Sessions
I	Model of network security – Security attacks - services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher Principles DES– Strength of DES – Block cipher design principles – Block cipher mode of operation.	K1	4
II	Number Theory – Prime number – Modular arithmetic – Euclid's algorithm.	K2	5
III	Authentication requirement – Authentication 6 function – MAC – Hash function – Security of hash function and MAC – SHA - HMAC – CMA.	K2	5
IV	Authentication applications – Kerberos – X.509 Authentication services - E-mail security – IP security - Web security.	K3	5
V	Intruder–Intrusion detection system – Virus and related threats – Counter measures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security. **Current Trends: * Trends for the Security Industry*.**	K4	5
	…… Self Study.		
Course Outcome	**CO1:** Recall the fundamentals of a network and its security.	K1	
	CO2: Classify the appreciation for the complexities of protecting networks and systems from attack.	K2	
	CO3: Sketch the tools used to detect and protect against malicious attacks.	K3	
	CO4: Analyze the skills to configure various security-related technologies.	K3	
	CO5: Design protocols such as TLS/SSL, IPSec, and SNMP in order to build secure systems.	K4	
Learning Resources			

Text Books	1. William Stallings, "Cryptography & Network Security", Pearson Education, Fourth Edition 2010.			
Reference Books	1.Charlie Kaufman, RadiaPerlman,Mike Speciner, "Network Security, Private communication in public world", PHI Second Edition,2002. 2.BruceSchneier,NeilsFerguson,"PracticalCryptography",WileyDreamtechIndi aPvtLtd,FirstEdition,2003. 3.Douglas R Simson" Cryptography– Theory and practice", CRC Press, First Edition,1995.			
Website Link	1. https://www.youtube.com/watch?v=zd0U1zNBYNk			
Self-Study Material	1. https://www.youtube.com/watch?v=IRCUokSvcdo			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc.,Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS17	**NETWORK SECURITY**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	S
CO2	S	S	S	S	M	S	S	S	S	M
CO3	S	M	S	S	S	S	M	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE

Designed By	Verified By	Approved By
Mr.M.Ravi	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.SC Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS18	**IMAGE PROCESSING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

Objective	Students can learn to familiar with digital image fundamentals, degradation function and restoration techniques, image segmentation and representation techniques.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization	K1	5
II	**IMAGE ENHANCEMENT**: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering	K2	5
III	**IMAGE RESTORATION:** Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters	K3	5
IV	**IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging	K4	5
V	**IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. **Current Trends - * Tiny ML***	K5	4
	…… Self Study.		
Course Outcome	**CO1:** Gain a fundamental understanding of digital image processing.	K1	
	CO2:Learn the basics of how digital images are represented and processed.	K2	
	CO3: Understand image enhancement techniques.	K3	
	CO4: Develop your programming skills to apply digital image processing algorithms.	K4	
	CO5: Design solutions for real-world problems that involve digital image processing.	K5	

Learning Resources	
Text Books	1. Anil K. Jain , Digital Image Processing: Principles and Applications 2. Wayne Niblack, "Introduction to Digital Image Processing" 3. B.S. Manjunath and Srimat T.V. Rao, "Digital Image Processing: An Algorithmic Approach Using Java"

Reference Books	1. Rafael C. Gonzalez and Richard Eugene Woods, "Digital Image Processing"			
Website Link	1.https://www.learnopencv.com/ 2.https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-435j-digital-image-processing-fall-2004/ 3. http://web.stanford.edu/class/cs155/			
Self-Study Material	1.https://www.geeksforgeeks.org/generative-adversarial-network-gan/ 2.https://en.wikipedia.org/wiki/Generative_adversarial_network			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc Data Science Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M_UDSS18	**IMAGE PROCESSING**	**SEC THEORY**		**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	M
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	M	M	S	S	S
CO4	S	S	S	S	S	S	M	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG
Tutorial Schedule	Group Discussion, Quiz program, Model preparation		
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation		
Assessment Methods	Class Test, Unit Test, Assignment, CIA-I, CIA-II and ESE		

Designed By	**Verified By**	**Approved By**
Mr.A.Raja	HOD – Mr.G.Selvakumar	Member Secretary – Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M5UDSIS1	**INTERNSHIP**	**INTERNSHIP**	**V**	**-**	**-**	**-**	**-**	**2**
Objective	Students gain optimum exposure on the practical aspects of IT industry							

S. No.	Guidelines for Internship Training Programme	Knowledge Levels	Sessions
1	The student should undergo **15 Days Internship** training in IT industry/ Private sector during the vacation which starts at the end of the 4th Semester.	K2-K4	
2	The training bridges the gap between the theoretical knowledge gained in the college and the practical application of the same in the institute / industry / company. The student will have a better exposure about the workplace and its nuances.		
3	Schedule of visit to be made by the staff is to be prepared by the HOD / Staff-in-charge.		
4	The trainees should strictly adhere to the rules and regulations and working hours of the institutions to which they are attached.		
5	A Staff member of a Department (Guide) will be monitoring the performance of the Candidate.		
6	The students should maintain a daily E - Attendance where the student should record his details of the training.		
7	The trainees have to obtain a certificate on successful completion of the internship from the chief executive of industry.		
8	The student should submit an attendance certificate to the institution for 15 days internship training from industry.		
9	Internship Training Report (30 – 50 pages) should be prepared by the student and submitted in a month's time and at the end of the semester student should present the report with a power point presentation.		
10	Industrial training reports shall be prepared by the students under the supervision of the faculty of the department.		
11	Industrial training report must contain the following: Cover page, Copy of training certificate, Profile of an industry report about the work undertaken by them during the tenure of training observation about the concern findings.		

12	Viva – voce examination will be conducted with internal & external examiners at the end of the **5th semester** and the credits will be awarded.		
13	Report Evaluation: External Viva-Voce examination will be conducted and the maximum mark is 100.		
Course Outcome	**CO1:** Apply new techniques and ideas in Computer industry	K3	
	CO2: Analyze the results of new initiatives	K4	
	CO3: Create a new work plan with greater output	K6	
	CO4: Create a framework of work execution ideas	K6	
	CO5: Create a detailed technical work plan and terminologies to be followed in industry.	K6	
Learning Resources			
Website Link	1.https://www.tutorialspoint.com/r/index.htm 2.https://www.javatpoint.com/net-framework 3.https://www.w3schools.com/java/java_intro.asp 4.https://www.w3schools.com/r/		

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M5UDSIS1	**INTERNSHIP**	**INTERNSHIP**	**V**	**-**	**-**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	M	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M	S	S	S
CO5	M	S	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	**CIA – 100 Marks** 1. Work Log Book – 25 Marks 2. Training Report and Viva-Voce – 75 Marks

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni Mr.M.Ravi Mr.V.Vengadesh	HOD - Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSPR1	**PROJECT WORK**	**PROJECT WORK**	**VI**	**4**	**4**	**-**	**-**	**4**
Objective	Students grasp the real-time software development environment and acquire comprehensive knowledge for chosen problem and programming language/software for their project work.							

Guidelines for Project Work and Viva Voce

PROJECT PLANNING:

B.Sc., (Data Science) Project is a complex undertaking that requires meticulous planning well in advance. The topic must be selected at the beginning of the final year, with related reading, training, and project discussions to be completed during the first term.

SELECTION OF TEAM:

Mini project is approached collaboratively as a team effort. It is recommended to select team members randomly, practical considerations may allow students the option to self-organize into teams of two members each, with a designated team leader. Each team must maintain written minutes of meetings and ensure clear assignment of tasks to every member. These meeting minutes will be incorporated into the project report. Despite working in groups, each student must independently handle distinct modules of the project and submit individual reports.

SELECTION OF TOOLS:

Students are free to choose any platform, tools, or programming languages for their project work, with a strong recommendation towards open source options wherever feasible. The evaluation of the project will not consider the choice of tools as a criterion.

REGULATIONS OF PROJECT WORK

Three copies of the project report must be submitted by each student.

- The final outer dimensions of the project report shall be 21cm X 30 cm.
- Only hard binding should be done. The text of the report should be set in 12pt, Times New Roman, 1.5 spaced. Headings should be set as follows: CHAPTER HEADINGS 16pt, Times New Roman, Bold, All caps and Centered.

Section Headings 14pt Times New Roman, Bold, Left adjusted. Section Sub-heading 12pt, Times New Roman.

- Title of figures, tables etc.., are done in 12 point, Times New Roman, Bold and Centered.
- 1.5 space need be left above a section or subsection heading and no space may be left after them. References shall be IEEE format (see any IEEE magazine for detail).
- While doing the project keep note of all books you refer, in the correct format and include them in alphabetical order in your reference list. The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the First

Week of December.

- Periodically the project should be reviewed.
- A Sample format is enclosed in Annexure-II.
- Format of the Title page and Certificate are enclosed in Annexure III.
- The students may use power point presentation during their viva voce examination.

Course Outcome	**CO1:** Identification of Research Area	K4	
	CO2: Analyze of problem solving skills	K4	
	CO3: Analyze sources for conduct of Research	K4	
	CO4: Evaluate the research report	K5	
	CO5: Create the research report	K6	

Learning Resources	
Text Books	1. Research Methodology: Methods and Techniques, by C.R. Kothari, New Age Publications, 2009.
Reference Books	1. Research Methodology: Methods and Techniques by C.R. Kothari, New Age Publications, 1985. 2. Essentials of Research Design and Methodology by: Geoffrey R. Marczyk, David DeMatteo, David Festinger, 2005.
Website Link	1. http://gen.lib.rus.ec/

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSPR1	**PROJECT WORK**	**PROJECT WORK**	**VI**	**4**	**4**	**-**	**-**	**4**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	S	M	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	M	M	M	S	S	M	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Working with programming languages such as R, Python, Java, .Net, etc..,
Assessment Methods	Attendance, Review / Work Diary, Final Report and Viva Voce

Designed By	Verified By	Approved By
Mrs.V.Krishnaveni Mr.M.Ravi Mr.V.Vengadesh	HOD - Mr.G.Selvakumar	Member Secretary - Dr.S.Shahitha

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M6UDSOE1	**DATA SCIENCE FOR COMPETITIVE EXAMINATION**	**PROFESSIONAL COMPETENCY SKILL (SELF STUDY)**	**VI**	**-**	**-**	**-**	**-**	**4**
Objective	Students can creating awareness about competitive examinations, imparting knowledge on their impact, and fostering a positive attitude towards appearing in such exams.							

Guidelines for Competitive Examination

This course comprehensively covers Python, Data Structures and algorithms, Data Science, Internet of Things, Operating Systems, Problem Solving Techniques, Database Management Systems, Computer Networks, Programming Languages (with a focus on Java), Artificial Intelligence, and Machine Learning.

It emphasizes recent advancements in these fields and aims to provide a holistic understanding through factual content and multiple-choice questions (MCQs). This makes it highly suitable for university and institute students preparing for entrance exams, as well as those gearing up for national and state-level competitive exams like TANCET, IBPS, and SSC, which follow an MCQ format.

1. Objective type online examination will be conducted at the end of 6th semester.
2. Questions must be taken from all courses of the Data Science Programme.
3. Test critical thinking through multiple-choice questions that challenge learners to interpret facts, evaluate situations, explain cause and effect relationships, make inferences, and predict outcomes.
4. Emphasize higher-level thinking with memory-plus application-oriented questions that prompt students to recall principles, rules, or facts within real-life contexts.
5. HOD's instruct to the faculty to prepare minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students.

Course Outcome	**CO1:** Remember the fundamental techniques for implementing programming languages.	K1	
	CO2: Interpret problem solving techniques to develop skills for competitive exams.	K2	
	CO3: Organize Computational problems for real time problems.	K3	

	CO4: Analyze Computer techniques and software development fundamentals to produce computing-based solutions	K4	
	CO5: Evaluate complex computing problems to apply fundamental computing principles effectively.	K5	
Learning Resources			
Reference Books	1. Computer Knowledge for SBI/ IBPS Clerk/ PO/ RRB/ RBI/ SSC/ Insurance Exams 2nd Edition,Disha Publication. 2. M.C.Qs For Competitive Exams Computer Science, LBH Authors' Division, Library Book House.		
Website Link	1. https://nptel.ac.in/courses/106106092 2. https://www.digimat.in/nptel/courses/video/106101061/L01.html 3. https://www.digimat.in/nptel/courses/video/106104122/L01.html		

B.Sc Data Science Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M6UDSOE1	**DATA SCIENCE FOR COMPETITIVE EXAMINATION**	**PROFESSIONAL COMPETENCY SKILL (SELF STUDY)**	**VI**	**-**	**-**	**-**	**-**	**4**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	M	M	S	S	S	M	M	S	S	S	
CO2	S	S	S	S	S	M	S	S	S	S	
CO3	L	M	S	S	M	S	S	S	M	M	
CO4	M	S	L	M	S	L	S	S	M	M	
CO5	M	M	M	S	S	M	M	S	S	S	

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Learning Computer Science Courses.
Assessment Methods	CIA I and CIA II Exams

Designed By	Verified By	Approved By
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