SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)

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DEGREE OF BACHELOR OF COMPUTER SCIENCE

(Artificial Intelligence and Data Science)

CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS FOR

B.Sc. CS (AI & DS) PROGRAMME

(SEMESTER PATTERN)

(For Students Admitted in the College from the Academic Year 2024-2025 Onwards)

REGULATIONS AND SYLLABUS FOR B.Sc. COMPUTER SCIENCE (Artificial Intelligence and Data Science) PROGRAMME

(For Students Admitted in the College from the Academic Year 2024-2025 Onwards)

1. Vision of the Department

To uplift the economically and educationally backward students by developing the personality of the individual, instilling high levels of discipline and preparing them to strive, to set global standards that contributes to the development of the society.

2. Mission of the Department

Impart the knowledge of recent technologies and equip the students with essential skills, technologically make them updated by creating intellectually inspiring environment for Learning, Research, Creativity, Innovation and Professional activities, enable them to become knowledgeable, motivated and resourceful IT professionals.

3. Definitions

(i) Programme: Programme means a course of study leading to the award of the degree in a discipline.

(ii) Course: Course refers to the subject offered under the Degree Programme.

4. Aim of the Programme

1. To produce the under Graduate in Computer Science (Artificial Intelligence and Data Science) with strong knowledge of theoretical computer science.
2. Impart quality education and provide technical skills in Computer Science through best of practices.
3. To produce graduates who can contribute professionally to the society and widely as IT professionals or entrepreneurs.
4. To develop Listening, Speaking, Reading, Writing skills with advanced technologies.
5. Forms the students to compete in the career and higher education with proper skillsets.
6. Effectively communicating computing concepts and solutions to create and initiate innovation in Computer field.
7. Effectively using their knowledge of Computing and Mathematical theory to develop sustainable solutions to computing problems.
8. To instill Human, Moral and ethical values in the young minds of the students and thereby improving the total personality of the students.

5. Programme Outcomes (POs)

PO1	Knowledge
PO2	Problem Analysis
PO3	Design / Development of Solutions
PO4	Conduct investigations of complex problems
PO5	Exhibit good domain knowledge and completes the assigned tasks Effectively and efficiently in par with the expected quality standards.
PO6	Apply analytical and critical thinking to identify, formulate, analyze and solve Complex problems in order to reach authenticated conclusions.

6. Programme Specific Outcomes (PSOs)

PSO1	Graduates should be able to evolve AI based efficient domain specific processes for effective decision making in several domains such as business and governance domains for Artificial Intelligence and Data Science
PSO2	Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve Problems in mathematics or statistics and realtime application related sciences.
PSO3	Demonstrate the ability to create innovative solutions from idea to product, applying Scientific methods and tools
PSO4	Provide innovative ideas to instigate new business ventures in the hospitality industry
PSO5	Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer Science and Industrial statistics.
PSO6	Apply the technical and critical thinking skills in the discipline of artificial Intelligence and Data Science to find solutions for complex problems.

7. Eligibility for Admission

A candidate who has passed in Higher Secondary Examination with Mathematics or Business Mathematics or Computer Science or Statistics (Academic stream or Vocational stream) as one of the subject under Higher Secondary Board of Examination, Tamilnadu as per norms set by the Government of Tamilnadu or an Examination accepted as equivalent there to by the syndicate, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the B.Sc. degree examination in Computer Science of this Autonomous College affiliated to Periyar University after a course of study of three academic years.

8. Duration of the Programme

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days (450 hours) for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

9. Features of Choice Based Credit System

Under Choice Based Credit System (CBCS), a set of Courses consisting of Core Courses, Elective Courses, Skill Based Elective Courses and Non-Major Elective Courses are offered. Beside the Core Courses, which are totally related to the major subject, the students have the advantage of studying supportive papers and Non-Major Courses. This provides enough opportunity to the students to learn not only the major courses but also inter disciplinary and application oriented courses.

10. Syllabus

The syllabus of the B.Sc. Computer Science(Artificia Intelligence and Data Science) Degree Programme is divided into the following Courses:

(i) Language Courses:

(ii) Core Courses: The Core Courses are releated to the Programme concerned including practicals and project offered under the Programme.

(iii) Elective Courses: There are TWO Elective Courses offered under the Programme related to the Discipline or Generic but are to be selected by the students.

(iv) Skill Enhancement Courses (SEC): This course aims to impart advanced and recent developments in the concerned discipline.

(v) Non-Major Elective (NME): Irrespective of the discipline, the student can select papers that are offered by other disciplines as non-major elective course.

(v) Extra Credit Courses: In order to facilitate the students gaining extra credits, the Extra Credit Courses are offered. According to the guidelines of the UGC, the students are encouraged to avail this option of enriching the knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals, such as SWAYAM, NPTEL, etc.

11. Programme of Study

The Programme of study for the Degree shall be in the Branch – Computer Science (Choice Based Credit System) with internal assessment comprised of instructions in the following subjects according to the syllabi and books prescribed from time to time.

12. Credit

Weightage given to each course of study is termed as Credit.

13. Credit System

The weightage of credits are spread over to four different semesters during the period of study and the cumulative credit point average shall be awarded based on the credits earned by the student. A total of 140 Credits are prescribed for the B.Sc. Computer Science (Artificial Intelligence and Data Science) Degree Programme which is the minimum Credit requirement for the three years B.Sc. Computer Science (Artificial Intelligence and Data Science) Degree Programme.

SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Bachelor of Computer Science (AI & DS)

Programme Pattern and Syllabus (CBCS)

(For Students Admitted in the College from the Academic Year 2024-2025 Onwards)

SI. No	Part	Nature of Course	Course Code	Name of the Course	Hours/ Week	Credits	Marks		
							CIA	ESE	Total
SEMESTER – I									
1	I	Language	24UTA1F01	Foundation Tamil – I / Other Language	5	3	25	75	100
2	II	Language	24UEN1F01	Foundation English - I	5	3	25	75	100
3	III	Core – I	24UAD1C01	Fundamentals of Computer Programming	6	5	25	75	100
4		Core Practical – I	24UAD1P01	Computer Programming Lab	3	5	25	75	100
5		Elective Course I-Generic		Allied 1: Discrete Mathematics I	5	3	25	75	100
6	IV	FC	24UAD1FC01	Data Structures	4	2	25	75	100
7		SEC – I		NME	2	2	25	75	100
Total					**30**	**23**	**175**	**525**	**700**
SEMESTER – II									
8	I	Language	24UTA2F02	Foundation Tamil – II / Other Language	5	3	25	75	100
9	II	Language	24UEN2F02	Foundation English - II	5	3	25	75	100
10	III	Core – II	24UAD2C02	Introduction to Python	7	5	25	75	100
11		Core	24UAD2P02	Python Programming	3	5	25	75	100

		Practical– II		Lab					
13		Elective Course II-Generic		Allied 2: Discrete Mathematics-II	6	3	25	75	100
14	IV	SEC - II		NME	2	2	25	75	100
		SEC - III	24UAD2S01	Introduction To HTML	2	2	25	75	100
Total					**30**	**23**	**175**	**525**	**700**
SEMESTER – III									
16	I	Language	24UTA3F03	Foundation Tamil – III / Other Language	5	3	25	75	100
17	II	Language	24UEN3F03	Foundation English – III	5	3	25	75	100
18	III	Core - III	24UAD3C03	Data analytics using R	5	5	25	75	100
20		Core Practical – III	24UAD3P03	Data analytics using R Lab	3	5	25	75	100
21		Elective Course III - Specific	24UAD3E01	Foundation of Artificial Intelligence	5	3	25	75	100
22	IV	Common Course		Environmental Studies	2	-	-	-	-
23		SEC- IV	24UAD3S02	Understanding Internet	2	1	25	75	100
24		SEC- V	24UAD3S03	Office Automation	3	2	25	75	100
Total					**30**	**22**	**175**	**525**	**700**
SEMESTER – IV									
24	I	Language	24UTA4F04	Foundation Tamil – IV / Other Language	5	3	25	75	100
25	II	Language	24UEN4F04	Foundation English – IV	5	3	25	75	100
27	III	Core - IV	24UAD4C04	Fundamentals of Data	6	5	25	75	100

				Science					
28		Core Practical – IV	24UAD4P04	Data Science Lab	3	5	25	75	100
29		Elective Course IV-Specific	24UAD4E02	Cognitive Science and Analytics	5	3	25	75	100
31	IV	SEC - VI	24UAD4S04	Web Designing	3	2	25	75	100
32		SEC - VII	24UAD4S05	Advanced Excel	2	2	-	-	-
		Common Course		Environmental Studies	1	2	25	75	100
Total					**30**	**25**	**175**	**525**	**700**
SEMESTER – V									
33	III	Core - V	24UAD5C05	Ethics of Artificial Intelligence	6	4	25	75	100
34		Core -VI	24UAD5C06	Database Design and Management	6	4	25	75	100
35		Core Practical – V	24UAD5P05	Database Programming Lab	3	4	25	75	100
36		Elective Course V-Specific	24UAD5E03/ 24UAD5E04/ 24UAD5E05	Image Processing /Cryptography/ Human Computer Interaction	5	3	25	75	100
		Elective Course VI-Specific	24UAD5E06/ 24UAD5E07/ 24UAD5E08	Cloud Computing/ Big Data Analytics/ Virtual Reality	5	3	25	75	100
		Core Course	24UAD5PR01	Project with Viva Voce Project (Individual)	3	4	25	75	100
37	IV			Value Education	2	2	25	75	100
			24UAD5IN01	Internship / Industrial Training (Summer	-	2	-	-	-

				vacation at the end of IV semester activity)					
Total					**30**	**26**	**175**	**525**	**700**
SEMESTER – VI									
38	III	Core -VII	24UAD6C07	Robotic Process Automation	7	4	25	75	100
39		Core - VIII	24UAD6C08	Natural Language Processing	3	4	25	75	100
40		Core Practical – VI	24UAD6P06	Programming in UI Path Automation Lab	3	4	25	75	100
41		Elective Course VII-Specific	24UAD6E09/ 24UAD6E10/ 24UAD6E11	Internet of Things and its Applications / Software Project Management/ Agile Project Management	7	3	25	75	100
42		Elective Course VIII-Specific	24UAD6E12/ 24UAD6E13/ 24UAD6E14	Fuzzy Logic/ Analytics for Service Industry/ Data Visualization	7	3	25	75	100
43	IV	SEC - VIII	24UAD6S06	Internet Basics Laboratory	3	2	25	75	100
44	V		24UEX601	Extension Activity		1			
Total					**30**	**21**	**175**	**525**	**700**
Grand Total					**180**	**140**	**1050**	**3150**	**4200**

Note

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

Elective Courses

Elective – V

Semester	Part	Course Code	Name of the Course
V	III	24UAD5E03	Image Processing
		24UAD5E04	Cryptography
		24UAD5E05	Human Computer Interaction

Elective – VI

Semester	Part	Course Code	Name of the Course
V	III	24UAD5E06	Cloud Computing
		24UAD5E07	Big Data Analytics
		24UAD5E08	Virtual Reality

Elective – VII

Semester	Part	Course Code	Name of the Course
VI	III	24UAD6E09	Internet of Things and its Applications
		24UAD6E10	Software Project Management
		24UAD6E11	Agile Project Management

Elective – VIII

Semester	Part	Course Code	Name of the Course
VI	III	24UAD6E12	Fuzzy Logic
		24UAD6E13	Analytics for Service Industry
		24UAD6E14	Data Visualization

Skill Enhancement Courses

Part	Semester	Course Code	Name of the Course	Hours/ Week	Credits	Marks		
						CIA	ESE	Total
IV	I		NME	2	2	25	75	100
IV	II		NME	2	2	25	75	100
IV	II	24UAD2S01	Introduction To HTML	2	2	25	75	100
IV	III	24UAD3S02	Understanding Internet	2	2	25	75	100
IV	III	24UAD3S03	Office Automation	3	1	25	75	100
IV	IV	24UAD4S04	Web Designing	2	1	25	75	100
IV	IV	24UAD4S05	Advanced Excel	2	2	25	75	100
IV	VI	24UAD6S06	Internet Basics Laboratory	3	2	25	75	100

Non Major Elective – (NME)

Extra Disciplinary Subjects offered by the Department of Computer Science (Artificial Intelligence and Data Science) . The department can offer any one of the subjects to the other major subject students in each semester.

Part	Semester	Course Code	Name of the Course	Hours/ Week	Credits	Marks		
						CIA	ESE	Total
IV	I	24UAD1N01	Introduction To HTML	2	2	25	75	100
IV	I	24UAD1N02	Understanding Internet	2	2	25	75	100
IV	II	24UAD2N03	Office Automation	2	2	25	75	100
IV	II	24UAD2N04	Internet Basics Laboratory	2	2	25	75	100

List of Extension Activities

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

14. Break-Up of Marks and Credits

The break-up of marks and credits for the B.Sc. Computer Science (Artificial Intelligence and Data Science) Degree Programme is as follows:

Sl. No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil	400	12
2.	II	Language – English	400	12
3.	III	Core Courses – Theory/Practical	1400	56
		Generic Elective Courses – Theory/Practical	400	12
		Discipline Elective Courses	400	12
		Project	100	4
4.	IV	Skill Enhancement Courses (NME)	200	4
		Skill Enhancement Courses	500	9
		Environmental Studies	100	2
		Value Education	100	2
		Foundation Course	100	2
		Ability Enhancement Compulsory Courses Soft Skill	400	8
		Professional Competency Skill Enhancement Course	100	2
		Internship / Industrial Training	-	2
5.	V	Extension Activities	-	1
Total			**4600**	**140**

- The students are advised to complete a **SWAYAM/MOOC** before the completion of the even semester of each year of study and submit the course completion certificate to the HOD. Two credits will be given to the candidates who have successfully completed.
- The field trip preferably relevant to the course should be undertaken every year.

15. Examinations

The examinations consist of Continuous Internal Assessment (CIA) and end of semester examinations (ESE). The ESE shall be of Three Hours duration for each theory course at the end of every semester. The candidate failing in any course(s) will be permitted to appear for each failed course(s) in the subsequent examination. The end of semester practical examinations shall be of Three Hours for each practical course conducted at the end of every even semester.

To maintain uniformity, particularly for interdepartmental transfer of credits, there shall be a uniform pattern of examination to be adopted by all the teachers offering courses. There shall be three tests, one seminar and one assignment for CIA and ESE during each semester. The distribution of marks for CIA and ESE shall be 25 marks and 75 marks, respectively. Further, the distribution of CIA will be 15 marks for test, 5 marks for assignment and 5 marks for attendance. The average of the highest two test marks out of the three CIA tests will be taken for CIA.

16. Components of Continuous Internal Assessment (CIA)

Components		Marks	Total Marks
Theory			
CIA I	75	(75+75 = 150/10)	25
CIA II	75	15	
Assignment		05	
Attendance		05	
Practical			
CIA		10	25
Practical Observation Notebook		10	
Attendance		05	

17. Question Paper Pattern

Bloom's Taxonomy Based Assessment Pattern

(**K1** – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate)

(i) Theory Examinations (CIA I & CIA II = 25 Marks and ESE = 75 Marks)

Knowledge Level	Section	Marks	Description	Total Marks
K1	A (Answer ALL) Q1–Q15	15 × 1 = 15	Multiple Choice Questions (MCQ) (Three questions from each unit)	15
K2	B (Answer any THREE out of FIVE) Q16–Q20	3 × 5 = 15	Short Answers (One question from each unit)	15
K3 & K4	C (Either or Pattern) Q20–Q25	5 × 9 = 45	Descripitive/Detailed Answers (Two questions from each unit)	45
Total Marks				**75**

Passing Minimum (CIA) 40% = 10 Marks

Passing Minimum (ESE) 40% = 30 Marks

40 Marks

(ii) Practical Examinations (CIA = 25 Marks and ESE = 75 Marks)

Knowledge Level	Components	Marks	Total
K3	Experiments	65	75
K4	Record Work	10	
K5			

Passing Minimum (CIA) 40% = 10 Marks

Passing Minimum (ESE) 40% = 30 Marks

40 Marks

The candidate shall be declared to have passed the examination if the candidates secure not less than 30 marks out of 75 marks in the semester examination in each theory course and 10 marks out of 25 marks in the CIA and in total not less than 40 marks.

For the practical course, 30 marks out of 75 marks in the semester examination and the record notebook taken together and 10 marks out of 25 marks in the CIA and in total 40 marks. There is no passing minimum for the record notebook. However, submission of the record

notebook is necessary.

Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

18. Maximum Duration for the Completion of the B.Sc. Computer Science(Artificial Intelligence and Data Science) Programme

The maximum duration for completion of the B.Sc. Computer Science(Artificial Intelligence and Data Science) Programme shall not exceed twelve semesters.

19. Commencement of this Regulation

This regulation and syllabus shall take effect from the academic year 2023–2024 for students who are admitted to the first year of the Programme during the academic year 2023–2024 and thereafter.

20. Grading

Once the marks of the cumulative CIA and ESE are available, they will be added. The marks thus obtained will then be graded as per details given below:

Marks and Grades:

The following table gives the marks grade points, letter grades and classification to indicate the performance of the candidate.

Range of Marks	Grade Points	Letter Grade	Description
90–100	9.0–10.0	O	Outstanding
80–89	8.0–8.9	D+	Excellent
75–79	7.5–7.9	D	Distinction
70–74	7.0–7.4	A+	Very Good
60–69	6.0–6.9	A	Good
50–59	5.0–5.9	B	Average
40–49	4.0–4.9	C	Satisfactory
00–39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Ci = Credits earned for course i in any semester

Gi = Grade Point obtained for course i in any semester

n = Semester in which such course were credited

Grade point average (for a Semester):

Calculation of grade point average semester-wise and part-wise is as follows:

GRADE POINT AVERAGE [GPA] = Σi Ci Gi / Σi Ci

$$GPA = \frac{\text{Sum of the multiplication of grade points by the credits of the courses under each part}}{\text{Sum of the credits of the courses under each part in a semester}}$$

Calculation of Grade Point Average (CGPA) (for the entire programme):

A candidate who has passed all the examinations under different parts (Part – I to V) is eligible for the following part wise computed final grades based on the range of CGPA.

CUMULATIVE GRADE POINT AVERAGE [CGPA] = Σn Σi Cni Gni / Σn Σi Cni

$$GPA = \frac{\text{Sum of the multiplication of grade points by the credits of the entire program under each part}}{\text{Sum of the credits of the courses of the entire program under each part}}$$

21. Classification of Successful Candidates

A candidate who passes all the examinations and securing following CGPA and Grades shall be declared as follows:

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5–10.0	O+	First Class – Exemplary
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	

7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
4.5 and above but below 5.0	C+	Third Class
4.0 and above but below 4.5	C	

22. Ranking

A candidate who qualifies for the B.Sc. Computer Science (Artificial Intelligence and Data Science), passing all the Examinations in the first attempt within the minimum period prescribed for the Programme from the date of admission to the Programme and secures first or second class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular subject to a maximum of 10 ranks.

23. Conferment of the Degree

No candidate shall be eligible for conferment of the Degree unless he/she has undergone the prescribed Programme of study for a period of not less than six Semesters in an Institution approved by and affiliated to the Periyar University and earns has passed the Examinations as have been prescribed.

24. Transitory Provision

Candidates who have undergone the Programme of Study prior to the Academic Year 2023–2024 will be permitted to take the Examinations under those Regulations for a period of six years i.e. up to and inclusive of the Examination of April 2029. Thereafter, they will be permitted to take the Examination only under the Regulations in force at that time.

PROGRAMME SYLLABUS

Programme: B.Sc. CS (AI & DS)				
Core – I		**Course Code:** 24UAD1C01		**Course Title:** Fundamentals of Computer Programming
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	6	90	5	100

COURSE OBJECTIVES

The main objectives of this course are to:

1. To impart knowledge about Computer fundamentals
2. To understand the concepts and techniques in C Programming
3. To equip and indulge themselves in problem solving using C
4. To introduce the concepts of Object Oriented Programming Paradigm in C++

Unit I

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

Unit II

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

Unit III

Introduction to C++ - key concepts of Object-Oriented Programming–Advantages–Object Oriented Languages –I/O in C++- C++Declarations. Functions in C++-inline functions– Function Overloading. Classes and Objects: Declaring Objects– Defining Member Functions– Static Member variables and functions–array of objects–friend functions–Overloading member functions–Bit fields and classes –Constructor and destructor with static members.

Unit IV

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

Unit V

Pointers & Files: Pointers–Declaration–Pointer to Class, Object– this pointer–Pointers to derived classes and Base classes–Arrays–Characteristics–array of classes. Files–File stream classes–file modes–Sequential Read/Write operations–Binary and ASCII Files – Random Access Operation–Templates–Exception Handling– Miscellaneous functions.

Text Book(s)

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008

2. Ashok N Kamthane ,Object-Oriented Programming with Ansi and Turbo C++,Pearson Education,2003.

Reference Books

1. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson, 2002.

2. E. Balagurusamy, Object-Oriented Programming with C++,TMH,1998

3. Maria Litvin &Gray Litvin, C++foryou,Vikaspublication,2002.

4. JohnRHubbard, Programming with C, 2ndEdition,TMH publication,2002

Related Online Contents (MOOC,SWAYAM,NPTEL,Websitesetc)

1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview

2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Learn about the Computer fundamentals and the Problem solving and understand the basic concepts of C and C++ programming	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Demonstrate the various basic programming constructs like decision making statements. Looping statements and functions	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Analyze the object oriented concepts like overloading, inheritance ,polymorphism, Virtual functions ,constructors and destructors	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Compare the various file stream classes;file types,usage of templates and exception Handling mechanisms, pros and cons of procedure oriented language with the concepts of programming language	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop programs incorporating the programming constructs of object oriented Programming concepts	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	2	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	14	14	15	15	14

S-Strong-3 **M-Medium-2** **L- Low-1**

Programme: B.Sc. CS (AI & DS)				
Core Practical – I	**Course Code:** 24UAD1P01		**Course Title:** Computer Programming Lab	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	3	45	5	100

COURSE OBJECTIVES

- To introduce the concepts of Object-Oriented Programming Paradigm and programming constructs of C++

List of Programs

1. Write a C program to find the sum, average, standard deviation for a given set of numbers.
2. Write a C program to generate n prime numbers.
3. Write a C program to generate Fibonacci series.
4. Write a C program to sort the given set of numbers in ascending order.
5. Write a C program to count the number of Vowels in the given sentence.
6. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_ Number, E_Name,Department, Basic, Salary, Grade. Write a member function to get and display them.
7. Write a C++ Program to create a class SHAPE which consists of two virtual functions
8. Write a C++ Program using function overloading to read two matrices of different Data Types Such as integers and floating point numbers.
9. Write a C++ Program to create a File and to display the contents of that file with line numbers.
10. Write a C++ Program to merge two files into a single file.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement
CO1	Apply the various basic programming constructs like decision making statements. Looping statements ,functions, concepts like overloading, inheritance ,polymorphism ,virtual functions , constructors and destructors
CO2	Illustrate the concept of Virtual Classes, inline functions and friend functions
CO3	Compare the various file stream classes; file types, usage of templates and exception Handling mechanisms.
CO4	Compare the pros and cons of procedure oriented language with the concepts of object Oriented language

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	14

S-Strong-3 **M-Medium-2** **L-Low-1**

Programme: B.Sc. CS (AI & DS)				
Foundation Course – I	**Course Code:** 24UAD1FC01		**Course Title:** Data Structures	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
I	4	60	2	100

Course Objectives

1. To understand the concepts of ADTs
2. To learn linear data structures - lists, stacks, queues
3. To learn Tree structures and application of trees
4. To learn graph structures and application of graphs
5. To understand various sorting and searching

UNIT – I

Algorithms (Analysis and Design): Problem Solving – Top-Down and Bottom-Up – Design, Implementation, Verification of Algorithm – Efficiency Analysis of Algorithms: Space, Time Complexity, and Frequency Count – Introduction: Definitions – Concepts – Overview – Abstract Data Types (ADTs).

UNIT – III

Arrays: Definition – Terminology – One Dimensional Array – Multi Dimensional Array. Linked List: Definition – Single Linked List – Double Linked List – Circular Linked List – Applications: Sparse Matrix – Polynomial Representation – Dynamic Storage Management.

UNIT – III

Stack ADT – Operations – Applications – Evaluating arithmetic expressions – Conversion of infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue – applications of queues.

UNIT – IV

Tree ADT – tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – Heap Tree. Graph: Definition – Representation of Graph – Types of graph – Breadth first traversal – Depth first traversal – Topological sort – Applications of graphs.

UNIT – V

Searching – Linear Search Techniques with – Array, Linked List, and Ordered List – Binary search – Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort – Quick Sort – Merge Sort.

Text Book

1. MarkAllenWeiss — Data Structures and Algorithm Analysis in C++, Pearson Education, 2014, 4th Edition.
2. ReemaThareja — Data Structures Using C, Oxford Universities Press 2014, 2nd Edition

Reference Books

1. Thomas H.Cormen, Chales E.Leiserson, Ronald L.Rivest, Clifford Stein - Introduction to Algorithms, McGraw Hill 2009,3rd Edition.
2. AhoHopcrofanUllman - Data Structures and Algorithms, Pearson Education, 2003.

WebResources

1. NPTEL&MOOCcoursestitledDataStructures
2. https://nptel.ac.in/courses/106106127/

Course Outcomes (COs)

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

CO Number	CO Statement	Programme Outcomes
CO1	Understand the concept of Dynamic memory management, datatypes, algorithms, Big O notation	PO1, PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2, PO4
CO4	Solve problem involving graphs, trees and heaps	PO6, PO8
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO7

Mapping of COs with PSOs

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	-	1	-
CO2	1	2	1	-	-	-
CO3	3	1	2	1	-	-
CO4	2	2	1	-	-	1
CO5	3	1	1	-	-	-
Weight age of course contributed to each PSO	12	9	8	1	1	1

3 – Strong **2– Medium** **1 – Low**

Programme: B.Sc. CS(AI & DS)				
Core – II	**Course Code:** 24UAD2C02		**Course Title:** Intoduction to Python	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	6	90	5	100

COURSE OBJECTIVES

The main objectives of this course are

1. To know the basics of algorithmic problem solving with read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and call them.
4. To use Python data structures - lists, tuples , dictionaries and fix input/output with files in Python.
5. To understand various sorting and searching

Unit I

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Unit II

Python interpreter and interactive mode, values and types: int, float, boolean, string and list; variables, expressions, statements, tuple assignment, precedence of operators, comments, modules and functions, function definition and use, flow of execution, parameters and arguments

Unit III

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration: state, while, for, break, continue, pass. Fruitful functions:

return values, parameters, local and global scope, function composition, recursion. Strings: string slices, immutability, string functions and methods, string module, Lists as arrays.

Unit IV

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters. Tuples: tuple assignment, tuple as return value, Dictionaries: operations and methods, advanced list processing - list comprehension.

Unit V

Files and exception: text files, reading and writing files, format operator, command line arguments, errors and exceptions, handling exceptions, modules, packages.

Text Book(s)

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

Reference Book(s)

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

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Develop algorithmic solutions to simple computational problems	PO1,PO6
CO2	Read, write, execute by hand simple Python programs. Structure simple Python programs for solving problems.	PO2
CO3	Decompose a Python program into functions.	PO2,PO4
CO4	Represent compound data using Python lists, tuples, dictionaries. Read and write data from/to files in Python Programs	PO4,PO6
CO5	Judge the pros and cons of Python	PO5,PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

S-Strong-3 **M-Medium-2** **L-Low-1**

Programme: B.Sc. CS(AI & DS)				
Core Practical – II	**Course Code:** 24UAD2P02		**Course Title:** Python Programming Lab	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	3	45	5	100

COURSE OBJECTIVES

The main objectives of this course are

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples and dictionaries.
5. Read and write data from/to files in Python.

List of Programs

1. Compute the GCD of two numbers
2. Find the square root of a number (Newton‟s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search.
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)

Text Book

1. Mark Summerfield. ―Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009

Reference Books

1. Martin C. Brown, ―PYTHON: The Complete Reference, McGraw-Hill, 2001

Web Resources

1. https://www.sanfoundry.com/python-problems-solutions/
2. https://www.tutorialgateway.org/python-programming-examples/

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Implement Python programs with conditionals and loops	PO1,PO4,PO5
CO2	Develop Python programs step-wise by defining functions and calling them.	PO1, PO4,PO6
CO3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
CO4	Use Python lists, tuples, dictionaries for representing compound data	PO3,PO4
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of coursecontributed to each PSO	15	15	13	15	13	15

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

Programme: B.Sc. CS(AI & DS)				
Core – III	**Course Code:** 24UAD3C03		**Course Title:** Data Analytics Using R	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
III	6	90	5	100

COURSE OBJECTIVES

The main objectives of this course are

1. To understand the problem solving approaches
2. To learn the basic programming constructs in R Programming
3. To learn the basic programming constructs in R Programming
4. To use R Programming data structures - lists, tuples, and dictionaries.
5. To do input/output with files in R Programming.

Unit I:

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of High- Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model

Unit II:

CONTROL STRUCTURES AND VECTORS –Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

Unit III:

LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix- Like Operations

Unit IV:

FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .

Unit V:

OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

Text Book

1. Roger D. Peng, R Programming for Data Science —, 2012
2. Norman Matloff,The Art of R Programming- A Tour of Statistical Software Design, 2011

Reference Books

1. Garrett Grolemund, Hadley Wickham,Hands-On Programming with R: Write Your Own Functions and Simulations , 1st Edition, 2014
2. Venables ,W.N.,andRipley,S programming—, Springer, 2000.

Web Resources

1. https://www.simplilearn.com

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn NoSQL databases and management.	PO5, PO6

Mapping of COs with POs

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
Weightage of coursecontributed to each PSO	14	13	14	14	14	13

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

Programme: B.Sc. CS(AI & DS)				
Core – III	**Course Code:** 24UAD3C03		**Course Title:** Data Analytics Using R	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
III	6	90	5	100

The main objectives of this course are

1. To understand the problem solving approaches
2. To learn the basic programming constructs in R Programming
3. To practice various computing strategies for R Programming -based solutions to real
4. world problems
5. To use R Programming data structures - lists, tuples, and dictionaries.
6. To do input/output with files in R Programming.

List of Programs

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user‘s choice.
2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
3. Write a program to find list of even numbers from 1 to n using R- Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.
11. Program to find factorial of the given number using recursive function
12. Write a R program to count the number of even and odd numbers from array of N numbers.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Acquire programming skills in core R Programming	PO1,PO4,PO5
CO2	Acquire Object-oriented programming skills in R Programming.	PO1, PO4,PO6
CO3	Develop the skill of designing graphical-user interfaces (GUI) in R Programming	PO1,PO3,PO6
CO4	Acquire R Programming skills to move into specific branches	PO3,PO4
CO5	Learn NoSQL databases and management.	PO1,PO5,PO6

Mapping of COs with POs

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
Weightage of coursecontributed to each PSO	14	13	14	14	14	13

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

Programme: B.Sc. CS (AI & DS)				
Core – III		**Course Code:** 24UAD3E01		**Course Title:** Fundamentals of Artificial Intelligence
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
III	5	90	3	100

The main objectives of this course are

1. Understand the basic concepts of intelligent agents
2. Develop general-purpose problem solving agents, logical reasoning agents and agents that reason under uncertainty.
3. Employ AI techniques to solve some of today‟s real world problems.
4. Analyze the implications of applying AI systems to organizations and future of work.
5. Explain how to develop AI systems to meet business, organizational, and technology requirements.

Unit I

Introduction to AI –Agents and Environments –Concept of rationality –Nature of environments –Structure of agents Problem solving agents – search algorithms –uninformed search strategies

Unit II

Heuristic search strategies –heuristic functions. Local search and optimization problems – local search in continuous space –search with non-deterministic actions –search in partially observable environments –online search agents and unknown environments

Unit III

Game theory –optimal decisions in games –alpha-beta search –montecarlo tree search – stochastic games –partially observable games. Constraint satisfaction problems –constraint propagation –backtracking search for CSP –local search for CSP –structure of CSP.

Unit IV

Knowledge-based agents –propositional logic –propositional theorem proving –propositional model checking –agents based on propositional logic. First-order logic –syntax and semantics –knowledge representation and engineering –inferences in first-order logic –forward chaining –backward chaining –resolution

Unit V

Ontological engineering –categories and objects –events –mental objects and modal logic –reasoning systems for categories –reasoning with default information. Classical planning –algorithms for classical planning –heuristics for planning –hierarchical planning –nondeterministic domains –time, schedule, and resources –analysis.

Text Book

1. Stuart Russel and Peter Norvig, ―Artificial Intelligence: A Modern Approach, Fourth
2. Edition, Pearson Education, 2020.
3. Dan W. Patterson, ―Introduction to AI and ES, Pearson Education, 2007
4. Kevin Night, Elaine Rich, and Nair B., ―Artificial Intelligence, McGraw Hill, 2008

Reference Books

1. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
2. Deepak Khemani, ―Artificial Intelligence, Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)
3. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases -by Dennis Rothman, 2018

Web Resources

1. https://www.javatpoint.com/artificial-intelligence-ai
2. https://www.tutorialspoint.com/artificial_intelligence/index.htm

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand autonomous agents that make effective decisions in fully informed, partially observable and adversarial settings	PO1
CO2	Choose appropriate algorithms for solving given AI problems	PO1,PO2
CO3	Design and implement logical reasoning agents.	PO4,PO6
CO4	Demonstrate agents that can reason under uncertainty	PO4,PO5,PO6
CO5	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	PO3,PO6

Mapping of COs with POs

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2
CO2	3	3	3	2	3	2
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	3	3	3	2	3	2
Weightage of coursecontributed to each PSO	15	15	14	12	14	10

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

Programme: B.Sc. CS (AI & DS)				
Core – IV		**Course Code:** 24UAD4C04		**Course Title:** Fundamentals of Data Science
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
IV	6	90	5	100

The main objectives of this course are

1. To acquire skills in data preparatory and preprocessing steps
2. To understand the mathematical skills in statistics
3. To learn the tools and packages in Python for data science
4. To gain understanding in classification and Regression Model
5. To acquire knowledge in data interpretation and visualization techniques

Content

Unit I:

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

Unit II:

Frequency distributions –Outliers –relative frequency distributions –cumulative frequency distributions – frequency distributions for nominal data –interpreting distributions –graphs – averages –mode –median –mean –averages for qualitative and ranked data.

Unit III:

Normal distributions –z scores –normal curve problems – finding proportions –finding scores – more about z scores –correlation –scatter plots –correlation coefficient for quantitative data – computational formula for correlation coefficien

Unit IV:

Basics of Numpy arrays, aggregations, computations on arrays, comparisons, structured arrays, Data manipulation, data indexing and selection, operating on data, missing data, hierarchical indexing, combining datasets –aggregation and grouping, pivot tables.

Unit V:

Visualization with matplotlib, line plots, scatter plots, visualizing errors, density and contour plots, histograms, binnings, and density, three dimensional plotting, geographic data

Text Books

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, ―Introducing Data Science, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, ―Statistics, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, ―Python Data Science Handbook, O‟Reilly, 2016.

References :

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

Web Resources

1. https://www.w3schools.com/datascience/
2. https://www.geeksforgeeks.org/data-science-tutorial/
3. https://www.coursera.org/

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Apply the skills of data inspecting and cleansing.	PO1, PO2, PO6
CO2	Determine the relationship between data dependencies using statistics	PO2, PO3, PO8
CO3	Understand the can handle data using primary tools used for data science	PO1, PO3, PO5
CO4	Represent the useful information using mathematical skills.	PO2, PO6
CO5	Apply the knowledge for data describing and visualization using tools	PO1, PO3, PO6

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	2	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weightage of course contributed to each PSO	14	14	14	14	14	11

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

Programme: B.Sc. CS (AI & DS)				
Core Practical – IV	**Course Code:** 24UAD4P04		**Course Title:** Data Science Lab	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
IV	3	45	5	100

The main objectives of this course are

1. Understand the Programming Language.
2. To prepare data for data analysis through understanding its distribution.
3. Exposure on data processing using excel
4. To acquire knowledge in plotting using visualization tools.
5. To understand and implement classification and regression model.

Content

1. Study of Basic function in Excel
2. Working with Range Names and Tables
3. Cleaning Data with Text Functions
4. Cleaning Data containing Data Values
5. Working with VLOOKUP functions and Pivot Table.
6. Demonstration of Data Visualization in Excel.
7. Importing Data from External Source Using Excel
8. Creating a data model
9. Create a dashboard for a given requirement
10. Implement a data analytics for the real time data set

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the basic concepts and techniques of Machine Learning.	PO1
CO2	Explain the regression methods, classification methods, c lustering methods.	PO1, PO2
CO3	Apply the inference and learning algorithms for the hidden Mark model.	PO4, PO6
CO4	Demonstrate Dimensionality reduction Techniques	PO4, PO5, PO6
CO5	Appreciate the underlying mathematical relationships with in and across Machine Learning algorithms and the para digms of supervise dandun-supervised learning.	PO3, PO6

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	14	14	13	14	14	12

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

Programme: B.Sc. CS (AI & DS)				
Core – III	**Course Code:** 24UAD4E02		**Course Title:** Cognitive Science and Analytics	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
IV	6	90	3	100

The main objectives of this course are

1. To explain cognitive computing and design principles
2. To distinguish between NLP and cognitive computing..
3. To apply advanced analytics to cognitive computing.
4. To discuss application of cognitive computing in business
5. To illustrate various applications of cognitive computing

Content

Unit I:

Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition.

Unit II:

Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.

Unit III:

Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems

Unit IV:

Relationship between Big Data and Cognitive Computing: Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data

Unit V:

Business Implications of Cognitive Computing: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future.

Text Book

1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, ―Cognitive computing and Big Data Analytics Wiley, 2015.
2. Vijay Raghvan, Venu Govindaraju, C.R. Rao, Cognitive Computing: Theory and Applications‟, by Elsevier publications, North Holland Publication, 1st Edition, 2016.
3. Bernadette Sharp (Author), Florence Sedes (Author), Wieslaw Lubaszewski (Author), Cognitive Approach to Natural Language Processing Hardcover, First Edition May 2017.

Reference Books

1. Arun Kumar Sangaiah, Arunkumar Thangavelu, et al., Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications: Lecture Notes on Data Engineering and Communications Technologies 1st edition 2018
2. Min Chen and Kai Hwang, Big-Data Analytics for Cloud, IoT and Cognitive Computing Wiley Publication, 1st Edition, 2017.
3. Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing, IGI Global Publishers, 2019

Web Resources

https://www.ulster.ac.uk/cognitive-analytics-research/cognitive-analytics#:~:text=Cognitive%20Analytics%20applies%20human%2Dlike,deep%20learning%20and%20machine%20learning.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Apply cognitive computing and design principles.	PO1
CO2	Understand the concept NLP and cognitive computing.	PO1, PO3
CO3	Analyze advanced analytics to cognitive computing.	PO2, PO6
CO4	Discuss application of cognitive computing in business.	PO4, PO5, PO6
CO5	Evaluate the performance of analytical frameworks	PO5, PO6

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	14	14	13	14	14	12

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

Programme: B.Sc. CS (AI & DS)				
Core – V		**Course Code:**24UAD5C05		**Course Title:** Ethics of Artificial Intelligence
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	4	100

The main objectives of this course are

1. To understand the need for ensuring ethics in AI
2. To understand ethical issues with the development of AI agents
3. To apply the ethical considerations in different AI applications
4. To evaluate the relation of ethics with nature
5. To overcome the risk for Human rights and other fundamental values.

Content

Unit I:

Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities

Unit II:

AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.

Unit III:

Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder.

Unit IV:

Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents

Unit V:

Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.

Text Books

1. Paula Boddington, ―Towards a Code of Ethics for Artificial Intelligence, Springer, 2017
2. Markus D. Dubber, Frank Pasquale, Sunit Das, ―The Oxford Handbook of Ethics of AI, Oxford University Press Edited book, 2020
3. S. Matthew Liao, ―Ethics of Artificial Intelligence, Oxford University Press Edited Book, 2020

References Books

1. N. Bostrom and E. Yudkowsky. ―The ethics of artificial intelligence. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
2. Wallach, W., & Allen, C, ―Moral machines: ceaching robots right from wrong, Oxford University Press, 2008.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the ethical issues in the development of AI agents	PO1
CO2	Learn the ethical considerations of AI with perspectives on ethical values	PO1, PO2
CO3	Apply the ethical policies in AI based applications and Robot development	PO4, PO6
CO4	To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights	PO4, PO5, PO6
CO5	Overcome the evil genesis in the concepts of AI	PO3, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	2	2	3
CO2	3	3	2	2	1	2
CO3	3	3	3	2	3	2
CO4	3	3	3	3	2	2
CO5	3	3	3	2	2	2
Weightage of coursecontributed to each PO/PSO	15	14	14	11	10	11

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

Programme: B.Sc. CS (AI & DS)				
Core – VI	**Course Code:** 24UAD5C06		**Course Title:** Database Design and Management	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	6	90	4	100

The main objectives of this course are

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

Content

Unit I:

Database environment –Database system development lifecycle –Requirements collection – Database design - -Entity-Relationship model –Enhanced-ER model – UML class diagrams

Unit II:

Relational model concepts --Integrity constraints -- SQL Data manipulation –SQL Data definition –Views --SQL programming.

Unit III:

ER and EER-to-Relational mapping –Update anomalies –Functional dependencies-Inference rules – Minimal cover –Properties of relational decomposition –Normalization upto BCNF..

Unit IV:

Transaction concepts –properties –Schedules – Serializability –Concurrency Control –Two-phase locking techniques.

Unit V:

Mapping EER to ODB schema –Object identifier – reference types –row types –UDTs – Subtypes and super types –user-defined routines –Collection types – Object Query Language

Text Books

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems –A Practical Approach to Design, Implementation and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamental of Database Systems, 7th Edition, Pearson, 2017

Reference Books

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, ―DATABASE MODELING AND DESIGN -Logical Design, Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, ―Database System Concepts", 6th Page 37 of 84 Edition, Tata Mc Graw Hill, 2011.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems: The Complete Book", 2nd edition, Pearson.
6. S Sumathi, S Esakkirajan, ― Fundamentals of Relational Database Management Systems ", (Studies in Computational Intelligence), Springer-Verlag, 2007.
7. Raghu Ramakrishnan, ―Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010

Web Resources

1. https://www.javatpoint.com/dbms-tutorial

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the database development life cycle and apply conceptual modeling	PO1
CO2	Apply SQL and programming in SQL to create, manipulate and query the database	PO1, PO2
CO3	Apply the conceptual-to-relational mapping and normalization to design relational database (DML)	PO4, PO6
CO4	Determine the serializability of any non-serial schedule using concurrency techniques multiple tables	PO4, PO5, PO6

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3 **M-Medium-2** **L-Low-1**

Programme: B.Sc. CS (AI & DS)				
Core Practical – VI	**Course Code:** 24UAD5P05		**Course Title:** Database Programming Lab	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	3	45	4	100

The main objectives of this course are

1. To understand the database development life cycle
2. To learn database design using conceptual modelling, Normalization
3. To implement database using Data definition, Querying using SQL manipulation and SQL programming
4. To implement database applications using IDE/RAD tools
5. To learn querying Object-relational databases

Content

1. Database Development Life cycle: Problem definition and Requirement analysis Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) –top-down approach .Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming -Stored Procedures/Functions –Constraints and security using Triggers
6. Database design using Normalization –bottom-up approach
7. Develop database applications.
8. Create a table for Employee details with Employee Number as primary key and following fields: Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform various queries using any one Comparison, Logical, Set, Sorting and Grouping operators.

9. Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.
10. Querying the Object-relational database using Objet Query language.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the database development life cycle	PO1
CO2	Design relational database using conceptual-torelational mapping, Normalization	PO1, PO2
CO3	Apply SQL for creation, manipulation and retrieval of data	PO4, PO6
CO4	Develop a database applications for real-time problems	PO4, PO5, PO6

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	14	14	13	14	14	12

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

Programme: B.Sc. CS (AI & DS)				
Core – VII	**Course Code:** 24UAD6C07		**Course Title:** Robotic Process Automation	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	4	100

The main objectives of this course are

1. To introduce the fundamental concept sand techniques of natural language processing(NLP)
2. Model the workflow of different scrapping methodologies
3. Understand how the Citrix and the Image Recognition can be helpful
4. Understand Image, Text and Data Tables Automation.
5. To learn the concept of Robatic Process

Content

Unit I:

Robotic Process Automation (RPA):Fundamentals of RPA – Programming basics from RPA perspective – Applying RPA – RPA development methodology – Architecture of RPA – RPA and emerging ecosystem

Unit II:

Basics of RPA - RPA Benefits - Processes that can be automated –Types of Robots. Automation and RPA Concepts: Business models for implementing RPA – Centre of Excellence - Types and their applications – Building an RPA team - Approach for implementing RPA initiatives.

Unit III:

Automation stages and the role of a Business Manager - Guidelines for tracking the implementation success – Metrics /Parameters to be considered for gauging success- Choosing the right licensing option.

Unit IV:

Introduction - Automation debugging – Automation library – Activities Packages – Basic automation tasks - Text and image automation.Setting up the UiPath environment -– Introduction to UiPath - The User Interface - Keyboard Shortcuts.

Unit V:

Tables in RPA - Data Manipulation in excel - Extracting Data from PDF – Using anchors in PDF.

Text Books

1. Robotic Process Automation using UiPath StudioX: A Citizen Developer‟s Guide to HyperautomationPaperback June 2021by Adeel Javed, Anum Sundrani, Nadia Malik, Sidney Madison Prescott.
2. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – UiPath Paperback March 2018by Alok Mani Tripathi

Web Resources

1.https://www.uipath.com/landing/academic-studio-download

2. https://www.uipath.com/rpa/robotic-process-automation

3. https://www.uipath.com/rpa/academy

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts and techniques of natural language processing (NLP)	PO1
CO2	Understanding of the models and algorithms in the field of NLP	PO1, PO2
CO3	Demonstrate the computational proper ties of natural languages and the commonly used algorithms for processing linguistic in formation	PO4, PO6
CO4	Understanding semantic sand pragmatics of languages for processing	PO4, PO5, PO6
CO5	To understand Robatics Process Automation	PO3, PO4

Mapping of COs with POs

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage of course contributed to each PSO	15	11	11	12	10	13

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

Programme: B.Sc. CS (AI & DS)				
Core – VIII	**Course Code:** 24UAD6C08		**Course Title:** Natural Language Processing	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	4	100

The main objectives of this course are

1. To introduce the fundamental concept sand techniques of natural language processing(NLP).
2. Develop speech-based applications that use speech analysis (phonetics, speech recognition, and synthe
3. Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.
4. Develop a conversational agent that uses natural language understanding and generation.
5. Evaluate the performance of NLP tools and systems.

Unit I:

Introduction :application of NLP technique sand key issues-MT grammercheckers-dictation–document generation- NL interfaces- Natural language processing key issues- the different analysis level used for NLP:morpho-lexical-syntactic-semantic-pragmatic-markup(TEI,UNICODE)- finite state automata- Recursive and augmented transition networks-open problems

Unit II:

Lexical level: error tolerant lexical processing(spellingerrorcorrection)- ransducers for the design of morphologic analyzers features-towards syntax: part-of- speech tagging (BRILL,HMM)-efficient representations for linguisticre sources (lexica,grammars,….) tries and Finite state automata

Unit III

Syntactic level: grammars (eg.formal/Chomsky hierarchy, DCSGs, systematic case, unification, stochastic) –parsing (top-down,bottomup,char (earlyalgorithm),CYKalgorithm)-automated estimation of probabilistic model parameters (inside-outside algorithm)- data oriented parsing grammar formalisms and tree banks- efficient patsing for context- free grammars (CFGs)-statistcial Parsing and probabilistic CFGs(PCFGs)-lexicilized PCFGse.

Unit IV:

Semantic level: logical forms – ambiguity resolution –semantic network and parsers – procedural semantics – montague semantics- vector space approaches-distributional semantics lexical semantics and word sense disambiguation-compositional semantic semantic rolela beling and sematic parsing

Unit V:

Pragmatic level: knowledge representation- reasoning –plan / goal recognition –speech acts/intentions– belief models- discourse- reference. Natural language generation: content determination – sent en ceplanning- surfa cerealization, subjectivity and sentiment analysis.

Text Books

1. Daniel Jand JamesH.Martin,speech and language processing an introduction to natural language processing,computational linguistcs & speech recognition prenticehall,2009

Reference Books

1. Lan H Written and Elbef,MarkA.Hall,datamining:practical machine learning tools and techiniques,Morgan Kaufmann,2013

Web Resources

1. https://www.tutorialspoint.com/natural_language_processing/index.htm
2. https://www.geeksforgeeks.org/natural-language-processing-nlp-tutorial/

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the fundamental concepts and techniques of natural language processing (NLP)	PO1, PO2, PO6
CO2	Understanding of the models and algorithms in the field of NLP	PO2, PO3, PO5
CO3	Demonstrate the computational proper ties of natural languages and the commonly used algorithms for processing linguistic in formation	PO1, PO3, PO6
CO4	Understanding semantic sand pragmatics of languages for processing	PO2, PO6
CO5	To understand Robatics Process Automation	PO1, PO3, PO6

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	2	2	3	3	3
CO3	3	3	3	2	3	3
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	13	12	14	14	14

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

Programme: B.Sc. CS (AI & DS)				
Core Practical – VI	**Course Code:** 24UAD6P06		**Course Title:** Programming in UI Path Automation Lab	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	3	45	4	100

The main objectives of this course are

1. To get a knowledge in dissecting the myths from the facts and realize the true benefits of RPA
2. To create Acquire knowledge of fundamental UI automation concepts
3. To Gain ability to create and debug workflows using UiPath
4. To implement Master installation of UiPath Studio on Windows
5. To Gain ability to implement error exception handling

Content

1. Robotic Process Automation – Introduction, Working
2. UiPath – Basics, Installation and Understanding User Interface Components
3. Keyboard Shortcuts & Customization.
4. Visual workflow automation straightforward and intuitive
5. UiPath is providing automated workflow design, Which can be used without programming knowledge
6. Recording are important functionality of UiPath studio, enables us to capture user‟s action on the screen and translate them into sequences.
7. Excel Automation
8. Email Automation

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand business functionalities in Robotics Process Automation	PO1, PO2, PO4
CO2	Implement RPA functions across the Organizations to boost revenues	PO3, PO5
CO3	Demonstrate the basics of robotic process automation using UI Path.	PO1, PO4, PO5
CO4	Manage RPA solutions to ensure lasting results	PO2, PO4, PO6
CO5	To develop a software to solve real-world problems using UI PATH	PO1,PO3, PO5, PO6

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

ELECTIVE COURSES

Programme: B.Sc. CS (AI & DS)				
Elective III	**Course Code:** 24UAD5E03		**Course Title**: Image Processing	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	3	100

The main objectives of this course are

1. To learn fundamentals of digital image processing.
2. To learn about various 2D Image transformations
3. To learn about various image enhancement processing methods and filters
4. To learn about various classification of Image segmentation techniques
5. To learn about various image compression techniques

Content

Unit I

Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis

Unit II

2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition

Unit III

Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.

Unit IV

Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.

Unit V

Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression - Transform based compression,

Text Book

1. S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015
2. Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009

Reference Books

1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988
2. Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003
3. Pratt William K , Digital Image Processing: , John Wiley,4/e,2007

Web Resources

1. https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
3. https://dl.acm.org/doi/10.5555/559707
4. https://www.ijert.org/image-processing-using-web-2-0-2

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Understand the fundamental concepts of digitalimage processing.	PO1
CO2	Understand various 2D Image transformations	PO1, PO2
CO3	Understand image enhancement processing techniques and filters	PO4, PO6
CO4	Understand the classification of Image segmentation Techniques	PO4, PO5, PO6
CO5	Understand various image compression techniques	PO3, PO5

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	15	14	11	15	10	10

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

Programme: B.Sc. CS (AI & DS)				
Elective III	**Course Code:** 24UAD5E04		**Course Title**: Cryptography	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	3	100

The main objectives of this course are

1. To understand the fundamentals of Cryptography
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks
5. To design security applications in the field of Information technology

Unit I:

Introduction: The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.

Unit II:

Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography

Unit III:

Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES –RSA: The RSA algorithm.

Unit IV:

Network Security Practices: IP Security overview - IP Security architecture – Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.

Unit V:

Intruders – Malicious software – Firewalls.

Text Book

1. William Stallings, ―Cryptography and Network Security Principles and Practices.

Reference Books

1. Behrouz A. Foruzan, ―Cryptography and Network Security, Tata McGraw-Hill, 2007.
2. AtulKahate, ―Cryptography and Network Security, Second Edition, 2003,TMH.
3. M.V. Arun Kumar, ―Network Security, 2011, First Edition,USP.

Web Resources

1. https://www.tutorialspoint.com/cryptography/
2. https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Analyze the vulnerabilities in any computing system and hence beable to design a security solution.	PO1,PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographic cryptographic algorithms	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographiccryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate differentapplications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand standards	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	2	3	2
CO2	3	2	3	2	3	3
CO3	3	3	3	2	3	3
CO4	2	3	3	3	2	3
CO5	3	2	3	3	3	3
Weightage of course contributed to each PSO	14	13	15	12	14	14

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

Programme: B.Sc. CS (AI & DS)				
Elective III	**Course Code:** 24UAD5E05		**Course Title:** Human Computer Interaction	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	3	100

The main objectives of this course are

1. To learn about the foundations of Human Computer Interaction.
2. To learn the design and software process technologies.
3. To learn HCI models and theories.
4. To learn Mobile Ecosystem.
5. To learn the various types of Web Interface Design.

Contents

Unit I

FOUNDATIONS OF HCI :

- The Human: I/O channels – Memory
- Reasoning and problem solving; The Computer: Devices – Memory – processing and networks;
- Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

Unit II:

DESIGN & SOFTWARE PROCESS:

- Interactive Design:
- Basics – process – scenarios
- Navigation: screen design Iteration and prototyping.
- HCI in software process:

Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

Unit III:

MODELS AND THEORIES:

- HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit IV:

Mobile HCI:

- Mobile Ecosystem: Platforms, Application frameworks
- Types of Mobile Applications: Widgets, Applications, Games
- Mobile Information Architecture, Mobile 2.0,
- Mobile Design: Elements of Mobile Design, Tools. - Case Studies

Unit V:

WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

Text Book

1 Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human –Computer Interaction, III Edition, Pearson Education, 2004 (UNIT I, II & III)

2 Brian Fling, ―Mobile Design and Development, I Edition, O_Reilly Media Inc., 2009(UNIT–IV)

3 Bill Scott and Theresa Neil, ―Designing Web Interfaces, First Edition, O_Reilly, 2009. (UNIT-V)

Reference Books

1. Shneiderman, ―Designing the User Interface: Strategies for Effective Human-Computer Interaction, V Edition, Pearson Education.

Web Resources

1. https://www.interaction-design.org/literature/topics/human-computer-interaction
2. https://link.springer.com/10.1007/978-0-387-39940-9_192
3. https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Understand thefundementals of HCI.	PO1
CO2	Understand the design and software process technologies.	PO1, PO2
CO3	Understand HCI models and theories.	PO4, PO6
CO4	Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design.	PO4, PO5, PO5
CO5	Understand the various types of Web Interface Design.	PO3, PO4

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	11	10

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

Programme: B.Sc. CS (AI & DS)				
Elective IV	**Course Code:** 24UAD5E06		**Course Title**: Cloud Computing	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	3	100

The main objectives of this course are

1. Learning fundamental concepts and Technologies of Cloud Computing.
2. Learning various cloud service types and their uses and pitfalls.
3. To learn about Cloud Architecture and Application design.
4. To know the various aspects of application design, benchmarking and security on the Cloud.
5. To learn the various Case Studies in Cloud Computing.

Content

Unit I

Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service LevelAgreements – Billing.

Unit II

Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure

Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack

Unit III

Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: RelationalApproach (SQL), Non- RelationalApproach (NoSQL).

Unit IV

Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for BenchmarkingMethodology – Benchmarking Tools and Types of Tests – DeploymentPrototyping.Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in motion – Key Management – Auditing.

Unit V

Case Studies: Cloud Computing for Healthcare – Cloud Computing for EnergySystems - Cloud Computing for Transportation Systems - Cloud Computing for ManufacturingIndustry - Cloud Computing for Education.

Text Book

1. ArshdeepBahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018

Reference Books

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.
3. David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.
4. Dr. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.

Web Resources

1. https://en.wikipedia.org/wiki/Cloud_computing
2. https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
3. https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-omputing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO2	Able to understand various cloud service types andtheir uses and pitfalls.	PO1, PO2
CO3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO5	Understand various Case Studies in CloudComputing.	PO3, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	15	10

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

Programme: B.Sc. CS (AI & DS)				
Elective IV	**Course Code:** 24UAD5E07		**Course Title**: Big Data Analytics	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	3	100

The main objectives of this course are

1. Understand the Big Data Platform and its Use cases, Map Reduce Jobs
2. To identify and understand the basics of cluster and decision tree
3. To study about the Association Rules,Recommendation System
4. To learn about the concept of stream
5. Understand the concepts of NoSQL Databases

Content

Unit I:

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications —Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of High- Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model

Unit II:

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.

Unit III:

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Unit IV:

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

Unit V:

NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation- Key Value Stores- Document Stores — Tabular Stores — Object DataStores — Graph Databases Hive — Sharding —Hbase— Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Text Book

1. AnandRajaraman and Jeffrey David Ullman, ―Mining of Massive Datasets, Cambridge University Press, 2012.

Reference Books

1. David Loshin, ―Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph, Morgan Kaufmann/El sevier Publishers, 2013

2. EMC Education Services, ―Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley publishers, 2015.

Web Resources

1. https://www.simplilearn.com
2. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn NoSQL databases and management.	PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
Weightage of course contributed to each PSO	14	13	14	14	14	13

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

Programme: B.Sc. CS (AI & DS)				
Elective IV	**Course Code:** 24UAD5E08		**Course Title**: Virtual Reality	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V	5	75	3	100

The main objectives of this course are

1. To provide knowledge on basic principles of virtual & augmented reality
2. To have the ability to use its technology as a platform for real-world applications.

Unit I:

Virtual Reality: The Three I‘s of VR – History – Early commercial VR Technology – Components of a VR System –Input Devices: Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces

Unit II:

Output Devices: Graphics Displays – Sound Displays – Haptic Feedback - Computer Architecture for VR: The Rendering Pipeline- PC Graphics Architecture - VR Programming: Toolkits and Scene Graphs – Traditional and Emerging Applications of VR

Unit III:

Augmented Reality: Introduction – Augmented Reality Concepts: Working Principle of AR – Concepts related to AR- Ingredients of an Augmented Reality Experience

Unit IV:

Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – Tools and Technologies

Unit V:

Augmented Reality Content: Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR - Mobile Augmented Reality: Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality

Textbooks

1. Grigore C. Burdea and Philippe Coiffet, ―Virtual Reality Technology, Wiley
2. Student Edition , Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9)
3. Alan B. Craig(2013), ―Understanding Augmented Reality: Concepts and Applications(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8)
4. Jon Peddie (2017), ―Augmented Reality: Where We Will All Live, Springer, Ist Edition (Unit IV: Chapter 7 (Tools & Technologies)

Reference Books

1. Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann(2009), ―Developing Virtual Reality Applications: Foundations of Effective Design, Elsevier(Morgan Kaufmann Publishers)
2. Paul Mealy (2018), ―Virtual and Augmented Reality, Wiley
3. Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018), ―Virtual Reality and Augmented Reality: Myths and Realities, Wiley

NOTE: Latest Edition of Textbooks May be Used

Web Resources

1. http://msl.cs.uiuc.edu/vr/
2. http://www.britannica.com/technology/virtual-reality/Living-in -virtual-worlds
3. https://mobidev.biz/blog/augmented-reality-development-guide

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Outline the basic terminologies, techniques and applications of VR and AR	
CO2	Describe different architectures and principles of VR and AR systems	
CO3	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications	
CO4	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition	
CO5	Assess the importance of VR/AR content and interactions to implement for the real- world problem	

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	15	10

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

Programme: B.Sc. CS (AI & DS)				
Elective V	**Course Code:** 24UAD6E09		**Course Title:** Internet of Things and its application	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	3	100

The main objectives of this course are

1. Use of Devices, Gateways and Data Management in IoT.
2. Design IoT applications in different domain and be able to analyze their performance
3. Implement basic IoT applications on embedded platform
4. To gain knowledge on Industry Internet of Things
5. To Learn about the privacy and Security issues in IoT

Content

Unit I:

IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

Unit II:

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

Unit III:

IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views

Unit IV:

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management

Unit V:

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Text Book

1 Vijay Madisetti and ArshdeepBahga, ―Internet of Things: (A Hands-on Approach), Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference Books

1. Michael Miller, ―The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World, kindle version.
2. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications 2013, 1st Edition,.
3. WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice 4..CunoPfister, ―Getting Started with the Internet of Things, O‟Reilly Media 2011

Web Resources

1. https://www.simplilearn.com
2. https://www.javatpoint.com
3. https://www.w3schools.com

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Explain the definition and usage of the term —Internet of Thing's in different contexts.	PO1
CO2	Understand the key components that make up an IoT system	PO1, PO2
CO3	Differentiate between the levels of the IoT stack and be familiar with the key Technologie sand protocols employed teach layer of the stack.	PO4, PO6
CO4	Apply the knowledge and skills acquired during the course to build and test a complete,working IoT system involving prototyping, programming and dataanalysis	PO4, PO5, PO6
CO5	Discover where the IoT concept fits within the broader ICT industry and possible future trends	PO3, PO5

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	2	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	12	11	15	15	14

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

Programme: B.Sc. CS (AI & DS)				
Elective V	**Course Code:** 24UAD6E10		**Course Title:** Software Project Management	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	3	100

The main objectives of this course are

1. Understand the principles and concepts of project management
2. Knowledge gained to train software project managers
3. Apply software project management methodologies.
4. Able to create comprehensive project plans
5. Evaluate and mitigate risks associated with software development process

Content

Unit I:

Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.

Unit II:

Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project - Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.

Unit III:

Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.

Unit IV:

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.

Unit V:

Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study

Textbooks

1. Robert T. Futrell, Donald F. Shafer, Linda I. Safer, ―Quality Software Project Management, Pearson Education Asia 2002.

Reference Books

1. PankajJalote, ―Software Project Management in Practice, Addison Wesley 2002.
2. Hughes, ―Software Project Management, Tata McGraw Hill 2004, 3rd Edition.

NOTE: Latest Edition of Textbooks May be Used

Web Resources

1. Software Project Management e-resources from Digital libraries
2. www.smartworld.com/notes/software-project-management

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the principles and concepts of project management	PO1,PO2
CO2	Knowledge gained to train software project managers	PO2, PO3
CO3	Apply software project management methodologies.	PO1, PO2,PO3
CO4	Able to create comprehensive project plans	PO2,PO3,PO4

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	2	2	2
CO2	3	1	3	2	2	2
CO3	2	3	2	3	3	3
CO4	3	3	2	3	3	2
CO5	2	2	2	3	3	3
Weightage of course contributed to each PSO	13	11	10	13	13	12

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

Programme: B.Sc. CS (AI & DS)				
Elective V	**Course Code:** 24UAD6E11		**Course Title:** Agile Project Management	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	3	100

The main objectives of this course are

1. Learning of software design, software technologies and APIs.
2. Detailed demonstration about Agile development and testing techniques.
3. Learning about Agile Planning and Execution.
4. Understanding of Agile Management Design and Quality Check.
5. Detailed examination of Agile development and testing techniques.

Content

Unit I:

Introduction:Modernizing Project Management: Project Management Needed a Makeover – Introducing Agile Project Management.Applying the Agile Manifesto and Principles: Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. Why Being Agile Works Better: Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.

Unit II:

Being Agile Agile Approaches: Diving under the umbrella of Agile approaches –Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary Agile Environments in Action: Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. Agile Behaviours in Action: Establishing Agile roles – Establishing new values – Changing team philosophy.

Unit III:

Agile Planning and Execution Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. Planning Releases and Sprints: Refining requirements and estimates – Release planning – Sprint planning.Working Throughout the Day: Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. Showcasing Work, Inspecting and Adapting: The sprint review – The sprint retrospective. Preparing for Release: Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment

Unit IV:

Agile Management Managing Scope and Procurement: What‘s different about Agile scope management – Managing Agile scope – What‘s different about Agile procurement – Managing Agile procurement. Managing Time and Cost: What‘s different about Agile time management – Managing Agile schedules – What‘s different about Agile cost management – Managing Agile budgets. Managing Team Dynamics and Communication: What‘s different about Agile team dynamics – Managing Agile team dynamics – What‘s different about Agile communication – Managing Agile communication.

Managing Quality and Risk: What‘sdifferent about Agile quality – Managing Agile quality – What‘s different about Agile risk management – Managing Agile risk.

Unit V:

Implementing Agile Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time. Being a Change Agent: Becoming Agile requires change – why change doesn‘t happen on its own – Platinum Edge‘s Change Roadmap – Avoiding pitfalls – Signs your changes are slipping.

Benefits, Factors for Success and Metrics: Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.

Text Book

1. Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
2. Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.

Reference Books

1. Mark C. Layton, David Morrow, Scrum for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
2. Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.
3. Alex Moore, Agile Project Management, 2020.
4. Alex Moore, Scrum, 2020.
5. Andrew Stellman and Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, Shroff/O'Reilly, First Edition, 2014.

Web Resources

1. www.agilealliance.org/resources

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understanding of software design, software technologies and APIs using Agile Management.	PO1
CO2	Understanding of Agile development and testingtechniques.	PO1, PO2
CO3	Understanding about Agile Planning and Executionusing Sprint.	PO4, PO5
CO4	Understanding of Agile Management Design, scope, Procurement, managing Time and Cost and Quality Check.	PO4, PO5, PO6
CO5	Analysing of Agile development and testing techniques	PO2, PO4

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	11	10

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

Programme: B.Sc. CS (AI & DS)				
Elective VI	**Course Code:** 24UAD6E12		**Course Title:** Fuzzy Logic	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	3	100

The main objectives of this course are

1. To understand the basic concept of Fuzzy logic
2. To learn the various operations on relation propertiesL
3. To study about the membership functions
4. To learn about the Defuzzification and Fuzzy Rule-Based System
5. To learn the concepts of Applications of Fuzzy Logic

Content

Unit I:

Introduction to Fuzzy Logic- Fuzzy Sets- Fuzzy Set Operations, Properties of Fuzzy Sets, Classical and Fuzzy Relations: Introduction-Cartesian Product of Relation-Classical Relations-Cardinality of Crisp Relation.

Unit II:

Operations on Crisp Relation-Properties of Crisp Relations-Composition Fuzzy Relations, Cardinality of Fuzzy Relations-Operations on Fuzzy Relations- Properties of Fuzzy Relations-Fuzzy Cartesian Product and Composition-Tolerance and Equivalence Relations,Crisp Relation.

Unit III:

Membership Functions: Introduction, Features of Membership Function, Classification of Fuzzy Sets, Fuzzification, Membership Value Assignments, Intuition, Inference, Rank Ordering.

Unit IV:

Defuzzification: Introduction, Lambda Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods, Fuzzy Rule-Based System: Introduction, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Properties of Set of Rules.

Unit V:

Applications of Fuzzy Logic: Fuzzy Logic in Automotive Applications, Fuzzy Antilock Brake System-Antilock-Braking System and Vehicle Speed- Estimation Using Fuzzy Logic.

Text Book

1 S. N. Sivanandam, S. Sumathi and S. N. Deepa-Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg 2007.

Reference Books

1. Guanrong Chen and Trung Tat Pham- Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems
2. Timothy J Ross , Fuzzy Logic with Engineering Applications

Web Resources

1. https://www.javatpoint.com/fuzzy-logic
2. https://www.guru99.com/what-is-fuzzy-logic.html

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the basics of Fuzzy sets, operation and properties.	PO1
CO2	Apply Cartesian product and composition on Fuzzyrelations and use the tolerance and Equivalence relations.	PO1, PO2
CO3	Analyze various fuzzification methods and features of membership Functions.	PO4, PO6
CO4	Evaluate defuzzification methods for real time applications.	PO3, PO4, PO6
CO5	Design an application using Fuzzy logic and its Relations.	PO3, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	14	11	14	11	10

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

Programme: B.Sc. CS (AI & DS)				
Elective VI	**Course Code:** 24UAD6E13		**Course Title:** Analytics For Service Industry	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	3	100

The main objectives of this course are

1. Recognize challenges in dealing with data sets in service industry.
2. Identify and apply appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data.
3. Make choices for a model for new machine learning tasks.
4. To identify employees with high attrition risk.
5. To Prioritizing various talent management initiatives for your organization.

Unit I:

Healthcare Analytics : Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges-Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.

Unit II:

Healthcare Analytics Applications : Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer- Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.

Unit III:

HR Analytics: Evolution of HR Analytics, HR information systems and data sources, HR Metric and HR Analytics, Evolution of HR Analytics; HR Metrics and HR Analytics; Intuition versus analytical thinking; HRMS/HRIS and data sources; Analytics frameworks like LAMP, HCM:21(r) Model.

Unit IV:

PerformanceAnalysis: Predicting employee performance,Training requirements, evaluating training and development, Optimizing selection and promotion decisions.

Unit V:

Tourism and Hospitality Analytics: Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.

Text Book

1. Chandan K. Reddy and Charu C Aggarwal, ―Healthcare data analytics, Taylor & Francis, 2015.
2. Edwards Martin R, Edwards Kirsten (2016),―Predictive HR Analytics: Mastering the HR Metric, Kogan Page Publishers, ISBN-0749473924
3. Fitz-enzJac (2010), ―The new HR analytics: predicting the economic value of your company‘s human capital investments, AMACOM, ISBN-13: 978-0-8144-1643
4. RajendraSahu, Manoj Dash and Anil Kumar. Applying Predictive Analytics Within the Service Sector.

Reference Books

1. Hui Yang and Eva K. Lee, ―Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016
2. Fitz-enzJac, Mattox II John (2014), ―Predictive Analytics for Human Resources, Wiley, ISBN- 1118940709.

Web Resources

1. https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php
2. https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Understand and critically apply the concepts and methods ofbusiness analytics	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Identify, model and solve decision problems in different settings.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Create viable solutions to decision making problems.	PO1, PO2,PO3, PO4, PO5, PO6
CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with POs

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	2	3	3	3	3	3
CO3	3	3	2	3	3	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	15	14	15	15	14

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

Programme: B.Sc. CS (AI & DS)				
Elective VI	**Course Code:** 24UAD6E14		**Course Title:** Data Visualization	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
VI	6	90	3	100

The main objectives of this course are

1. To introduce the concept of Data Visualization
2. To explain the various techniques in Data Visualization
3. To introduce students to the fundamental problems
4. Able to realize concepts, and approaches in the design and analysis of data
5. visualization systems.
6. Able to understand building blocks of Data.

Unit I:

Introduction- context of data visualization – definition methodology, visualization design objectives. Key factors- purpose, visualization function and tone, visualization design options- data representation, data presenation, seven stages of data visualization, widgets, data visualization tools.

Unit II:

Visualizing data methods- mapping, time series- connections and correlations- scatter plot maps -trees, Hierachiesan drecursion-networks naadgraphs, infographics

Unit III:

Visualizing data process- acquiring data, where to find data, tools of acquiring data from the internet, locating file for use with processing, loading text data, dealing with files and folders, lisiting files in a folder, asynchronous image downloads, advanced web techniques, using a database, dealing with large number of files.

Unit IV:

Interactive data visualization-drawing with data, scales-axes-updates, transaction and mode interactivity- layouts- geomapping- exporting framework-T3l stabio

Unit V:

Security data visualization- ports can visualization- vulnerability assessment and exploitation - firewall log visualization- instruction detection log visualization- attacking and defending visualization systems creating security visualization system

Text Book

1. Scott Murray, interactive data visualization for the web—,O Reilly media,inc,2013

Reference Books

1. Benfry, visualizing data,O Reilly media,inc,2007
2. Greg conti,security data visualization:graphical techniques for network analysis, Nostarchpress inc,2007

Web Resources

https://www.tutorialspoint.com/business_writing_skills/data_visualization.htm#:~:text=Data%20Visualization%20is%20used%20to,accessible%2C%20understandable%2C%20and%20usable.

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Understand the basics of data visualization.	PO1
CO2	Understand the importance fdatavisualization and the design and use of many visual components	PO1, PO3
CO3	Explain the process of data visualization	PO2, PO6
CO4	Explain the basics of interactive data visualization techniques visualization-based issues.	PO4, PO5, PO6
CO5	Understand the concept of various types of visulaization	PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	2	2	2
CO3	2	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	4	3	4
Weightage of course contributed to each PSO	13	13	14	14	14	14

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

Skill Enhancement Course (SEC)

Programme: B.Sc. CS (AI & DS)				
Skill Enhancement Course III		**Course Code:** 24UAD2S01		**Course Title**: Introduction to HTML
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	2	30	2	100

The main objectives of this course are

1. Insert a graphic within a web page.
2. Create a link within a web page.
3. Create a table within a web page.
4. Insert heading levels within a web page.
5. Insert ordered and unordered lists within a web page. Create a web page.

Content

Unit I:

Introduction :Web Basics: What is Internet–Web browsers–What is Webpage –
HTML Basics: Understanding tags.

Unit II:

Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph (<p> tag)–Font style elements: (bold, italic, font, small, strong, strike, big tags)

Unit III:

Lists: Types of lists: Ordered, Unordered – Nesting Lists–Other tags: Marquee, HR, BR-Using Images –Creating Hyperlinks.

Unit IV:

Tables: Creating basic Table, Table elements,Caption– Table and cell alignment–
Rowspan, Colspan – Cellpadding.

Unit V:

Frames: Frame set–Targeted Links–No frame–Forms:Input, Text area,Select,Option.

Text Books

2. Mastering HTML5 and CSS3 Made Easy, TeachUComp Inc., 2014.
3. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"

Web Resources

1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2. https://www.w3schools.com/html/default.asp

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, O3, PO4,PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4,PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4,PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4,PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4,PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of coursecontributed to each PSO	14	15	14	14	15	15

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

Programme: B.Sc. CS (AI & DS)				
Skill Enhancement Course IV		**Course Code:** 24UAD3S02		**Course Title**: Understanding Internet
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
III	2	30	1	100

The main objectives of this course are

1. Knowledge of Internet medium
2. Internet as a mass medium
3. Features of Internet Technology,
4. Internet as source of infotainment
5. Study of internet audiences and about cyber crime

Content

Unit I

The emergence of internet as a mass medium–the world of_world wide web‘.

Unit II

Features of internet as a technology.

Unit III

Internet as a source of infotainment – classification based on content and style.

Unit IV

Demographic and psychographic descriptions of internet _audiences‘ – effect of internet on the values and life-styles.

Unit V

Present issues such as cyber crime and future possibilities.

Text books

1. Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.
2. Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.
3. Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.

Reference Book

1. Acharya, R N [1987] Television in India. Manas Publications, New Delhi.
2. Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP
3. Luthra, H R [1986] Indian Broadcasting. Ministry of I& B, New Delhi.
4. Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.

Web Resources

1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2. https://www.w3schools.com/html/default.asp

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows the concept of internet as a technology.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Can be able to know about Demographic and psychographic description of internet	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the concept of cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each	14	15	14	14	15	15

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

Programme: B.Sc. CS (AI & DS)				
Skill Enhancement Course V		**Course Code:** 24UAD3S03	**Course Title**: Office Automation	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
III	3	45	2	100

The main objectives of this course are

1. Understand the basics of computer systems and its components.
2. Understand and apply the basic concepts of a word processing package.
3. Understand and apply the basic concepts of electronic spreadsheet software.
4. Understand and apply the basic concepts of database management system.
5. Understand and create a presentation using PowerPoint tool.

Content

Unit I:

Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems &its features: DOS–UNIX –Windows. Introduction to Programming Languages.

Unit II:

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets;Spell Checker - Document formatting – Paragraph alignment, indentation,headers and footers, numbering; printing–Preview, options, merge.

Unit III:

Spreadsheets: Excel– opening, entering text and data, formatting, navigating; Formulas–entering, handling andcopying; Charts–creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.

Unit IV:

Database Concepts: The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).

Unit V:

Power point: Introduction to Power point - Features – Understanding slide typecasting &viewing slides – creating slide shows. Applying special object – including objects & pictures – Slidetransition–Animation effects, audio inclusion, timers.

Text Book

PeterNorton,—IntroductiontoComputers–TataMcGraw-Hill.

Reference Books

Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, —Microsoft 2003, Tata McGrawHill.

Web Resources

1. https://www.udemy.com/course/office-automation-certificate-course/
2. https://www.javatpoint.com/automation-tools

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3, PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3, PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5, PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7, PO8

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each	14	15	14	14	15	15

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

Programme: B.Sc. CS (AI & DS)				
Skill Enhancement Course VI		**Course Code:** 24UAD4S04	**Course Title**: Web Designing	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
IV	3	45	2	100

The main objectives of this course are

1. Understand the basics of HTML and its components
2. To study about the Graphics in HTML
3. Understand and apply the concepts of XML and DHTML
4. Understand the concept of JavaScript
5. To identify and understand the goals and objectives of the Ajax

Content

Unit I:

HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.

Unit II:

Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.

Unit III:

XML & DHTML: Cascading style sheet (CSS)- what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).

Unit IV:

Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning- Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,

Unit V

Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.

Text Book

1. Pankaj Sharma, ―Web Technology, SkKataria& Sons Bangalore 2011.
2. Mike Mcgrath, ―Java Script, Dream Tech Press 2006, 1st Edition.
3. Achyut S Godbole&AtulKahate, ―Web Technologies, 2002, 2nd Edition.

Reference Books

1. Laura Lemay, RafeColburn , Jennifer Kyrnin, ―Mastering HTML, CSS &Javascript Web Publishing, 2016.
2. DT Editorial Services (Author), ―HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Paperback 2016, 2nd Edition.

Web Resources

1. NPTEL & MOOC courses titled Web Design and Development.
2. https://www.geeksforgeeks.org

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages usingHypertext Markup Language (HTML).	PO1,PO2,PO3, PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using Ajax.	P02, PO6, PO7

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	1	2	1	2
CO 2	3	3	2	2	3	3
CO 3	3	3	2	3	3	2
CO 4	3	2	3	2	2	3
CO 5	3	2	2	2	3	3
Weightage of course contributed to each	15	12	10	11	12	13

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

Programme: B.Sc. CS (AI & DS)				
Skill Enhancement Course VII		**Course Code:** 24UAD4S05		**Course Title**: Advanced Excel
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
IV	3	45	2	100

The main objectives of this course are

1. Handle large amounts of data
2. Aggregate numeric data and summarize into categories and subcategories
3. Filtering, sorting, and grouping data or subsets of data
4. Create pivot tables to consolidate data from multiple files
5. Presenting data in the form of charts and graphs

Content

Unit I

Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un- protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets

Unit II

Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data -Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.

Unit III

Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.

Unit IV

More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.

Unit V

Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.

Text Book

1. Excel 2019 All
2. Microsoft Excel 2019 Pivot Table Data Crunching

Reference Books

2. Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition

Web Resources

1. https://www.simplilearn.com
2. https://www.javatpoint.com
3. https://www.w3schools.com

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No-SQL databases and management.	PO3, PO8

Mapping of COs with POs

CO/ PSO	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	3	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	2	2	3	3	3
Weightage of course contributed to each PSO	15	12	10	15	15	15

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

Programme: B.Sc. CS (AI & DS)				
Skill Enhancement Course VIII		**Course Code:** 24UAD6S06	**Course Title**: Internet Basics Labrotary	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
V1	3	45	2	100

The main objectives of this course are

Introduce the fundamentals of Internet and the Web functions

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

Find ,evaluate ,and use online information resources.

Use Google Apps for education effectively.

List of Programs:

1. Create an email account in Gmail. Using the account created compose a mail to invite other college students for your college fest, enclose the invitation as attachment and send the mail to at least 10 recipients.Use CC and BCC options accordingly.
2. Open your inbox in the Gmail account created, check the mail received from your peer from other college inviting you for his college fest, and download the invitation. Reply to the mail with a thank you note for the invite and forward the mail to other friends.
3. Assume that you are studying in final year of your graduation and are eagerly looking for a job. Visit Any job port a land upload your resume.
4. Create a label and upload bulk contacts using import option in Google Contacts.
5. Create one-pages to try in your mother tongue by using voice recognition facility of Google Docs.
6. Create your own Google classroom and inviteall your friends throughemailed. Post study material in Google class roo musing Google drive. Createa separate folder for every subject and upload all unit wise EContent Material.

7. Create and share a folder in Google Drive using_sharealink,,option and set the permission to access That folder by your friends only.
8. Create a meet using Google Calendar and record the meet using Google Meet.
9. Create a registration form for your Department Seminar or Conference using Google Forms.
10. Create a question paper with multiple choice types of questions for a subject of your choice, using Google Forms.

COURSE OUTCOMES (CO)

On Completion of the course the students will Program

CO Number	CO Statement	Programme Outcomes
CO1	Introduce the fundamentals of Internet and the Web functions	PO1, PO2, PO6
CO2	Impart knowledge and essential skills necessary to use the internet and its various components.	PO2,PO4. PO5, PO6
CO3	Find, evaluate, and use online information resources.	PO1, PO2, PO4, PO5, PO6
CO4	Use Google Apps for education effectively.	PO2, PO3, PO4, PO5

Text Books

1. IanLamont,GoogleDrive&Docsin30Minutes, 2nd Edition

References Books

1. Sherry Kinkoph Gunter ,My Google Apps, 2014.

Non Major Elective Course (NMEC)

Programme: B.Sc. CS (AI & DS)				
Non Major Elective I	**Course Code:** 24UAD1N01		**Course Title**: Introduction to HTML	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
1	2	30	2	100

The main objectives of this course are

1. Insert a graphic within a web page.
2. Create a link within a web page.
3. Create a table within a web page.
4. Insert heading levels within a web page.
5. Insert ordered and unordered lists within a web page. Create a web page.

Content

Unit I:

Introduction :Web Basics: What is Internet–Web browsers–What is Webpage –
HTML Basics: Understanding tags.

Unit II:

Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph (<p> tag)–Font style elements: (bold, italic, font, small, strong, strike, big tags)

Unit III:

Lists: Types of lists: Ordered, Unordered – Nesting Lists–Other tags: Marquee, HR, BR-Using Images –Creating Hyperlinks.

Unit IV:

Tables: Creating basic Table, Table elements,Caption– Table and cell alignment–
Rowspan, Colspan – Cellpadding.

Unit V:

Frames: Frame set–Targeted Links–No frame–Forms:Input, Text area,Select,Option.

Text Books

4. Mastering HTML5 and CSS3 Made Easy, TeachUComp Inc., 2014.
5. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"

Web Resources

1. https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2. https://www.w3schools.com/html/default.asp

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, O3, PO4,PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4,PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4,PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4,PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4,PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

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

Programme: B.Sc. CS (AI & DS)				
Non Major Elective I	**Course Code:** 24UAD1N02		**Course Title**: Understanding Internet	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
1	2	30	2	100

The main objectives of this course are

1. Knowledge of Internet medium
2. Internet as a mass medium
3. Features of Internet Technology,
4. Internet as source of infotainment
5. Study of internet audiences and about cyber crime

Content

Unit I

The emergence of internet as a mass medium–the world of_world wide web‘.

Unit II

Features of internet as a technology.

Unit III

Internet as a source of infotainment – classification based on content and style.

Unit IV

Demographic and psychographic descriptions of internet _audiences‘ – effect of internet on the values and life-styles.

Unit V

Present issues such as cyber crime and future possibilities.

Text books

Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.

Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.

Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.

Reference Book

Acharya, R N [1987] Television in India. Manas Publications, New Delhi.

Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP

Luthra, H R [1986] Indian Broadcasting. Ministry of I& B, New Delhi.

Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.

Web Resources

https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf

https://www.w3schools.com/html/default.asp

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcome
CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows the concept of internet as a technology.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Can be able to know about Demographic and psychographic description of internet	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the concept of cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each	14	15	14	14	15	15

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

Programme: B.Sc. CS (AI & DS)				
Non Major Elective II	**Course Code:** 24UAD3N03		**Course Title**: Office Automation	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	2	30	2	100

The main objectives of this course are

1. Understand the basics of computer systems and its components.
2. Understand and apply the basic concepts of a word processing package.
3. Understand and apply the basic concepts of electronic spreadsheet software.
4. Understand and apply the basic concepts of database management system.
5. Understand and create a presentation using PowerPoint tool.

Content

Unit I:

Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems &its features: DOS– UNIX –Windows. Introduction to Programming Languages.

Unit II:

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets;Spell Checker - Document formatting – Paragraph alignment, indentation,headers and footers, numbering; printing–Preview, options, merge.

Unit III:

Spreadsheets: Excel– opening, entering text and data, formatting, navigating; Formulas– entering, handling andcopying; Charts–creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.

Unit IV:

Database Concepts: The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).

Unit V:

Power point: Introduction to Power point - Features – Understanding slide typecasting &viewing slides – creating slide shows. Applying special object – including objects & pictures – Slidetransition–Animation effects, audio inclusion, timers.

Text Book

1. PeterNorton,—IntroductiontoComputers–TataMcGraw-Hill.

Reference Books

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, —Microsoft 2003, Tata McGrawHill.

Web Resources

1. https://www.udemy.com/course/office-automation-certificate-course/
2. https://www.javatpoint.com/automation-tools

COURSE OUTCOMES (CO)

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

CO Number	CO Statement	Programme Outcomes
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3, PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3, PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5, PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7, PO8

Mapping of COs with POs

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each	14	15	14	14	15	15

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

Programme: B.Sc. CS (AI & DS)				
Non Major Elective II	**Course Code:** 24UAD2S04		**Course Title**: Internet Basics Labrotary	
Semester	**Hours/Week**	**Total Hours**	**Credits**	**Total Marks**
II	2	30	2	100

The main objectives of this course are

Introduce the fundamentals of Internet and the Web functions

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

Find ,evaluate ,and use online information resources.

Use Google Apps for education effectively.

List of Programs:

1. Create an email account in Gmail. Using the account created compose a mail to invite other college students for your college fest, enclose the invitation as attachment and send the mail to at least 10 recipients.Use CC and BCC options accordingly.
2. Open your inbox in the Gmail account created, check the mail received from your peer from other college inviting you for his college fest, and download the invitation. Reply to the mail with a thank you note for the invite and forward the mail to other friends.
3. Assume that you are studying in final year of your graduation and are eagerly looking for a job. Visit Any job port a land upload your resume.
4. Create a label and upload bulk contacts using import option in Google Contacts.
5. Create one-pages to try in your mother tongue by using voice recognition facility of Google Docs.
6. Create your own Google classroom and inviteall your friends throughemailed. Post study material in Google class roo musing Google drive. Createa separate folder for every subject and upload all unit wise EContent Material.
7. Create and share a folder in Google Drive using_sharealink,,option and set the permission to access That folder by your friends only.

8. Create a meet using Google Calendar and record the meet using Google Meet.
9. Create a registration form for your Department Seminar or Conference using Google Forms.
10. Create a question paper with multiple choice types of questions for a subject of your choice, using Google Forms.

COURSE OUTCOMES (CO)

On Completion of the course the students will Program

CO Number	CO Statement	Programme Outcomes
CO1	Introduce the fundamentals of Internet and the Web functions	PO1, PO2, PO6
CO2	Impart knowledge and essential skills necessary to use the internet and its various components.	PO2,PO4. PO5, PO6
CO3	Find, evaluate, and use online information resources.	PO1, PO2, PO4, PO5, PO6
CO4	Use Google Apps for education effectively.	PO2, PO3, PO4, PO5

Text Books

1. IanLamont,GoogleDrive&Docsin30Minutes, 2nd Edition

References Books

1. Sherry Kinkoph Gunter ,My Google Apps, 2014.