ALAGAPPA UNIVERSITY

(A State University Established in 1985)

Karaikudi - 630003. Tamil Nadu, India

2017 Accredited with A+ Grade by NAAC (CGPA : 3.64)

2018 MHRD Govt. of India UGC Graded as Category - I Granted Autonomy

2018 MHRD Swachh Campus Rank : 4

2021 nirf National Institutional Ranking Framework Rank : 33

2021 QS University Rankings Asia Rank : 199

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER APPLICATIONS

M.Sc., ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATIONS AND SYLLABUS

(For the candidates admitted from the Academic Year 2023 - 2024)

DEPARTMENT OF COMPUTER APPLICATIONS
M.Sc., Artificial Intelligence and Data Science

REGULATIONS AND SYLLABUS

[For the candidates admitted from the Academic Year 2023– 2024 onwards]

ALAGAPPA UNIVERSITY

(A State University Accredited with "A+" grade by NAAC (CGPA: 3.64) in the Third Cycle andGraded as Category-I University by MHRD-UGC)

Karaikudi -630003, Tamil Nadu.

ALAGAPPA UNIVERSITY
DEPARTMENT OF COMPUTER APPLICATIONS
Science Campus, Karaikudi -630003, Tamil Nadu.

REGULATIONS AND SYLLABUS - (CBCS-University Department)
[For the candidates admitted from the Academic Year 2023 – 2024 onwards]

Name of the Department : Computer Applications

Name of the Programme : M.Sc., Artificial Intelligence and Data Science

Duration of the Programme : Full Time (Two Years)

Choice-Based Credit System

A choice-Based Credit System is a flexible system of learning. This system allows students to gain knowledge at their own tempo. Students shall decide on electives from a wide range of elective courses offered by the University Departments in consultation with the Department committee. Students undergo additional courses and acquire more than the required number of credits. They can also adopt an inter-disciplinary and intra-disciplinary approach to learning, and make the best use of the expertise of available faculty.

Programme

"Programme" means a course of study leading to the award of a degree in a discipline.

Courses

'Course' is a component (subject paper) of a programme. Each course offered by the Department is identified by a unique course code. A course contains lectures/ tutorials/laboratory/seminar/project / practical training/report writing /Viva-voce, etc or a combination of these, to meet effectively the teaching and learning needs.

Credits

The term "Credit" refers to the weightage given to a course, usually in relation to the instructional hours assigned to it. Normally in each of the courses credits will be assigned on the basis of the number of lectures/tutorial/laboratory and other forms of learning required to complete the course contents in a 15-week schedule. One credit is equal to one hour of lecture per week. For laboratory/field work one credit is equal to two hours.

Semesters

An Academic year is divided into two Semesters. In each semester, courses are offered in 15 teaching weeks and the remaining 5 weeks are to be utilized for conduct of examination and evaluation purposes. Each week has 30 working hours spread over 5 days a week.

Medium of Instruction: English

Departmental committee

The Departmental Committee consists of the faculty of the Department. The Departmental Committee shall be responsible for admission to all the programmes offered by the Department including the conduct of entrance tests, verification of records, admission, and evaluation. The Departmental Committee determine the deliberation of courses and specifies the allocation of credits semester-wise and course-wise. For each course, it will also identify the number of credits for lectures, tutorials, practical, seminars etc. The courses (Core/Discipline Specific Elective/Non-Major Elective) are designed by teachers and approved by the Departmental Committees. Courses approved by the Departmental Committees shall be approved by the Board of Studies/Broad Based Board of Studies. A teacher offering a course will also be responsible for maintaining attendance and performance sheets (CIA -I, CIA-II, assignments and seminar) of all the students registered for

the course. The Non-major elective programme, MOOCs coordinator and Internship Mentor are responsible for submitting the performance sheet to the Head of the department. The Head of the Department consolidates all such performance sheets of courses pertaining to the programmes offered by the department. Then forward the same to be Controller of Examinations.

Programme Educational Objectives

PEO-1	To implement Artificial Intelligence and Data Science techniques such as search algorithms, neural networks, machine learning and data analytics for solving a problem and designing novel algorithms for successful career and entrepreneurship.
PEO-2	To offer high-grade, value-based Post-graduate programme in Computer Science - Specialization in Artificial Intelligence and Data Science
PEO-3	To investigate the requirements of a problem and find the solution to them using computing principles.
PEO-4	To gain knowledge for creating and evaluating computer based system, components and process to meet the specific needs of applications
PEO-5	To utilize current techniques and tools necessary for complex computing practices
PEO-6	To bridge the gap between industry and academia by framing curricula and syllabi based on industrial and societal needs.
PEO-7	To gain practical, hands-on experience with statistics programming languages and big data tools
PEO-8	To develop skilled professional workforce that is prepared to address the increasing needs in the rapidly expanding area of Data Science
PEO-9	To provide skills in quantitative data analysis, data mining, data modeling and prediction, data storage and management, machine learning, big data processing, data visualization, multimedia big data, programming and communication skills.
PEO-10	To apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.

Programme Specific Objectives

PSO-1	To understand, analyze and develop essential proficiency in the areas related to data science and artificial intelligence in terms of underlying statistical and computational principles and apply the knowledge to solve practical problems.
PSO-2	To identify the need and develop the skill required to become computing, AI and Data Scientist professional.
PSO-3	To improve the proficiency in developing applications with required AI Data Science domain knowledge.
PSO-4	To classify opportunities and use innovative ideas to create value and wealth for the betterment of individual and society.
PSO-5	To design applications for desired needs with appropriate considerations for the needs of societal and environmental aspects

Programme Outcomes (PO)

PO-1	**Problem Solving Skill:** Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.
PO-2	**Decision Making Skill:** Foster analytical and critical thinking abilities for data-based decision-making.
PO-3	**Ethical Value:** Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.
PO-4	**Communication Skill:** Ability to develop communication, managerial and interpersonal skills.
PO-5	**Individual and Team Leadership Skill:** Capability to lead themselves and the team to achieve organizational goals.
PO-6	**Employability Skill:** Inculcate contemporary business practices to enhance employability skills in the competitive environment.
PO-7	**Entrepreneurial Skill:** Equip with skills and competencies to become an entrepreneur
PO-8	**Contribution to Society:** Succeed in career endeavors and contribute significantly to society.
PO-9	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-10	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

PSO-1	To upgrade knowledge and undertake further study and research in Artificial Intelligence according to the need of society.
PSO-2	To combine the knowledge of Human Cognition, AI, Machine Learning and Data Engineering for designing systems.
PSO-3	To expose the techniques and developments in various domains where AI can be applied.
PSO-4	To model computational problems by applying mathematical concepts and solving real-world problems using algorithmic techniques.
PSO-5	To become a skilled Data Scientist in industry, academia and government.

Eligibility for admission

Candidates for admission to the first year of the M.Sc (AI &DS)programme shall be required to have passed with a minimum of 60% marks in Part-III (minimum 55% marks for SC/ST candidates) in any one of the following examinations of any recognized University:

B.Sc. Degree in Mathematics / Statistics / Applied Sciences / Computer Science / Information Technology (OR) B.Sc. Degree in Physics / Chemistry / Electronics as major subject and Mathematics as ancillary subject (OR) B.C.A./B.Com./B.B.A.(OR) qualification equivalent thereto. The candidate should have studied 10+2+3 pattern with Mathematics/Statistics/Business Mathematics in +2 levels.

Bridge Course

The University recommended two to three weeks bridge courses for the non-computer science background students covering essential basics required to pursue two year MCA programme from the academic year 2022-23.

Suggested Bridge Courses:

i. Introduction to Information Technology
ii. Programming in C
iii. Introduction to Database Systems
iv. Basics of Computer Networks
v. Problem Solving Techniques

Minimum Duration of programme

The programme is for a period of two years. Each year shall consist of two semesters' viz. Odd and Even semesters. Odd semesters shall be from June / July to October / November and even semesters shall be from November / December to April / May. Each semester there shall be 90 working days consisting of 6 teaching hours per working day (5 days/week).

Components

MCA programme consists of a number of courses. The term "course" is applied to indicate a logical part of the subject matter of the programme and is invariably equivalent to the subject matter of a "paper" in the conventional sense. The following are the various categories of the courses suggested for the MCA programme:

A. Core courses (CC)- "Core Papers" means "the core courses" related to the programme concerned including practical's and project work offered under the programme and shall cover core competency, critical thinking, analytical reasoning, and researchskill.

B. Discipline-Specific Electives (DSE) means the courses offered under the programme related to the major but are to be selected by the students, shall cover additional academic knowledge, critical thinking, and analyticalreasoning.

C. Non-Major Electives (NME)- Exposure beyond the discipline

- Students have to undergo a total of two Non Major Elective courses with 2 credits offered by other departments (one in II Semester another in IIISemester).
- A uniform time frame of 3 hours on a common day (Tuesday) shall be allocated for the Non-MajorElectives.
- Non Major Elective courses offered by the departments pertaining to a semester should be announced before the end of previous semester.

D. Registration process: Students have to register for the Non-Major Elective course within 15 days from the commencement of the semester either in the department or NME Portal (University Website).

E. Self-Learning Courses from MOOCs platforms.

- MOOCs shall be on voluntary for thestudents.
- Students have to undergo a total of 2 Self Learning Courses (MOOCs) one in II semester and another in IIIsemester.
- The actual credits earned through MOOCs shall be transferred to the credit plan of programmes as extracredits. Otherwise 2 credits/course be given if the Self Learning Course (MOOCs) is without credit.
- While selecting the MOOCs, preference shall be given to the course related to employabilityskills.

F. Projects: The duration of the Project shall be six months in the fourthsemester. The candidate shall undergo Project Work during the final semester. The candidate should prepare report of work for the project and should get approval from the guide. The candidate, after completing the project work, shall be allowed to submit it to the University departments at the end of the final semester.

The candidate should prepare three copies of the project report andsubmit the same for the evaluation of examiners. After evaluation, one copy will be retained in the department library, one copy will be retained by the guide and the student shall hold onecopy.

Teaching Methods

- **Presentation with visual aids like Smart Board and Power Point/Pdf slide:**

A presentation delivers content through oral, audio and visual channels allowing teacher-learner interaction and making the learning process more attractive. Through presentations, teachers can clearly introduce difficult concepts by illustrating the key principles and by engaging the students in active discussions. When presentations are designed by learners, their knowledge sharing competences, their communication skills and their confidence are developed.

- **Demonstration especially for Practical Courses:**

Demonstration is a specific type of presentation and a technique of teaching by example rather than simple explanation. Demonstration is a visual practical presentation of a concept and process. The learners perform a demonstration to ascertain learning. The teacher performs the tasks step-by-step to enable the learners to repeat the same task independently or in groups.

- **Group Discussion:**

Group Discussion is mainly used to generate ideas, increase learner's confidence in their answers, encourage broad participation, promote higher level of reasoning and learn concepts in-depth, develop skills such as teamwork, critical thinking, inter personal communication and peer teaching.

- **Seminar:**

Students take the initiative to preview the course content, find evidence and answers to questions assigned before course, share knowledge points with peers during the course. Students develop the quality of listening, questioning scientifically, debating with evidence, and collaborating during the discussion and communications.

- **Quiz:**

It is sometimes used to assess learners. It often has fewer questions of lesser difficulty and requires less time for completion than a test. This gives the teacher an instant idea of what learners already know about the topic. Quizzes can be used to revise learner's retention of previous lessons or at the end of a lesson. This allows the teacher to get feedback on learner's progression.

Attendance

Students must have earned 75% of attendance in each course for appearing for the examination. Students who have earned 74% to 70% of attendance need to apply for condonation in the prescribed form with the prescribed fee. Students who have earned 69% to 60% of attendance need to apply for condonation in the prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 60% of attendance are not eligible to appear for the End Semester Examination (ESE). They shall re- do the semester(s) after completion of the programme.

Examination

The examinations shall be conducted separately for theory and practical's to assess (remembering, understanding, applying, analyzing, evaluating, and creating) the knowledge required during the study. There shall be two systems of examinations viz., internal and external examinations. The internal examinations shall be conducted as Continuous Internal Assessment tests I and II (CIA Test I & II).

a. Internal Assessment

The internal assessment shall comprise a maximum of 25 marks for each subject. The following procedure shall be followed for awarding internal marks.

Theory – 25 marks

S.No	Content	Marks
1	Average marks of two CIA tests	15
2	Seminar/Group Discussion/Quiz	5
3	Assignment	5
	Total	25

Practical – 25 marks

S.No	Content	Marks
1	Average marks of two CIA tests	15
2	Lab observation note	10
	Total	25

Project – 50 marks

S.No	Content	Marks
1	Review First	20
2	Review Second	20
3	Presentation	10
	Total	50

External Examination

There shall be examinations at the end of each semester, for odd semesters in the month of October / November; for even semesters in April / May.

A candidate who does not pass the examination in any course(s) may be permitted to appear in such failed course(s) in the subsequent examinations to be held in October / November or April / May. However candidates who have arrears in Practical shall be permitted to take their arrear Practical examination only along with Regular Practical examination in the respective semester.

A candidate should get registered for the first semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit / regulation prescribed OR belated joining OR on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after completion of the programme.

For the Project Report the maximum marks will be 100 marks for project report evaluation and for the Viva-Voce it is 50 marks. Each candidate shall be required to appear for Viva-Voce Examination (in defense of the Project).

A. Scheme of External Examination (Question Paper Pattern)

Theory - Maximum 75 Marks

Section A	10 questions. All questions carry equal marks. (Objective type questions)	10 x 1 = 10 Marks	10 questions – 2 each from every unit
Section B	5 questions Either / or type like 1.a (or) b. All questions carry equal marks and each answer should not exceed500 words.	5 x 5 = 25	5 questions – 1 each from every unit
Section C	5 questions Either / or type like 1.a (or) b. All questions carry equal marks and each answer should not exceed 1000 words.	5 x8 = 40	5 questions – 1 each from every unit

Practical –Maximum 75 Marks

Section A	Software Programmes (2Nos)	50 Marks
Section B	Record note	10 Marks
Section C	Vivo voce	15 Marks

Project report– Maximum 150 Marks

Project report	100 Marks
Vivo voce	50 Marks

Results

The results of all the examinations will be published through the Department where the student underwent the course as well as through University Website

Passing Minimum

- A candidate shall be declared to have passed in each course if he/she secures not less than 40% marks in the End Semester Examinations and 40% marks in the Internal Assessment and not less than 50% in the aggregate, taking Continuous assessment and End Semester Examinations marks together.
- The candidates not obtained 50% in the Internal Assessment are permitted to improve their Internal Assessment marks in the subsequent semesters (2 chances will be given) by writing the CIA tests and by submitting assignments.
- Candidates, who have secured the pass marks in the End-Semester Examination and in the CIA but failed to secure the aggregate minimum pass mark (E.S.E + C I.A), are permitted to improve their Internal Assessment mark in the following semester and/or in University examinations.
- A candidate shall be declared to have passed in the Project if he /she get not less than 40% in each of the Project Report and Viva-Voce and not less than 50% in the aggregate of both the marks for Project Report and Viva-Voce.
- A candidate who gets less than 50% in the Project must resubmit the report. Such candidates need to take again the Viva-Voce on the resubmitted Project report.

Grading of the Courses

The following table gives the marks, Grade points, Letter Grades and classifications meant to indicate the overall academic performance of the candidate.

Conversion of Marks to Grade Points and Letter Grade (Performance in Paper / Course)

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**
00 - 49	**0.0**	**U**	**Re-appear**
ABSENT	**0.0**	**AAA**	**ABSENT**

- Successful candidates passing the examinations and earning GPA between 9.0 and 10.0 and marks from 90 – 100 shall be declared to have Outstanding (O).

- Successful candidates passing the examinations and earning GPA between 8.0 and 8.9 and marks from 80 - 89 shall be declared to have Excellent (D+).
- Successful candidates passing the examinations and earning GPA between 7.5 – 7.9 and marks from 75 - 79 shall be declared to have Distinction (D).
- Successful candidates passing the examinations and earning GPA between 7.0 – 7.4 and marks from 70 - 74 shall be declared to have Very Good (A+).
- Successful candidates passing the examinations and earning GPA between 6.0 – 6.9 and marks from 60 - 69 shall be declared to have Good (A).
- Successful candidates passing the examinations and earning GPA between 5.0 – 5.9 and marks from 50 - 59 shall be declared to have Average (B).
- Candidates earning GPA between 0.0 and marks from 00 - 49 shall be declared to have Re-appear (U).
- Absence from an examination shall not be taken as an attempt.
- From the second semester onwards the total performance within a semester and continuous performance starting from the first semester are indicated respectively **by Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA).** These two are calculated by the following formulate

GRADE POINT AVERAGE (GPA) = $\Sigma_i C_i G_i / \Sigma_i C_i$

GPA = Sum of the multiplication of Grade Points by the credits of the courses
Sum of the credits of the courses in a Semester

Classification of the final result

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**	
0.0 and above but below 5.0	**U**	Re-appear

The final result of the candidate shall be based only on the CGPA earned by the candidate.

- Successful candidates passing the examinations and earning CGPA between 9.5 and 10.0 shall be given Letter Grade (O+), those who earned CGPA between 9.0 and 9.4 shall be given Letter Grade (O) and declared to have First Class –Exemplary*.
- Successful candidates passing the examinations and earning CGPA between 7.5 and 7.9 shall be given Letter Grade (D), those who earned CGPA between 8.0 and 8.4 shall be given Letter Grade (D+), those who earned CGPA between 8.5 and 8.9 shall be given Letter Grade (D++) and declared to have First Class with Distinction*.
- Successful candidates passing the examinations and earning CGPA between 6.0 and 6.4 shall be given Letter Grade (A), those who earned CGPA between 6.5 and 6.9 shall be given Letter Grade (A+), and those who earned CGPA between 7.0 and 7.4 shall be given Letter Grade (A++) and declared to have First Class

- Successful candidates passing the examinations and earning CGPA between 5.0 and 5.4 shall be given Letter Grade (B), those who earned CGPA between 5.5 and 5.9 shall be given Letter Grade (B+) and declared to have passed in Second Class.
- Candidates those who earned CGPA between 0.0 and 4.9 shall be given Letter Grade (U) and declared to have Re-appear.
- Absence from an examination shall not be taken as an attempt.
- CUMULATIVE GRADE POINT AVERAGE (CGPA) = $\Sigma_n \Sigma_i C_{ni} G_{ni} / \Sigma_n \Sigma_i C_{ni}$

CGPA = Sum of the multiplication of Grade Points by the credits of the entire rogramme
Sum of the credits of the courses for the entire Programme

Where '**Ci**' is the Credit earned for Course i in any semester; '**Gi**' is the Grade Point obtained by the student for Course i and 'n' refers to the semester in which such courses were credited.

CGPA (Cumulative Grade Point Average) = Average Grade Point of all the Courses passed starting from the first semester to the current semester.

Note: * The candidates who have passed in the first appearance and within the prescribed Semesters of the PG Programme are alone eligible for this classification.

Conferment of the Master's Degree

A candidate shall be eligible for the conferment of the Degree only after he/ she has earned the minimum required credits for the Programme prescribed therefore (i.e. 90 credits).

a. All the candidates who have passed the examinations in all the prescribed courses shall be eligible for the award of the Degree of Master of Science in Computer Science.
b. A Candidate who has passed all the examinations in the first attempt within two years of admission shall be declared to have passed in First Class with Distinction provided he/she secures more than 75% marks in the aggregate.
c. A Candidate who has passed all the examinations within FOUR years of admission shall be declared to have passed in First Class provided he/she secures not less than 60% marks in the aggregate.

Maximum duration of the completion of the programme

A student shall be permitted to continue the programme from I to IV semester irrespective of failure(s) in the courses of the earlier semesters. The candidate will qualify for the M.Sc degree only if he/she passes all the arrears courses with in a period of FOUR years.

Village Extension Programme

The Sivaganga and Ramanathapuram districts are very backward districts where a majority of people Lives in poverty. The rural mass is economically and educationally backward. Thus the aim of the introduction of this Village Extension Programme is to extend out to reach environmental awareness, social activities, hygiene, and health to the rural people of this region. The students in their third semester have to visit any one of the adopted villages within the jurisdiction of Alagappa University and can arrange various programs to educate the rural mass in the following areas for three day based on the theme.1. Environmental awareness 2.Hygiene and Health. A minimum of two faculty members can accompany the students and guide them.

BRIDGE COURSE - I

INTRODUCTION TO INFORMATION TECHNOLOGY

Objectives:

- To educate the beginners the fundamentals of computer hardware and software.
- To teach them the basic concepts of internet and programming concepts.

Internet and World Wide Web: Internet and World Wide Web-Web Multimedia-Recent Trends in IT- Anatomy of Computer-Central Processing Unit-Memory **Input and Output Devices:** Input and Output Devices-Secondary Storage Media-Introduction to Software-User Interfaces-Types of Operating Systems **Word Processing:** Word Processing: Formatting Documents-Word Processing Features-Desktop Publishing-Spreadsheet Applications & Database Applications-Internet Connectivity

Communications: Communications: Network Applications-The Electronic Web-Local Area Networks-Multimedia-IT in Business. **Programming and System Development:** Programming and System Development: Programming Languages-Programming Techniques-Personal, Social and Ethical issues.

Reference and Text Books:

Dennis P.Curtin, Kim Foley,KunalSen,Cathleen Morin, *"Information Technology The Breaking Wave",* Tata McGraw Hill Publication, 2017.

Outcomes:

- Learn word processing using MS word
- Understand about internet concepts

Online Resource:

https://jdgsmahilacollege.files.wordpress.com/2014/01/ch3.pdf

https://www.ebookbou.edu.bd/Books/Text/SST/DCSA/dcsa_1201/Unit-04.pdf

BRIDGE COURSE - II

PROGRAMMING IN C

Objectives:

- To understand structure of C program
- TounderstandArrays, Strings, Functions and Pointers

Basic Structure of C Programs – Programming Style – Character Set – C Tokens – Keywords and Identifiers – Constants, Variables and Data Types – Declaration of Variables – Defining Symbolic Constants – Declaring a variable as a constant. Operators and Expressions.**Managing I/O Operations:**Reading and Writing a Character – Formatted Input, Output. Decision making and branching – Flow of control **Arrays:**One-Dimensional Arrays – Declaration, Initialization – Two-Dimensional Arrays – Multi-dimensional Arrays – Dynamic Arrays – Initialization. **Strings:**Declaration, Initialization of String variables – Reading and Writing strings– String handling functions. **User-defined functions:**Need – Multi-function programs – Elements of user defined functions – Definition – Return values and their types – Function calls, declaration, category – All types of arguments and return values – Nesting of functions – Recursion – Passing arrays, Strings to functions – Scope visibility and life time of variables. **Structures and Unions:** Structure Definition – Giving Values to Members – Structure Initialization – Arrays of Structures – Arrays Within Structures – Structures Within Structures – Structures And Functions – Unions**. Pointers:** Introduction – Understanding Pointers – Accessing the Address of a Variable – Declaring and Initializing Pointers – Accessing a Variable through its Pointer.

Reference and Text Books:

E.Balagurusamy , 2012, 6th Edition *Programming in ANSI C*,, Tata McGraw Hill Publishing Company.
Ashok N.Kamthane, 2006 ,*Programming with ANSI and Turbo C*, Pearson Education
Schaum's Outline Series, Gottfried, 2006, *Programming with C*, Tata McGraw Hill.

Outcomes:

- Able to understand and design the solution to a problem using C
- Understand and implement Structures, Arrays and function

Online Resource:

https://www.idc-online.com/technical_references/pdfs/information_technology/Structures_in_C_Programming.pdf

https://vpmpce.files.wordpress.com/2019/01/unit-5-acp.pdf

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

BRIDGE COURSE - III

INTRODUCTION TO DATABASE SYSTEMS

Objectives:

- To introduce the Database Architecture
- TounderstandData Normalization, Relational Algebra and its operations.

Introduction to Database Management Systems: Why a Database – Characteristics of Data in a Database – Database Management System: Transaction Management System – Concurrency Control – Security Management – Language Interface – Storage Management – Why DBMS – Types of Database Management Systems: Hierarchical Model – Network Model – Relational Model - **Database Development Life Cycle :** Database Development Life Cycle Phases - **Database Architecture :** Conceptual, Physical and Logical Database Models –**Data Normalization** Data Normalization : Keys and Relationships – First Normal Form – Second Normal Form – 3NF – BCNF – 4NF – 5NF – DKNF – **Relational Algebra** : Relational Algebraic Operations – UNION, INTERSECTION, DIFFERENCE – CARTESIAN PRODUCT – SELECT – PROJECT – RENAME – JOIN – DIVISION.

Reference and Text Books:

Alexis Leon, Mathews Leon, *Database Management Systems,* Tata McGraw Hill Education, 2008.
ElmasriRamez, NavatheShamkant, *Fundamentals of Database System,* Pearson Education, 7th Edition, 2017.
Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, Tata McGraw Hill Education, 2014.

Outcomes:

- Describe Normalization for Database design.
- Understand the Relational Algebraic Operations

Online Resource:

https://wanivipin.files.wordpress.com/2019/02/dbms_notes-unit-1-1.pdf

https://www.tutorialspoint.com/dbms/pdf/relational_algebra.pdf

BRIDGE COURSE - IV

BASICS OF COMPUTER NETWORKS

Objectives:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.

Introduction to Computer Networks: Definition of a Computer Network, Classification of networks: Based on transmission technology, Based on the their scale, Local area networks, Metropolitan area networks, Wide area networks - Merits and De-merits of Layered Architecture, Service Primitives: **Reference models:** The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI & the TCP/IP Reference Models-**Network topologies**; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology -**Switching;** Circuit switching, Message switching, Packet switching, Implementation of packet switching, Relationship between Packet Size and Transmission time, Comparison of switching techniques- Multiplexing-Transmission medium-Data Link Layer-Network Layer-Transport Layer.

Reference and Text Books:

Andrew S. Tanenbaum and David J. Wetherall, 2011 *"Computer Networks",* 5th Edition, University of Washington, Pearson.

BhushanTrivedi, 2016, *"Data Communication and Networks*" Oxford University Press

K S Easwarakumar, R S Rajesh, R.Balasubramanian, 2010 "*Computer Networks: Fundamental and Application"*, 1/e, Vikas Publishing.

Rajneesh Agarwal, 2011, "Data Communication and Computer Networks*",* 1/e, Vikas Publishing.

Outcomes:

- Able to understand the working principles of various application protocols
- Acquire knowledge about security issues and services available

Online Resource:

https://www.scribd.com/presentation/404951540/2140709-CN-UNIT-1

https://faculty.sfcc.spokane.edu/Rudlock/files/WP_Simoneau_OSIModel.pdf

https://samyzaf.com/braude/CLISERV/notes/Part_03.pdf

https://littleflowercollege.edu.in/upload/e_contents/files/29d3a76e1ea3718438a66e222d21956f.pdf

BRIDGE COURSE - V

PROBLEM SOLVING TECHNIQUES

Objectives:

- To acquire knowledge on problem solving techniques
- To understand the basics of programming

Introduction: Overview of computer-history-what is hardware-software-components of computer-input devices-output devices-memory-types of software- introduction to programming languages- assembler-interpreter-compiler

Problem solving: Identification of problem – steps of problem solving-overview of problem solving techniques-Algorithm-method of writing-Rules-Examples- Flowchart-Symbols used in flowchart-conditional statement-looping statements-connectors-Examples-Pseudo code-Definition-method of writing-data types-high level languages- logical operators-conditional statement-for loop-while loop-Data Structures-Examples

Programming: Architecture of a computer program- Programming languages- first Program --Writing, compiling, and executing a program – finding errors and debugging

Reference and Text Books:

Ata Elahi Springer, 2018, *Computer Systems: Digital Design, Fundamentals of Computer Architecture and Assembly Language.*
Harold Abelson,*Structure and Interpretation of Computer Programs,* 2nd Edition, MIT Electrical Engineering .
Pradeep K. Sinha&PritiSinha, 2012 *Computer Fundamentals.*

Outcomes:

- Able to write algorithm, pseudo code
- Able to draw flowchart

Online Resource:

https://ncert.nic.in/textbook/pdf/kecs101.pdf

https://www.scribd.com/document/338384391/unit-1

M.Sc., Artificial Intelligence & Data Science- Programme Structure

S. No	Paper Code	Core	Title of the paper		Credits	Hours/ Week	Marks		
I Semester							**I**	**E**	**Total**
1	557101	Core 1	Principles of Data Science and Analytics		5	5	25	75	100
2	557102	Core 2	Relational Database Management System		4	4	25	75	100
3	557103	Core 3	Python Programming		5	5	25	75	100
4.	557104	Core 4	Discrete Mathematics		4	4	25	75	100
5	557105	Core 5	Lab-I : Data Science Lab		2	4	25	75	100
6.	557106	Core 6	Lab-II : Python Programming Lab		2	4	25	75	100
7		DSE*:1	1. Cloud Computing 2. Advanced Java Programming 3. Digital Image Processing		3	3	25	75	100
			Library / Seminar/Yoga/ counselling/Field trip			1			
					25	**30**	**175**	**525**	**700**
II Semester									
8	557201	Core 7	Data Mining and Warehousing		4	4	25	75	100
9	557202	Core 8	Artificial Intelligence and Machine Learning		4	4	25	75	100
10	557203	Core 9	Web Technology		4	4	25	75	100
11	557204	Core 10	Design and Analysis of Algorithms		4	4	25	75	100
12	557205	Core 11	Lab-I: Algorithms Lab		2	4	25	75	100
13	557206	Core 12	Lab II: AI and Machine Learning Lab		2	4	25	75	100
14			DSE*:2 1. Deep Learning 2. Cyber Security 3. Block Chain Technology		3	3	25	75	100
15			NME		2	3	25	75	100
			Self-learning course (SLC) –MOOCs		Extra credit				
					25	**30**	**200**	**600**	**800**
III Semester									
16	557301	Core 13	Big Data Analytics		4	4	25	75	100
17	557302	Core 14	Data Visualization		4	4	25	75	100
18	557303	Core 15	Virtual Reality and Augmented Reality		4	4	25	75	100
19	557304	Core 16	Internet of Things		4	4	25	75	100
20	557305	Core 17	Lab-I: Big Data Analytics Lab		2	4	25	75	100
21	557306	Core 18	Lab II: IoT Lab		2	4	25	75	100
22			DSE * 3 1. Natural Language Processing 2. Theory of Computation 3. Social Media Analytics		3	3	25	75	100
23			NME		2	3	25	75	100
			Self-learning course (SLC) –MOOCs		Extra credit				
					25	**30**	**200**	**600**	**800**
IV Semester									
24	557999	Core 19	Project Work Programme		15	30	50	150	200
					15	**30**	**50**	**150**	**200**
			Total		**90+**	**120**	**625**	**1875**	**2500**

Discipline Specific Elective		
S.No	**Paper Code**	**Title of the Paper**
DSE – I		
1.	557551	Cloud Computing
2.	557552	Advanced Java Programming
3.	557553	Digital Image Processing
DSE – II		
1.	557554	Deep Learning
2.	557555	Cyber Security
3.	557556	Block Chain Technology
DSE – III		
1.	557557	Natural Language Processing
2.	557558	Theory of Computation
3.	557559	Social Media Analytics

SEMESTER-I					
Core: 1	**Course code 557101**	**PRINCIPLES OF DATA SCIENCE AND ANALYTICS**	**T**	**Credits: 5**	**Hours: 5**

UNIT I

Objective 1	**To define the terms and concepts of data science**

Data Science: Benefits and uses – facets of data – Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis – build the model– presenting findings and building applications – Data Mining – Data Warehousing – Basic Statistical descriptions of Data **DESCRIBING DATA** Types of Data – Types of Variables -Describing Data with Tables and Graphs – Describing Data with Averages – Describing Variability – Normal Distributions and Standard (z) Scores

Outcome 1	**To list the key concepts in data science**	**K1,K2**

UNIT II

Objective2	**To describe the relationship between data science and statistics**

Introduction to Data Analytics - Data Analytics Overview - Importance of Data Analytics - Types of Data Analytics - Descriptive Analytics - Diagnostic Analytics- Predictive Analytics -Prescriptive Analytics- Benefits of Data Analytics -Data Visualization for Decision Making , Measure Of central tendency, Measures of Dispersion - Graphical Techniques, Skewness& Kurtosis, Box Plot - Descriptive Stats - Sampling Funnel, Sampling Variation, Central Limit Theorem, Confidence interval

Outcome 2	**To understand the statistics and machine learning concepts that are vital for data science**	**K2**

UNIT III

Objective 3	**To describe the classifications and characteristics of data**

DESCRIBING RELATIONSHIPS Correlation –Scatter plots –correlation coefficient for quantitative data – computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean

Outcome 3	**To identify the relationships between data and describe it**	**K3**

UNIT IV

Objective 4	To learn Python code to statistically analyze a dataset

PYTHON LIBRARIES FOR DATA WRANGLING Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

Outcome 4	**To produce Python code to statistically analyze a dataset**	**K6**

UNIT V

Objective 5	**To list the visualization tools of Python**

DATA VISUALIZATION Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting – Geographic Data with Basemap – Visualization with Sea born.

Outcome 5	**To critically evaluate data visualizations based on their design and use for communicating stories from data.**	**K5**

Suggested Readings:-

Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)

Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)

Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

Online Resources:

https://www.coursesidekick.com/statistics/study-guides/boundless-statistics
https://open.maricopa.edu/psy230mm/chapter/chapter-6-z-scores/
https://www.geeksforgeeks.org/python

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr.G. Shanthi

Course Outcome VS Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M(2)	M(2)	M(2)	M(2)	L(1)	S(3)	L(1)	L(1)	L(1)
CO2	M(2)	M(2)	S(3)	M(2)	L(1)	M(2)	M(2)	M(2)	M(2)	M(2)
CO3	M(2)	M(2)	M(2)	L(1)	L(1)	M(2)	M(2)	L(1)	L(1)	L(1)
CO4	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	S(3)	M(2)	L(1)	L(1)
CO5	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	S(3)	M(2)	L(1)	L(1)
W. AV	**2.4**	**2**	**2**	**1.4**	**1.4**	**1.4**	**2.6**	**1.6**	**1.2**	**1.2**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	M(2)	M(2)
CO2	M(2)	M(2)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	L(1)	M(2)	M(2)
CO4	M(2)	S(3)	L(1)	L(1)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	L(1)
W. AV	**2.4**	**2.4**	**1.6**	**1.8**	**1.6**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER I					
Core: 2	**Course code 557102**	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**T**	**Credits: 4**	**Hours: 4**

Unit – I

Objective 1	**To understand the fundamentals of data models**	
Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor. History of Data base Systems - Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets		
Outcome 1	**Compile an understanding of data models, data abstraction, and the ER model in database systems.**	**K2**

Unit II

Objective 2	**To make a study of SQL and relational database design**	
Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying / altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus		
Outcome 2	**Design logical structures using relational algebra and SQL queries, while maintaining data integrity.**	**K3**

Unit III

Objective 3	**To know about data storage techniques and query processing.**	
Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases. Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.		
Outcome 3	**Evaluate SQL queries, integrity constraints, and normalization techniques for efficient database design.**	**K5**

Unit IV

Objective 4	**To impart knowledge in transaction processing, concurrency control techniques and External storage**	
Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for Serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity. Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of non-volatile storage-Advance Recovery systems- Remote Backup systems.		
Outcome 4	**Implement transaction management strategies and recovery mechanisms to ensure data consistency.**	**K3**

Unit V		
Objective 5	**To know basic database storage structures and access techniques: file and page Organizations, indexing methods including B tree, and hashing.**	
Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure. Dynamic Content: Big Data - Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, and Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.		
Outcome 5	**Discuss advanced database concepts, including indexing, big data challenges, and analytics applications.**	**K6**

Suggested Readings:-

Abraham Silberschatz, Henry F.Korth, S.Sudarshan, 2019, Data base System Concepts, 7th Edition, Tata McGraw Hill.

Garcia-molina, 2013,"Database Systems - The Complete Book", 2e, Dorling Kindersley India. Raghurama Krishnan, Johannes Gehrke, 2014, Data base Management Systems,3e TATA McGrawHill.

RamezElmasri, ShamkantB.Navathe, 2013 “Database Systems, Models, Language, Design and Application Programming, 6th Edition, Pearson Education.

SeemaAcharya, SubhashiniChellappan, 2019“ Big Data and Analytics”, Wiley Publications

SharadMaheshwariRuchinjain, 2016,"Database Management Systems: Complete Practical Approach", 2e, Laxmi Publications

Online Resources:

https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/2/PG_M.Sc._Information%20Technology_313%2022_RDBMS_CRC.pdf

https://diblokdcma.files.wordpress.com/2009/10/springer-fundamentals-of-relational-database-management-systems-apr-2007.pdf

https://www.geeksforgeeks.org/dbms/

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.K.Mahesh

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	L(1)	L(1)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO2	S(3)	S(3)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO3	S(3)	S(3)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO4	S(3)	S(3)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
CO5	S(3)	S(3)	M(2)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)
W. AV	**3**	**3**	**1.8**	**1.8**	**1**	**2**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PS06
CO1	S(3)	M (2)	S(3)	L(1)	L(1)	M(2)
CO2	S(3)	M (2)	L(1)	S (3)	L(1)	M(2)
CO3	S(3)	M (2)	L(1)	L(1)	L(1)	S(3)
CO4	L(1)	L(1)	L(1)	M (2)	L(1)	S(3)
CO5	M(2)	L(1)	L(1)	S(3)	L(1)	L(1)
W.AV	**2.4**	**1.6**	**1.4**	**2**	**1**	**2.2**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER-I					
Core: 3	**Course code 557103**	**PYTHON PROGRAMMING**	**T**	**Credits: 5**	**Hours: 5**

Unit I		
Objective 1	**To obtain basic knowledge in Python**	
Introduction to Python: Introduction-Python Overview-Comments-Identifiers-Reserved Keywords-Variables-Standard Data type-Operators -Statements and Expressions-String Operations-Boolean Expressions-Control Statements-Iteration Statements-Input from Keyboard.		
Outcome 1	**Students can summarize the overview of python programming concepts**	**K1**

Unit II		
Objective 2	**TodevelopknowledgeoncreatingPythonprogramswithconditionals,loopsandfunctions.**	
Creating Python Programs: String -String handling functions-String Formatting operator and functions, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, Lists: Introduction-Built-in Functions-User defined Functions-Python Recursive Function-Writing Python Scripting. **Control Structures:** Input and Output Statements, Control Statements - Looping while Loop, for Loop, Loop Control, Conditional Statement-if...else, Difference between break, continue and pass.		
Outcome 2	**Students can create programs using string Handling and formatting functions, built-in & user defined functions and control structures.**	**K3**

Unit III		
Objective 3	**To define a classwithattributesandmethods and to establish database connection inpython**	
Classes & Objects: Introduction-class Definition-creating Objects-Objects as a Arguments-Object as Return Values-Built-in Class Attributes-Inheritance-Method Overriding-Data Encapsulation-Data Hiding. **Python Libraries and Database Connectivity :** Reading and Writing CSV Files in Python using CSV Module- Python-Database Connectivity-Establishing Connection and Cursor Object		
Outcome 3	**Learners can build libraries and database connectivity**	**K5**

Unit IV		
Objective4	**To gain knowledge about Numpy and data manipulation with pandas**	
Introduction to NumPy: Basics of NumPy Array -Computation on NumPy Array-Aggregations – Broadcasting-Comparisons, Masks and Boolean Logic-Sorting Arrays –NumPy Structured Array. **Data Manipulation with Pandas:** Introducing Panda Objects-Data Indexing and Selection-Operating Data on Pandas-Handling Missing Data-Hierarchical Indexing-Combining Datasets-Vectorized String Operations-Working with Time Series.		
Outcome 4	**Learners can acquire knowledge about NumPy and database connectivity.**	**K6**

Unit V		
Objective 5	**Todevelopvisualiszation with Matplotlib**	
Visualization with Matplotlib: Simple Line Plots-Simple Scatter Plots-Visualizing Errors-Density and Contour Plots-Histograms, Binnings and Density-Customizing Plot Legends-Customizing Colorbars-Multiple Subplots-Text and Annotation-Three Dimension Plotting in Matplotlib-Geographic Data with Basemap-Visualization with Seaborn		
Outcome 5	**Learners can design visualization using Matplotlib**.	**K6**

Suggested Readings:-

CharlesDierbach,2016IntroductiontoComputerScienceusingPython,1st Edition,Wiley IndiaEdition.

MartinC.Brown,2018Python:TheCompleteReference,1st Edition,McGrawHillIndia.

ReemaThareja,2017PythonProgrammingusingProblemSolvingApproach,1st Edition Oxford University Press.

SheetalTaneja,NaveenKumar,2017,PythonProgramming,1st Edition,PearsonIndia.

Online Resources:

https://pandas.pydata.org/pandas-docs/version/1.4.4/pandas.pdf

https://static.realpython.com/python-basics-sample-chapters.pdf

https://www.guru99.com/python-tutorials.html

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.M.Vanitha

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)	L(1)	M(2)	M(2)
CO2	S(3)	S(3)	M(2)	L(1)	M(2)	L(1)	L(1)	M(2)	S(3)	M(2)
CO3	S(3)	S(3)	M(2)	L(1)	L(1)	L(1)	M(2)	L(1)	M(2)	M(2)
CO4	S(3)	S(3)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	M(2)	M(2)
CO5	S(3)	S(3)	S(3)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)
W.AV	2.6	2.8	2.4	1.6	1.4	1	1.2	1.2	2	1.8

S-Strong (3) M- Medium (2) L-Low (1)

Course Outcome VS Programme Specific Outcomes

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	M(2)	S(3)	L(1)	L(1)
CO2	S(3)	M(2)	L(1)	L(1)	L(1)
CO3	S(3)	M(2)	S(3)	S(3)	M(2)
CO4	S(3)	L(1)	L(1)	L(1)	M(2)
CO5	S(3)	M(2)	S(3)	L(1)	M(2)
W.AV	3	1.8	2.2	1.4	1.6

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER-I					
Core 4	**Course code 557104**	**DISCRETE MATHEMATICS**	**T**	**Credits: 4**	**Hours: 4**
Unit I					
Objective 1	**To have an understanding of the theory of inference for the statement of calculus.**				
Mathematical Logic: Statements and notation–Connectives- Normal forms– The theory of inference for the statement calculus–The predicate calculus– Inference theory and predicate calculus.					
Outcome 1	**Develop Problem-solving skills.**				**K1**
Unit II					
Objective2	**To discuss the basic concepts of sets, Notation, Inclusion, Equality of sets and functions**				
Set theory : Sets – Basic concepts – Notation – Inclusion and equality of sets – The power set – Relations and ordering – Properties – relation matrix and graph of a relation – Partition – Equivalence and compatibility relations – Composition – Partial ordering – Partially ordered set - Functions – Definition – Composition – Inverse – Binary and n-ary operations – Characteristic function – Hashing function.					
Outcome 2	**Enhance Analytical skills.**				**K3**
Unit III					
Objective 3	**To know and understand the concept of Groups, Co-sets and Lagrange's theorem and Normal subgroups.**				
Algebraic structures - Algebraic systems: Examples and general properties – semi groups and monoids:Definitionsandexamples–Homomorphismofsemigroupsandmonoids–Sub semi groups and sub monoids–Groups:Definitionsandexamples–CosetsandLagrange'stheorem–Normalsubgroups –Algebraic systems with two binary operations.					
Outcome 3	**Learn Algebraic structures.**				**K4**
UnitIV					
Objective 4	**To understand the concept of basic graph theory notions and to apply with computer applications.**				
Graph theory: Basic concepts–Definitions–Paths–Reachability and connectedness–Matrix representation of graphs–Trees.					
Outcome 4	**Define and recognize the basic concepts of graph theory.**				**K2**
Unit V					
Objective5	**Develop the probability distributions and mathematical expectations.**				
Finite probability–Probabilitydistributions–Conditionalprobability–independence–Bayes'theorem–Mathematical expectation.					
Outcome5	**Identify the concepts of finite probability.**				**K5**

Suggested Readings:-

Tremblay,J.P.,Manohar,R.(2017).DiscreteMathematicalStructureswithApplicationstoComputerScience.NewYork: Mc-Graw Hill Book Company. (Unit I to IV).

References:

JudithGersting,L.(2003).MathematicalStructuresforComputerScience.(5th ed.).W.H.FreemanandCompany. (UnitV)

Kolman,B., Roberty Busby,C.,Sharn Cutter Ross,(2013).Discrete Mathematical Structures. (6th ed.). Pearson Education.

Ramasamy,V.,(2006).DiscreteMathematicalStructureswithapplicationtoCombinatorics.UniversitiesPress

Online resources **https://ocw.mit.edu/courses/18-310-principles-of-discrete-applied-mathematics-fall-2013/** **https://www.classcentral.com/course/swayam-discrete-mathematics-5217**					
K1-Remember	***K2-Understand***	***K3-Apply***	***K4-Analyze***	***K5-Evaluate***	***K6-Create***
Course Designed by: B.Yasodara					

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	L(1)	S(3)	S(3)
CO2	S(3)	M(2)	S(3)	L(1)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)
CO4	S(3)	S(3)	L(1)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	S(3)
W.AV	**3**	**2.8**	**2.4**	**2.4**	**2.8**	**2.8**	**2.8**	**2.6**	**2.8**	**2.8**

S–Strong(3),M-Medium(2),L-Low(1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	S(3)	S(3)
CO2	S(3)	L(1)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	S(3)	S(3)	S(3)
CO4	S(3)	M(2)	S(3)	S(3)	L(1)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)
W.AV	**3**	**2.2**	**2.8**	**3**	**2.4**

S–Strong(3),M-Medium(2),L-Low(1)

SEMESTER I					
Core: 5	**Course code 557105**	**LAB I: DATA SCIENCE LAB**	**P**	**Credits:2**	**Hours:4**

Objectives:

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science.
- To learn descriptive analytics on the benchmark data sets.
- To apply correlation and regression analytics on standard data sets.
- To present and interpret data using visualization packages in Python.

LIST OF EXPERIMENTS

1. Working with dictionaries
2. Working with random
3. Working with Numpy arrays
4. Working with Pandas data frames
5. Working with CSV dataset
6. Working with web crawling
7. Working with datetime class
8. Develop python program for Basic plots using Matplotlib
9. Develop python program for Frequency distributions
10. Develop python program for Variability
11. Develop python program for Averages
12. Develop python program for Normal Curves
13. Develop python program for Correlation and scatter plots
14. Develop python program for Correlation coefficient
15. Develop python program for Simple Linear Regression

Outcomes:

- CO1: Make use of the python libraries for data science
- CO2: Make use of the basic Statistical and Probability measures for data science.
- CO3: Perform descriptive analytics on the benchmark data sets.
- CO4: Perform correlation and regression analytics on standard data sets
- CO5: Present and interpret data using visualization packages in Python.

Online Resources

https://shanmugha.edu.in/pdf/dept/aids/Fundamentals%20of%20Data%20science%20Lab%20manual.pdf
https://www.scribd.com/document/662099314/cs3362-foundations-of-data-science-lab-manual
https://www.geeksforgeeks.org/data-science-fundamentals

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr. G. Shanthi

Course Outcome VS Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M(2)	M(2)	M(2)	M(2)	L(1)	-	-	-	L(1)
CO2	M(2)	M(2)	S(3)	M(2)	L(1)	M(2)	-	-	L(1)	M(2)
CO3	M(2)	S(3)	M(2)	L(1)	L(1)	M(2)	M(2)	L(1)	L(1)	L(1)
CO4	M(2)	M(2)	M(2)	L(1)	M(2)	L(1)	-	M(2)	L(1)	L(1)
CO5	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	-	M(2)	L(1)	L(1)
W. AV	**2.4**	**2.2**	**2**	**1.4**	**1.4**	**1**	**2**	**1.7**	**1**	**1.2**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	M(2)	M(2)	M(2)	M(2)
CO2	M(2)	M(2)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	L(1)	M(2)	M(2)
CO4	M(2)	M(2)	L(1)	L(1)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	L(1)
W. AV	**2.4**	**2**	**1.6**	**1.8**	**1.6**

S –Strong (3), M-Medium (2), L- Low (1)

Semester-I				
Core: 6	**Course code 557106**	**LAB II: PYTHON PROGRAMMING LAB**	**Credits:2**	**Hours:4**
Objectives of the Course	This course gives practical experience in Python basics, Object Oriented programming like Classes, Inheritance, and Polymorphism, GUI Applications and Database connection.			
Course Outline	1. Python Basic programs 2. Control Structures 3. Lists 4. Functions and Recursions 5. Modules 6. String Processing 7. Dictionaries and Sets 8. Classes and Objects 9. Polymorphism 10. Inheritance 11. CSV Module 12. Working with Database 13. Data Manipulation with Pandas 14. Visualization with Matplotlib			

Suggested Readings:

Wesley J. Chun, (2007), "Core Python Programming", Pearson Education, Second Edition –

MarkLutz,(2013),"LearningPythonPowerfulObjectOrientedProgramming",O"reilly Media,5 th Edition.

TimothyA.Budd,(2011),"ExploringPython",TataMCGrawHillEducationPrivateLimited, First Edition.

AllenDowney,JeffreyElkner,ChrisMeyers,(2012),"Howtothinklikeacomputerscientist: Learning with Python"

Charles Dierbach, 2016 *Introduction to Computer Science using Python*, 1st Edition, Wiley India Edition.

MartinC.Brown,2018*Python:TheCompleteReference*,1stEdition,McGrawHillIndia.ReemaThareja,2017*PythonProgrammingusingProblemSolvingApproach*,1stEditionOxfordUniversityPress.

SheetalTaneja,NaveenKumar,2017,*PythonProgramming,*1stEdition,PearsonIndia.

Online Resources:

https://www.rgmcet.edu.in/assets/img/departments/CSE/materials/R19/2-1/Python%20Lab.pdf

https://www.geeksforgeeks.org/python-programming-examples/

https://web.ics.purdue.edu/~vmerwade/education/p1.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.M.Vanitha

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO1 0
CO1	1	2	1	1	1	1	1	1	2	2
CO2	3	3	2	1	2	1	1	2	3	2
CO3	3	3	2	1	1	1	2	1	2	2
CO4	3	3	3	2	1	1	1	1	2	2
CO5	3	3	3	3	2	1	1	1	1	1
W.A V	2.6	2.8	2.4	1.6	1.4	1	1.2	1.2	2	1.8

Strong (3) M- Medium (2) L-Low (1)

Course Outcome VS Programme Specific Outcomes

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	1
CO2	3	2	1	1	1
CO3	3	2	3	3	2
CO4	3	1	1	1	2
CO5	3	2	3	1	2
W.AV	3	1.8	2.2	1.4	1.6

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER - I					
DSE-1	**Course code 557551**	**CLOUD COMPUTING**	**T**	**Credits: 3**	**Hours: 3**

Unit I

Objectives	**To understand the concept of cloud and utility computing.**	
Introduction to Cloud Computing: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS Cloud computing platforms: Infrastructure as a Service: Virtual Machines – Layered Architecture-Life Cycle – VM Provisioning Process – Provisioning and Migration Services. Management of Virtual Machines Infrastructure – Scheduling Techniques. Cluster as a service – RVWS Design – Logical Design. Cloud Storage - Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.		
Outcomes	**Identify the architecture, infrastructure and delivery models of cloud computing.**	**K1,K2**

Unit II

Objectives	**To understand the various technologies in cloud.**	
Introduction to Cloud Technologies: Study of Hypervisors Compare SOAP and REST Web services, AJAX and mashups-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization Multitenant software: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise applications.		
Outcomes	**Articulate the main concepts, key technologies, strengths and limitations of cloud computing.**	**K4**

Unit III

Objectives	**.To Understand the data in the Cloud.**	
Data in the Cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Example/Application of Map reduce, Features and comparisons among GFS,HDFS etc, Map-Reduce model		
Outcomes	**To familiarize with the Relational databases and Cloud file systems**	**K2**

Unit IV

Objectives	**To Understand the Fundamentals of Cloud Security.**	
Cloud Security Fundamentals:Vulnerability assessment tool for cloud, Privacy and Security in cloud Cloud computing security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control Identity management, Access control, Autonomic Security Cloud computing security challenges: Virtualization security management virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.		
Outcomes	**Explain the core issues of cloud computing such as security, privacy and interoperability.**	**K2**

Unit V		
Objectives	To Understand the various issues in Cloud	
Issues in Cloud Computing: Implementing real time application over cloud platform, Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud'. Cloud computing platforms, Installing cloud platforms and performance evaluation Features and functions of cloud platforms: Xen Cloud Platform, Eucalyptus, Open Nebula, Nimbus, TPlatform, Apache Virtual Computing Lab (VCL), Enomaly Elastic Computing Platform Applications: Best Practices in Architecting cloud applications in the AWS cloud – Massively multiplayer online Game hosting on cloud Resources – Building content delivery Networks using clouds – Resource cloud Mashups.		
Outcomes	**Choose the appropriate technologies, algorithms and approaches for the related issues.**	**K5**

Suggested Readings:-

Naresh Kumar Sehgal Pramod Chandra P. Bhatt, 2018, "Cloud Computing: Concepts and Practices, Springer", 1st ed.

Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, 2012, "Cloud Computing for Dummies", (Wiley India Edition).

Bible Barrie Sosinsky, 2013, "Cloud Computing", Wiley India.

GautamShroff, Cambridge, 2013, "Enterprise Cloud Computing " .

Ronald Krutz and Russell Dean Vines, 2014, "Cloud Security ", Wiley-India,.

RajkumarBuyya, James Broberg, and AndrzejGoscinski, 2011, " Cloud Computing Principles and Paradigms", John Wiley and Sons, Inc,

George Reese, 2009, "Cloud Application Architectures, First Edition, O'Reilly Media, Inc.

Online Resources:

https://www.kth.se/social/files/554fa451f276544829be2e5e/9-cloud-computing.pdf

https://www.cl.cam.ac.uk/teaching/2122/CC/lectures/Introduction22.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by:Dr.N.Geetha

Course Outcome Vs. Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	M (2)	M (2)	M (2)	M (2)	M (2)	-	M (2)	M (2)	M (2)
CO2	S (3)	S(3)	S(3)	S(3)	S (3)	S (3)	-	S(3)	S(3)	S (3)
CO3	M (2)	M (2)	M (2)	M (2)	M (2)	S(3)	-	M (2)	M (2)	M (2)
CO4	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	-	S(3)	S(3)	S(3)
CO5	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	S (3)	S(3)
W.AV.	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	**2.8**	**-**	**2.6**	**2.6**	**2.6**

S-Strong(3), M-Medium(2), L-Low(1)

Course Outcome Vs. Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	S(3)	M(2)	S(3)
CO2	S(3)	S(3)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	S(3)	S(3)	S(3)
CO4	S(3)	S(3)	S(3)	S(3)	S(3)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)
W.AV.	**3**	**3**	**3**	**2.8**	**3**

S-Strong(3), M-Medium(2), L-Low(1)

SEMESTER-I					
DSE-1	**Course Code 557552**	**ADVANCED JAVAPROGRAMMING**	**T**	**Credits: 3**	**Hours: 3**

UNIT I		
Objective 1	**To provide an overview of Object Oriented Programming concepts and Java Programming Language**	
Fundamentals of Object-Oriented Programming: - Basic concepts of OOP –Benefits – Applications Java Evolution: Features – how java differs from C and C++ - java and internet-java support system – java environment - Overview of Java Language –constants variables and data types- Operators and Expressions - Decision Making and Branching – Looping		
Outcome 1	**Students can summarize Object Oriented Programming**	**K1**
UNIT II		
Objective 2	**To create programs using classes, methods, Arrays Strings, vectors, Inheritance, Interface and packages**	
Classes, Objects and Methods: - Defining a class –fields –methods –creating objects – accessing class members – constructors – methods overloading –static members – nesting of methods – Inheritance –overriding methods –final variables-classes – methods- Arrays, Strings and Vectors :One dimensional Arrays –creating of array – Twodimensionalarrays-strings–vectors– Wrapperclasses–EnumeratedTypes- Packages: Defining interface –Extending interfaces – Implementing Interfaces.		
Outcome 2	**Learners can create programs using Arrays, inheritance, interfaces and Packages**	**K6**
UNIT III		
Objective 3	**To build Java applications using JDBC**	
JDBC Overview - Connection Class –Meta Data Function –SQL Exception– SQL warning - Statement –Result Set - Other JDBC Classes.		
Outcome 3	**Learners can construct Java applications using JDBC**	**K6**
Unit IV		
Objective 4	**To create applications using RMI**	
Part B. Answer ALL Questions(4X5=20)		
Outcome 4	**Students can design applications to remotely invoke services using RMI**	**K3**
Unit V		
Objective 5	**To develop application programs using AWT and swing packages**	
JApplet - Button - Combo - Trees - Tables – Panes. Introduction to AWT – Working with windows, Graphics, Text using AWT Controls and Layout managers.		
Outcome 5	**Students can build interactive applications using AWTand swing**	**K6**

Suggested Readings:-

Balagurusamy.E,2011,5e,TataMcGraw-Hill.
HerbertSchildt,2017,"JavaProgrammingwithJava-TheCompleteReference",9E,McGraw-Hill.
Krishnamoorthy.RandPrabhu.S,2004,InternetandJavaProgramming,NewAgeInternationalPublishers
WigglesworthandWandra,2011,"JavaProgrammingAdvanceTopics",3e,Cengage.

Online Resources:

https://gfgc.kar.nic.in/sirmv-science/GenericDocHandler/138-a2973dc6-c024-4d81-be6d-5c3344f232ce.pdf

https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.M.Vanitha

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	S(3)	M(2)	M(2)	S(3)	M(2)	L(1)	M(2)	L(1)
CO2	S(3)	S(3)	S(3)	M(2)	M(2)	L(1)	L(1)	L(1)	M(2)	M(2)
CO3	S(3)	M(2)	S(3)	M(2)	M(2)	L(1)	L(1)	L(1)	M(2)	M(2)
CO4	S(3)	M(2)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)	S(3)
CO5	S(3)	M(2)	S(3)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	M(2)
W.AV	3	2.4	3	2	1.6	1.6	1.2	1	1.6	2

S-Strong (3) M- Medium (2) L-Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	M(2)	S(3)	L(1)	L(1)
CO2	S(3)	M(2)	L(1)	L(1)	M(2)
CO3	S(3)	M(2)	S(3)	S(3)	L(1)
CO4	S(3)	L(1)	L(1)	L(1)	L(1)
CO5	S(3)	M(2)	S(3)	L(1)	L(1)
W.AV	3	1.8	2.2	1.4	1.2

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER-I					
DSE-1	**Course Code 557553**	**DIGITAL IMAGE PROCESSING**	**T**	**Credits:3**	**Hours:3**

Unit I		
Objective 1	**Toprovidethefundamentaltechniquesandalgorithmsusedforacquiring,processingandextractingusefulinformationfromdigitalimages.**	
DIGITAL IMAGE FUNDAMENTALS: Element of Digital Image Processing-ElementsofVisualPerception-PsychoVisualModelBrightness-Contrast-Hue-Saturation, Machband Effect, Color Image Fundamentals – RBG – His Models, Image Sampling, Quantization, Dither, Matrix Theory Result, Block Matrices and Kronecker Products.		
Outcome 1	**Students can summarize the fundamentals of digital images**	**K2**

UNIT II		
Objective 2	**To introduce the methods for images ampling and quantization**	
IMAGE TRANSFORMS: 2-D Orthogonal And Unitary Transforms,1-D And 2-D:Discrete Fourier Transformation, Cosine, Sine, Walsh, Hadamard, Slant, Kurhunen-Loeve, Singular Value DecompositionTransforms.		
Outcome 2	**Learners can understand 2D transformation concepts**	**K2**

Unit III		
Objective 3	**To understand about image transforms and image enhancement**	
IMAGE ENHANCEMENT: Point Operation-Contrast Stretching, Clipping and Thresholding Density Slicing, Histogram Equalization, Modification and Specification, Spatial Operation-Spatial Averaging, Low Pass, Highpass Band Pass Filtering, Direction Smoothing, Medium Filtering and Homomorphic Filtering		
Outcome 3	**Students can acquire knowledge about enhancing the images and apply it.**	**K3**

Unit IV		
Objective 4	**To acquire knowledge about restoration and principles**	
IMAGE RESTORATION: Image Observation Model, Sources of Degradation, Inverse and Wiener Filtering, Geometric Mean Filter, Non Linear Filter, Smoothing Splines and Interpolation, Constrained Least Squares Restoration.		
Outcome 4	**Students can cultivate the knowledge about restoration of images**	**K5**

Unit V		
Objective 5	**To introduce Image compression and video compression standards.**	
IMAGE DATA COMPRESSION: Image Data Rates, Pixel Coding, Need For Data Compression. Error Free Compression: Variable Length Coding, Bit Plane Coding, LZW Coding, Lossy Compression: Transform Coding, Wavelet Coding, Compression Standards: Binary Image Compression Standard, Still Image Compression Standards, Video Compression Standards.		
Outcome 5	**Learners can understand and gain knowledge about Image Compression**	**K4**

Suggested Readings:-

AnilK.Jain,2015*FundamentalsofDigitalImageProcessing*,Pearson.

Jayaraman.S,Veerakumar.TandEsakkirajan.S,2009,*DigitalImageProcessing,*1eMcGrawHill Education.

Khalidsayood,2018.*IntroductiontoDataCompression*,5thEditionpublishedbyMorganKaufmann.

RafaelGonzalez.CandRichardWoodsE.2014,*DigitalImageProcessing*,3e,Pearson.

Online Resources:

https://dl.icdst.org/pdfs/files4/01c56e081202b62bd7d3b4f8545775fb.pdf

https://library.uoh.edu.iq/admin/ebooks/75289-bernd-jahne---digital-image-processing-5th-ed.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.M.Vanitha

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	M(2)	M(2)	L(1)	L(1)	L(1)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	L(1)	M(2)	L(1)	M(2)	M(2)	S(3)	M(2)	L(1)
CO3	S(3)	S(3)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)	M(2)	L(1)
CO4	M(2)	M(2)	L(1)	M(2)	M(2)	L(1)	L(1)	M(2)	M(2)	M(2)
CO5	L(1)	M(2)	L(1)	L(1)	M(2)	L(1)	L(1)	M(2)	M(2)	M(2)
W.AV	1.8	2.2	1.2	1.6	1.4	1.2	1.6	2.2	2	1.4

S-Strong (3) M- Medium (2) L-Low (1)

Course Outcome VS Programme Specific Outcomes

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	M(2)	S(3)	L(1)	L(1)
CO2	S(3)	M(2)	L(1)	L(1)	M(2)
CO3	S(3)	M(2)	S(3)	S(3)	L(1)
CO4	S(3)	L(1)	L(1)	L(1)	L(1)
CO5	S(3)	M(2)	S(3)	L(1)	L(1)
W.AV	3	1.8	2.2	1.4	1.2

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER- II					
Core: 7	**Course code 557201**	**DATA MINING AND WAREHOUSING**	**T**	**Credits:4**	**Hours:4**

Unit I		
Objective 1	**To study OLAP operations, OLAP engine in Data Warehousing**	
Data Warehousing Introduction – Definition-Multi Dimensional Data Model- OLAP operations-Warehouse Schema - Data Modeling tools – Fact tables and dimensions - Warehouse Architecture -Warehouse server-. Meta Data – OLAP Engine-Backend Process: Data Extraction, cleaning, Transformation and loading -Data warehousing case studies: Data warehousing in Government, Tourism, Industry and Genomics data.		
Outcome 1	**Able to solve data mining case studies using real-world datasets.**	**K1**

Unit II		
Objective 2	**To study the Data mining techniques like association rule, clustering, classification, web mining, temporal and sequential data mining.**	
Data Mining fundamentals - Definition – KDD vs. Data Mining- KDD steps: Data selection, cleaning, Integration, Transformation, Reduction and Enrichment-DM Techniques –Issues and Challenges in Data Mining-application areas: types of data – Data Mining Applications-current trends affecting data mining – Data Preprocessing - Exploration: Summary statistics – Visualization		
Outcome 2	**Able to do the preprocessing activities on datamining applications.**	**K2**

Unit III		
Objective 3	**To study the Data mining techniques like association rule algorithms.**	
Association rules: Introduction – Methods to discover association rules – Apriori algorithm - Partition Algorithm – Pincer search algorithm – Dynamic Item set Counting algorithm – FP-Tree Growth algorithm. Classification: Decision Tree classification – Bayesian Classification – Classification by Back Propagation.		
Outcome 3	**Understand Association rule algorithms like Apriori, Partition and Pincer Search algorithm**	**K3**

Unit IV		
Objective 4	**To study the Data mining techniques like clustering and classification**	
Clustering Techniques: Introduction – Clustering Paradigms – Partitioning Algorithms: K means & K Medoid algorithms – CLARA – CLARANS – Hierarchical clustering – DBSCAN – BIRCH – Categorical Clustering algorithms – STIRR – ROCK – CACTUS. Introduction to machine learning – Supervised learning – Unsupervised learning – Machine learning and data mining. Neural Networks: Introduction – Use of NN – Working of NN - Genetic Algorithm: Introduction –Data Mining using GA.		
Outcome 4	**Acquire knowledge in clustering techniques**	**K5**

Unit V		
Objective 5	**To study the Data mining techniques like web mining, temporal and sequential data mining**	
Web Mining and Big Data: Introduction –Web content mining – Web structure mining –Web usage mining –Text mining –Text clustering – Visual data mining – Various mining tools and techniques for implementation using weka, Rapidminer and Matlab. Introduction to Big Data Analytics – Data Analytics – Analytics Terminology –Types of Analytics – Analytics Life Cycle - Data Store.		
Outcome 5	**Understand the data mining techniques, classification and web mining**	**K4**

Suggested Readings:

ArunK.Pujari, 2016, *Data Mining Techniques*, 4th Edition, Orient Blackswan Publications

Parteek Bhatia, 2019, Data Mining and Data Warehousing: Principles and Practical Techniques, Cambridge University Press

Jiawei Han, Jian Pei and MichelineKamber, 2016, *Data Mining: Concepts and Techniques*, 3e, Morgan Kaufmann.

Lakshmi Prasad.Y, 2016, *Big Data Analytics*, 1st Edition, Notion Press.

Liam Damien, 2019, *Data Mining : Your Ultimate guide to a Comprehensive understanding of Data Mining*, Independently Published

Online Resources

http://hanj.cs.illinois.edu/bk2/toc.pdf

https://www.scribd.com/document/333396661/Dunham-Data-Mining-pdf#

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr.P. Prabhu

Course Outcome VS Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	M(2)	L(1)	M(2)	M(2)	L(1)	L(1)	M(2)	L(1)
CO2	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	L(1)	S(3)	M(2)	S(3)
CO3	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	M(2)	S(3)	M(2)	S(3)
CO4	S(3)	S(3)	M(2)	S(3)	S(3)	M(2)	M(2)	S(3)	M(2)	S(3)
CO5	S(3)	S(3)	M(2)	S(3)	S(3)	M(2)	M(2)	S(3)	M(2)	S(3)
W. AV	**3**	**3**	**2.4**	**2.2**	**2.8**	**2**	**1.6**	**2.6**	**2**	**2.6**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	M(2)	M(2)	M(2)
CO2	S(3)	S(3)	M(2)	M(2)	S(3)
CO3	S(3)	S(3)	S(3)	M(2)	S(3)
CO4	S(3)	S(3)	S(3)	L(1)	S(3)
CO5	S(3)	S(3)	S(3)	L(1)	S(3)
W. AV	**2.8**	**2.8**	**2.6**	**1.6**	**2.8**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER II					
Core: 8	**Course code 557202**	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**	**T**	**Credits: 4**	**Hours: 4**

Unit – I

Objective 1	**To Understand the basic concepts in Artificial Intelligence and Knowledge**	
Artificial Intelligence - The AI Problems – The Underlying Assumptions – AI Techniques Problems: Problems Spaces and Search – Defining the Problems as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the Design of Search Programmes - Generate – and-Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction – Means – Ends – Analysis.		
Outcome 1	**Analyze the foundational concepts of Artificial Intelligence, including problem spaces, search techniques, production systems, and constraint satisfaction, to develop a deep understanding and effective problem-solving strategies**	**K4**

Unit II

Objective 2	**Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.**	
Knowledge Representation Issues: Representation and Mappings – Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem - Using predicate logic – Representing Simple facts in Logic – Representing Instance and Is a relationships – Computable functions and Predicates – Resolutions – Natural Deductions – Representing Knowledge Using Rules: Procedural versus Declarative Knowledge – Forward versus Backward Reasoning – Matching – Control Knowledge.		
Outcome 2	**Comprehend knowledge representation approaches, logic-based representation of facts and relationships, and the distinctions between procedural and declarative knowledge, enabling effective analysis and understanding of knowledge representation issues and reasoning strategies**	**K2**

Unit III

Objective 3	**To know about the basic concepts of Machine Learning**	
Introduction to Machine Learning : Human Learning - Types of Human Learning - Machine Learning - Types of Machine Learning - Problems Not to be Solved using Machine Learning - Applications of Machine Learning - State of the Art Languages / Tools in Machine Learning - Issues in Machine Learning		
Outcome 3	**Gain a solid understanding of machine learning concepts, distinguish between human and machine learning types, and critically assess the applicability and limitations of machine learning, thereby enabling the analysis and evaluation of key aspects in the field**	**K4**

Unit IV		
Objective 4	**To acquire knowledge about various tools of Machine Learning**	
Preparing to Model: Introduction - Machine Learning Activities - Basic Types of Machine Learning - Exploring Structure of Data - Data Quality and Remuneration - Data Pre-processing. Modelling and Evaluation : Introduction - Selecting a Model - Training a Model - Model Representation and Interpretability – Evaluating Performance of a Model - Improving Performance of a Model.		
Outcome 4	**Prepare to model by understanding fundamental machine learning activities and exploring data structure, ensuring data quality through pre-processing, and then proceed to model selection, training, representation, and evaluation for enhanced performance**	**K3**
Unit V		
Objective 5	**To understand about Probability and statistical tools**	
Overview of Probability : Introduction - Importance of Statistical Tools in Machine Learning - Concept of Probability - Random Variables - Common Discrete Distributions - Multiple Random Variables - Central Limit Theorem - Sampling Distributions - Hypothesis Testing - Monte Carlo Approximation - Bayesian Concept Learning : Introduction - Importance of Bayseian Methods - Bayes Theorem - Bayes Theorem and Concept Learning - Bayesian Belief Network.		
Outcome 5	**Understand probability's role in machine learning, including concepts like random variables, distributions, Bayesian methods, and hypothesis testing, to effectively apply statistical tools in analyzing and enhancing machine learning models**	**K5**

Suggested Readings:

AnuradhaSrinivasaraghavan, Vincy Elizabeth, 2019, Machine Learning, Wiley Publications.

Kevin Night and Elaine Rich, Nair B , 2017 ,“Artificial Intelligence”, McGraw Hill - (Unit I,II) Russel, Artificial Intelligence, 2015, A Modern Approach, Pearson Education India; 3rd Edition.

SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, 2018 "Machine Learning" – Pearson Education; First Edition, (Unit III,IV and V)

Online Resources:

https://www.infosys.com/oracle/insights/documents/ai-machine-learning.pdf

https://mimo.mit.edu/wp-content/uploads/2023/03/mimoDLW23.pdf

https://brighterion.com/wp-content/uploads/2019/05/Artificial-Intelligence-And-Machine-Learning-The-Next-Generation.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.K.Mahesh

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	L (1)	L (1)
CO2	L (1)	L (1)	S(3)	L (1)	L (1)	M(2)	L(1)	M(2)	L (1)	L (1)
CO3	M(2)	M (2)	S(3)	L (1)	M(2)	M(2)	M (2)	L(1)	M(2)	M (2)
CO4	M(2)	M (2)	S(3)	L (1)	M(2)	L(1)	L(1)	L(1)	M(2)	L (1)
CO5	L(1)	L (1)	L(1)	L (1)	S(3)	L(1)	L(1)	M(2)	M(2)	L (1)
W. AV	**1.6**	**1.6**	**2.6**	**1.2**	**1.8**	**1.4**	**1.2**	**1.4**	**1.6**	**1.2**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)
CO2	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)
CO3	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)
CO5	L (1)	L (1)	S (3)	L (1)	S (3)	L (1)
W.AV	**1.6**	**1.6**	**1.8**	**1.4**	**1.4**	**1.4**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER- II					
Core: 9	**Course code 557203**	**WEB TECHNOLOGY**	**T**	**Credits:4**	**Hours:4**
Unit I					
Objective 1	**To develop a web application using HTML technologies**.				
HTML Common tags: List, Tables, images, forms, Frames; Cascading Style sheets. Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script. XML - Document type definition, XML Schemas, Document Object model, Presenting XML.					
Outcome 1	**Acquired the skills and project-based experience needed for entry into web application and development careers.**				**K1**
Unit II					
Objective 2	**To develop a web application using java technologies.**				
Java Beans – Introduction, Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties, Persistence, Customizes, Java Beans API, Introduction to EJB's.					
Outcome 2	**To do the experiment based on Java Beans**				**K2**
Unit III					
Objective 3	**To be able to understand server side software development**				
Web Servers and Servlets: Tomcat web server, Introduction to Servlets - Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.					
Outcome 3	**Students will be able to write a server side java application**				**K4**
Unit IV					
Objective 4	**To understand the Server side programming using JSP**				
Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment - Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat. JSP Application Development - Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages.					
Outcome 4	**Students will be able to write a server side java application**				**K3**
	Unit V				
Objective 5	**To understand JSP, JDBC and Java Beans**				
Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from a JSP Page, Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page.					
Outcome 4	**Students will be able to write a server side java application along with JDBC connectivity.**				**K5**

Suggested Readings:-

Chris Bates, 2006 Web Programming: Building Internet Applications, 3e

Jeffrey C. Jackson, 2011 Web Technologies: A Computer Science Perspective, Pearson education, 1e

Jason Hunter, O' Reilly, 2010 Java Servlet Programming, 2e

Hans Bergsten, O'Reilly, 2009 Java Server Pages, 3e.

Patrick Naughton and Herbert Scheldt, The complete Reference Java 2, 7e, Tata McGraw Hill.

Robert W. Sebesta, "Programming the World Wide Web", Pearson Education, 4e, 2011.

Online Resources:

https://www.tutorialspoint.com/jsp/jsp_tutorial.pdf

https://www.javacodegeeks.com/2014/12/java-servlet-tutorial.html

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr.P. Prabhu

Course Outcome VS Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	M(2)	L(1)	M(2)	L(1)	L(1)	L(1)	M(2)	M(2)
CO2	S(3)	S(3)	S(3)	M(2)	S(3)	S(3)	L(1)	L(1)	M(2)	S(3)
CO3	S(3)	S(3)	S(3)	M(2)	S(3)	S(3)	M(2)	M(2)	M(2)	S(3)
CO4	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	M(2)	M(2)	M(2)	S(3)
CO5	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	M(2)	M(2)	M(2)	S(3)
W. AV	**3**	**3**	**2.4**	**2.2**	**2.8**	**2.6**	**1.6**	**1.6**	**2**	**2.8**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	L(1)	M(2)	M(2)	M(2)
CO2	S(3)	S(3)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	S(3)	S(3)	S(3)
CO4	S(3)	S(3)	S(3)	M(2)	S(3)
CO5	S(3)	S(3)	S(3)	M(2)	S(3)
W. AV	**2.8**	**2.6**	**2.8**	**2.4**	**2.8**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER-II					
Core: 10	**Course code 557204**	**DESIGN AND ANALYSIS OFALGORITHMS**	**T**	**Credits:4**	**Hours:4**

UNIT I		
Objective 1	**To understand the basics of Algorithm**	
Introduction: What is Algorithm? – Fundamentals of Algorithmic problem solving – important problem types – Fundamentals of Analysis of Algorithm efficiency– Mathematical Analysis of Non Recursive Algorithms-Mathematical Analysis of Recursive Algorithms – Algorithm for Computing Fibonacci Numbers – Empirical Analysis of Algorithms.		
Outcome 1	**To list the fundamental concepts of Algorithm**	**K1,K2**

UNIT II		
Objective 2	**To demonstrate a familiarity with major algorithms and data structures**	
Brute Force – Selection Sort, Bubble sort, Sequential Search – Closet-Pair and Convex-Hull Problems-Depth first search and Breadth first search – Divide and Conquer – Merge sort, Quick sort, Binary Search, Strassen's matrix multiplication.		
Outcome 2	**To develop efficient algorithm for a given problem and able to analyze its time and space complexity**	**K3**

UNIT III		
Objective 3	**To apply important algorithmic design paradigms and methods of analysis**	
Dynamic Programming – General Method – Computing a Binomial Coefficient – Warshall's and Floyd's Algorithms- Optimal Search Binary trees – Knapsack Problem – Greedy Technique - General Method, Applications - Prim's Algorithm, Kruskal's Algorithm, Dijikstra's Algorithm.		
Outcome 3	**To apply design and development principles in the construction of software systems of varying complexity**	**K3, K4**

UNIT IV		
Objective 4	**To explain about the various algorithm design techniques**	
DecreaseandConquer–Insertionsort–DepthFirstSearch, BreadthFirstSearch - Topological Sorting – Algorithm for generating Combinatorial Objects. Transform and Conquer – Presorting – Heap and Heap sort – Problem Reduction – Computing Least Common Multiple – Counting Paths in a Graph- Reduction of Optimization Problem – Reduction to Graph Problems.		
Outcome 4	**To apply the algorithm design techniques to any of the real world problem.**	**K3**

UNIT V		
Objective 5	**To determine the various problem types**	
Back Tracking – General Method – 8 Queen's Problem – Sum of Subsets – Graph Colouring – Hamiltonian cycle – Branch and Bound – General Method – Assignment Problem - Knapsack problem – Travelling Salesman Problem. P, NP and NP-complete Problems		
Outcome 5	**To use current techniques, skills, and tools necessary for computing practice**	**K5**

Suggested Readings:-

AnanyLevitin, 2012. Introduction to Design and Analysis of Algorithms, Pearson education, 3e.

Lee.R.C.T, Shian-Shyong Tseng, Ruei-Chuan Chang, Tsai.Y.T, 2005, Introduction to the Designand Analysis of Algorithms: A Strategic Approach, McGraw-Hill

Sridhar.S,1e, Design and Analysis of Algorithms, 2014 oxford university press.

Online Resources

www.geeksfor geeks.org/design-and-analysis-of-algorithms

https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015

https://onlinecourses.nptel.ac.in/noc20_cs71/preview

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr.G. Shanthi

Course Outcome VS Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M(2)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)	M(2)	L(1)
CO2	M(2)	S(3)	S(3)	M(2)	M(2)	L(1)	L(1)	L(1)	M(2)	M(2)
CO3	S(3)	S(3)	S(3)	M(2)	M(2)	M(2)	M(2)	M(2)	M(2)	L(1)
CO4	M(2)	M(2)	M(2)	S(3)	M(2)	M(2)	M(2)	M(2)	L(1)	M(2)
CO5	S(3)	M(2)	M(2)	S(3)	L(1)	L(1)	M(2)	M(2)	L(1)	L(1)
W. AV	**2.6**	**2.4**	**2.4**	**2.2**	**1.6**	**1.4**	**1.6**	**1.6**	**1.6**	**1.4**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	S(3)	M(2)	M(2)
CO2	M(2)	S(3)	M(2)	M(2)	L(1)
CO3	S(3)	M(2)	S(3)	M(2)	M(2)
CO4	M(2)	S(3)	M(2)	M(2)	M(2)
CO5	M(2)	M(2)	M(2)	M(2)	M(2)
W. AV	**2.4**	**2.6**	**2.4**	**2**	**1.8**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER II					
Core: 11	**Course code 557205**	**LAB I: ALGORITHMS LAB**	**P**	**Credits:2**	**Hours:4**

Objectives:

- To understand the importance of algorithm and its complexities.
- To implement various divide and conquer techniques examples.
- To implement various Greedy techniques examples.
- To implement various Dynamic Programming techniques examples.
- To provide a practical exposure of all algorithms.

LIST OF EXPERIMENTS

1. Write a program to find **GCD and LCM** of given numbers
2. Write a program to display **Fibonacci series** using recursion
3. Write a to sort given set of numbers using **Selection Sort**
4. Write a program to sort given set of numbers using **Bubble Sort**
5. Write a program to search the given number using **Linear Search**
6. Write a program to search the given number using **Binary Search**
7. Write a program to perform **Stack operations** (Push, Pop, and Display) using arrays.
8. Write a program to find **Binomial coefficient**
9. Write a program to implement **Warshall's Algorithm** for finding transitive closure of the given graph
10. Write a program to implement all-pairs shortest paths problem using **Floyd's algorithm**
11. Write a program to implement **Knapsack Problem** using Dynamic Programming
12. Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm.**
13. Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal's algorithm.**
14. Write a program to implement **Topological Ordering**for Directed Acyclic Graph (DAG)
15. Write a program to printallthenodesreachablefromagivenstartingnodeinadigraphusing**Breadth First Search**method.
16. Write a program to checkwhetheragivengraphisconnectedornotusing**Depth First Search**method
17. Write a program to sort set of n integer elements using the **Quick sort method** and compute its time complexity.
18. Write a program to sort set of n integer elements using the **Merge Sort method** and compute its time complexity.
19. Write a program to design and implement in java to find a Subset of a given set S= {S1, S2,….,Sn} of n positive integers whose SUM is equal to a given positive integer d.
20. Write a program to implement **Traveling Salesman Problem**
21. Write a program to find all **Hamiltonian Cycle** in a connected undirected Graph G of n vertices using the backtracking principle

Outcomes:

- CO1: To calculate the time complexity of algorithm.
- CO2: To sort the given numbers using various sorting algorithms.
- CO3: To write programs for the problems using divide and conquer and greedy method.
- CO4: To write programs for the problems using dynamic programming.
- CO5: To write programs for the problems using backtracking

Online Resources	https://sjcit.ac.in/wp-content/uploads/2022/03/DAA-LAB-MANUAL2020-1.pdf https://camelliait.ac.in/Lab%20Manual/ADA%20Lab%20Programs.pdf https://people.iitism.ac.in/~download/lab%20manuals/cse/CSC204.pdf

K1-Remember	***K2-Understand***	***K3-Apply***	***K4-Analyze***	***K5-Evaluate***	***K6-Create***

Course designed by: Dr. G. Shanthi

Course Outcome VS Programme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M(2)	M(2)	M(2)	L(1)	L(1)	-	-	-	L(1)
CO2	M(2)	M(2)	S(3)	M(2)	L(1)	-	-	-	M(2)	M(2)
CO3	M(2)	M(2)	M(2)	L(1)	L(1)	-	-	-	-	L(1)
CO4	M(2)	M(2)	M(2)	L(1)	M(2)	-	-	-	L(1)	L(1)
CO5	S(3)	M(2)	M(2)	L(1)	L(1)	L(1)	-	-	L(1)	L(1)
W. AV	**2.4**	**2**	**2.2**	**1.4**	**1.2**	**1**	**-**	**-**	**1.3**	**1.2**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	M(2)	M(2)
CO2	M(2)	M(2)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	M(2)	M(2)	L(1)
CO4	M(2)	S(3)	L(1)	L(1)	L(1)
CO5	M(2)	M(2)	L(1)	L(1)	L(1)
W. AV	**2.4**	**2.4**	**1.8**	**1.8**	**1.4**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER- II					
Core: 12	**Course code 557206**	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB**	**P**	**Credits:2**	**Hours:4**

Objectives:

- Develop a strong understanding of graph traversal and search algorithms through the implementation of BFS and DFS.
- Gain practical experience in solving optimization problems using the Hill Climbing and A* search algorithms.
- Create a functional Tic-Tac-Toe game, enhancing programming and user interface design abilities.
- Learn how to work with datasets, perform statistical analysis, and create visualizations using Python libraries such as Pandas and Matplotlib.
- Gain insights into machine learning through the implementation of rule-based algorithms (Find S, Candidate Elimination) and linear regression, setting the foundation for further ML exploration.

1. Write a Program to Implement Breadth First Search.
2. Write a Program to Implement Depth First Search
3. Write a program to implement Hill Climbing Algorithm
4. Write a program to implement A* Algorithm
5. Write a program to implement Tic-Tac-Toe game
6. Implementation of Python basic Libraries such as Math, Numpy and Scipy
7. Implementation of Python Libraries for ML application such as Pandas and Matplotlib
8. Creation AND Loading different datasets in Python.
9. Write a python program to compute Mean, Median, Mode, Variance and Standard Deviation using Datasets
10. Implementation of Find S Algorithm
11. Implementation of Candidate elimination Algorithm
12. Write a program to implement simple Linear Regression and Plot the graph

Outcomes: Upon completion of the course, the students should be able to:

- Apply various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction,)
- Understand the fundamentals of knowledge representation, inference.
- Understand the fundamentals of theorem proving using AI tools.
- Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information

Online Resources:

https://mrcet.com/pdf/Lab%20Manuals/CSEAIML/Artificial%20Intelligence%20and%20Machine%20Learning%20Lab%20Manual.pdf

https://www.jnit.org/wp-content/uploads/2020/04/Machine-Learning-Lab-Manual.pdf

https://www.scribd.com/document/640302664/AIML-Manual

COURSE OUTCOMES

After the completion of this course the students will be able to,

S.No.	Course Outcomes	Level	Unit Covered
CO1	Recall and explain BFS and DFS graph traversal algorithms.	K1,K2	-
CO2	Apply Python libraries (Pandas, Matplotlib) for data manipulation and rule-based algorithms for machine learning.	K3	-
CO3	Analyze data using statistical measures and evaluate optimization algorithm effectiveness.	K4,K5	-
CO4	Create a functional Tic-Tac-Toe game and generate hypotheses and linear regression models.	K6	-
CO5	Analyze datasets, identify patterns, and evaluate algorithm and model outcomes critically.	K4,K5	-

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Outcome Vs. Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)	L(1)	L(1)	L(1)
CO2	L(1)	S(3)	M(2)	M(2)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)
CO3	L(1)	L(1)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)	L(1)
CO4	L(1)	L(1)	M(2)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)	L(1)
CO5	L(1)	L(1)	L(1)	M(2)	S(3)	M(2)	L(1)	L(1)	L(1)	L(1)
W.AV.	**1.4**	**1.6**	**1.8**	**2**	**1.8**	**1.2**	**1**	**1**	**1**	**1**

S-Strong(3), M-Medium(2), L-Low(1)

Course Outcome Vs. Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	S(3)	-	-	-	-	S(3)
CO2	M(2)	S(3)	S(3)	-	-	S(3)
CO3	-	-	S(3)	-	-	-
CO4	-	-	-	-	-	-
CO5	M(2)	-	-	-	S(3)	S(3)
W.AV.	**1.4**	**0.6**	**1.2**	**-**	**0.6**	**1.8**

S-Strong(3), M-Medium(2), L-Low(1)

SEMESTER-II					
DSE-2	**Course Code 557554**	**DEEP LEARNING**	**T**	**Credits:3**	**Hours:3**

Unit I

Objective 1	**To Understand the principles of neural networks**	
Basics of neural networks - Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.		
Outcome 1	**Summarize the fundamentals of neural networks**	**K1**

UNIT II

Objective 2	**To Understand the basic concepts of deep learning**	
Introduction to deep learning - Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout.		
Outcome 2	**Understand the deep learning concepts and apply them to different problems**	**K3**

Unit III

Objective 3	**To Understand and implement the architectures of Convolution neural networks**	
Convolutional neural networks - Kernel Filters – Multiple Filters - CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning - Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications		
Outcome 3	**Acquire knowledge about how to design and apply Convolutional and Recurrent Neural Networks and Understand the concepts of different deep learning architectures.**	**K4**

Unit IV

Objective 4	**To introduce and implement the architectures of deep learning**	
Deep Learning Architectures: LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- VariationalAutoencoders – Adversarial Generative Networks – Autoencoder and DBM.		
Outcome 4	**Cultivate the knowledge about Deep learning architectures**	**K2**

Unit V

Objective 5	**To acquire knowledge about deep learningapplications**	
Applications of deep learning : Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models.		
Outcome 5	**Understand and gain knowledge about how to create deep learning applications and analyze the role of deep learning models in image processing.**	**K5**

Suggested Readings:-

Ian Good Fellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2017.

Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.

Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.

Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Apress , 2017.

RagavVenkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.

Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.

Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016.

Online Resource:

https://web.pdx.edu/~nauna/week7b-neuralnetwork.pdf

https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/DeepLearningBook_RefsByLastFirstNames.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.L.Sathiya

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	L(1)	S(3)	S(3)
CO2	S(3)	M(2)	S(3)	L(1)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)
CO4	S(3)	S(3)	L(1)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	S(3)
W.AV	**3**	**2.8**	**2.4**	**2.4**	**2.8**	**2.8**	**2.8**	**2.6**	**2.8**	**2.8**

S-Strong (3) M- Medium (2) L-Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	S(3)	S(3)
CO2	S(3)	L(1)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	S(3)	S(3)	S(3)
CO4	S(3)	M(2)	S(3)	S(3)	L(1)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)
W.AV	**3**	**2.2**	**2.8**	**3**	**2.4**

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER-II					
DSE-2	**Course code 557555**	**CYBER SECURITY**	**T**	**Credits: 3**	**Hours: 3**

Unit I

Objective 1	**To Understand the fundamentals of cybercrimes**	
INTRODUCTION TO CYBERCRIME: Cybercrime- Definition and Origins of the WordCybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them:How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.		
Outcome 1	**Summarizethe fundamentals of cybercrimes**	**K1, K2, K3**

UNIT II

Objective 2	**To Understand the basic concepts ofmoblie and wireless devices in cybercrime**	
CYBERCRIME: Mobile and Wireless Devices:Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.		
Outcome 2	**Understand the cybercrime concepts and apply them to different devices**	**K2,K3,K4**

Unit III

Objective 3	**To Understand the tools and methods in cybercrimes**	
TOOLS AND METHODS USED IN CYBERCRIME: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan-horses and Backdoors, Steganography, DoS and DDoS At-tacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction to Phishing, Identity Theft (ID Theft).		
Outcome 3	**Acquire knowledge about how the tools and methods are used in cybercrime**	**K2,K3,K4**

Unit IV

Objective 4	**To understand the concepts of computer forensics**	
UNDERSTANDING COMPUTER FORENSICS: Introduction, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics.		
Outcome 4	**Cultivate the knowledge about computer forensics**	**K4,K5**

Unit V		
Objective 5	**To acquire knowledge about forensics and social networking sites and cyber laws**	
Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics. **INTRODUCTION TO SECURITY POLICIES AND CYBER LAWS:** Need for An Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual Property Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.		
Outcome 5	**Understand and gain knowledge about forensics and social networking sites and acquire the knowledge of cyber laws**	**K3,K6**

Suggested Readings:-

SunitBelapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, Publish Date 2013.

Dr. Surya PrakashTripathi, RitendraGoyal, Praveen Kumar Shukla, KLSI. "Introduction to information security and cyber laws". Dreamtech Press. ISBN: 9789351194736, 2015.

Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 - 1-118 -84965 -1

James Graham, Ryan Olson, Rick Howard, "Cyber Security Essentials", CRC Press, 15-Dec 2010.

Anti- Hacker Tool Kit (Indian Edition) by Mike Shema, McGraw-Hill Publication.

Online Resource:

https://oulms.in/wp-content/uploads/2022/04/Chapter-1.pdf

https://osou.ac.in/eresources/introduction-to-indian-cyber-law.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.L.Sathiya

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L(1)	M(2)	M(2)	L(1)	S(3)	S(3)	M(2)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	M(2)	M(2)	M(2)	M(2)	M(2)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	S(3)	M(2)	M(2)	S(3)	M(2)	M(2)	S(3)	S(3)
CO4	M(2)	M(2)	L(1)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	S(3)
CO5	S(3)	S(3)	M(2)	S(3)	M(2)	M(2)	L(1)	S(3)	S(3)	S(3)
W.AV	2.2	2.4	2	2	2.2	2.4	2	2.4	2.8	2.6

S-Strong (3) M- Medium (2) L-Low (1)

Course Outcome VS Programme Specific Outcomes

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	M(2)	M(2)	S(3)
CO3	M(2)	L(1)	S(3)	S(3)	M(2)
CO4	M(2)	S(3)	M(2)	S(3)	S(3)
CO5	L(1)	S(3)	L(1)	S(3)	S(3)
W.AV	2	2.4	2	2.6	2.4

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER-II					
DSE-2	**Course code 557556**	**BLOCK CHAIN TECHNOLOGY**	**T**	**Credits: 3**	**Hours: 3**

UNIT I

Objective 1	**To understand the basic concepts and components of blockchain**	
Fundamentals of Blockchain: Introduction - Origin of Blockchain - Blockchain Solution - Components of Blockchain - Components of Blockchain - Block in Blockchain - The Technology and the Future.		
Outcome 1	**To know the fundamental concepts and components of blockchain.**	**K1**

UNIT II

Objective 2	**To understand various Blockchain types and Consensus Mechanism.**	
Blockchain types and Consensus Mechanism: Introduction - Decentralization and Distribution - Types of Blockchain - Consensus Protocol - Crypto currency - BITCOIN, ALTCOIN and TOKEN: Introduction - Bitcoin and Crypto currency Basics - Types of Crypto currency – Crypto currency Usage.		
Outcome 2	**Acquire knowledge about various blockchain types and Consensus Mechanism.**	**K2**

UNIT III

Objective 3	**To study the concepts of public blockchain system.**	
Public Blockchain System: Introduction - Public Blockchain - Popular Public Blockchains - The BitcoinClockchain – EtherumBlockchain.		
Outcome 3	**Students can gain knowledge about public blockchain system**	**K3**

UNIT IV

Objective 4	**To explain about the characteristics and various block algorithms.**	
Private Blockchain System : Introduction - Key Characteristics of Private Blockchain - Why We Need Private Blockchain - Private Blockchain Examples - Private Blockchain and Open Source - E-Commerce Site Examples - Various Commands in E-Commerce Blockchain - Smart Contract in Private Environment - State Machine - Different Algorithms of Permissioned Blockchain - Byzantine Fault – Multichain.		
Outcome 4	**Learners can understand the characteristics and various block algorithms.**	**K5**

UNIT V

Objective 5	**To examine various security aspects and major application areas of blockchain.**	
Security in Blockchain : Introduction - Security Aspects in Bitcoin - Security and Privacy Challenges of Blockchain in General - Performance and Scalability - Identity Management and Authentication - Regularity Compliance and Assurance - Safeguarding Blockchain Smart Contract - Security Aspects in Hyper ledger Fabric. **Applications of Blockchain:**Blockchain in Banking and Finance - Blockchain in Healthcare.		
Outcome 5	**Learners gain idea about security aspects and major application areas of blockchain.**	**K4**

Suggested Readings:-

ChandramouliSubramaniam, Asha A George, Abhilash K A, MeeraKarthikeyan, Blockchain Technology,2020, University Press

Daniel DrescherBlockchain Basics, 2017: A Non-Technical Introduction, Academic Press.

DebajaniMohanty, 2018, Blockchain from Concept to Execution, BPB

Online Resource: https://www.buffalo.edu/content/dam/www/ubblockchain/files/basics/001%20What%20is%20Blockchain.pdf https://www.shiksha.com/online-courses/articles/private-blockchain/					
K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*
Course designed by: Dr.A.Pramila					

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	M(2)	L(1)	M(2)	M(2)	L(1)	L(1)	M(2)	L(1)
CO2	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	L(1)	L(1)	M(2)	S(3)
CO3	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	M(2)	M(2)	M(2)	S(3)
CO4	S(3)	S(3)	M(2)	S(3)	S(3)	M(2)	M(2)	M(2)	M(2)	S(3)
CO5	S(3)	S(3)	M(2)	S(3)	S(3)	M(2)	M(2)	M(2)	M(2)	S(3)
W. AV	**3**	**3**	**2.4**	**2.2**	**2.8**	**2**	**1.6**	**1.6**	**2**	**2.6**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	M(2)	M(2)	M(2)
CO2	S(3)	S(3)	M(2)	M(2)	S(3)
CO3	S(3)	S(3)	S(3)	M(2)	S(3)
CO4	S(3)	S(3)	S(3)	M(2)	S(3)
CO5	S(3)	S(3)	S(3)	M(2)	S(3)
W. AV	**2.8**	**2.8**	**2.6**	**2**	**2.8**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER III					
Core: 13	**Course Code 557301**	**BIG DATA ANALYTICS**	**T**	**Credits:4**	**Hours:4**

Unit I

Objectives 1	To understand Big Data and its analytics in the real world

INTRODUCTION TO BIG DATA ANALYTICS: Big Data Overview–Data Structures Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – BigDataEcosystem-DataAnalyticsLifecycle–DataDiscovery–DataPreparation Model Planning–Model Building–Communicate Results–Operationalize.

Outcomes 1	**To understand the building blocks of Big Data.**	**K1,K2**

Unit II

Objectives 2	To process Big Data to generate analytics.

DATA ANALYTIC METHODS: Basic Data Analytic Methods Using R:IntroductiontoR programming – RGraphical User Interfaces– Data Import and Export Attribute and DataTypes–Descriptive StatisticsExploratoryData Analysis :VisualizationBeforeAnalysis–Dirty Data – Visualizing a Single Variable – Examining MultipleVariablesDataExplorationVersus Presentation -– Statistical Methods of Evaluation:HypothesisTesting–DifferenceofMeans–WilcoxonRank-SumTest–TypeIandTypeIIErrors– Power and Sample Size–ANOVA.

Outcomes 2	**To understand the specialized aspects of big data with the help of different big data applications.**	**K2**

Unit III

Objectives 3	To Develop clustering techniques and association rules for large standard datasets and user datasets.

ADVANCED METHODS: Advanced Analytical Theory and Methods: Clustering–K-Means–Use Cases - Overview – Determining number of clusters –Diagnostics Reasons to choose andcautions–Additional Algorithms–Association Rules: A Priori Algorithm–Evaluation of Candidate Rules Applications of Association Rules–Validation and Testing– Diagnostics. Regression: Linear Regression and Logistic Regression: –Use cases–Model Description –Diagnostics-Additional Regression Models.

Outcomes 3	**To know the recent research areas related to Genetic Algorithm, Map Reduce and File System.**	**K6**

Unit IV

Objectives 4	Design classification models for various standard datasets and user datasets.

CLASSIFICATION : Decision Trees – Overview–Genetic Algorithm– DecisionTreeAlgorithms–EvaluatingDecisionTree–DecisionTreesinR-Na'iveBayes –BayesTheorem–NaïveBayesClassifier–Smoothing–Diagnostics–NaïveBayes in R – Diagnosticsof Classifiers – Additional Classification Methods -TimeSeries Analysis: Overview – Box – Jenkins Methodology – ARIMA Model–Autocorrelation Function – Autoregressive Models –MovingAverageModels –ARMA and ARIMA Models – BuildingandEvaluatingandARIMA Model - TextAnalysis :TextAnalysisSteps–Example–Collecting–RepresentingTermFrequency–Categorizing–DeterminingSentiments– Gaining Insights.

Outcomes	**To know classification models for various standard datasets and user datasets.**	**K6**

Unit V		
Objectives	To analyze the Big Data framework like Hadoop	
ADVANCED ANALYTICS - TECHNOLOGY AND TOOLS: MapReduceandHadoop:AnalyticsforUnstructuredData.-*UseCases-MapReduce*- Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase –Manout – NoSQL - Tools in Database Analytics : SQL Essentials– Joins – Set operations – Grouping Extensions – In Database Text Analysis- Advanced SQL – Windows Functions–User Defined Functions and Aggregates–ordered aggregates-MADiib–Analytics Reports Consolidation–Communicating and operationalizing and Analytics Project–Creating the Final Deliverables: Developing Core Material for Multiple Audiences–Project Goals–Main Findings - Approach Model Description – Key points support with Data - Model details –Recommendations–Data Visualization.		
Outcomes	**To apply Hadoop ecosystem components. To participate data science and big data analytics projects.**	**K6**

Suggested Readings:

AnilMaheshwari,2017 ,"Data Analytics " , Mc-Graw Hill Education,

JohnWiley&Sons, 2015, Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services.

Noreen Burling game, 2012, "The little book on Big Data", New Street publishers,

Norman Mat off, 2011, "The Art of R Programming: A Tour of Statistical Software Design", Starch Press, 1edition,.

SandipRakshit, , 2017 ,"R for Beginners", Mc-Graw Hill Education.

Online Resources:

http://www.johndcook.com/R_language_for_programmers.html.

http://bigdatauniversity.com/.

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr.N.Geetha

Course Outcome Vs. Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M (2)	M (2)	M (2)	M (2)	S (3)	-	S(3)	M (2)	M (2)
CO2	S (3)	S(3)	S(3)	S(3)	S(3)	S (3)	-	S(3)	S(3)	M (2)
CO3	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	S (3)	M (2)
CO4	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	S (3)	M (2)
CO5	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	S (3)	M (2)
W.AV.	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**-**	**3**	**2.8**	**2**

S-Strong(3), M-Medium(2), L-Low(1)

Course Outcome Vs. Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	M(2)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	M(2)
CO3	S(3)	S(3)	S(3)	M(2)	S(3)
CO4	S(3)	S(3)	S(3)	M(2)	S(3)
CO5	S(3)	S(3)	S(3)	M(2)	S(3)
W.AV.	**2.6**	**2.6**	**2.6**	**2**	**2.6**

S-Strong(3), M-Medium(2), L-Low(1)

SEMESTER-III					
Core: 14	**Course code 557302**	**DATA VISUALIZATION**	**T**	**Credits:4**	**Hours:4**

Unit I		
Objective 1	**To Understand the introduction of data visualization**	
Introduction to Data Visualization: Acquiring and Visualizing Data, Simultaneous acquisition and visualization, Applications of Data Visualization, Keys factors of Data Visualization (Control of Presentation, Faster and Better JavaScript processing, Rise of HTML5, Lowering the implementation Bar) Exploring the Visual Data Spectrum: charting Primitives (Data Points, Line Charts, Bar Charts, Pie Charts, Area Charts), Exploring advanced Visualizations (Candlestick Charts, Bubble Charts, Surface Charts, Map Charts, Infographics). Making use of HTML5 CANVAS, Integrating SVG		
Outcome 1	**Summarize theintroduction of data visualization**	**K1,K3**

UNIT II		
Objective 2	**To Understand the basic concepts of data format and how to visualizing data programmatically**	
Tables: Reading Data from Standard text files (.txt, .csv, XML), Displaying JSON content Outputting Basic Table Data (Building a table, Using Semantic Table, Configuring the columns), Assuring Maximum readability (Styling your table, Increasing readability, Adding dynamic Highlighting), Including computations, Using data tables library, relating data table to a chart **Visualizing data Programmatically:** Creating HTML5 CANVAS Charts (HTML5 Canvas basics, Linear interpolations, A Simple Column Chart, Animations), Starting with Google charts (Google Charts API Basics, A Basic bar chart, A basic Pie chart, Working with Chart Animations).		
Outcome 2	**Understand the concepts of tables, data format and how to visualizing them to programmatically**	**K3,K4**

Unit III		
Objective 3	**To Understand the concepts of D3.js**	
Introduction to D3.js: Getting setup with D3, Making selections, changing selection's attribute, Loading and filtering External data : Building a graphic that uses all of the population distribution data, Data formats you can use with D3, Creating a server to upload your data, D3's function for loading data, Dealing with Asynchronous requests, Loading and formatting Large Data Sets.		
Outcome 3	**Acquire knowledge about how the D3.js worked in external data**	**K2,K4**

Unit IV		
Objective 4	**To understandd the concepts of advanced data visualization**	
Advanced Data Visualization: Making charts interactive and Animated: Data joins, updates and exits, interactive buttons, Updating charts, Adding transactions, using keys Adding a Play Button: wrapping the update phase in a function, Adding a Play button to the page,Making the Play button go, Allow the user to interrupt the play, sequence		
Outcome 4	**Cultivate the knowledge about advanced data visualization**	**K4,K5**

Unit V		
Objective 5	**To acquire knowledge about information dashboard design**	
Information Dashboard Design: Introduction, Dashboard design issues and assessment of needs, Considerations for designing dashboard-visual perception, Achieving eloquence, Advantages of Graphics _Library of Graphs, Designing Bullet Graphs, Designing Sparklines, Dashboard Display Media, Critical Design Practices, Putting it all together - Unveiling the dashboard.		
Outcome 5	**Understand and gain knowledge about how to design information dashboard**	**K5,K6**

Suggested Readings:-

Jon Raasch, Graham Murray, VadimOgievetsky, Joseph Lowery, "JavaScript and jQuery for Data Analysis and Visualization", WROX

Ritchie S. King, Visual story telling with D3" Pearson

Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.

A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Relly

Andy Kirk, Data Visualization: A Successful Design Process, PAKT

Scott Murray, Interactive Data Visualization for Web, O'Relly

Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

Online Resources:

https://library.carleton.ca/sites/default/files/help/Intro%20to%20Data%20Viz%202016.pdf

https://data.vk.edu.ee/PowerBI/Opikud/Fundamentals_of_Data_Visualization.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.L.Sathiya

Course Outcomes VsProgramme Outcomes

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M(2)	M(2)	L(1)	M(2)	M(2)	M(2)	M(2)	S(3)	M(2)
CO2	M(2)	M(2)	M(2)	S(3)	S(3)	M(2)	M(2)	S(3)	S(3)	L(1)
CO3	S(3)	S(3)	M(2)	M(2)	L(1)	M(2)	M(2)	M(2)	S(3)	S(3)
CO4	M(2)	S(3)	L(1)	M(2)	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)
CO5	L(1)	M(2)	S(3)	S(3)	M(2)	L(1)	L(1)	L(1)	S(3)	M(2)
W.AV	2	2.4	2	2.2	2.2	2	2	2	3	2

S-Strong (3) M- Medium (2) L-Low (1)

Course Outcomes Vs Programme Specific Outcomes

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	M(2)	L(1)
CO2	M(2)	M(2)	M(2)	M(2)	S(3)
CO3	M(2)	L(1)	S(3)	S(3)	M(2)
CO4	M(2)	S(3)	M(2)	S(3)	S(3)
CO5	L(1)	S(3)	L(1)	S(3)	S(3)
W.AV	2	2.4	2	2.6	2.4

S-Strong (3) M- Medium (2) L-Low (1)

SEMESTER III					
Core: 15	**Course code 557303**	**VIRTUAL REALITY ANDAUGMENTED REALITY**	**T**	**Credits: 4**	**Hours: 4**

Unit – I		
Objective 1	**To make students know the basic concept and framework of virtual reality.**	
Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.		
Outcome 1	**Students gain knowledge about fundamental concepts of Virtual Reality**	**K2**

Unit II		
Objective 2	**To make a study of the principles and multidisciplinary features of virtual reality.**	
Multiple Modals of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices. **Visual Computation in Virtual Reality** (4 hours): Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. **Advanced Techniques in CG**: Management of Large Scale Environments & Real Time Rendering.		
Outcome 2	**Learners able to work in Virtual Reality System framework.**	**K3**

Unit III		
Objective 3	**To know about environment modeling and iterative techniques in virtual reality.**	
Environment Modeling in Virtual Reality: Geometric Modeling, Behavior Simulation, Physically Based Simulation. **Interactive Techniques in Virtual Reality**: Body Track, Hand Gesture, 3D Manus, Object Grasp		
Outcome 3	**Students gain knowledge about environment modeling and iterative techniques in virtual reality.**	**K5**

Unit IV		
Objective 4	**To impart knowledge about fundamental concepts of Augmented Reality.**	
Introduction of Augmented Reality (AR): System Structure of Augmented Reality, Key Technology in AR, Augmented City Maps, Geo Location in AR Technology, Customization and Development of AR technologies.		
Outcome 4	**Students gain knowledge about fundamental concepts of Augmented Reality.**	**K3**

Unit V		
Objective 5	**To know concepts about virtual reality development tools and frameworks.**	
Development Tools and Frameworks in Virtual Reality: Frameworks of Software, Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc. **Application of VR in Digital Entertainment**: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.		
Outcome 5	**Learners now and able to work virtual reality development tools and frameworks.**	**K6**

Suggested Readings:

Burdea, G. C. and P. Coffet. 2003/2006, Virtual Reality Technology, Second Edition. Wiley-IEEE Press.

Fei GAO, 2006, Design and Development of Virtual Reality Application System, Tsinghua

Press, March 2012.
Guangran LIU. 2011, Virtual Reality Technology, Tsinghua Press, Jan.
Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India.
Sherman, William R. and Alan B. Craig. 2002, Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann.

Online Resources:

https://www.lncc.br/~jauvane/papers/RelatorioTecnicoLNCC-0603.pdf

https://avida.cs.wright.edu/courses/CEG3500/CEG3500_0.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.A.Pramila

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	M(2)	M(2)	S(3)	M(2)	S(3)	L(1)	S(3)	S(3)
CO2	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)	M(2)	S(3)	S(3)
CO3	M(2)	S(3)	S(3)	M(2)	L(1)	M(2)	S(3)	M(2)	S(3)	M(2)
CO4	S(3)	M(2)	S(3)	S(3)	S(3)	L(1)	M(2)	S(3)	S(3)	S(3)
CO5	S(3)	M(2)	M(2)	M(2)	S(3)	M(2)	S(3)	S(3)	M(2)	M(2)
W. AV	**2.8**	**2.6**	**2.6**	**2.4**	**2.6**	**2**	**2.6**	**2.2**	**2.8**	**2.4**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	M (2)	M (2)	M (2)	M (2)
CO2	S(3)	S(3)	S(3)	M (2)	S(3)
CO3	S(3)	S(3)	M (2)	M (2)	M (2)
CO4	S(3)	M (2)	M (2)	M (2)	S(3)
CO5	M (2)	S(3)	S(3)	S(3)	S(3)
W.AV	**2.8**	**2.6**	**2.4**	**2.2**	**2.6**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER – III					
Core: 16	**Course code 557304**	**INTERNET OF THINGS**	**T**	**Credits: 4**	**Hours: 4**

Unit – I		
Objective 1	**To study the fundamental concepts of Internet of Things.**	
INTRODUCTION TO IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.		
Outcome 1	**Students can understand the fundamental concepts of Internet of Things.**	**K2**

Unit II		
Objective 2	**Students to learn about the basics of IoT protocols.**	
IoT ARCHITECTURE: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.		
Outcome 2	**Lerner's can Develop web services to access/control IoT devices.**	**K4**

Unit III		
Objective 3	**Students to build a small low cost embedded system using Raspberry Pi**	
IoT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security.		
Outcome 3	**Students can build a small low cost embedded system using Raspberry Pi.**	**K4**

Unit IV		
Objective 4	**To apply the concept of Internet of Things in the real world scenario.**	
BUILDING IoT WITH RASPBERRY PI & ARDUINO: Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.		
Outcome 4	**Students know to apply the concept of Internet of Things in the real world scenario.**	**K2**

Unit V		
Objective 5	**To know the real world applications of IoT**	
CASE STUDIES AND REAL-WORLD APPLICATIONS: Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.		
Outcome 5	**Learners can analyze applications of IoT in real time scenario.**	**K5**

Suggested Readings:-

ArshdeepBahga, Vijay Madisetti, 2015, "Internet of Things: A hands-on approach", Universities Press.

Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), 2011, "Architecting the Internet of Things", Springer.

Honbo Zhou, 2012, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press.

Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Aves and. David

Boyle, 2014, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier.
Olivier Hersent, David Boswarthick, Omar Elloumi, 2012, “The Internet of Things – Key applications and Protocols”, Wiley.

Online Resources:

https://methodist.edu.in/web/uploads/files/DR%20jwc%20IOT.pdf

https://www.researchgate.net/profile/Mohamed-Fezari-2/publication/330513589_Internet_of_Things_IOT_Using_Raspberry_Pi/links/5c4581d892851c22a384a44b/Internet-of-Things-IOT-Using-Raspberry-Pi.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.A.Pramila

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	L(1)	M(2)	L(1)	S(3)	L(1)	M(2)	L (1)	L (1)
CO2	L (1)	L (1)	M (2)	L (1)	L (1)	S(3)	L(1)	M(2)	L (1)	**L (1)**
CO3	M(2)	M (2)	L (1)	L (1)	M(2)	S(3)	M (2)	M(2)	M(2)	L (1)
CO4	M(2)	M (2)	M (2)	L (1)	M(2)	S(3)	M (2)	M(2)	M(2)	L (1)
CO5	L(1)	L (1)	-	L (1)	M(2)	S(3)	M (2)	M(2)	M(2)	L (1)
W. AV	**1.8**	**1.6**	**1.2**	**1.2**	**1.6**	**3**	**1.6**	**2**	**1.6**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	S (3)	M (2)	L (1)	L (1)
CO2	M (2)	M (2)	M (2)	M (2)	M (2)
CO3	M (2)	M (2)	M (2)	L (1)	M (2)
CO4	M (2)	L (1)	M (2)	S (3)	M (2)
CO5	M (2)	L (1)	M (2)	S (3)	M (2)
W.AV	**2**	**1.8**	**2**	**2**	**1.8**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER- III					
Core: 17	**Course code 557305**	**LAB I: BIG DATA ANALYTICS LAB**	**T**	**Credits:2**	**Hours:4**

Objectives:

- Get familiar with Hadoop distributions, configuring Hadoop and performing File management tasks
- Experiment MapReduce in Hadoop frameworks
- Implement MapReduce programs in various applications
- Explore MapReduce support for debugging
- Understand different approaches for building HadoopMapReduce programs for real-time applications Experiments

1. Install Apache Hadoop

2. Develop a MapReduce program to calculate the frequency of a given word in agiven file.

3. Develop a MapReduce program to find the maximum temperature in each year.

4. Develop a MapReduce program to find the grades of student's.

5. Develop a MapReduce program to implement Matrix Multiplication.

6. Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.

7. Develop a MapReduce to 70nalyse weather data set and print whether the day is shinny or cool day.

8. Develop a MapReduce program to find the number of products sold in each country by considering sales data containing fields like

Tranction_Date	Product	Price	Payment_Type	Name	City	State	Country	Account_Created	Last_Login	Latitude	Longitude

9. Develop a MapReduce program to find the tags associated with each movie by 70nalyse70g movie lens data.

10. XYZ.com is an online music website where users listen to various tracks, the data gets collected which is given below.

The data is coming in log files and looks like as shown below.

UserId	TrackId	Shared	Radio	Skip
111115	222	0	1	0
111113	225	1	0	0
111117	223	0	1	1
111115	225	1	0	0

Write a Map Reduce program to get the following:

- Number of unique listeners
- Number of times the track was shared with others
- Number of times the track was listened to on the radio
- Number of times the track was listened to in total
- Number of times the track was skipped on the radio

15. Develop a MapReduce program to find the frequency of books published eachyear and find in which year maximum number of books were published usingthe following data.

Title	Author	Published year	Author country	Language	No of pages

16. Develop a MapReduce program to 71nalyse Titanic ship data and to find the average age of the people (both male and female) who died in the tragedy. How many persons are survived in each class.

The titanic data will be..

Column 1 :PassengerI d
Column 2 : Survived (survived=0 &died=1)
Column 3 :Pclass
Column 4 : Name
Column 5 : Sex
Column 6 : Age
Column 7 :SibSp
Column 8 :Parch
Column 9 : Ticket
Column 10 : Fare
Column 11 :Cabin
Column 12 : Embarked

13. Develop a MapReduce program to 71nalyseUber data set to find the days on which each basement has more trips using the following dataset. The Uber dataset consists of four columns they are

dispatching_base_number	date	active_vehicles	trips

14. Develop a program to calculate the maximum recorded temperature by yearwise for the weather dataset in Pig Latin

15. Write queries to sort and aggregate the data in a table using HiveQL.

16. Develop a Java application to find the maximum temperature using Spark.

Outcomes: Upon completion of the course, the students should be able to:

- Configure Hadoop and perform File Management Tasks (L2)
- Apply MapReduce programs to real time issues like word count, weather dataset and sales of a company (L3)
- Critically 71nalyse huge data set using Hadoop distributed file systems and MapReduce (L5)
- Apply different data processing tools like Pig, Hive and Spark.(L6)

Online Resource:

https://vemu.org/uploads/lecture_notes/22_12_2022_182935242.pdf

https://www.slideshare.net/nithyakumaravel/bigdata-analytics-lab-manual-finalpdf

Course designed by:Dr.N.Geetha

Course Outcome Vs. Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M(2)	M (2)	M (2)	M (2)	M (2)	S (3)	-	S(3)	M (2)	M (2)
CO2	S (3)	S(3)	S(3)	S(3)	S(3)	S (3)	-	S(3)	M(2)	M (2)
CO3	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	S (3)	M (2)
CO4	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	M(2)	M (2)
CO5	S (3)	S (3)	S (3)	S (3)	S (3)	S (3)	-	S (3)	S (3)	M (2)
W.AV.	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**-**	**3**	**2.4**	**2**

Strong(3), M-Medium(2), L-Low(1)

Course Outcome Vs. Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M(2)	M(2)	M(2)	M(2)	M(2)
CO2	M(2)	M(2)	M(2)	M(2)	M(2)
CO3	S(3)	S(3)	S(3)	S(3)	S(3)
CO4	M(2)	M(2)	M(2)	M(2)	M(2)
CO5	S(3)	S(3)	S(3)	M(2)	S(3)
W.AV.	**2.6**	**2.6**	**2.6**	**2.2**	**2.6**

S-Strong(3), M-Medium(2), L-Low(1)

SEMESTER III					
Core:18	**Course Code 557306**	**LAB II: INTERNET OF THINGS LAB**	**P**	**Credits:2**	**Hours: 4**

Objectives:	• To understand the sensors and actuators for an IoT application • To understand the protocols for a specific IoT application. • To utilize the cloud platform and APIs for IoT application. • To apply embedded boards for creating IoT prototypes. • To design solution for a given IoT application.

LIST OF EXPERIMENTS

1. Temperature and Humidity
2. Light control with LDR
3. Home Automation
4. Security Alarm System
5. Soil Moisture Monitoring
6. Smart Door Lock
7. Weather Station
8. Vehicle Tracking system
9. Smart Irrigation System
10. Gas Leakage Detector
11. Health Monitoring
12. Smart Traffic Light Control
13. Smart Garbage Bin
14. Water Quality Monitoring
15. Home Energy Monitoring

Outcomes:	At the end of the course, students will be able to • Choose the sensors and actuators for an IoT application (L1) • Select protocols for a specific IoT application (L2) • Utilize the cloud platform and APIs for IoT application (L3) • Experiment with embedded boards for creating IoT prototypes (L3) • Design a solution for a given IoT application (L6)
Online Resource:	https://mlritm.ac.in/assets/cse/cse_lab_manuals/R20_cse_manuals/IOT%20lab%20Manual.pdf https://www.ucpesbam.in/public/images/lab_manuals_pdf/IOT%20Lab%20Manual%20(1)_compressed.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course designed by: Dr.A.Pramila

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	M(2)	M(2)	M(2)	M(2)	L(1)	M(2)	-	S(2)	L(1)
CO2	M(2)	S(3)	S(3)	M(2)	L(1)	M(2)	-	-	M(2)	M(2)
CO3	M(2)	S(3)	M(2)	L(1)	L(1)	M(2)	M(2)	L(1)	L(1)	L(1)
CO4	M(2)	M(2)	S(3)	M(2)	M(2)	L(1)	-	M(2)	M(2)	S(2)
CO5	M(2)	M(2)	L(1)	L(1)	L(1)	L(1)	S(3)	M(2)	L(1)	L(1)
W. AV	**2.4**	**2.2**	**2**	**1.4**	**1.4**	**1**	**2**	**1.7**	**2**	**1.2**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	M(2)	M(2)	M(2)	M(2)
CO2	M(2)	M(2)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	L(1)	M(2)	M(2)
CO4	M(2)	L(1)	M(2)	L(1)	L(1)
CO5	M(2)	M(2)	L(1)	M(2)	L(1)
W. AV	**2.4**	**2**	**1.6**	**1.8**	**1.6**

S –Strong (3), M-Medium (2), L- Low (1)

SEMESTER-III					
DSE-3	**Course code 557557**	**NATURAL LANGUAGE PROCESSING**	**T**	**Credits: 3**	**Hours: 3**

Unit I		
Objective 1	**To understand the basic terminology and theory underlying natural language processing**	
Introduction: Need for processing of natural languages, Language processing levels, Applications of NLP, Ambiguity and uncertainty in language, Regular Expressions, NLP tasks in syntax, semantics and pragmatics, Machine Translation, Introduction to Finite State Automata and Regular expressions, Introduction to Formal languages and Context- free grammars.		
Outcome 1	**Learners understand basic mathematical models of regular expression, NLP problems that can be solved by computers.**	**K1**

UNIT II		
Objective 2	**To Understand approaches inflectional and derivational morphology and finite state transducers**	
Morphological Processing: Introduction to Corpus, Tokenization ,Stemming, Lemmatization Inflectional and Derivational morphology, Morphological parsing, Finite state transducers, N-gram language models, practical illustrations with NLTK,Python3, Textual sources, APIs, Social Media and Web Scraping, practical illustrations with NLTK,Python3, Textual sources, APIs, Social Media and Web Scraping.		
Outcome 2	**Students can understand morphological processing and their models and the necessary mathematical techniques to prove more advanced applications of these models.**	**K3**

Unit III		
Objective 3	**To understand approaches to part of speech tagging, parsing syntax and semantics in NLP.**	
Part-of-Speech Tagging: Corpus, Tokenization ,Stemming, Lemmatization, stopwords and Text Features, Word Classes, Part-of-speech tagging, Tagsets, Rule-based, Stochastic and Transformation based POS tagging, TF-IDF Classification, Hidden Markov Models.		
Outcome 3	**Beginners know about the basic concepts of part of speech tagging and their models.**	**K4,K1**

UnitIV		
Objective 4	**To Understand approaches to discourse, generation, dialogue and summarization within NLP.**	
Parsing: Basic parsing strategies, Parsing with context-free grammars, Earley algorithm, Finite-state parsing methods, Unification of feature structures, Non-probabilistic Parsing		
Outcome 4	**Beginners know theconceptof parsing and non-probabilistic parsing**	**K2,K5**

UnitV		
Objective 5	**ToUnderstand current methods for statistical approaches to Semantic Analysis**	
Semantic Analysis: Lexical Semantics, Lexemes, Relations among lexemes and their senses, WordNet, Word Sense Disambiguation. Pragmatics: Discourse, Discourse structure. Dialogue - Acts, structure, conversational agents.		
Outcome 5	**Students gain knowledge about to how to apply approaches to discourse, generation, dialogue and summarization within NLP**	**K5**

Suggested Readings:-

D. Jurafsky and J. H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education,2008.

J. Allen , "Natural Language Understanding", Addison Wesley,2007.

J. Handke, "The Structure of the Lexicon: Human Versus Machine (Natural Language Processing)", Mouton de Gruyter,1995.

Natural Language Processing - A Paninian Perspective by AksharBharathi, VineetChaitanya, Rajeev Sangal

Online Resource:

https://www.london.ac.uk/sites/default/files/study-guides/introduction-to-natural-language-processing.pdf

https://medium.com/mlearning-ai/nlp-tokenization-stemming-lemmatization-and-part-of-speech-tagging-9088ac068768

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.A.Nagarajan

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	L(1)	S(3)	S(3)
CO2	S(3)	M(2)	S(3)	L(1)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)
CO4	S(3)	S(3)	L(1)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	S(3)
W.AV	**3**	**2.8**	**2.4**	**2.4**	**2.8**	**2.8**	**2.8**	**2.6**	**2.8**	**2.8**

S–Strong(3),M-Medium(2),L-Low(1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	S(3)	S(3)
CO2	S(3)	L(1)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	S(3)	S(3)	S(3)
CO4	S(3)	M(2)	S(3)	S(3)	L(1)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)
W.AV	**3**	**2.2**	**2.8**	**3**	**2.4**

S–Strong(3),M-Medium(2),L-Low(1)

SEMESTER – III					
DSE -3	**Course code 557558**	**THEORY OF COMPUTATION**	**T**	**Credits:3**	**Hours:3**

Unit–I		
Objective1	**To study foundational areas of computer science namely the basic mathematical models of computation, problems that can be solved by computers.**	
Review of Mathematical Theory: Sets, Functions, Logical statements, Proofs, Relations, Languages, Principal of Mathematical Induction, Strong Principle, Recursive Definitions, Structural Induction. Regular Languages and Finite Automata: Regular Expressions, Regular Languages, Application of Finite Automata, Automata with output - Moore machine & Mealy machine, Finite Automata, Memory requirement in a recognizer, Definitions, union- intersection and complement of regular languages, Non Deterministic Finite Automata, Conversion from NFA to FA, ^ - Non Deterministic Finite Automata, Conversion of NFA- ^ to NFA, Kleene's Theorem, Minimization of Finite automata, Regular And Non Regular Languages – pumping lemma		
Outcome1	**Learners understand basic mathematical models of computation, problems that can be solved by computers.**	**K1**

Unit II		
Objective2	**To introduces basic computation models, their properties and the necessary mathematical techniques to prove more advanced attributes of these models.**	
Context free grammar (CFG): Definitions and Examples, Unions Concatenations And Kleene's of Context free language, Regular Grammar for Regular Language, Derivations and Ambiguity, Unambiguous CFG and Algebraic Expressions, BacosNaur Form (BNF), Normal Form – CNF. Pushdown Automata, CFL And NCFL: Definitions, Deterministic PDA, Equivalence of CFG and PDA & Conversion, Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL.		
Outcome 2	**Students can attend basic computation models, their properties and the necessary mathematical techniques to prove more advanced attributes of these models.**	**K3**

Unit III		
Objective3	**Tounderstandtheconceptof turning machine and context sensitive languages.**	
Turing Machine (TM): TM Definition, Model of Computation, Turing Machine as Language Acceptor, TM that Compute Partial Function, Church Turning Thesis, Combining TM, Variations of TM, Non Deterministic TM, Universal TM, Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy.		
Outcome3	**Beginners know about the basic concepts of turning machine context sensitive languages.**	**K4**

Unit IV		
Objective4	**Tounderstandtheconceptofbasiccomputable functions and recursive functions.**	
Computable Functions: Partial - Total - Constant Functions, Primitive Recursive Functions, Bounded Mineralization, Regular function, Recursive Functions, Quantification, Minimalization, and μ-Recursive Functions, All Computable Functions Are μ- Recursive.		
Outcome 4	**Beginners know theconceptofbasiccomputable functions and recursive functions.**	**K2**

UnitV		
Objective5	**To develop non recursive enumerable language and context free language.**	
A Language That Can't Be Accepted, and a Problem That Can't Be Decided, Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Undecidable Problems Involving Context-Free Languages, Post's Correspondence Problem, The Class P and NP.		
Outcome 5	**Students gain knowledge non recursive enumerable language and context free language.**	**K5**

Suggested Readings:-

Introduction to Languages and the Theory of Computation, 4th by John Martin, Tata McGraw Hill

An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S.K. Kataria& Sons.

Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc

Computation: Finite and Infinite By Marvin L. Minsky Prentice-Hall

Compiler Design By Alfred V Aho, Addison Weslley.

Introduction to the Theory of Computation By Michael Sipser.

Automata Theory, Languages, and Computation By John Hopcroft, Rajeev Motowani, and Jeffrey Ullman

Online Resource:

https://www.math.toronto.edu/weiss/set_theory.pdf

https://www.univ-orleans.fr/lifo/Members/Mirian.Halfeld/Cours/TLComp/l3-CFG.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by: Dr.P.Eswaran

CourseOutcomeVSProgrammeOutcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	L(1)	S(3)	S(3)
CO2	S(3)	M(2)	S(3)	L(1)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)
CO3	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)
CO4	S(3)	S(3)	L(1)	S(3)	S(3)	M(2)	S(3)	S(3)	S(3)	S(3)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)	S(3)	M(2)	S(3)	M(2)	S(3)
W.AV	**3**	**2.8**	**2.4**	**2.4**	**2.8**	**2.8**	**2.8**	**2.6**	**2.8**	**2.8**

S–Strong(3),M-Medium(2),L-Low(1)

CourseOutcomeVSProgrammeSpecificOutcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S(3)	S(3)	M(2)	S(3)	S(3)
CO2	S(3)	L(1)	S(3)	S(3)	M(2)
CO3	S(3)	M(2)	S(3)	S(3)	S(3)
CO4	S(3)	M(2)	S(3)	S(3)	L(1)
CO5	S(3)	S(3)	S(3)	S(3)	S(3)
W.AV	**3**	**2.2**	**2.8**	**3**	**2.4**

S–Strong(3),M-Medium(2),L-Low(1)

SEMESTER-III					
DSE-3	**Course code 557559**	**SOCIAL MEDIA ANALYTICS**	**T**	**Credits: 3**	**Hours: 3**

Unit – I		
Objective 1	**To provide basic understanding of the use and deployment of Digital marketing tools and web/social/mobile analytics platforms.**	
Social Media & Analytics: Introduction to Social Media, Social media landscape, Social Media Analytics & its need. SMA in Small and large organizations; Application of SMA in different social media platforms. Introduction to Web Analytics: Definition, Process, Key terms: Site references, Keywords and Key phrases; building block terms: Visit characterization terms, Content characterization terms, Conversion metrics; Categories: Offsite web, on site web; Web analytics platform, Web analytics evolution, Need of web analytics, Advantages & Limitations.		
Outcome 1	**Students can understand the use and deployment of Digital marketing tools and web/social/mobile analytics platforms.**	**K2**

Unit II		
Objective 2	**Students to learn about the network fundamentals and java script tags.**	
Network fundamentals: The social networks perspective - nodes, ties and influencers, Social network, web data and methods. Data Collection and Web Analytics Fundamentals: Capturing Data: Web logs, web Beacons, java script tags, packet sniffing; Outcome data: E-commerce, Lead generation, Brand/ Advocacy and support; Competitive Data: Panel Based measurement, ISP based measurement, Search Engine Data; Organizational Structure. Type and size of data, identifying unique page definition, cookies, Link Coding Issues.		
Outcome 2	**Lerner's can understand the network fundamentals and java script tags.**	**K4**

Unit III		
Objective 3	**To build web analytics and business implication.**	
Web Metrics & Analytics: Common metrics: Hits, Page views, visits, unique page views, Bounce, Bounce rate & its improvement, Average time on site, Real time report, traffic source report, custom campaigns, content report, Google analytics; Key Performance Indicator: Need, characteristics, perspective and uses. Graphs and Matrices- Basic measures for individuals and networks. Random graphs & network evolution, Social Context: Affiliation & Identity Web analytics tools: A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis		
Outcome 3	**Students can develop web analytics and business implications.**	**K4**

Unit IV		
Objective 4	**To prepare the students with growth potentials for Web Analysts professionals.**	
Facebook Analytics: Introduction, parameters, demographics. Analyzing page audience: Reach and engagement analysis. Post-Performance on FB; Social Campaigns: Goals and evaluating outcomes, Measuring and analyzing social campaigns, Social Network Analysis like Instagram, twitter, LinkedIn, YouTube etc. AdWords, Benchmarking, Categories of traffic: Organic traffic, Paid traffic; Google Analytics: Brief introduction and working, Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues.		
Outcome 4	**Students know to develop web applications for current trends.**	**K2**

Unit V		
Objective 5	**To know the real world applications of web metrics and web analytics through different social media**	
Qualitative Analysis: Heuristic evaluations: Conducting a heuristic evaluation, Benefits of heuristic evaluations; Site Visits: Conducting a site visit, Benefits of site visits; Surveys: Website surveys, Post-visit surveys, creating and running a survey, Benefits of surveys. Web analytics 2.0: Web analytics 1.0 & its limitations, Introduction to WA 2.0, competitive intelligence analysis and data sources; website traffic analysis: traffic trends, site overlap and opportunities.		
Outcome 5	**Learners can analyze the web metrics and web analytics through different social media.**	**K5**

Suggested Readings:

RobStokes,(2014),emarketing:TheEssentialGuidetoDigitalMarketing,QuirkEducation.

Tuten&BikramjitRishi,SocialMediaMarketing,3rdEd.2020,SAGEPublishingIndia

Dave Chaffey, Fiona Ellis-Chadwick,RichardMayer, Kevin Johnston,(2012), InternetMarketing:Strategy,ImplementationandPractice,PrenticeHall.

LianaEvans,SocialMediaMarketing:StrategiesforEngaginginFacebook,Twitter&OtherSocial Media,QuePublishing.

VandanaAhuja,(DigitalMarketing,1stedition,OxfordUniversityPress.

AvinashKaushik,WebAnalytics2.0:TheArtofOnlineAccountabilityandScienceofCu stomerCentricity,

CliftonB.,AdvancedWebMetricswithGoogleAnalytics,WileyPublishing,Inc.2nded.

KaushikA.,WebAnalytics2.0,TheArtofOnlineAccountabilityandScienceofCustomerCen tricity,WileyPublishing,Inc.1sted.

SterneJ.,WebMetrics:Provenmethodsformeasuringwebsitesuccess,JohnWileyandSons10.

AnnmarieHanlon,DigitalMarketing,SAGEPublishingIndia

Online Resource:

https://www.upa.it/static/upload/the/the-fundamentals-of-social-media-analytics.pdf

https://www.cisco.com/c/dam/global/fi_fi/assets/docs/SMB_University_120307_Networking_Fundamentals.pdf

K1-Remember	*K2-Understand*	*K3-Apply*	*K4-Analyze*	*K5-Evaluate*	*K6-Create*

Course Designed by:Dr.A.Nagarajan

Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S(3)	S(3)	L(1)	M(2)	L(1)	S(3)	L(1)	M(2)	L (1)	L (1)
CO2	L (1)	L (1)	M (2)	L (1)	L (1)	S(3)	L(1)	M(2)	L (1)	**L (1)**
CO3	M(2)	M (2)	L (1)	L (1)	M(2)	S(3)	M (2)	M(2)	M(2)	L (1)
CO4	M(2)	M (2)	M (2)	L (1)	M(2)	S(3)	M (2)	M(2)	M(2)	L (1)
CO5	L(1)	L (1)	M(2)	L (1)	M(2)	S(3)	M (2)	M(2)	M(2)	L (1)
W. AV	**1.8**	**1.6**	**1.2**	**1.2**	**1.6**	**3**	**1.6**	**2**	**1.6**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	S (3)	M (2)	L (1)	L (1)
CO2	M (2)	M (2)	M (2)	M (2)	M (2)
CO3	M (2)	M (2)	M (2)	L (1)	M (2)
CO4	M (2)	L (1)	M (2)	S (3)	M (2)
CO5	M (2)	L (1)	M (2)	S (3)	M (2)
W.AV	**2**	**1.8**	**2**	**2**	**1.8**

S –Strong (3), M-Medium (2), L- Low (1)

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