V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)
An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
Reaccredited with 'A++' Grade (4th Cycle) by NAAC
VIRUDHUNAGAR
Quality Education with Wisdom and Values

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS
(with effect from Academic Year 2025 - 2026)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 13 UG Programmes (Aided), 13 UG Programmes (SF), 13 PG Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) &Tamil Nadu State Council for Higher Education (TANSCHE) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose Courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

Arts & Humanities	:	History (E.M. & T.M.), English, Tamil
Physical & Life Sciences	:	Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology, Data Science, Computer Applications and Computer Applications - Graphic Design
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Chemistry, Biochemistry,Home Science - Nutrition and Dietetics, Biotechnology, Computer Science and Computer Applications (MCA) *
Commerce & Management	:	Commerce, Business Administration (MBA) *

* AICTE approved Programmes

OUTLINE OF CHOICE BASED CREDIT SYSTEM – UG

1. Core Courses
2. Elective Courses
   - Generic Elective Courses
   - Discipline Specific Elective Courses (DSEC)
   - Non Major Elective Courses (NMEC)
3. Skill Enhancement Courses (SEC)
4. Environmental Studies (EVS)
5. Value Education
6. Self-Study Courses (Online)
7. Extra Credit Courses (Self Study Courses) (Optional)

List of Non Major Elective Courses (NME)
(2024-2025 onwards)

UG PROGRAMMES

Name of the Course	Course Code	Semester	Department	
			Offered by	Offered for
Introduction to Tourism	24UHIN11	I	History (E.M)	Students other than B.A. History Discipline
Indian Constitution	24UHIN21	II		
சுற்றுலா ஓர் அறிமுகம்	24UHIN11	I	History (T.M)	
இந்திய அரசியலமைப்பு	24UHIN21	II		
Popular Literature and Culture	24UENN11	I	English	Students other than B.A. English Discipline
Philosophy for Literature	24UENN21	II		
அடிப்படைத் தமிழ் இலக்கணம் – I எழுத்தறிதல்	24UBTN11	I	Tamil	Students who have chosen Part I Hindi
அடிப்படைத்தமிழ் –II மொழித் திறனறிதல்	24UBTN21	II		
பேச்சுக்கலைத்திறன்	24UTAN11	I	Tamil	Students other than B.A. Tamil Discipline
பயன்முறைத் தமிழ்	24UTAN21	II		

Basic Hindi - I	24UBHN11	I	Hindi	All Discipline students
Basic Hindi - II	24UBHN21	II		
Everyday Banking/ Practical Banking	24UCON11N/ 24UCON11	I	Commerce (Aided)	Students other than Commerce Discipline
Basic Accounting Principles	24UCON21	II		
Everyday Banking	24UCON11N	I	Commerce (Self)	
Emotional Intelligence	24UCON21N	II		
Everyday Banking/Self- Employment and Startup Business	24UCON11N/ 24UCCN11	I	Commerce C.A.(Self)	
Fundamentals of Marketing	24UCCN21	II		
Everyday Banking/ Practical Banking	24UCPN11N/ 24UCPN12N	I	Commerce Professional Accounting	
Basic Accounting Principles	24UCPN21N	II		
Basics of Event Management	24UBAN11	I	Business Administration	Students other than B.B.A. Discipline
Managerial Skill Development	24UBAN21	II		
Quantitative Aptitude -I	24UMTN11	I	Mathematics	Students other than B.Sc. Mathematics Discipline
Quantitative Aptitude – II	24UMTN21	II		
Physics for EveryDay Life	24UPHN11	I	Physics	Students other than B.Sc. Physics Discipline
Astrophysics	24UPHN21	II		
Food Chemistry	24UCHN11	I	Chemistry	Students other than B.Sc. Chemistry Discipline
Dairy Chemistry	24UCHN21	II		
Ornamental fish farming and Management	24UZYN11	I	Zoology	Students other than B.Sc. Zoology Discipline
Biocomposting for Entrepreneurship	24UZYN21	II		
Foundations of Baking and Confectionery	24UHSN11	I	Home Science – Nutrition and Dietetics	Students other than B.Sc. Home Science – Nutrition and Dietetics Discipline
Women's Health and Wellness	24UHSN21	II		
Nutrition and Health	24UBCN11	I	Biochemistry	Students other than B.Sc. Biochemistry Discipline
Life Style Diseases	24UBCN21	II		
Social and Preventive Medicine	24UMBN11	I	Microbiology	Students other than B.Sc. Microbiology Discipline
Nutrition and Health Hygiene	24UMBN21	II		

Herbal Medicine	24UBON11	I	Biotechnology	Students other than B.Sc. Biotechnology Discipline
Organic Farming and Health Management	24UBON21	II		
Basics of Fashion	24UCFN11	I	Costume Design And Fashion	Students other than B.Sc. Costume Design And Fashion Discipline
Interior Designing	24UCFN21	II		
Introduction to HTML	24UCSN11N	I	Computer Science	Students other than Computer Science Discipline
Office Automation	24UCSN21N	II		
Basics of Internet	24UITN11N	I	Information Technology	
Data Analysis using Spreadsheet	24UITN21N	II		
Fundamentals of Information Technology	24UDSN11	I	Data Science	
Computer Fundamentals	24UDSN21	II		
Web Designing	24UCAN11N	I	B.C.A.	
Fundamentals of Computers	24UCAN21N	II		
Organic Farming	24UBYN11	I	Botany	All Discipline students
Nursery and Landscaping	24UBYN12	I		
Mushroom Cultivation	24UBYN21	II	Botany	
Medicinal Botany	24UBYN22	II		
Library and Information Science - I	24ULSN11	I	Library Science	All Discipline students
Library and Information Science - II	24ULSN21	II		
Cadet Corps for Career Development I	24UNCN11	I	National Cadet Corps	students who have chosen NCC as Part V course
Cadet Corps for Career Development II	24UNCN21	II		

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfil the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

B.1 Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfil the Vision and Mission of the Department offering the Programme.

Vision of the Department of Data Science

The Department of Computer Science is envisioned to create industry ready Computer Science students with ardour for personal growth.

Mission of the Department of Data Science

To create an environment conducive for transforming rural women students into eminent students prepared for a globalized technological era and to instil in them a passion to strive for perpetual personal uplift.

The students will be able to

PEO1	gain specialized knowledge and expertise to analyze data, provide inference and solution to analytical industry.
PEO2	acquire significant opportunities in various domains such as business analyst, consultancy, teaching and as entrepreneurial pursuit.
PEO3	inculcate value system and work in team to achieve the target solution through their critical thinking and competency holding the ethical values.

Programme Educational Objectives (PEOs) of B.Sc. Data Science

Key Components of Mission Statement	**P**rogramme **E**ducational **O**bjectives (**PEOs**)		
	PEO1	**PEO2**	**PEO3**
transforming rural women students		√	
eminent students	√	√	√
prepared for a globalized technological era		√	√
a passion to strive for perpetual personal uplift		√	√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

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

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 articulate innovative thoughts and ideas proficiently in both in spoken and written forms. (*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions through assignments, case studies, Internship and projects for the fullfillment of the local, national and global developmental needs. (*Critical Thinking and Analytical Reasoning)*

5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory that each PO should be mapped to the respective PSO.

PROGRAMME SPECIFIC OUTCOMES

On completion of B.Sc. Data Science programme, the students will be able to

PO1 - *Disciplinary Knowledge*

PSO 1.a: apply the knowledge of mathematics, computer science, data science fundamentals to solve a wide range of data science applications.

PSO 1.b: use various application software elements to identify various analysis and design methodologies.

PO2 – *Communication Skills*

PSO 2.a: Communicate effectively on complex data problem by providing clear instructions and make remarkable inferences on the data providing apt solutions to business problems.

PSO 2.b: able to comprehend and write effective reports, design documentation and make effective presentations through better communication.

PO3 - *Scientific Reasoning and Problem Solving*

PSO 3: demonstrate the ability to create innovative solutions by applying scientific methods and tools.

PO4 - *Critical Thinking and Analytical Reasoning*

PSO 4: apply the technical and critical thinking skills in the fields of all advanced computer science and data science to find solutions for any complex research and business problems.

PO5 - *Digital Literacy, Self - directed and Lifelong Learning*

PSO 5.a: Create, select, and apply appropriate techniques, resources, and modern IT tools to demonstrate complex business problems through the creation of e-content.

PSO 5.b: acquire knowledge and pursue higher studies by engaging in independent and life-long learning or use their potential in their career or entrepreneurial endeavors.

PO6 - *Cooperation/Team Work and Multi-Cultural Competence*

PSO 6: function effectively as an individual, and as a member or leader in diverse teams of their allotted career works.

PO7 - *Moral and Ethical Awareness*

PSO 7: apply ethical principles and commit to professional ethics by being responsible in developing business solutions.

PO-PEO Mapping Matrix

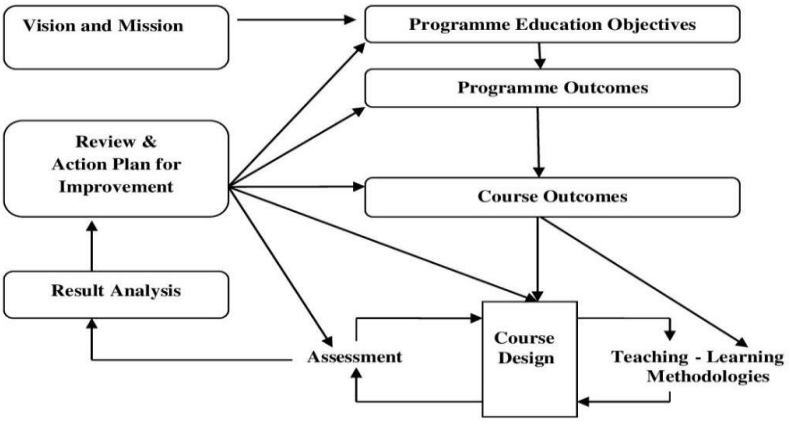
Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each

PEO should be mapped to at least one of the POs.

PEOs / POs/PSOs	PEO1	PEO2	PEO3
PO1/PSO1.a	-	✓	✓
PO1/PSO1.b	✓	✓	✓
PO2/PSO2.a	✓	✓	-
PO2/PSO2.b	✓	✓	-
PO3/PSO3	-	✓	✓
PO4/PSO4.a	-	✓	✓
PO4/PSO4.b	✓	✓	-
PO5/PSO5	✓	✓	-
PO6/PSO6	-	✓	✓
PO7/PSO7	-	-	✓

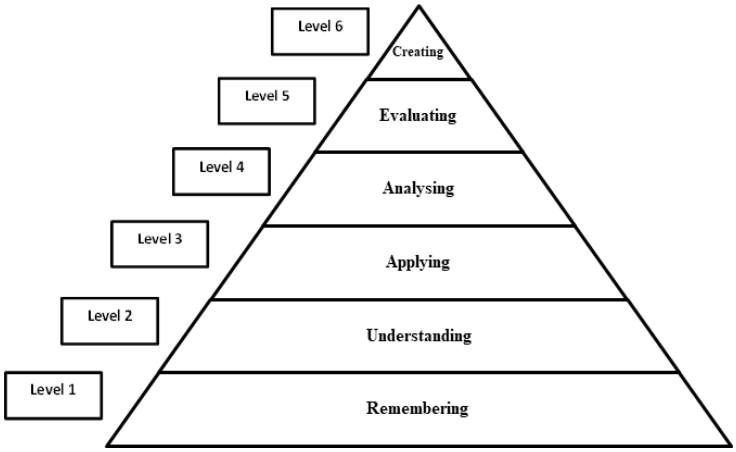
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'S TAXONOMY



CO – PO Mapping of Courses

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2and 1 respectively.

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

The Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other examination accepted by Academic Council with Mathematics as one of the subjects in Higher Secondary Course.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academicyears (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi Course
Part II	:	English
Part III	:	Core Courses
		Elective Courses • Generic Elective Courses • Discipline Specific Elective Courses
		Self-Study Course - online
Part IV	:	Skill Enhancement Courses (SEC)
		Elective Course (NMEC)
		Environmental Studies Value Education
		Internship/Industrial Training
		Self-Study Course - online
Part V	:	National Service Scheme/ Physical Education/ Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Club/ Health and Fitness Club/ National Cadet Corps/ Rotaract Club

B.2 EVALUATION SCHEME

B.2.1.PART II

Components	Internal Assessment Marks	Summative Examination Marks	Total Marks
Theory	15	60	100
Practical	5	15	
Assignment	5	-	

Three Periodic Tests - Average of the best two will be considered

B.2.2.Part I & PART III - Core Courses, Elective Courses (Generic, DSEC)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	**100**

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	K3 Level	:	5
Quiz	K1 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Practical Test*	:	30
Record & Performance	:	10
Total	**:**	**40**

*Average of the two practical tests will be considered

Question Pattern for Internal Tests **Duration: 2 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 4	Multiple Choice	4	4	1	4
B	5 -6	Internal Choice - Either … or Type	3	3	7	21
C	8 -9	Internal Choice - Either… or Type	2	2	10	20
					Total	**45***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Q. No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 -10	Multiple Choice	10	10	1	10
B	11 - 15	Internal Choice – Either …or Type	5	5	7	35
C	16 - 18	Internal Choice – Either… or Type	3	3	10	30
					Total	**75**

PROJECT

Assessment by Internal Examiner Only

Internal Assessment

Distribution of Marks

Mode of Evaluation	:	Marks
Project work and Report	:	60
Presentation and Viva –Voce	:	40
Total	**:**	**100**

B.2.3 PART IV - Skill Enhancement Courses, Non Major Elective Courses and Foundation Course

B.2.3.1 FOUNDATATION COURSE

INTERNAL ASSESSMENT
Distribution of Marks
Theory

Mode of Evaluation			**Marks**
Periodic Test		:	15
Assignment	K2 Level	:	5
Quiz	K1 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	**Q.No.**	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A	1 - 3	Internal Choice - Either …or Type	3	3	5	15
B	4	Internal Choice – Either …or Type	1	1	10	10
	Total					**25***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Mode of Evaluation		**Marks**
Summative Examination	:	50
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Total	**:**	**75**

Question Pattern **Duration: 2 Hours**

Section	**Q.No.**	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 7	Internal Choice – Either… or Type	2	2	10	20
	Total					**50**

B.2.3.2 Skill Enhancement Course - Entrepreneurial skills

INTERNAL ASSESSMENT ONLY
Distribution of Marks

Mode of Evaluation		**Marks**
Periodic Test	:	15
Assignment	:	5
Quiz	:	5
Model Examinations	:	60
Online Quiz (Multiple Choice Questions - K2 Level)	:	15
Total	**:**	**100**

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	5	15
B Q. No.(4)	Internal Choice – Either Or Type	1	1	10	10
Total					**25**

The total marks obtained in the Periodic Test will be calculated for 15 marks
Two Periodic Tests - Better of the two will be considered
Two Assignments - Better of the two will be considered
Two Quiz Tests - Better of the two will be considered

Question Pattern for Model Examination **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1-5)	Internal Choice – Either Or Type	5	5	6	30
B Q. No.(6- 8)	Internal Choice – Either Or Type	3	3	10	30
Total					**60**

B.2.3.3 Skill Enhancement Courses/ Non Major Elective Courses

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	K3 Level	:	5
Quiz	K2 Level	:	5
Total		**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Better of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 3	Internal Choice - Either …or Type	3	3	5	15
B	4	Internal Choice – Either …or Type	1	1	10	10
	Total					**25***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

SUMMATIVE EXAMINATION

Mode of Evaluation		Marks
Summative Examination	:	50
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Total	**:**	**75**

Question Pattern **Duration: 2 Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 7	Internal Choice – Either… or Type	2	2	10	20
	Total					**50**

B.2.4 PART IV- ENVIRONMENTAL STUDIES / VALUE EDUCATION

INTERNAL ASSESSMENT ONLY

Evaluation Pattern

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment - K3 Level	:	10
Online Quiz (Multiple Choice Questions - K2 Level)	:	25
Poster Presentation - K3 Level		10
Report - K3 Level		10
Model Examination	:	30
Total	**:**	**100**

Three Assignment - Best of the three will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	6	18
B Q. No.(4)	Internal Choice – Either Or Type	1	1	12	12
Total					**30**

Two Periodic tests - Better of the two will be considered

*The total marks obtained in the Periodic Test will be calculated for 15 marks

Question Pattern for Model Examination **Duration: 2 ½ Hours**

Section	Q.No.	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A	1 - 5	Internal Choice - Either … or Type	5	5	6	30
B	6 - 8	Internal Choice – Either… or Type	3	3	10	30
	Total					**60***

*The total marks obtained in the Model Examination will be calculated for 30 marks

B. 2. 5 PART IV- Internship / Industrial Training

Internship / Industrial Training is mandatory for all the Students

- **Internship:** Students have to involve in a designated activity, working in an organization under the guidance of an identified mentor for a period of 15 days.
- **Industrial Training:** Student has to undertake in-plant training in industries individually or in group for a period of 15 days.
- Internship / Industrial Training must be done during the fourth semester holidays
- **Internal Assessment only.**

Mode of Evaluation		Marks
Onsite Learning/Survey	:	50
Report	:	25
Viva-Voce	:	25
Total		**100**

B.2.5 SELF STUDY COURSE

B.2.5.1 PART III – Discipline Specific Quiz – Online

- Assessment by Internal Examiner only
- Question Bank is prepared by the Faculty Members of the Departments for all the Core and Elective Courses offered in all the Semesters.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.5.2 PART IV - Practice for Competitive Examinations – Online

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Subject wise Allotment of Marks

Subject		Marks
Tamil	:	10
English	:	10
History	:	10
Mathematics	:	10
Current affairs	:	10
Commerce, Law & Economics	:	10
Physical Sciences	:	10
Life Sciences	:	15
Computer Science	:	5
Food and Nutrition	:	5
Sports and Games	:	5
Total	**:**	**100**

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	25
Model Examination	:	75
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.6. Part V – Extension Activities

INTERNAL ASSESSMENT ONLY

Distribution of Marks

Mode of Evaluation		**Marks**
Attendance	:	5
Performance	:	10
Report/Assignment/Project/Camp/Practical	:	10
Total	**:**	**25***

*The marks obtained will be calculated for 100 marks

B.2.7 Transfer of credits earned through MOOC (UGC recognized Courses)

- Students can opt for minimum of
    - 12 weeks Courses for Core Courses
    - 8 weeks Courses for Elective Courses
    - 4 weeks Courses for Skill Enhancement Course
- The Online Courses opted by the students will be verified and approved by the Head of the Department and forwarded to the Controller of Examinations through the Principal.
- Students are required to register for the equivalent Online Courses through the Institution's SWAYAM-NPTEL Local Chapter after submitting a Permission letter to the Head of the Department.
- The Course should be completed before the beginning of that particular Semester in which the selected Course is offered.
- The student should submit the Course Completion Certificate immediately after receiving it, to the Department.
- The Head of the Department has to send the list of the students and their Course Completion Certificates to the Controller of Examinations through the Principal.
- The students who have submitted the Completion Certificate are exempted from appearing the Periodic Tests and Summative Examinations of the respective course but without any exemption for class attendance.
- Credits allotted for the particular Course in the Curriculum will be transferred after the completion of the Online Course
- Students can earn up to 10 credits within the mandatory credits requirements of the Degree Programme by completing UGC recognised Online Courses.

B.2.8 EXTRA CREDIT COURSES (OPTIONAL)

2.8.1 Extra Credit Course offered by the Department.

Assessment by Internal Examiner Only (To be conducted along with the III Periodic Test)

Distribution of Marks

Mode of Evaluation		**Marks**
Quiz (Multiple Choice Questions)	:	25
Model Examination	:	75
Total	**:**	**100**

Question Pattern for Model Examination

Section	**Types of Question**	**No. of Questions**	**No. of Questions to be answered**	**Marks for each Question**	**Total Marks**
A Q.No.(1-5)	Internal Choice-Either or Type	5	5	7	35
B Q.No.(6-9)	Internal Choice-Either or Type	4	4	10	40
				Total	**75**

2.8.2 Extra credit Course offered by MOOC (Massive Open Online Course)

- The Courses shall be completed within the first V Semesters of the Programme.
- The allotment of credits is as follows **(Maximum of 10 credits)**

4weeks Course - 1 credit
8 weeks Course - 2 credits
12 weeks Course - 3 credits

ELIGIBILITY FOR THE DEGREE

- The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc.*, and a minimum Pass marks in all the Courses.
- No Pass minimum for Internal Assessment.
- Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Elective Courses (Generic Elective, DSEC Courses)
- Pass minimum for External Examination is 18 marks out of 50 marks for Skill Enhancement Courses and Non Major Elective Courses (NMEC).
- The aggregate minimum pass percentage is 40 marks for all Courses.
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.

Attendance

- The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.
- The students who have only 60-75 days (66% - 84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.
- The students who have attended the classes for 59 days and less - up to 45 days (50%- 65%) can appear for the Summative Examinations only after getting special permission from the Principal.
- The students who have attended the classes for 44 days or less (<50%) cannot appear for the Summative Examinations and have to repeat the whole semester.
- For Part V in UG Programmes, the students require 75 % of attendance to get a credit.
- For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.2 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (Rubric based) - Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment contributes 50% and

Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment Direct

CO Attainment

Course Outcomes of all Courses are assessed and the CO – wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics.

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who scored more than the Target}}{\text{Total Number of Students}} \times 100$$

Attainment Levels of COs

Assessment Methods	**Attainment Levels**	
Internal Assessment	Level 1	50% of students scoring more than set target marks in Internal Assessment tools
	Level 2	55% of students scoring more than set target marks in Internal Assessment tools
	Level 3	60% of students scoring more than set target marks in internal Assessment tools
End Semester Summative Examination	Level 1	50% of students scoring more than average marks in End Semester Summative Examination
	Level 2	55% of students scoring more than average marks in End Semester Summative Examination
	Level 3	60% of students scoring more than average marks in End Semester Summative Examination

Indirect CO Attainment

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the Course Outcomes.

Overall CO Attainment= 75% of Direct CO Attainment + 25 % of Indirect CO Attainment

In each course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as a value greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester Examination and 25% weightage is given to attainment through Internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-curricular/ Extra-curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage - 25%)	Graduate Exit Survey 10%	At the end of the Programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment of Programme Outcomes
	Co-curricular/ Extra-curricular activities 15%	For participation in Co-curricular/Extra-curricular activities during the period of their study.

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Average Direct PO Attainment								
Direct PO Attainment in percentage								

Indirect Attainment of POs for all Courses

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Graduate Exit Survey							
Indirect PO Attainment							

Attainments of POs for all Courses

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
Direct Attainment (Weightage - 75%)							
Indirect Attainment (Weightage - 25%)							
Overall PO Attainment							

Overall PO Attainment= 75% of Direct PO Attainment +
25% of Indirect PO Attainment (Graduate Exit Survey & Participation in Co- curricular and Extra-curricular Activities)

Expected Level of Attainment for each of the Programme Outcomes

Pos	Level of Attainment
Attainment Value ≥70%	Excellent
60% ≤ Attainment Value < 70%	Very Good
50% ≤ Attainment Value < 60%	Good
40% ≤ Attainment Value < 50%	Satisfactory
Attainment Value <40%	Not Satisfactory

Level of PO Attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the Courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the Programme only through indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	15% of the class strength	30% of the class strength
Progression to Higher Education	50% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Attainment of PEOs

Assessment Criteria & Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

Pos	Level of Attainment
Attainment Value ≥70%	Excellent
60% ≤ Attainment Value < 70%	Very Good
50% ≤ Attainment Value < 60%	Good
40% ≤ Attainment Value < 50%	Satisfactory
Attainment Value <40%	Not Satisfactory

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stakeholders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analysed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Data Science Programme.

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BACHELOR OF SCIENCE DATA SCIENCE (UG) (2032)

Outcome Based Education with Choice Based Credit System

Programme Structure - Allotment of Hours and Credits

For those who joined in the Academic Year 2024-2025 and after

Components	Semester						Total Number of Hours / Credits
	I	II	III	IV	V	VI	
Part I: Tamil /Hindi	6(3)	6(3)	6 (3)	6(3)	-	-	24 (12)
Part II: English	6(3)	6(3)	6 (3)	6(3)	-	-	24 (12)
Part III: Core, Allied and DSEC Courses:							
Core Course	5(5)	5(5)	5(5)	5(5)	6 (6)	6(5)	32 (31)
Core Course	-	-	-	-	6 (6)	6(5)	12 (11)
Core Course	-	-	-	-	-	-	-
Core Course Practical	5 (3)	5 (3)	5(3)	4(3)	5 (3)	6 (3)	30 (18)
Core Course Project	-	-	-	-	1 (1)	-	1 (1)
DSEC	-	-	-	-	5 (4)	5 (4)	10 (8)
DSEC Practical	-	-	-	-	5 (3)	5 (3)	10 (6)
Elective Course I (Allied)	4 (4)	4 (4)	4 (4)	4 (4)	-		16 (16)
Elective Course I Practical I(Allied)	-	-	-	-	-	-	-
Elective Course II (Allied)	-	-	-	-	-	-	-
Elective Course II Practical I(Allied)	-	-	-	-	-	-	-
Self-Study Course	-	-		-	-	0 (1)	0 (1)
Part IV: Skill Enhancement Courses, Elective Courses, Ability Enhancement Compulsory Courses, Self-Study Course and Internship/Industrial Training							
SEC	2(2)	-	1 (1)	2 (2)	-	-	5 (5)
SEC	-	2 (2)	2 (2)	2 (2)	-	2 (2)	8 (8)
Elective Course (NME)	2(2)	2(2)	-	-	-	-	4 (4)
Value Education	-	-	-	-	2 (2)	-	2 (2)
Environmental Studies	-	-	1 (0)	1 (2)	-	-	2 (2)
Self-Study Course	-	-	-	-	0 (1)	-	0 (1)
Internship / Industrial Training	-	-	-	-	0 (1)	-	0 (1)
Part V: Extension Activities	-	-	-	-	-	0 (1)	0 (1)
Total	**30 (22)**	**30 (22)**	**30 (21)**	**30 (24)**	**30 (27)**	**30 (24)**	**180 (140)**
Extra Credit Course (Self-Study Course)					0 (2)	-	0 (2)

DSEC: Discipline Specific Elective Course SEC: Skill Enhancement Course

GEC: Generic Elective Course

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B.Sc. DATA SCIENCE - 2032
PROGRAMME CONTENT

SEMESTER I

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG11/ 24UHDG11	6	3	3	25	75	100
2.	**Part II**		English	24UENG11	6	3	3	25	75	100
3.	**Part III**	Core Course - 1	Python Programming	24UDSC11	5	5	3	25	75	100
4.		Core Course – 2 Practical I	Python Programming Practical	24UDSC11P	5	3	3	40	60	100
5.		Elective Course 1	Numerical Methods	24UDSA11	4	4	3	25	75	100
6.	**Part IV**	NME -1	Fundamentals of Information Technology	24UDSN11	2	2	2	25	75	100
7		SEC – 1 Foundation Course	Problem Solving Techniques	24UDSF11	2	2	2	25	75	100
				Total	**30**	**22**				**700**

B.Sc. DATA SCIENCE
SEMESTER II

S. No.	Components		Title of the Course	CourseCode	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG21/ 24UHDG21	6	3	3	25	75	100
2.	**Part II**		English	24UENG21	6	3	3	25	75	100
3.	**Part III**	Core Course – 3	Data Structures and Algorithms	24UDSC21N	5	5	3	25	75	100
4.		Core Course – 4 Practical II	Data Structures and Algorithms Practical	24UDSC21P	5	3	3	40	60	100
5.		Elective Course - 2	Mathematical Statistics	24UDSA21	4	4	3	25	75	100
6.	**Part IV**	NME – 2	Computer Fundamentals	24UDSN21	2	2	2	25	75	100
7		SEC – 2	Web Technology	24UDSS21N	2	2	2	25	75	100
				Total	**30**	**22**				**700**

B.Sc. DATA SCIENCE
SEMESTER III

S. No.	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG31/ 24UHDG31	6	3	3	25	75	100
2.	**Part II**		English	24UENG31	6	3	3	25	75	100
3.	**Part III**	Core Course – 5	Data Science	24UDSC31	5	5	3	25	75	100
4.		Core Course – 6 Practical III	Data Science Practical	24UDSC31P	5	3	3	40	60	100
5.		Elective Course - 3	Operations Research	24UDSA31	4	4	3	25	75	100
6.	**Part IV**	SEC -3 Entrepreneurial Skill	E-Commerce	24UDSS31	1	1	2	100	-	100
7.		SEC – 4	PHP Programming	24UDSS32	2	2	2	25	75	100
8.			Environmental Studies	24UGES41	1	-	-	-	-	-
				Total	**30**	**21**				**700**

B.Sc. DATA SCIENCE
SEMESTER IV

S. No	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part I**		Tamil/ Hindi	24UTAG41/ 24UHDG41	6	3	3	25	75	100
2.	**Part II**		English	24UENG41	6	3	3	25	75	100
3.	**Part III**	Core Course - 7	Object Oriented Programming with Java	24UDSC41	5	5	3	25	75	100
4.		Core Course – 8 Practical IV	Object Oriented Programming with Java Practical	24UDSC41P	4	3	3	40	60	100
5.		Elective Course - 4	Introduction to Linear Algebra	24UDSA41	4	4	3	25	75	100
6.	**Part IV**	SEC - 5	Cyber Forensics	24UDSS41	2	2	2	25	75	100
7.		SEC - 6	Data Mining and Warehousing	24UDSS42	2	2	2	25	75	100
8.			Environmental Studies	24UGES41	1	2	-	25	75	100
				Total	**30**	**24**				**800**

B.Sc. DATA SCIENCE
SEMESTER V

S. No	Components		Title of the Course	Course Code	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	**Part III**	Core Course - 9	Relational Database Management System	24UDSC51	6	6	3	25	75	100
2.		Core Course - 10	Software Metrics	24UDSC52	6	6	3	25	75	100
3.		Core Course - 11 Practical V	Relational Database Management System Practical	24UDSC51P	5	3	3	40	60	100
4.		Core Course Project	Project	24UDSC53PR	1	1	-	100	-	100
5.		Elective Course DSEC - 1	Operating System / Cryptography	24UDSE51/ 24UDSE52	5	4	3	25	75	100
6.		Elective Course DSEC – 2 Practical - I	Operating System Practical / Cryptography Practical	24UDSE53P / 24UDSE54P	5	3	3	40	60	100
7	**Part IV**		Value Education	24UGVE51	2	2	2	25	75	100
8.		Self-Study Course	Practice for Competitive Examinations – Online	24UGCE51	-	1	-	100	-	100
9.		Internship/ Industrial Training	Internship	24UDSI51	-	1	-	100	-	100
				Total	**30**	**27**				**900**
10.		Extra Credit Course	C and C++ Aptitude	24UDSO51	-	2	-	100	-	100

B.Sc. DATA SCIENCE
SEMESTER VI

S. No.	Components		Title of the Course	CourseCode	Hours Per Week	Credits	Exam. Hours	Marks		
								Int.	Ext.	Total
1.	Part III	Core Course - 12	Mobile Applications Development	24UDSC61	6	5	3	25	75	100
2.		Core Course - 13	Machine Learning	24UDSC62	6	5	3	25	75	100
3.		Core Course-14 Practical VI	Mobile Applications Development Practical	24UDSC61P	6	3	3	40	60	100
4.		Elective Course DSEC - 3	Big Data Analytics / Natural Language Processing	24UDSE61/ 24UDSE62	5	4	3	25	75	100
5.		Elective Course DSEC - 4 Practical - II	Big Data Analytics Practical / Natural Language Processing Practical	24UDSE63P/ 24UDSE64P	5	3	3	40	60	100
6.		Self-Study Course	Discipline Specific Quiz – Online	24UDSQ61	-	1	-	100	-	100
7.	Part IV	SEC- 7	Open Source Software Technologies	24UDSS61	2	2	2	25	75	100
8.	Part V		Extension Activities		-	1	-	100	-	100
				Total	**30**	**24**				**800**

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B.Sc. Data Science
(2024 - 2025 onwards)

Semester I	**PYTHON PROGRAMMING**	Hours/Week: 5	
Core Course - 1		Credits: 5	
Course Code **24UDSC11**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: describe fundamental concepts in Python Programming. [K1]

CO2: interpret the concepts of basic Python, functions, operations on files and string manipulation. [K2]

CO3: infer looping, control statements and representation of complex data using lists, tuples and dictionaries. [K2]

CO4 apply the concepts of basic programming, functions, strings, modules and file handling in Python programs. [K3]

CO5: determine the methods to develop Python programs utilizing control statements, jump statements, list, tuples and dictionaries. [K3]

UNIT I

Basics of Python Programming: History of Python – Features of Python – Literal Constants - Variables and Identifiers - Data Types – Input operations- Comments – Indentation – Operators and Expressions – Type conversions. (15 Hours)

UNIT II

Decision Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Basic Loop Structures/Iterative Statements: while loop, for loop - nested loops- **:** break, continue and pass statements**.** (15 Hours)

UNIT III

Functions and Modules : Function Declaration and Definition – Function Call – Variable Scope and its Lifetime-Return Statement - More on Defining Function - Required Arguments,

Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **Modules**: The from import statement– Name of the Modules – Making your own modules. **Python Strings Revisited:** Concatenating, Appending and Multiplying Strings - String are Immutable – Built-in String Methods and Functions – Comparison Strings. (15 Hours)

UNIT IV

Data Structures: Lists: Access values in List- Updating values in Lists- Nested lists –Cloning Lists - Basic list operations - List Methods. Tuples: Creating Tuples - Accessing values in a Tuples, Updating Tuples - Deleting Elements in Tuple – Nested Tuples– Advantages of Tuples over Lists. **Dictionaries:** Creating a Dictionaries, Adding and Modifying an item in a Dictionaries – Modifying an entry – Deleting items – Built-in Dictionary Functions and Methods - Difference between Lists and Dictionaries. (15 Hours)

UNIT V

File Handling: Types of Files - Opening and Closing Files -Reading and Writing Files: write() and writelines() Methods- append() Method – read() and readlines() Methods – Opening Files with keyword – Splitting words – some other useful File Methods - File Positions- Renaming and deleting files. (15 Hours)

SELF-STUDY:

Jump Statements: break, continue and pass statements**.**

TEXT BOOK

Reema Thareja. (2017). *Python Programming using problem solving approach*, 1st Edition, Oxford University Press.

Unit	Chapters	Sections
I	3	3.1, 3.2,,3.5-3.9.3.11,3.12,3.16
II	4	4.2 – 4.4
III	5, 6	5.2-5.6 ,5.10, 5.11.1-5.11.3 6.1, 6.2,6.4,6,8
IV	8	8.2.1- 8.2.6 , 8.4.1,8.4.3-8.4.6, 8.4.9,8.4.16,8.6.1-8.6.4 , 8.6.8 - 8.6.9
V	7	7.3-7.7

REFERENCE BOOKS

1. Vamsi Kurama. *Python Programming: A Modern Approach*, Pearson Education.
2. Mark Lutz. *Learning Python*, Orielly.
3. Adam Stewarts. *Python Programming, Online*.
4. Fabio Nelli. *Python Data Analytics,* APress.
5. Kenneth A. Lambert. *Fundamentals of Python – First Programs*, CENGAGE Publication.

WEB RESOURCES

1. https://www.programiz.com/python-programming
2. https://www.w3schools.com/python/python_intro.asp
3. https://www.geeksforgeeks.org/python-programming-language/
4. https://en.wikipedia.org/wiki/Python_(programming_language)

Course Code 24UDSC11	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	2	3	2	2	2	2	2	2	-
CO2	3	2	3	2	2	2	3	2	2	-
CO3	3	3	3	2	3	2	3	3	2	-
CO4	3	3	3	3	3	3	3	3	3	1
CO5	3	3	3	3	3	3	3	3	3	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. S.Veni
Course Designer

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B.Sc. Data Science

(2024 - 2025 onwards)

Semester I	**PYTHON PROGRAMMING PRACTICAL**	Hours/Week: 5	
Core Course -2 Practical I		Credits: 3	
Course Code **24UDSC11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write Python programs using I/O statements and various operators of Python. [K2]

CO2: draw flow chart and write programs with various program structures of Python, functions and modules. [K2]

CO3: demonstrate data representation using Arrays, Strings, List, Tuple, Dictionaries and Files in Python. [K3]

CO4: demonstrate various programs with different inputs and complete the record work. [K3]

CO5: explore the uses of Python compound data in real life. [K3]

Write Python Programs for the following

1. variables, constants, I/O statements in Python.
2. Operators in Python.
3. Conditional Statements.
4. Loops.
5. Jump Statements.
6. Functions.
7. Recursion.
8. Arrays.
9. Strings.
10. Modules.
11. Lists.
12. Tuples.
13. Dictionaries.
14. File Handling.

Course Code 24UDSC11P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	1	1	2	2	2	1	1	-
CO2	3	3	1	1	2	2	2	1	1	-
CO3	3	3	3	2	2	3	2	3	1	1
CO4	3	3	2	2	2	3	2	2	1	1
CO5	3	3	3	3	3	3	2	3	1	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. S.Veni
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. Data Science
(2024 - 2025 onwards)

Semester I	**NUMERICAL METHODS**	Hours/Week: 4	
Elective Course 1		Credits: 4	
Course Code 24UDSA11		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Recall the fundamental concepts of algebraic, transcendental and simultaneous equations.[K1]

CO2: Derive the solutions of equations by various iterative methods. [K2]

CO3: Find the missing data by using interpolation and inverse interpolation methods.[K2]

CO4: Perform numerical differentiation and integration to find the derivatives and integral value numerically. [K3]

CO5: Apply Taylor series method, Picard's method, Euler's and Runge-kutta methods to obtain the solution of the initial value problems. [K3]

UNIT I

Algebraic and Transcendental Equations:

Introduction-Errors in numerical computation-Iteration method-Bisection method-Regula-Falsi method-Newton-Raphson method-Horner's method. (12 hours)

UNIT II

Simultaneous Equations:

Introduction-Simultaneous equations-Back substitution-Gauss Elimination method-Gauss –Jordan Elimination method-Calculation of Inverse of a matrix- Crout's method-Iterative methods-Gauss-Jacobi Iteration method-Gauss seidal Iteration method-Newton Raphson's method for simultaneous equations. (12 hours)

UNIT III

Interpolation:

Introduction- Newton's interpolation Formulae-Central difference Interpolation formulae-Gauss forward Interpolation Formula, Gauss backward Interpolation Formula, Lagrange's Interpolation formula - Divided differences-Newton's divided difference formula-Inverse Interpolation. (12 hours)

UNIT IV

Numerical Differentiation and Integration:

Introduction-Derivates using Newton's forward difference formula-Derivates using Newton's backward difference formula- Numerical Integration-Newton-cotes quadrature formula-Trapezoidal Rule-Simpson's one third rule-Simpson's 3/8th rule. (12 hours)

UNIT V

Numerical Solution of Ordinary Differential Equations:

Introduction-Taylor series method-Picard's method-Euler's method-Runge- kutta method of second, third, fourth order- Predictor & corrector methods-Milne's method. (12 hours)

TEXT BOOK

Arumugam. S, A.Thangapandi lssac. A, Somasundaram. A, *Numerical Methods*, Second Edition, SCITECH publications. Reprint, December 2013.

Unit	Chapter	Section
I	3	3.0 - 3.6
II	4	4.0 - 4.8, 4.10
III	7	7.0 - 7.2((i), (ii) and related problems), 7.3, 7.4,7.5, 7.6
IV	8	8.0 - 8.2,8.5 (excluding Weddles rule, Booles rule, Romberg's method and related problems)
V	10	10.0 - 10.2, 10.3(excluding modified Euler's method & its related problems),10.4 - 10.6

REFERENCE BOOK:

Mathews J.H. Numerical Method for Maths, Science and Engineering: PHI, New Delhi,2001.

Web Resources: https://27x37.files.wordpress.com/2011/05/mcgraw-hill-numerical-methods-using-matlab.pdf

Course Code 24UDSA11	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO 6**	**PO7**
CO1	3	2	1	3	1	1	-
CO2	3	2	1	3	2	1	-
CO3	3	1	1	3	2	1	-
CO4	3	2	1	3	2	1	-
CO5	2	2	1	3	2	1	-

Strong (3) Medium (2) Low (1)

Dr. M.C.Maheswari K.Muthulakshmi

Head of the Department **Course Designer**

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B.Sc. Data Science

(2024 - 2025 onwards)

Semester I	**PROBLEM SOLVING TECHNIQUES**	Hours/Week: 2	
SEC - 1 Foundation Course		Credits: 2	
Course Code **24UDSF11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : familiarize with basics of computer, programming languages, data, flowchart and program. [K1]

CO2 : realize the hardware components, software, steps in programming, concepts of programming and data structures. [K1]

CO3 : explain the need for data, different programming languages, programming structures and modules for problem solving. [K2]

CO4 : identify the use of hardware, software and the relationship between the program steps and flow of data in the program. [K2]

CO5 : explore various programming languages, programming structures to manipulate data and the use of flowcharts to write programs for the solution of a problem. [K2]

UNIT I

Introduction to Digital Computer: Introduction – Von Neumann Concept – Storage – Programming Languages – Translators – Hardware and Software – Operating Systems.

(6 Hours)

UNIT II

An Introduction to Computers and Programming: Creating Computer Program the Program Development Cycle - Basic Programming Concepts - Data Processing and Output. **Developing a Program:** Coding, Documenting and Testing a Program – Structured Programming. (6 Hours)

UNIT III

Selection Structures: Making Decisions: Relational and Logical Operators – Selecting from Several Alternatives - Applications of Selection Structures. **Repetition Structures: Looping:** Types of Loop – The For Loop. (6 Hours)

UNIT IV

Arrays: List and Tables: One Dimensional Arrays - Strings as Arrays of Characters - Two Dimensional Arrays. **Program Modules and Subprograms and Functions:** Data Flow Diagrams, Arguments and Parameters. (6 Hours)

UNIT V

Program Modules and Subprograms and Functions: More about Subprograms – Functions – Recursion. **Sequential Data Files:** An Introduction to Data Files - Modifying Sequential files. (6 Hours)

TEXT BOOKS

1. E. Balagurusamy. *Introduction to Computing and Problem Solving using Python,* 1st Edition, McGraw Hill Education (India) Private Limited
2. Stewart Venit, Elizabeth Drake. (2014)**.** *Prelude to Programming: Concepts and Design*, 5th Edition, Pearson Publishers.

BOOK	UNIT	CHAPTERS	SECTIONS
I	I	1	1.1-1.7
II	II	1	1-3
		2	3,5
	III	3	2,4,5
		4	2,3
	IV	6	1,4,5
		7	1
	V	7	2,3,4
		8	1,2

REFERENCE BOOKS

1. Karl Beecher. (2017). *Computational Thinking: A Beginner's Guide to Problem-Solving and Programming,* BCS Learning & Development Ltd.
2. Johan Sannemo. (2018). *Principles of Algorithmic Problem Solving,* KTH Royal Institute of Technology.

WEB RESOURCES

1. https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2. http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3. http://utubersity.com/?page_id=876

Course Code 24UDSF11	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO7**
CO1	3	2	1	3	2	2	1	2	2	2
CO2	2	2	-	1	2	2	1	2	2	1
CO3	3	1	-	1	3	3	2	2	1	3
CO4	2	1	2	2	1	2	1	3	2	1
CO5	3	3	2	2	3	3	1	2	2	3

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. M. Sangeetha Alias Sheeba
Course Designer

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B.Sc. Data Science
(2024 - 2025 onwards)

Semester II	**DATA STRUCTURES AND ALGORITHMS**	Hours/Week: 5	
Core Course – 3		Credits: 5	
Course Code **24UDSC21**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: describe various data structures, its asymptotic notations and its time and space complexities. [K1]

CO2: interpret the concepts of array, linked list, trees and graphs. [K2]

CO3: infer searching and sorting techniques, greedy method, dynamic programming and backtracking [K2]

CO4 apply searching and sorting techniques, operations on array, linked list, trees and graphs. [K3]

CO5: determine the methods for solving problems using greedy method, dynamic programming and backtracking. [K3]

UNIT I

Arrays and ordered Lists Abstract data types – asymptotic notations – complexity analysis- **Linked lists:** Linked lists – Insertion and deletion - Circular linked list - doubly linked lists. (15 Hours)

UNIT II

Stacks, Queues, Recursion: stacks – Queues – Circular Queues – Arithmetic Expressions; Polish Notations. **Trees:** Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). (15 Hours)

UNIT III

Graphs and Their Applications: Representation of Graphs - Shortest Paths – Operations on Graphs – Traversing a Graph - Minimum Spanning Trees. **Searching and Sorting** Sorting – Bubble Sort - Insertion Sort - Selection Sort - Merge Sort – Shell Sort – Radix Sort. Searching – Linear search, Binary search. (15 Hours)

UNIT IV

Greedy Method and Dynamic programming Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method — All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components**.** (15 Hours)

UNIT V

Backtracking General Method – 8-Queen's – Sum Of Subsets – Graph Colouring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem. (15 Hours)

SELF-STUDY:

Greedy Method: Multistage Graph Forward Method

TEXT BOOKS

1. Seymour Lipshutz (2011),Schaum"s Outlines - Data Structures with C, Tata McGraw Hill publications.
2. Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd.

Unit	Book	Chapter	Section
I	1	2 5	2.5, 2.6, 2.8 5.2, 5.7, 5.8, 5.10, 5.11
II	1	6 7	6.2, 6.11, 6.14, 6.6 7.2, 7.4, 7.8, 7.7, 7.24
III	1	8 4 9	8.3, 8.4, 8.6, 8.7, 8.9 4.7, 4.8, 4.9 9.3 – 9.8
IV	2	4 5 6	4.2, 4.4, 4.6 5.3, 5.4 6.2, 6.3, 6.4
V	2	7 8	7.2 – 7.5 8.1, 8.3

REFERENCE BOOKS

1. Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.
2. A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication.
3. Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd.

WEB RESOURCES

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.programiz.com/dsa
3. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Course Code 24UDSC21	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	2	3	2	2	2	2	2	2	-
CO2	3	2	3	2	2	2	3	2	2	-
CO3	3	3	3	2	3	2	3	3	2	-
CO4	3	3	3	3	3	3	3	3	3	1
CO5	3	3	3	3	3	3	3	3	3	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. T.Chitra
Course Designer

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B.Sc. DATA SCIENCE
(2025 -2026 onwards)

Semester II	**DATA STRUCTURES AND ALGORITHMS**	Hours/Week: 5	
Core Course - 3		Credits: 5	
Course Code **24UDSC21N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : describe various data structures, its asymptotic notations and its time and space complexities. [K1]

CO2 : interpret the concepts of array, linked list, trees and graphs. [K2]

CO3 : infer searching and sorting techniques, greedy method, dynamic programming and backtracking. [K2]

CO4 : apply searching and sorting techniques, operations on array, linked list, trees and graphs. [K3]

CO5 : determine the methods for solving problems using greedy method, dynamic programming and backtracking. [K3]

UNIT I

Arrays: Introduction –Declaration of Arrays – Accessing the Elements of an Array – Storing Values in Arrays – Operations on Arrays – Passing Arrays to Functions. **Linked Lists**: Introduction – Singly Linked Lists. (15 Hours)

UNIT II

Stacks: Introduction to Stacks – Array Representation of Stacks – Operations on Stack – Linked Representation of Stacks – Operations on a Linked Stack. **Queues:** Introduction to Queues – Array Representation of Queues –Linked Representation of Queues – Types of Queues. (15 Hours)

UNIT III

Efficient Binary Trees: Binary Search Trees – Operations on Binary Search Trees. **Graphs:** Introduction – Graph Terminology – Directed Graphs - Representation of Graphs –Graph Traversal Algorithms **Searching and Sorting:** Linear search - Binary search - Bubble Sort - Insertion Sort - Selection Sort. (15 Hours)

UNIT IV

Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. **Dynamic programming:** General method — All pairs shortest path – Single source shortest path. (15 Hours)

UNIT V

Backtracking: General Method – 8-Queen's Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – **Branch and Bound:** Travelling Sales Person Problem. (15 Hours)

SELF STUDY: (Not included for Examination)

Greedy Method: Multistage Graph Forward Method (Text Book 2: Pages:257 - 265)

TEXT BOOKS

1. Reema Thareja. (2014). *Data Structures Using C,* 2nd Edition, Oxford University Press.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran. (2010). *Fundamentals of Computer Algorithms*, Galgotia Publications Pvt., Ltd.

UNIT	TEXT BOOK	CHAPTER	SECTIONS
I	1	3	3.1 – 3.6
		6	6.1, 6.2
II		7	7.1 – 7.5
		8	8.1 – 8.4
III		10	10.1, 10.2
		13	13.1 – 13.3, 13.5, 13.6
		14	14.2, 14.3, 14.7 – 14.9
IV	2	4	4.2, 4.4, 4.6
		5	5.1,5.3,5.4
V		7	7.1 – 7.5
		8	8.3

REFERENCE BOOKS

1. Gregory L. Heileman. (1996). *Data Structures, Algorithms and Object-Oriented Programming*, McGraw Hill International Edition, Singapore.
2. A.V.Aho, J.D. Ullman, J.E. Hopcraft. (2000). *Data Structures and Algorithms*, Addison Wesley Publication.
3. Thomas H. Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein. (2009). *Introduction to Algorithms*, 3rd Edition, McGraw Hill.

WEB RESOURCES

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.programiz.com/dsa
3. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Course Code 24UDSC21N	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	2	3	2	2	2	2	2	2	-
CO2	3	2	3	2	2	2	3	2	2	-
CO3	3	3	3	2	3	2	3	3	2	-
CO4	3	3	3	3	3	3	3	3	3	1
CO5	3	3	3	3	3	3	3	3	3	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. P. Aruna Devi
Mrs. S. Rajapriya
Course Designers

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B.Sc. Data Science
(2024 - 2025 onwards)

Semester II	**DATA STRUCTURES AND ALGORITHMS PRACTICAL**	Hours/Week: 5	
Core Course -4 Practical II		Credits: 3	
Course Code **24UDSC21P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: write the programs to perform operations on array, linked list, stack, queue, tree traversal. [K2]

CO2: perform various searching and sorting techniques. [K2]

CO3: apply operation on data structures, searching and sorting techniques, greedy method, dynamic programming and backtracking [K3]

CO4: develop programs to find optimal solutions for the problems using greedy method, dynamic programming methods and backtracking. [K3]

CO5: determine the methods for solving problems using greedy method, dynamic programming and backtracking. [K3]

Develop programs for the following concepts

1. Stack operations
2. Queue operations
3. Linked list Operations
4. Array operations
5. Tree traversal operations
6. Search an element in an array using linear search.
7. Search an element in an array using binary search
8. Sort the given set of elements using Merge Sort.
9. Sort the given set of elements using Quick sort.

10. Search the Kth smallest element using Selection Sort
11. Find the Optimal solution for the given Knapsack Problem using Greedy Method.
12. Find all pairs shortest path for the given Graph using Dynamic Programming method
13. Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method
14. Find all possible solution for an N Queen problem using backtracking method
15. Find all possible Hamiltonian Cycle for the given graph using backtracking method

Web Resource

https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Course Code 24UDSC21P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	2	3	2	2	2	2	2	2	-
CO2	3	2	3	2	2	2	3	2	2	-
CO3	3	3	3	2	3	2	3	3	2	-
CO4	3	3	3	3	3	3	3	3	3	1
CO5	3	3	3	3	3	3	3	3	3	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. T.Chitra
Course Designer

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B.Sc. DATA SCIENCE

(2024 - 2025 onwards)

Semester II	**MATHEMATICAL STATISTICS**	Hours/Week:4	
Elective Course- 2		Credits: 4	
Course Code **24UDSA21**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to CO1: define the basic concepts in statistics. [K1]

CO2: explain various statistical methods and techniques in solving problems. [K2]

CO3: infer the data to draw conclusion in probability. [K2]

CO4: apply the statistical methods and theory of probability to solve real life problems. [K3]

CO5: calculate some statistical constants to get the regression analysis. [K3]

UNIT I

Measures of Central Value: Types of Averages - Arithmetic Mean – Median – Mode. (12 Hours)

Unit II

Skewness, Moments &Kurtosis: Introduction, Skewness Defined, Tests of Skewness, Measures of Skewness, Moments, Kurtosis. (12 Hours)

UNIT III

Correlation Analysis: Types of Correlation, Methods of Studying Correlation, Karl Pearson's coefficient of correlation, Interpreting Coefficient of Correlation, Coefficient of Correlation and Probable Error, Rank Correlation.

Regression Analysis: Regression Lines, Regression Equations, Deviation taken from Arithmetic Means of X and Y- Deviation taken from Assumed Means (Except Graphing Regression Lines). (12 Hours)

UNIT IV

Association of Attributes: Consistency of Data – Association and Disassociation – Methods of Studying Association – Criteria of Independence. (12 Hours)

UNIT V

Probability & Expected Value: Calculation of Probability, Theorems of Probability, conditional Probability, Bayes Theorem, Mathematical Expectation. (12 Hours)

TEXT BOOK

Dr. S. P. Gupta, (Revised Edition 2010), *Statistical Methods*, Sultan Chand & Sons.

Unit	Volume	Chapter	Pages
I	I	**7**	180–218
II	I	9	330–370 (Up to Problem No:40)
III	I	10	381–394 (Up to Problem No:11)
			399–411 (Up to Problem No:22)
	I	11	439-451
IV	I	12	481-499
V	I I	1	759–792 (Up to Problem No:59)

REFERENCE BOOKS

1. Dr. Arumugam.S, Mr.Thangapandi Isaac.A, (2016), *Statistics*, New Gamma Publishing House.
2. S.C.Gupta, V.K.Kapoor, (2001), *Elements of Mathematical Statistics*, Sultan Chand & Sons.

Web Resources

Web resources from NDL Library, E-content from open-source libraries

Course Code 24UDSA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	3	1	2
CO2	3	3	3	3	3	1	2
CO3	3	3	3	3	3	1	2
CO4	3	2	3	3	3	3	2
CO5	3	2	3	2	3	3	2

Strong (3) Medium (2) Low (1)

Dr.M.C.Maheswari — **Head of the Department**

S.Swathi Sundari — **Course Designer**

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B.Sc. Data Science

(2024 - 2025 onwards)

Semester II	**ADVANCED EXCEL PRACTICAL**	Hours/Week: 2	
SEC - 2		Credits: 2	
Course Code **24UDSS21P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: write programs to develop worksheets with advanced excel function. [K2]

CO2: write programs to develop worksheets with lookup functions, what if analysis, charts, pivot table and visualize as pivot charts. [K2]

CO3: build worksheets using advanced concepts and completion of the record work. [K3]

CO4 demonstrate formatting, mathematical, logical, decision making, statistical and advanced filtering concepts. [K3]

CO5: perform referencing, lookup, what-if scenarios and data analysis with pivot tables and visualize the results as charts. [K3]

Develop worksheets for the following concepts

1. Absolute and Relative Referencing
2. Logical Functions
3. Decision Making
4. Conditional Formatting
5. Statistical Functions
6. Mathematical Functions
7. Data & Time functions
8. What If Analysis
9. Look Up Functions
10. Match and Index Lookup Function
11. Advanced Filtering
12. Chart Design and Sparklines
13. Pivot Table Design and Pivot Charts

Course Code 24UDSS21P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	2	3	2	2	2	3	2	2	-
CO2	2	2	3	2	2	2	3	2	2	-
CO3	2	2	3	2	2	2	3	2	2	-
CO4	2	2	3	2	2	2	3	2	2	-
CO5	3	2	3	3	3	3	3	3	3	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Ms. A. Dhivya
Course Designer

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B.Sc. DATA SCIENCE
(2025 -2026 onwards)

Semester II	**WEB TECHNOLOGY**	Hours/Week: 2	
SEC - 2		Credits: 2	
Course Code **24UDSS21N**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : outline the basic structure and syntax of HTML and develop static and dynamic web pages using CSS, XML, JavaScript and AJAX. [K1]

CO2 : identify the functionalities of components to build simple web pages. [K1]

CO3 : discuss the concepts to develop web application based on ethics using HTML, CSS, XML, JavaScript and AJAX. [K2]

CO4 : describe the purpose of different HTML tags and CSS properties to create dynamic content through XML, JavaScript and AJAX. [K2]

CO5 : apply HTML tags to create secure structured web pages, utilize CSS styles, XML and AJAX techniques to create asynchronous web applications and validate forms using JavaScript. [K3]

UNIT I

HTML (HYPERTEXT MARKUP LANGUAGE): Introduction - Structure of HTML document: Header or Head Section, Body Section, Heading Tags, Paragraph Formatting Tags, Font Setting Tag - Creating Lists: The OL (Ordered List) Tag, Nesting Lists – Tables: Basic Table Tags – Frames: Defining Frameset - Images: Using the ALT Attribute, Using the Align Attribute in Inline Graphics, Setting the Height and Width of an Inline Image. (6 Hours)

UNIT II

HTML (HYPERTEXT MARKUP LANGUAGE): Forms: Creating a Form, Input Elements, Adding a Check Box, Adding a Radio Button, Adding a Password Field, Multiple Line Text Input, Pull Down Menus, Adding Submit and Reset Button, Attributes to Form tag.

CASCADING STYLE SHEET (CSS): Introduction – Style Sheet: Style Rule, Including Style Information Inline-Inline Styles – Embedding Style Sheet – Grouping Style Rules.

(6 Hours)

UNIT III

XML (EXTENSIBLE MARKUP LANGUAGE): XML Basics – XML Markup (XML Schema) – Naming Rules – Entity Declarations – Working with Elements and Attributes – Element Declarations. **JAVASCRIPT AND AJAX:** What is JavaScript? - What can a JavaScript Do? – How to Put a JavaScript into an HTML Page – Variables.

(6 Hours)

UNIT IV

JAVASCRIPT AND AJAX: Conditional Statements – JavaScript Functions – JavaScript Loops - Object Oriented Programming: Properties, Methods, String object, Defining Arrays, Boolean Object, Math Object – The HTML DOM - Browser Detection – JavaScript Form Validation. (6 Hours)

UNIT V

Overview of AJAX: Exploring AJAX: AJAX Web Application Model, How AJAX Works? – Creating a Simple AJAX Application, Displaying Date and Time without using AJAX – Displaying Date and Time using AJAX. **Asynchronous Data Transfer with XMLHttpRequest:** Creating the XMLHttpRequest Object – Using XMLHttpRequest Object in Different Browsers. (6 Hours)

SELF STUDY: (Not included for Examination)

Asynchronous Data Transfer with XMLHttpRequest: Reading a File Synchronously – Reading a File Asynchronously (Text Book 2: Pages: 936 - 941)

TEXT BOOKS

1. Pankaj Sharma. (2011). *Web Technology*, SK Kataria & Sons, Bangalore.
2. DT Editorial Services. (2016). *HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*, Dreamtech Press.

UNIT	TEXT BOOK	CHAPTER	SECTIONS/PAGES
I	1	2	2.0, 2.2.2 - 2.2.6, 2.3.1, 2.3.2, 2.4.1, 2.5.1 – 2.5.3, 2.7.1
II		2	2.6.2 - 2.6.10
		3	3.0, 3.1.1 – 3.1.4
III		4	4.3 – 4.8
		5	5.1 – 5.4
IV		5	5.5, 5.8, 5.9, 5.13.1 - 5.13.6, 5.14 - 5.16
V	2	33	916 – 926
		34	928 – 935

REFERENCE BOOKS

1. Mike Mcgrath. (2006). *Java Script*, Dream Tech Press, 1st Edition.
2. Achyut S Godbole & AtulKahate. (2002). *Web Technologies*, 2nd Edition.
3. Laura Lemay, Rafe Colburn, Jennifer Kyrnin. (2016). *Mastering HTML, CSS & Javascript Web Publishing*.

WEB RESOURCES

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

Course Code 24UDSS21N	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO7
CO1	3	2	2	1	2	2	2	2	-	-
CO2	3	2	2	1	2	2	2	2	-	-
CO3	3	2	2	2	2	2	2	2	-	3
CO4	3	2	2	2	2	2	2	2	-	-
CO5	3	3	2	3	3	3	3	2	1	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Ms. M. Porkalai Selvi
Course Designer

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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester III	**DATA SCIENCE**	Hours/Week: 5	
Core Course - 5		Credits: 5	
Course Code **24UDSC31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : understand the core concepts of data science, the role of Big Data, and the concepts of functions, modules, python libraries and Object-Oriented Programming (OOP) in python programming. [K1]

CO2 : discuss the essential skill sets needed in the data science field and fundamental concepts of classes, inheritance, exception handling and database programming. [K2]

CO3 : demonstrate proficiency in Python functions, modules, packages, and date-time operations for data analysis tasks. [K2]

CO4 : apply NumPy and Pandas libraries for numerical computations, data manipulation and transformation. [K3]

CO5 : design and implement database operations and user interfaces using Python for real-world applications, including GUI and CGI programming. [K3]

UNIT I

Introduction: What is Data Science? : Big Data and Data Science hype – getting past the hype – Datafication – The Current Landscape of perspectives - Skill sets needed - **Statistical Inference, Exploratory Data Analysis and the Data Science Process:** Basic tools (plots, graphs and summary statistics) of EDA – Applications of Data Science - Data Science in Business - Business Intelligence vs Data Science – Data Analytics Life Cycle .

(14 Hours)

UNIT II

Functions: Function Definition - Function Calling - Function Arguments - Anonymous Functions (Lambda Functions) - Recursive Functions - **Modules and Packages**: Built-in Modules - Creating Modules - import Statement - Namespaces and Scope - The dir() function - The reload() function -Packages in Python - Date and Time Modules.

(16 Hours)

UNIT III

Introduction to NumPy: The Basics of NumPy Arrays – Aggregations: Min, Max, and Everything in Between - Computation on Arrays: Broadcasting - Sorting Arrays - **Data Manipulation Using Pandas**: Installing and Using Pandas – Introducing Pandas Objects - Data Indexing and Selection - Operating on Data in Pandas - Handling Missing Data - Combining Datasets: Concat and Append.

5 Hours)

UNIT IV

Object Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python - Encapsulation - Data Hiding – Inheritance - Method Overriding – Polymorphism - **Exception Handling:** Built-in Exceptions - Handling Exceptions - Exception with Arguments - Raising an Exception - User-defined Exception. (16 Hours)

UNIT V

Database Programming: Connecting to a Database - Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control - Disconnecting from a Database - Exception Handling in Databases. **GUI Programming:** Introduction - Tkinter Widgets - **CGI Programming:** Introduction - A Simple CGI Program - HTTP Headers - Environment Variables – Forms - Radio Buttons - Drop Down Box - Check Boxes - Text Area – Cookies - Uploading File.

(14 Hours)

SELF STUDY: (Not included for Examination)

List - Tuple - Set – Dictionary (Text Book 2: Pages: 33-55)

TEXT BOOKS

1. Cathy O'Neil and Rachel Schutt. (2014). *Doing Data Science Straight Talk From The Frontline*, O'Reilly.
2. Dr. Jeeva Jose. (2018). *Taming Python By Programming*, Khanna Publishers.

3. Jake Vanderplas. *Python Data Science Handbook: Essential Tools for Working with Data*, 1st Edition, O'Reilly.

UNIT	TEXT BOOK	CHAPTER	PAGES
I	1	1	1 - 15
		2	17 - 45
II	2	4	102 - 110
		5	119 - 142
III	3	2	42 – 50, 58-70, 85-90
		3	97 – 128
IV	2	7	170 – 185
		8	196 – 204
V	2	10	223 – 230
		12	287 – 293
		14	307 - 318

REFERENCE BOOKS

1. Ljubomir Perkovic. (2012). *Introduction to Computing Using Python: An Application Development Focus*, John Wiley & Sons.
2. John V Guttag. (2013). *Introduction to Computation and Programming Using Python*, Revised and expanded Edition, MIT Press.
3. Kenneth A. Lambert. (2012). *Fundamentals of Python: First Programs*, Cengage Learning.

Course Code 24UDSC31	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	2	3	3	3	2	3	2	2	-
CO2	2	2	2	1	3	2	3	2	1	-
CO3	3	2	2	1	3	3	2	2	1	-
CO4	3	3	2	2	3	3	2	2	1	-
CO5	3	3	2	2	3	3	2	2	2	-

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. S. Rajapriya
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester III	**DATA SCIENCE PRACTICAL**	Hours/Week: 5	
Core Course – 6 Practical III		Credits: 3	
Course Code **24UDSC31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write, test, and debug Python programs using functions, modules, packages, and exception handling to build foundational coding skills. [K2]

CO2: perform data manipulation and numerical computation using NumPy and Pandas [K2]

CO3: demonstrate various programs with different inputs and complete the record work. [K3]

CO4: implement one-dimensional and multi -dimensional Numpy arrays, and pandas series and data frames. [K3]

CO5: design and develop different plots for basic exploratory data analysis [K3]

Write Python Programs for the following

1. Functions
2. Recursion
3. Modules
4. Fancy indexing and boolean filtering on NumPy arrays
5. Vectorized string operations
6. Identify Data Types, Missing Values, Correlations, Outliers using Dataset
7. Mean, Median, Mode using Sample Dataset
8. Classes and Objects
9. Inheritance
10. Exception handling.
11. Bar Charts, Histograms and Pie Charts.
12. Remove rows in Numpy array that contains non-numeric values.

13. Counts the number of non-zero values in the array.
14. Trim the leading and/or trailing zeros from a 1-D array.
15. Reverse a numpy array.
16. Find the number of rows and columns of a given matrix using NumPy.
17. Count the frequency of unique values in NumPy array.
18. Get row numbers of NumPy array having element larger than X.
19. Find the k smallest values of a NumPy array.
20. Create a Pandas dataframe using list of lists.
21. Insert row at given position in Pandas Dataframe.
22. GUI application for insert, update and delete in a table.
23. GUI with Dropdowns, Radio Buttons, and Checkboxes.

Course Code 24UDSC31P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	2	3	3	3	2	3	2	2	-
CO2	2	2	2	1	3	2	3	2	1	-
CO3	3	2	2	1	3	3	2	2	1	-
CO4	3	3	2	2	3	3	2	2	1	-
CO5	3	3	2	2	3	3	2	2	2	-

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. S. Rajapriya
Course Designer

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B.Sc. Data Science
(2024-2025 onwards)

Semester III	**OPERATIONS RESEARCH**	Hours/Week: 4	
Elective Course		Credits: 4	
Course Code **24UDSA31**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: define the basic concepts in Operations Research. [K1]

CO2: explain various methodologies involved in resource management techniques. [K2]

CO3: find the optimal solutions to various problems using optimization techniques. [K2]

CO4: apply the acquired computational skills to formulate the problems in real life situations. [K3]

CO5: solve the problems in linear programming problem, assignment problem and transportation problem. [K3].

UNIT I

Development of OR : Definition of OR- Modelling-Characteristics and Phases-Tools,Techniques & Methods - scope of OR. (12 hours)

UNIT II

Linear Programming Problem : Formulation-Slack & surplus variables-Graphical solution of LPP. (12 hours)

UNIT III

Simplex Method : Computational Procedure-Big M method-Concept of duality in LPP-Definition of primal and dual problems-General rules for converting any primal into its dual. (12 hours)

UNIT IV

Duality: Theorems(without proof)- Primal and dual correspondence-Duality and simplex method – Mathematical formulation of assignment problem-Method for solving assignment problem. (12 hours)

UNIT V

Mathematical Formulation of Transportation Problem : Methods for finding Initial Basic Feasible Solution for the Transportation Problems, Optimal Solution (Excluding Unbalanced, Degeneracy and Non-Degeneracy). (12 hours)

TEXT BOOK

Sharma.S.D (2009), *Operations Research*, Kedar Nath Ram Nath & Co 16th Revised Edition.

Unit	Chapter	Section
I	1	1.1-1.2,1.4,1.8-1.11
II	3	3.1- 3.3, 3.3.1 - 3.3.4, 3.4 - 3.5
III	5	5.1-5.2, 5.2.1, 5.3, 5.4, 5.5-4
	7	7.1 - 7.4
IV	7	(7.5) (Theorem Statement and Problems only) ; 7.6,7.7
	11	11.2 - 11.4
V	12	12.2 - 12.9

REFERENCE BOOKS

1. Kanti Swarup, Gupta. P. K, Man Mohan. (Reprint 2011). *Operations Research*, Sultan Chand& Sons.
2. Hamdy A.Taha, A.M. Natarajan, P.Balasubramanie and A.Tamilarasi, (2009). *Operations Research* - An Introduction, Eighth Edition, Prentice-Hall of India Pvt. Ltd.
3. Arumugam. S and Thangapandi Isaac. A. (2015). *Topics in Operations Research Linear Programming*, New Gamma Publishing house.

Web Resources:

Web resources from NDL Library, E-content from open-source libraries

Course Code 24UDSA31	PO1	PO2	PO3	PO4	PO5	PO 6	PO7
CO1	3	2	2	3	2	1	-
CO2	3	2	3	3	2	1	-
CO3	3	2	3	3	2	1	1
CO4	3	2	3	3	3	2	1
CO5	3	2	3	3	1	2	-

Strong(3) Medium(2) Low(1)

Dr.M.C. Maheswari — **Head of the Department**

K. Muthulakshmi — **Course Designer**

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B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester III	**E-COMMERCE**	Hours/Week: 1
SEC – 3 Entrepreneurial Skill		Credits: 1
Course Code **24UDSS31**		Internal 100

COURSE OUTCOMES

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

CO1 : recall e-commerce framework components, and distinguish between consumer and organizational applications. [K1]

CO2 : identify internet terminology, architecture, components, and types of ISPs (local, regional, national). [K1]

CO3 : understand e-commerce architecture, web technology, and security challenges in online transactions. [K2]

CO4 : describe electronic payment systems and EDI-related legal, security, and privacy issues. [K2]

CO5 : apply knowledge of consumer search tools and software agents to improve e-commerce experiences. [K3]

UNIT I

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

(3 Hours)

UNIT II

The Internet as a Network Infrastructure: The Internet Terminology – NSFNET: Architecture and Components – National Research and Education Network – Internet Governance: The Internet Society – An overview of Internet Applications. (3 Hours)

UNIT III

E-Commerce and the World Wide Web: Architectural Framework for Electronic

commerce – World Wide Web (WWW) as the architecture – Technology behind the web – Security and the web. (3 Hours)

UNIT IV

Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token-Based Electronic Payment Systems – Credit Card-Based Electronic Payment Systems – Risk and Electronic Payment Systems. **Interorganizational Commerce and EDI:** EDI: Legal, Security and Privacy issues. (3 Hours)

UNIT V

Consumer Search and Resource Discovery: Electronic Commerce Catalogs or Directories – Information Filtering – Consumer-Data Interface: Emerging tools. **Software Agents:** Characteristics and Properties of Agents – The Technology behind Software Agents – Applets, Browsers, and Software Agents. (3 Hours)

SELF STUDY: (Not included for Examination)

The Business of Internet Commercialization (Sections: 4.1- 4.4)

TEXT BOOK

Ravi Kalakota, Andrew B. Whinston. (1995). *Frontiers of Electronic Commerce,* Addison Wesley.

UNIT	CHAPTER	SECTIONS
I	1	1.1 – 1.5
II	3	3.1, 3.3, 3.4, 3.6, 3.7
III	6	6.1, 6.2, 6.4, 6.5
IV	8	8.1, 8.2, 8.4, 8.5
	9	9.3
V	14	14.3 – 14.5
	16	16.2, 16.3, 16.6

REFERENCE BOOKS

1. Efraim Turvan J. Lee, David kug and chung. (2002). *Electronic commerce*, Pearson Education, Asia.

2. Marilyn Greenstein, Miklos A. Vasarhelyi. (2001). *Electronic Commerce: Security, Risk Management,* 2nd Edition, McGraw-Hill Publishing Co.

WEB RESOURCES

1. https://www.the-reference.com/en/expertise/creation-and.../e-commerce
2. https://en.wikipedia.org/wiki/E-commerce
3. https://www.tutorialspoint.com/e_commerce/index.htm

Course Code 24UDSS31	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	1	2	1	1	1	2	2	1	-
CO2	2	2	2	1	2	2	2	2	1	-
CO3	2	2	2	2	3	2	2	2	1	-
CO4	2	2	2	2	1	2	2	3	2	1
CO5	2	2	2	3	3	2	3	2	2	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. V. Subhasini
Course Designer

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B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester III	**PHP PROGRAMMING**	Hours/Week: 2	
SEC - 4		Credits: 2	
Course Code **24UDSS32**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : describe the basics concepts of PHP. [K1]

CO2 : recall operators, control structures, arrays, functions and database operations. [K1]

CO3 : infer the usage of PHP variables, operators, functions, database and cookies. [K2]

CO4 : interpret the concepts of control flow, arrays and cookies in PHP. [K2]

CO5 : apply the concepts of basic programming, functions, arrays, database and cookies in PHP programs. [K3]

UNIT I

Introduction: Getting PHP – Creating a First PHP Page – Running First PHP Page – Mixing HTML and PHP – Working with Variables – Storing Data in Variables – Creating Variables – Creating Constants – Understanding PHP's Internal Data Types. **Operators and Flow Control:** PHP's Math Operators – Working with the Assignment Operators – Incrementing and Decrementing Values. PHP String Operators. (5 Hours)

UNIT II

Operators and Flow Control: Bitwise Operators – Execution Operators – PHP Operator Precedence – Using the if Statement – PHP Comparison Operators – PHP Logical Operators – else Statement – elseif Statement – Ternary Operators – Switch Statement – Using for Loops – Using while Loops – Using do..while Loops. (6 Hours)

UNIT III

Strings and Arrays: Arrays – Modifying Data in Arrays – Deleting Array Elements – Handling Arrays with Loops – PHP Array Functions – Extracting Data from Arrays – Sorting Arrays - Using PHP's Array Operator – Comparing Arrays to Each Other – Handling Multidimensional Arrays – Using Multidimensional Arrays in Loops. (7 Hours)

UNIT IV

Creating Functions: Creating Functions in PHP – Passing Functions – Passing Arrays to Functions – Passing by Reference – Using Default Arguments – Passing Variable Numbers of Arguments – Returning Data from Functions – Returning Arrays – Returning Lists – Returning References. (6 Hours)

UNIT V

Working with Databases: What Is a Database? – Creating a MySQL Database – Creating a New Table – Putting Data into the New Database – Accessing the Database in PHP – Updating Databases – Inserting New Data Items into a Database – Deleting Records. **Sessions, Cookies, and FTP:** Setting a Cookie –Reading a Cookie – Setting Cookies Expiration – Deleting Cookies. (6 Hours)

SELF STUDY: (Not included for Examination)

Working with Databases: Creating New Tables – Creating a New Database – Sorting Data (Pages: 385 - 394)

TEXT BOOK

Steven Holzner. (2011). *PHP: The Complete Reference*, TATA McGraw-Hill Edition.

UNIT	CHAPTER	PAGES
I	1	3 - 5, 8 - 13, 26 - 30, 33 – 39
	2	41 – 50
II	2	51 – 75
III	3	92 - 115
IV	4	123 – 143
V	10	362, 364 – 385
	11	395 - 402

REFERENCE BOOKS

1. DT Editorial Services. *HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*, Paperback 2016, 2nd Edition.
2. Alan Forbes. *The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL*.
3. Lynn mighley and Michael Morrison. (2009). *Head First PHP & MySQL: A Brain-Friendly Guide*

Course Code 24UDSS32	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	3	3	2	2	3	3	2	-
CO2	3	3	2	2	2	2	2	2	2	-
CO3	3	3	2	2	3	3	2	2	3	-
CO4	3	2	2	2	2	2	2	2	3	-
CO5	3	2	2	2	2	2	3	3	3	-

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. R. Sabitha
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B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester IV	**OBJECT ORIENTED PROGRAMMING WITH JAVA**	Hours/Week: 5	
Core Course – 7		Credits: 5	
Course Code **24UDSC41**		Internal 25	External 75

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1: describe data types, operators, expressions, control statements and object oriented paradigm. [K1]
CO2: infer user-defined packages, interface, applet, multi-threads and exceptions. [K2]
CO3: illustrate basics of java, arrays, strings, vectors, polymorphism and applets. [K2]
CO4: employ data types, operators, expressions, control statements and object oriented paradigm. [K3]
CO5: implement inheritance, packages, interfaces, exception handling, multi-threading and applets. [K3]

UNIT I

Overview of Java Language: Introduction - Simple Java program - More of Java - An Application with two classes - Java Program Structure - Java Tokens - Java Statements - Implementing a Java Program - Java Virtual Machine - Command Line Arguments.

Operators and Expressions: Introduction - Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators - Special Operators - Arithmetic Expressions- Evaluation of Expressions - Precedence of Arithmetic Operators - Type Conversion in Expressions - Operator Precedence and Associativity - Mathematical Functions.

(15 Hours)

UNIT II

Decision Making and Branching: Introduction - Decision Making with If Statement -Simple If Statement - The If…Else Statement - Nesting of If…Else Statements - The Else If Ladder - The Switch Statement -The ?: Operator.

Decision Making and Looping: Introduction - while Statement - do Statement - for statement - Jumps in Loops - Labeled Loops.

Classes, Objects and Methods: Introduction - Defining a Class - Methods Declaration - Creating Objects - Accessing Class Members - Constructors - Method Overloading - Static Members - Nesting of Methods – Inheritance: Extending a Class.

(15 Hours)

UNIT III

Arrays, Strings and Vectors: Introduction - One-dimensional Arrays - Creating an Array - Two-dimensional Arrays - Strings - Vectors - Enumerated types.

Interfaces: Multiple Inheritance: Introduction - Defining Interfaces - Extending Interfaces - Implementing Interfaces - Accessing Interface Variables.

Packages: Putting Classes Together: Introduction - Java API Packages - Using System Packages - Naming Conventions - Creating Packages - Accessing a Package - Using a Package - Adding a Class to a Package. (15 Hours)

UNIT IV

Multithreaded Programming: Introduction - Creating Threads - Extending the Thread Class - Stopping and Blocking a Thread - Life Cycle of a Thread - Using Thread Methods - Thread Exceptions.

Managing Errors and Exceptions: Introduction - Types of Errors - Exceptions - Syntax of Exception Handling Code - Multiple Catch Statements - Using finally Statement - Throwing Our Own Exceptions. (15 Hours)

UNIT V

Applet Programming: Introduction - How Applets differ from Applications – Preparing to write Applets - Building Applet Code - Applet Life Cycle - Creating an Executable Applet - Designing a Webpage - Applet Tag - Adding Applet to HTML File - Running the Applet. (15 Hours)

SELF-STUDY: (Not included for Examination)

Java Evolution (Pages: 10 – 21)

TEXT BOOK

E.Balagurusamy (2015), *Programming with Java - A Primer,* 7th Edition, McGraw Hill Company, India.

UNIT	CHAPTER	PAGES
I	3	3.1 - 3.7, 3.9 - 3.11
	5	5.1 - 5.14
II	6	6.1 - 6.8
	7	7.1 - 7.5, 7.7
	8	8.1 - 8.11
III	9	9.1 - 9.6, 9.8
	10	10.1 - 10.5
	11	11.1 - 11.8
IV	12	12.1 - 12.7
	13	13.1 - 13.7
V	14	14.1 - 14.10

REFERENCE BOOKS

1. Debasish Jana. (2008). *Java and Object-Oriented Programming Paradigm*, Prentice Hall of India Private Limited, New Delhi.
2. Y. Daniel Liang. (2010). *Introduction to Java Programming*, 7th Edition, Pearson Education India
3. Dr. Somasundaram. (2013). *Introduction to Java Programming,* 1st Edition, Jaico Publishing House, India.

WEB RESOURCES

1. https://javabeginnerstutorial.com/core-java-tutorial
2. http://docs.oracle.com/javase/tutorial/
3. https://www.coursera.org/

Course Code 24UDSC41	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	2	3	2	2	2	2	-	-
CO2	3	3	2	3	2	2	3	3	-	-
CO3	3	3	2	3	2	2	3	3	-	-
CO4	3	3	2	3	3	3	3	3	3	2
CO5	3	3	2	3	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. S. Veni
Course Designer

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Quality Education with Wisdom and Values

B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester IV	**OBJECT ORIENTED PROGRAMMING WITH JAVA PRACTICAL**	Hours/Week: 4	
Core Course – 8 Practical IV		Credits: 3	
Course Code **24UDSC41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write Java programs using arrays, strings, methods, inheritance, interface and threads. [K2]

CO2: write Java programs using packages, exceptions, interfaces and applets. [K2]

CO3: execute Java programs for various inputs. [K3]

CO4: prepare record with Java programs using basic object oriented programming concepts, packages, multi-threads and exception concepts. [K3]

CO5: implement simple graphical methods using Applet. [K3]

Write a Java program for the following

1. To print all the prime numbers between two limits
2. To reverse the digits of the given number and check whether the given number is palindrome or not.
3. To print the Pascal triangle.
4. To count odd and even numbers in the given array of numbers.
5. To transpose the given matrix.
6. To find sum of elements in the array.
7. To calculate volume of three shapes implementing Method Overloading concept.
8. To perform String Manipulation:
   a. String length
   b. String concatenation
   c. Finding a character at a particular position
   d. String comparison
9. To perform string operations using String Buffer class:

a. Length of a string
b. Reverse a string
c. Delete a substring from the given string

10. To prepare student mark sheet using Single Inheritance concept.
11. To prepare an EB bill of a customer using Multilevel Inheritance concept.
12. To perform arithmetic operations using package.
13. To prepare a pay bill of an employee using Interface concept.
14. To implement a multi-thread application that has two threads by generating odd and even numbers.
15. To implement a multi-thread application which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2
16. To demonstrate the use of following exceptions:
    a. ArithmeticException
    b. NumberFormatException
    c. ArrayIndexOutofBoundException
    d. NegativeArraySizeException
17. To handle User defined Exception.
18. To simulate a traffic light in Applet.
19. To draw our national flag in the AppletViewer screen.

Course Code 24UDSC41P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	2	2	3	1	1	3	-	-
CO2	3	3	3	2	3	2	1	3	-	-
CO3	3	3	3	2	2	2	2	3	2	-
CO4	3	3	3	1	2	2	2	3	3	2
CO5	3	3	3	2	3	2	3	3	2	2

Strong (3) **Medium (2)** **Low (1)**

Mrs. P. Aruna Devi
Head of the Department

Mrs. S. Veni
Course Designer

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B.Sc. Data Science

(2024-2025 onwards)

Semester IV	**INTRODUCTION TO LINEAR ALGEBRA**	Hours/Week: 4	
Elective Course		Credits: 4	
Course Code **24UDSA41**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: define the concepts in vector spaces, inner product spaces and theory of matrices. [K1]

CO2: explain the fundamental concepts of Linear Algebra. [K2]

CO3: explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension, Linear Transformations, their Matrix representation. [K2]

CO4: apply the properties of vector spaces, linear transformations, inner product spaces and matrices to solve variety of problems. [K3]

CO5: find the dimension, rank, nullity, matrices from a linear transformation and inner product of a vector space. [K3]

UNIT I

Linear Equations in Linear Algebra: Systems of linear equations – Row Reduction and Echelon Forms – Vector Equations – Linear Combinations – Linear Combinations in applications. (12 hours)

UNIT II

Linear Equations in Linear Algebra Continued: Introduction to Linear Transformation – Matrix Transformation – Linear Transformations – The Matrix of a Linear Transformations.

Vector Spaces : Vector Spaces and Subspaces – A Subspace spanned by a set. (12 hours)

UNIT III

Vector Spaces Continued: Null Spaces, Column Spaces and Linear Transformations - Kernel and Range of a Linear Transformations - Linearly Independent Sets; Bases – The Spanning Set Theorem – Bases for Nul *A* and Col *A* – Two views of a Basis – The

Dimension of a Vector Space – Subspaces of a Finite-Dimensional Space – The Dimensions of Nul A and Col A – Rank. (12 hours)

UNIT IV

Eigenvalues and Eigenvectors: Eigenvalues and Eigenvectors – The Characteristic Equation – Determinants – Similarity – Diagonalization – Diagonalizing Matrices – Matrices whose eigenvalues are not distinct – Eigenvectors and Linear Transformations - Linear Transformations from V into V - Linear Transformations on $\mathbb{R}^n$ – Similarity of Matrix Representations. (12 hours)

Unit V

Orthogonality and Least Squares: Inner Product, Length and Orthogonality – Length of a Vector - Orthogonal Vectors – Orthogonal Complements – Orthogonal Sets – Orthonormal Sets. (12 hours)

TEXT BOOK

David C. Lay, Steven R. Lay and Judi J. McDonald (2018), *Linear Algebra and its Applications*, 5th Edition, Pearson Education Asia.

Unit	Chapter	Page No.
I	1	1-19, 24-31
II	1	63-73
	4	191-197
III	4	200-215, 227-237
IV	5	267-294
V	6	331-346

REFERENCE BOOKS

1. Gilbert Strang (2007), *Linear Algebra and its Applications*, Thomson Brooks/Cole. 4th Edition.
2. Stephen H Friedberg, Arnold J Insel and Lawrence E Spence (2018), Linear Algebra, Pearson 5th edition.
3. S. Lang,(2005). *Introduction to Linear Algebra*, 2nd Ed., Springer.

Web Resources:

Web resources from NDL Library, E-content from open-source libraries

Course Code 24UDSA41	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	3	2	3	3	2	1	-
CO2	3	2	3	3	2	1	-
CO3	3	2	3	3	2	1	-
CO4	3	2	3	3	2	2	1
CO5	3	2	3	3	1	1	-

Strong (3) Medium(2) Low(1)

Dr.M.C. Maheswari
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S. Swathi Sundari
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester IV	**CYBER FORENSICS**	Hours/Week: 2	
SEC – 5		Credits: 2	
Course Code **24UDSS41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : recall the basic concepts, tools, and steps involved in computer forensics, evidence handling, digital preservation, forensic analysis, and network investigations across all domains. [K1]

CO2 : identify key terminologies, types of forensic technologies, evidence types, legal considerations, and digital forensic processes involved in investigating and preserving computer-based evidence. [K1]

CO3 : describe computer forensics is applied in law enforcement, employment, data recovery, evidence authentication, and network intrusion analysis. [K2]

CO4 : interpret the methodologies used in collecting digital evidence, processing crime scenes, analyzing forensic data, reconstructing past events, and handling file and network artifacts. [K2]

CO5 : apply appropriate forensic techniques to perform end-to-end digital investigations including evidence collection, preservation, analysis, and reporting in various digital environments. [K3]

UNIT I

Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources / Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: - Types of Business Computer Forensic Technology. (6 Hours)

UNIT II

Computer Forensics Evidence and capture: Data Recovery: Data Recovery Defined - Data Back-up and Recovery - The Role of Back-up in Data Recovery - The Data - Recovery Solution.

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options – Obstacles - Types of Evidence - The Rules of Evidence - Volatile Evidence - General Procedure - Collection and Archiving - Methods of Collections - Art facts - Collection Steps. (6 Hours)

UNIT III

Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene - Computer Evidence processing steps - Legal Aspects of collecting and Preserving Computer forensic Evidence.

Computer Image Verification and Authentication: Special needs of Evidential Authentication - Practical Consideration - Practical Implementation. (6 Hours)

UNIT IV

Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool.

Identification of Data: Time Travel - Forensic Identification and Analysis of Technical Surveillance Devices. (6 Hours)

UNIT V

Reconstructing Past Events: How to Become a Digital Detective - Useable File Formats - Unusable File Formats - Converting Files.

Networks: Network Forensics Scenario - a technical approach - Destruction of E–Mail - Damaging Computer Evidence - Documenting - The Intrusion on Destruction of Data - System Testing. (6 Hours)

SELF STUDY: (Not included for Examination)

Controlling Contamination: The chain of Custody (Pages: 132 – 138)

TEXT BOOK

Vacca, R John. (2002). *Computer Forensics: Computer Crime Scene Investigation*, Charles River Media, Massachusetts.

UNIT	CHAPTER	PAGES
I	1	1 – 14
	2	45 – 48
II	4	95 – 117
	5	121 – 132
III	6	143 – 159
	7	164 – 176
IV	8	183 – 187
	9	192 – 204
V	10	210 – 216
	11	220 - 230

REFERENCE BOOKS

1. Keith J Jones, Richard Bejitlich, Curtis W. Rose, *Real Digital Forensics*, Addison-Wesley Pearson Education.
2. Tony Sammes and Brain Jenkinson. *Forensic Compiling, A Tractitioneris Guide*, Springer International Edition.
3. Chrostopher L.T. Brown. *Computer Evidence Collection & Presentation*, Firewall Media.
4. Jesus Mena. *Homeland Security, Techniques & Technologies* Firewall Media.
5. Robert M.Slade. (2005). *Software Forensics Collecting Evidence from the Scene of a Digital Crime*, TMH.

Course Code 24UDSS41	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	2	1	1	2	2	1	2	1	2
CO2	3	2	1	2	2	2	1	2	1	2
CO3	2	3	2	2	2	2	2	2	1	2
CO4	2	2	3	2	3	3	2	2	2	3
CO5	2	2	3	3	3	3	3	3	3	3

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. P. Aruna Devi
Course Designer

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B.Sc. DATA SCIENCE
(2024 -2025 onwards)

Semester IV	**DATA MINING AND WAREHOUSING**	Hours/Week: 2	
SEC - 6		Credits: 2	
Course Code **24UDSS42**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : define data mining basics, data pre-processing, data warehousing and online analytical processing. [K1]

CO2 : identify associations, correlations and mining frequent patterns. [K1]

CO3 : summarize the usage of data pre-processing, classification, clustering and data warehouse operations. [K2]

CO4 : describe pre-processing methods, OLAP operations and various frequent item set mining methods. [K2]

CO5 : apply data mining algorithms to perform classification, clustering on particular data set. [K3]

UNIT I

Introduction: Data mining – Kinds of data mined – Kinds of Patterns mined. **Data Preprocessing:** An Overview – Data Cleaning – Data Integration – Data Reduction.

(6 Hours)

UNIT II

Data Warehouse and Online Analytical Processing: Data Warehouse: Basic Concepts – Data Warehouse Modeling: Data Cube and OLAP – Data Generalization by Attribute – Oriented Induction. (6 Hours)

UNIT III

Mining frequent patterns, Associations and Correlations: Basic Concepts and Methods Basic Concepts – Frequent Itemset Mining Method – Pattern Evaluation methods.

(6 Hours)

UNIT IV

Classification: Basic Concepts – Decision Tree Induction - Attribute Selection Measures -Tree Pruning. **Advanced Methods:** Classification by Back Propagation.

(6 Hours)

UNIT V

Cluster Analysis: **:** Cluster Analysis – Partitioning Methods - Hierarchical Methods – Density Based Methods. (6 Hours)

SELF STUDY: (Not included for Examination)

Data Mining Trends. (Section 13.5)

TEXT BOOK

Jiawei Han and Micheline Kamber, Jian Pei. (2016). *Data Mining Concepts and Techniques*, 3rd Edition, New Delhi: Morgan Kaufmann Publishers, An imprint of Elsevier.

UNIT	CHAPTER	SECTIONS
I	1	1.2 - 1.4
	3	3.1 - 3.4
II	4	4.1, 4.2, 4.5
III	6	6.1 – 6.2.1, 6.2.3
IV	8	8.1, 8.2.1 - 8.2.3
	9	9.2
V	10	10.1 - 10.4

REFERENCE BOOKS

1. Mehmed Kantardzic. (2011). *Data mining Concepts, Models, Methods, and Algorithms*, 2nd Edition, New Delhi: Wiley Inter science.
2. Alex Berson, & Stephen J. Smith. (2016). *Data Warehousing, Data Mining and OLAP*, Mumbai: Tata McGraw Hill Edition, 35th Reprint 2007.
3. Soman, K.P. Shyam Diwakar and Ajay, V. (2014). Insight *into Data Mining Theory and Practice*, New Delhi: PHI Learning Private Limited, Eastern Economy Edition, Seventh Printing.
4. Ian H. Witten, Eibe Frank, Mark A. Hall and Christopher J. Pal (2017). *Data Mining: Practical Machine Learning Tools and Techniques*, 4th Edition, New Delhi: Elsevier – Morgan Kaufmann an imprint of Elsevier.

Course Code 24UDSS42	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	2	2	2	1	1	1	1	-	-
CO2	2	2	2	2	2	2	1	1	-	-
CO3	3	3	3	2	2	2	2	2	-	-
CO4	3	3	3	3	2	3	3	3	1	-
CO5	3	3	3	3	3	3	3	3	1	-

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. R. Sabitha
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	Hours/Week: 6	
Core Course - 9		Credits: 6	
Course Code **24UDSC51**		Internal 25	External 75

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1: understand the basic concepts of data base system management systems and PL/SQL. [K1]

CO2: Describe various SQL functions, subqueries, joins, and their applications in data retrieval and manipulation. [K2]

CO3: illustrate database operations by utilizing relational algebra and PL/SQL, normalization methods, and the E-R model. [K2]

CO4: Develop and execute PL/SQL blocks with control structures, procedures, and functions. [K3]

CO5: Implement exception handling, triggers, and cursors in PL/SQL for effective database management. [K3]

UNIT I

Database Basics, Software Analysis and Design, Data Flow Diagram and ER Model: Introduction – Database System – Characteristic of Database Management System – Database Management System Architecture – Database Models – System Development Life Cycle – Entity Relationship Model (ER Model). (18 Hours)

UNIT II

Relational Algebra and Normal Forms: Relational Database Model – Structure of Relational Model – Keys – Relational Algebra – Normalization – Functional Dependency – First Normal form – Second Normal Form – Third Normal form – Boyce-Codd Normal Form – Fourth Normal Form. (18 Hours)

UNIT III

SQL Basics, Functions, Subquery and Joins: Introduction – Data Retrieval – Single Row Functions – Group Functions – Set Functions – Subquery – Joins. **Data Manipulation Language, Objects, Constraints and Security in Oracle:** Introduction – The Insert Statement – The Update Statement – The Delete Statement – Transaction Control Language – Defining Constraints. (18 Hours)

UNIT IV

Oracle PL/SQL Basics: Introduction - PL/SQL Basics - PL/SQL Structure. **Function, Procedure and Package:** Introduction – Subprograms – Functions – Procedures. (18 Hours)

UNITV

Oracle Exception Handler, Database Triggers and Implicit Cursor: Introduction – Exception Handler – Database Trigger – Implicit Cursor. **Explicit and Advance Cursors:** Introduction – Explicit Cursor – Loops in Explicit Cursor. (18 Hours)

SELF-STUDY: (Not included for Examination)

Data Manipulation Language, Objects, Constraints and Security in Oracle: View (Section: 6.7)

TEXT BOOK

Pranab Kumar Das Gupta and P. Radha Krishnan. (2013). *Database Management System Oracle SQL and PL/SQL*", 2nd Edition, PHI Learning Private Limited.

UNIT	CHAPTER	SECTIONS
I	1	1.1-1.5, 1.8, 1.10
II	2	2.3 – 2.13
III	5	5.1,5.2,5.4-5.8
	6	6.1-6.5,6.10
IV	7	7.1-7.3
	8	8.1-8.4
V	9	9.1-9.4
	10	10.1-10.3

REFERENCE BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan. (2020). *Database System Concepts*, 7th Edition, McGraw Hill International Publication.

2. Shio Kumar Singh. *Database Systems*, 2nd Edition, Pearson publications.
3. Ramez Elmasri, Shamkant B. Navathe. (2016). *Fundamentals of Database Systems*, 7th Edition, Pearson Education Pvt. Ltd, India.

Course Code 24UDSC51	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	1	3	1	1	1	2	2	1	-
CO2	2	3	3	1	2	2	2	3	1	-
CO3	3	3	2	2	3	2	2	2	1	-
CO4	3	2	2	2	1	3	3	3	2	-
CO5	3	3	2	3	3	3	3	3	2	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**SOFTWARE METRICS**	Hours/Week: 6	
Core Course – 10		Credits: 6	
Course Code **24UDSC52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recall fundamental concepts of software measurement, measurement scales, empirical investigation, and software quality models. [K1]

CO2: explain the scope of software metrics, goal-based measurement frameworks, data collection methods, and internal/external product attributes related to software measurement. [K2]

CO3: interpret different measurement models, data analysis techniques, software size and structure attributes, and reliability growth models used in software engineering. [K2]

CO4: apply statistical techniques for analyzing software measurement data, assess software size and structure, and evaluate measurement validation methods. [K3]

CO5: utilize measurement techniques to predict software quality, maintainability, usability, security, and reliability, demonstrating an ability to apply knowledge to practical scenarios. [K3]

UNIT I

Measurement: Measurement in Software Engineering - Scope of Software Metrics. **The Basics of measurement**: The Representational Theory of Measurement - Measurement and models - Measurement Scales and Scale Types - Meaningfulness in Measurement.

(18 Hours)

UNIT II

A Goal-Based Framework for Software Measurement: Classifying software measures - Applying the framework - Software Measurement Validation - Performing Software Measurement Validation. **Empirical Investigation**: Planning Experiments.

(18 Hours)

UNIT III

Software Metrics Data Collection: Defining good Data - Data collection for incident reports - How to collect Data. **Analyzing Software Measurement Data**: Statistical Distributions and Hypothesis Testing - Classical Data Analysis Techniques - Examples of simple Analysis Techniques: Box Plots, Bar Charts, Control Charts, Scatter Plots. (18 Hours)

UNIT IV

Measuring Internal Product Attributes: Size: Properties of Software Size - Code Size - Design Size - Requirements Analysis and Specification Size. **Measuring Internal Product Attributes: Structure:** Aspects of Structural Measures - Control Flow Structure of Program Units - Design-Level Attributes. (18 Hours)

UNIT V

Measuring External Product Attributes: Measuring aspects of Quality - Usability Measures - Maintainability Measures - Security Measures. **Software Reliability: Measurement and Prediction:** Basics of Reliability Theory - The Software Reliability Problem - Parametric Reliability Growth Models: The Jelinski–Moranda Model, The Littlewood Model - Predictive Accuracy. (18 Hours)

SELF-STUDY: (Not included for Examination)

Measuring Internal Product Attributes: Size: Functional Size Measures and Estimators, Applications of Size Measures. (Sections: 8.5, 8.6)

TEXT BOOK

Norman Fenton, James Bieman. (2014). *Software Metrics A Rigorous and Practical Approach*, 3rd Edition.

UNIT	CHAPTERS	SECTIONS
I	1	1.2, 1.3
	2	2.1-2.4
II	3	3.1, 3.3-3.5
	4	4.2
III	5	5.1-5.3
	6	6.1, 6.2, 6.3.1-6.3.4
IV	8	8.1-8.4
	9	9.1-9.3
V	10	10.2-10.5
	11	11.1-11.2,11.3.1,11.3.3, 11.4

REFERENCE BOOKS

1. Norman E, Fenton and Shari Lawrence P fleeger. (1997). *Software metrics*, International Thomson Computer Press.
2. Stephen H.Kan. (2002). *Metric and models in software quality engineering*, 2nd Edition, Addison Wesley Professional.
3. Robert B.Grady. (1992). *Practical Software Metrics for Project Management and Process Improvement*, Prentice Hall.

Course Code 24UDSC52	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	3	1	1	1	1	1	1	-
CO2	3	3	3	1	1	2	1	1	1	-
CO3	3	3	2	1	2	2	1	2	2	-
CO4	3	3	2	2	2	3	2	2	2	1
CO5	3	3	2	2	2	3	2	2	2	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**RELATIONAL DATABASE MANAGEMENT SYSTEM PRACTICAL**	Hours/Week: 5	
Core Course 11 Practical - V		Credits: 3	
Course Code **24UDSC51P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write SQL statements to create and manipulate tables using DDL & DML and display using DQL statements. [K2]

CO2: write PL/SQL programs using functions, procedures, exceptions, cursors and triggers. [K2]

CO3: enter and execute programs for different database and interactive user inputs. [K3]

CO4: generate the results and prepare the output in the required format. [K3]

CO5: examine the results of database query statements in various environments such as command prompt, admin window and user-interactive programs. [K3]

Write SQL commands for the following

1. Create and manipulate the employee pay details using DDL and DML commands.
2. Create a student table with the following constraints: Primary Key, Foreign Key, Unique, Check, Not Null.
3. Manipulate students mark details using aggregate functions.
4. Implement different types of set operations.
5. Implement different types of join operations.
6. Apply nested queries on employee details.

Write PL/SQL programs for the following

1. Check if a student has passed or failed based on marks using IF-ELSE.
2. Use a FOR loop to display the first 10 natural numbers.
3. Use a WHILE loop to calculate factorial of a given number.
4. Display the name of the department with the maximum number of employees.
5. Calculate the student grade using case statement.

6. Calculate incentive achieved according to the specific sale limit.
7. Use built-in exception for bank customer details.
8. Handle user-defined exception for inventory details.
9.Use implicit cursor to list all student names and their courses.
10. Find the highest salary of an employee using explicit cursor.
11. Prepare EB-Bill for a customer using procedure.
12. Calculate simple and compound interest using user defined function.
13. Raise the trigger after every insertion and deletion.
14. Use TCL Commands (Commit, Rollback, Savepoint)

Course Code 24UDSC51P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	2	2	3	2	2	2	1	2
CO2	3	3	2	2	3	2	2	2	1	2
CO3	2	3	3	1	1	1	1	1	1	-
CO4	2	2	3	1	1	1	1	1	1	-
CO5	3	3	3	2	3	3	2	3	1	-

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. M. Suguna
Course Designer

V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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VIRUDHUNAGAR
Quality Education with Wisdom and Values

B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**PROJECT**	Hours/Week: 1
Core Course Project		Credits: 1
Course Code **24UDSC53PR**		Internal: 100

COURSE OUTCOMES

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

CO1: understand the problem for the project. [K2]

CO2: solve the problem by identifying the objective and project requirements. [K3]

CO3: collect the data for the problem domain and identify design methodologies based on the collected data. [K3]

CO4: implement the source code based on programming tools and techniques to solve the problem. [K3]

CO5: test the project work based on the formulated problem domain. [K4]

- Students are expected to select a project in the field of Computer Science or related interdisciplinary fields.
- Projects can be done individually or in a group of two students.
- Minimum pages for project report should be 20.
- A copy of the project report will be submitted to the Controller of Examinations through the Head of the Department in the month of November during V Semester.
- Evaluation will be done internally.

Project work & Report - 60 marks

Presentation & Viva-voce - 40 marks

Course Code 24UDSC53PR	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	2	3	1	2	2	2	2
CO3	3	3	2	3	3	2	3	2	2	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	3	3	3	3	3	3	2	2	3

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. V. Subhasini
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**OPERATING SYSTEM**	Hours/Week: 5	
Elective Course DSEC – 1		Credits: 4	
Course Code **24UDSE51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : recall the fundamental concepts and components of Operating Systems, including OS structure, services, scheduling, memory management, and file systems. [K1]

CO2 : infer key operating system concepts such as process management, CPU scheduling, synchronization mechanisms, memory management, and file system implementation. [K2]

CO3 : interpret techniques related to CPU scheduling, process synchronization, deadlock handling, and memory management in different OS scenarios. [K2]

CO4 : apply appropriate operating system techniques to solve real-world problems in process scheduling, synchronization, memory management, and file systems. [K3]

CO5 : implement solutions for memory management, file systems, and process synchronization based on real-time and system requirements. [K3]

UNIT I

Introduction - Operating Systems Do – Operating System Structure – **Operating-System Structures**: Operating System Services - User and Operating System interface - System Call- Types of System Calls – Operating System Design and Implementation. **Process Management**: Process concept- Process Scheduling - Operations on Processes- Interprocess Communication. (15 Hours)

UNIT II

CPU Scheduling: Basic Concepts-Scheduling Criteria - Scheduling Algorithms – Multiple-Processor Scheduling- Real-Time CPU Scheduling. **Process Synchronization**: The

Critical-Section Problem - Synchronization Hardware – Semaphores- Classic Problem of Synchronization. (15 Hours)

UNIT III

Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.

(15 Hours)

UNIT IV

Main Memory- Swapping - Contiguous Memory Allocation - Segmentation- Paging - Structure of the Page Table. **Virtual-Memory Management:** Demand Paging - Page Replacement - Allocation of Frames -Thrashing. (15 Hours)

UNIT V

File System Interface: File Concept - Access Methods- Directory and Disk Structure -File Sharing- Protection. **File-System Implementation:** Allocation Methods - Free- Space Management - Efficiency and Performance – Recovery. (15 Hours)

SELF STUDY: (Not included for Examination)

Multicore Programming, Multithreading Models (Pages : 166 -171)

TEXT BOOK

Silberschatz P.B. Galvin, Gange. (2013). *Operating System Concepts*, 9th Edition, Addison Wesley Publishing Company.

UNIT	CHAPTER	SECTIONS
I	1	1.1, 1.4
	2	2.1 – 2.4, 2.6
	3	3.1 - 3.4
II	6	6.1 – 6.3, 6.5, 6.6
	5	5.2, 5.4, 5.6, 5.7
III	7	7.2 - 7.7
IV	8	8.2 - 8.6
	9	9.2, 9.4 – 9.6
V	11	11.1-11.3, 11.5, 11.6
	12	12.4 - 12.7

REFERENCE BOOKS

1. Andrew S Tanenbaum, Albert S. Woodhull. *Operating System Design and Implementation,* Prentice-Hall India Publication.
2. William Stallings. (2018). *Operating Systems Internals and Design Principles*, 9th Edition, Pearson Publication.
3. Elmasri, Carrick, Levine. *Operating Systems: A Spiral Approach*, TMH Edition.

WEB RESOURCES

1. https://www.guru99.com/operating-system-tutorial.html
2. https://en.wikipedia.org/wiki/Operating_system
3. https://www.geeksforgeeks.org/what-is-an-operating-system/

Course Code 24UDSE51	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	2	1	1	1	1	1	1	1	1
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	2	3	2	3	3	2	2	2	2
CO4	3	3	3	2	3	3	3	2	3	2
CO5	3	3	3	3	3	3	3	2	3	2

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. P. Aruna Devi
Course Designer

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**CRYPTOGRAPHY**	Hours/Week: 5	
Elective Course DSEC – 1		Credits: 4	
Course Code **24UDSE52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : define the fundamental concepts of network security and its architecture. [K1]

CO2 : discuss symmetric, asymmetric and public-key cryptography. [K2]

CO3 : summarize the principles of firewalls and intrusion detection systems. [K2]

CO4 : apply classical encryption techniques to encrypt and decrypt messages. [K3]

CO5 : implement the algorithm and virus countermeasures to protect systems from malicious attacks. [K3]

UNIT I

Introduction: Services, Mechanisms and Attacks - The OSI Security Architecture – A Model for Network Security. (15 Hours)

UNIT II

Classical Encryption Techniques: Symmetric Cipher Model: Cryptography - Cryptanalysis - Substitution Techniques: Caesar Cipher - Monoalphabetic Ciphers - Playfair Cipher - Polyalphabetic Ciphers - One-Time Pad - Transposition Techniques – Steganography. (15 Hours)

UNIT III

Block Ciphers and the Data Encryption Standard: Block Cipher Principles – The Data Encryption Standard – The Strength of DES –**Public-Key Cryptography and RSA**: The RSA Algorithm. (15 Hours)

UNIT IV

IP Security: IP Security Overview - IP Security Architecture – Authentication Header. **Web Security:** Secure Sockets Layer and Transport Layer Security – Secure Electronic Transaction. (15 Hours)

UNIT V

Intruders: Intruders – Intrusion Detection – Password Management – **Malicious Software:** Viruses and Related Threats – Virus Countermeasures – **Firewalls**: Firewall Design Principles – Trusted Systems. (15 Hours)

SELF-STUDY: (Not included for Examination)

Hill Cipher (Pages: 37-40)

TEXT BOOK

William Stallings. (2002). *Cryptography and Network Security Principles and Practices*, 3rd Edition, Pearson.

UNIT	CHAPTER	SECTIONS
I	1	1.1 – 1.3
II	2	2.1 – 2.3, 2.5
III	3	3.2 - 3.4
	9	9.2
IV	16	16.1-16.3
	17	17.2, 17.3
V	18	18.1-18.3
	19	19.1, 19.2
	20	20.1, 20.2

REFERENCE BOOKS

1. Behrouz A. Foruzan. (2007). *Cryptography and Network Security*, Tata McGraw-Hill.
2. AtulKahate. (2003). *Cryptography and Network Security*, TMH, 2nd Edition.
3. M.V. Arun Kumar. (2011). *Network Security*, USP, 1st Edition.

WEB RESOURCES

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

Course Code 24UDSE52	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	2	1	1	1	1	3	2	-	-
CO2	2	2	2	2	1	1	2	2	-	-
CO3	3	2	1	3	2	1	2	2	2	2
CO4	3	2	3	3	2	3	2	2	2	2
CO5	3	2	3	3	2	3	2	3	2	2

Strong (3) Medium (2) Low (1)

Mrs. S. Rajapriya
Mrs. P. Aruna Devi Mrs. M. Suguna
Head of the Department **Course Designers**

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**OPERATING SYSTEM PRACTICAL**	Hours/Week: 5	
Elective Course DSEC – 2 Practical - I		Credits: 3	
Course Code **24UDSE53P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : understand the basic algorithms in scheduling and management. [K2]

CO2 : illustrate the techniques involved in memory management, storage management and its allocation strategies. [K2]

CO3 : demonstrate algorithms related to operating system concepts. [K3]

CO4 : implement programs using the techniques necessary for finding the solution to the allocation problems in operating system. [K3]

CO5 : examine the correctness of the solution for the given problem. [K3]

Write C/C++ program to implement the following

1. FCFS CPU Scheduling Algorithm
2. SJF CPU Scheduling Algorithm
3. Round Robin CPU Scheduling Algorithm
4. Priority CPU Scheduling Algorithm
5. Producer Consumer Problem with the help of semaphore
6. MFT Memory Management Technique
7. MVT Memory Management Technique
8. Best Fit Contiguous Memory Allocation
9. Worst Fit Contiguous Memory Allocation
10. First Fit Contiguous Memory Allocation
11. FIFO Page Replacement Algorithm
12. LRU Page Replacement Algorithm

13. Optimal Page Replacement Algorithm
14. FCFS Disk Scheduling Algorithm
15. SCAN Disk Scheduling Algorithm

Course Code 24UDSE53P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	2	2	2	2	2	2	1	2	1
CO2	2	2	2	2	2	2	2	1	2	1
CO3	3	3	3	2	3	3	3	2	3	1
CO4	3	3	3	2	3	3	3	2	3	1
CO5	3	3	3	3	3	3	3	2	3	2

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. P. Aruna Devi
Course Designer

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**CRYPTOGRAPHY PRACTICAL**	Hours/Week: 5	
Elective Course DSEC – 2 Practical - I		Credits: 3	
Course Code **24UDSE54P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : understand the basic cryptographic operations such as XOR, AND, and bitwise manipulation for text encoding. [K2]

CO2 : illustrate the concepts of symmetric and asymmetric encryption techniques. [K2]

CO3 : demonstrate encryption and decryption algorithms. [K3]

CO4 : implement programs using substitution and transposition techniques. [K3]

CO5 : design and develop software applications incorporating secure encryption methods. [K3]

Write C/Java program to implement the following

1. XOR each character in string with 0 and displays the result.
2. AND and XOR each character in the string with 127 and display the result.
3. Caesar Cipher technique.
4. Shift Cipher technique.
5. Caesar Cipher technique.
6. Vigenere Cipher technique.
7. Play fair Cipher technique.
8. Hill Cipher technique.
9. Rail fence Cipher technique.
10. Row - Columnar Transformation
11. DES algorithm.
12. RSA algorithm.
13. Blowfish algorithm.

Course Code 24UDSE54P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	2	1	1	2	2	2	2	-	-
CO2	3	2	1	2	2	2	2	2	-	-
CO3	3	3	2	2	3	3	2	2	1	-
CO4	3	3	2	2	3	3	2	2	1	-
CO5	3	3	2	2	3	3	2	2	-	-

Strong (3) Medium (2) Low (1)

Mrs. S. Rajapriya
Mrs. P. Aruna Devi Mrs. M. Suguna
Head of the Department **Course Designers**

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**INTERNSHIP**	Credits: 1
Internship		
Course Code **24UDSI51**		Internal: 100

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1 : observe, analyze, and understand organizational processes, systems, and cultures, and identify areas for further improvement. [K2]

CO2 : apply theoretical concepts learned in the classroom to Industry based problems. [K3]

CO3 : demonstrate professional skills, including team communication and work, and time management, and adhere to organizational norms and etiquette. [K3]

CO4 : develop industry ready graduates and lifelong learning. [K3]

CO5 : analyse problem-solving and critical thinking skills by identifying and addressing organizational challenges and problems. [K4]

Guidelines/ Regulations

- Each student must go for Internship training in a reputed Industry / Company / Organization/ Educational Institution.
- Students should produce the completion certificate after the completion of Internship period.
- A report of 10-15 pages must be submitted by each student after the completion of the Internship period.
- Internal Viva-voce examination will be conducted.
- Students with diverse disabilities must complete a 10 day internship programme at their preferred places.

Course Code 24UDSI51	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	3	2	2	2	2	2	2	3
CO2	3	3	3	2	3	2	2	2	2	3
CO3	3	3	2	3	3	2	3	2	2	3
CO4	3	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	3	2	2	3

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
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Mrs. S. Veni
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester V	**C AND C++ APTITUDE**	Credits: 2
Extra Credit Course		
Course Code **24UDSO51**		Internal: 100

COURSE OUTCOMES

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

CO1 : describe data types, expressions and user defined functions in C.

CO2 : explore the merits of object oriented programming.

CO3 : discuss dynamic memory management techniques using pointers, constructors, destructors.

CO4 : use virtual functions and templates efficiently.

CO5 : analyse an object oriented concept that suits an application.

UNIT I

Expressions in C – Floating Point Issues – Functions – The C Preprocessor.

UNIT II

Pointers in C – Pointers and Arrays – Pointers and Strings – Pointers and Structures

UNIT III

Classes in C++ – Memory management in C++ – Inheritance

UNIT IV

Virtual Functions in C++

UNIT V

Class Templates, function Templates in C++

REFERENCE BOOKS

1. Yashwant Kanetkar. (2005). *Test Your C Skills*, BPB Publications, New Delhi, India.
2. Yashwant Kanetkar. (2019). *Understanding Pointers in C & C++*, BPB Publications, New Delhi, India.
3. Yashwant Kanetkar. (2006). *Test Your C++ Skills*, BPB Publications, New Delhi, India.
4. Herbert Schildt. (2002). *C++ Complete Reference*, McGraw Hill Education, New Delhi, India.

Mrs. P. Aruna Devi
Head of the Department

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**MOBILE APPLICATIONS DEVELOPMENT**	Hours/Week: 6	
Core Course - 12		Credits: 5	
Course Code **24UDSC61**		Internal 25	External 75

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1 : identify and understand the basic Android widgets and application components. [K1]

CO2 : explain the attributes and functionalities of Android user interfaces, layouts, maps, SMS messaging, and storage mechanisms. [K2]

CO3 : describe Android widgets, dialogs and database management in Android applications. [K2]

CO4 : categorize and organize Android widgets, layouts, and components based on their roles and functionality. [K3]

CO5 : select the appropriate Android widgets, layouts, and storage solutions based on the application requirements. [K3]

UNIT I

Getting Started with Android Programming: What is Android: Android Versions, Features of Android, Architecture of Android - Obtaining the Required Tools: Eclipse, Android SDK, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs) – Create your First Android Application - Anatomy of an Android Application.

Activities, Fragments, And Intents: Understanding Activities: Applying Styles and Themes to Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog - Linking Activities Using Intents: Resolving Intent Filter Collision, Returning Results from an Intent, Passing Data Using an Intent Object. (18 Hours)

UNIT II

Getting to Know the Android User Interface: Understanding the Components of a Screen: Views and ViewGroups, LinearLayout, AbsoluteLayout, TableLayout, RelativeLayout, FrameLayout, ScrollView - Managing Changes to Screen Orientation:

Persisting State Information during Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity.

Designing your User Interface with Views: Using Basic Views: TextView View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView View - Using List Views to Display Long Lists: ListView View, Using the Spinner View. (18 Hours)

UNIT III

Data Persistence: Saving and Loading User Preferences: Using getSharedPreferences(), Using getPreferences() - Persisting Data to Files: Saving to Internal Storage, Saving to External Storage (SD Card) - Creating and Using Databases: Creating the DBAdapter Helper Class, Using the Database Programmatically, Pre-Creating the Database. (18 Hours)

UNIT IV

Messaging: SMS Messaging: Sending SMS Messages Programmatically, Sending SMS Messages Using Intent, Receiving SMS Messages - Sending E-mail - Networking: Downloading Binary Data, Downloading Text Files. (18 Hours)

UNIT V

Location-Based Services: Displaying Maps: Creating the Project, Obtaining the Maps API Key, Displaying the Map, Displaying the Zoom Control, Changing Views, Navigating to a Specific Location, Adding Markers, Getting the Location that was Touched, Geocoding and Reverse Geocoding. (18 Hours)

SELF STUDY: (Not included for Examination)

Designing your User Interface with Views: Using Picker Views: TimePicker View, DatePicker View. (Page No: 144-156)

TEXT BOOKS

Wei – Meng Lee, (2011). *Beginning Android Application Development,* Wiley India Edition.

UNIT	CHAPTER	PAGES
I	1	1-4, 6-25
	2	27-56
II	3	81-97, 104-111
	4	125-144, 156-165
III	6	203-216, 218-233

IV	**8**	**263-267, 269-273, 281-297**
V	**9**	**301-322**

REFERENCE BOOKS

1. Ed Burnette. (2010), *Hello Android: Introducing Google's Mobile Development Platform*, 3rd Edition, The Pragmatic Publishers.
2. Reto Meier (2012). *Professional Android 4 Application development*, John Wiley and Sons, Inc.
3. Prasanna Kumar Dixit (2014). *Android*, Vikas Publishing House Private Ltd, India.
4. John Horton (2015). *Android Programming for beginners*, 1st Edition, Packt Publishing, Birmingham, Mumbai, India.

WEB RESOURCES

1. https://www.tutorialspoint.com/mobile_development_tutorials.htm
2. https://www.tutorialspoint.com › Android › Android - Home

Course Code 24UDSC61	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	2	2	3	2	3	3	-	-
CO2	3	3	2	2	3	2	3	3	-	-
CO3	3	3	2	3	3	2	3	3	2	-
CO4	3	3	2	3	3	2	3	3	2	2
CO5	3	3	2	3	3	2	3	3	2	3

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
Head of the Department

Mrs. T.Chitra
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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**MACHINE LEARNING**	Hours/Week: 6	
Core Course – 13		Credits: 5	
Course Code **24UDSC62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : identify the appropriate supervised and unsupervised machine learning techniques for the given problem. [K1]

CO2 : understand a very broad collection of machine learning algorithms and problems. [K2]

CO3 : explain the concepts of supervised and unsupervised learning algorithms. [K2]

CO4 : apply machine learning algorithms to classification and regression problems, including binary and multiclass classification, using supervised learning algorithms (linear models, naive Bayes classifiers, decision trees, and neural networks) and evaluate model performance. [K3]

CO5 : implement suitable machine learning algorithms for a given problem, considering the type of learning (supervised or unsupervised), data characteristics, and performance metrics [K3]

UNIT I

Introduction: Why Machine Learning? – scikit-learn - Essential Libraries and Tools - A First Application: Classifying Iris Species. (16 Hours)

UNIT II

Supervised Learning: Classification and Regression - Generalization, Overfitting, and Underfitting - Supervised Machine Learning Algorithms: Some Sample Datasets – k-Nearest Neighbors - Linear Models - Naive Bayes Classifiers - Decision Trees - Neural Networks (Deep Learning) - Uncertainty Estimates from Classifiers. (20 Hours)

UNIT III

Unsupervised Learning and Preprocessing: Types of Unsupervised Learning - Challenges in Unsupervised Learning - Preprocessing and Scaling - Dimensionality Reduction, Feature Extraction, and Manifold Learning: Principal Component Analysis (PCA). (18 Hours)

UNIT IV

Unsupervised Learning and Preprocessing: Clustering - Agglomerative Clustering – DBSCAN. **Model Evaluation and Improvement:** Cross-Validation - Evaluation Metrics and Scoring: Metrics for Binary Classification - Using Evaluation Metrics in Model Selection. **(**17 Hours)

UNIT V

Representing Data and Engineering Features: Categorical variables – Binning, Discretization, Linear Models, and Trees - Interactions and Polynomials - Univariate Nonlinear Transformations - Automatic Feature Selection - Utilizing Expert Knowledge.

(19 Hours)

SELF-STUDY: (Not included for Examination)

Non-Negative Matrix Factorization (NMF) (PAGES: 156 - 163)

TEXT BOOK

Andreas C. Müller & Sarah Guido. (2017). *Introduction to Machine Learning with Python*, 1st Edition. O'Reilly Media.

UNIT	CHAPTER	PAGES
I	1	1 - 23
II	2	25 – 83, 104 - 127
III	3	131 - 155
IV	3	168 - 191
V	5	251 - 260, 276 - 296, 300 - 302
	4	211 - 250

REFERENCE BOOKS

1. Tom M. Mitchell. (2013). *Machine Learning*, McGraw-Hill Education (India) Private Limited.
2. Ethem Alpaydin. (2004). *Introduction to Machine Learning (Adaptive Computation and Machine Learning)*, The MIT Press.
3. Stephen Marsland. (2009). *Machine Learning: An Algorithmic Perspective*, CRC Press.

Course Code 24UDSC62	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	1	3	1	1	1	2	2	1	-
CO2	2	3	3	1	2	2	2	3	1	-
CO3	3	3	2	2	3	2	2	2	1	-
CO4	3	2	2	2	1	3	3	3	2	-
CO5	3	3	2	3	3	3	3	3	2	1

Strong (3) Medium (2) Low (1)

Mrs. P. Aruna Devi
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V.V.VANNIAPERUMAL COLLEGE FOR WOMEN
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Quality Education with Wisdom and Values

B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**MOBILE APPLICATIONS DEVELOPMENT PRACTICAL**	Hours/Week: 6	
Core Course – 14 Practical - VI		Credits: 3	
Course Code **24UDSC61P**		Internal 40	External 60

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1 : apply knowledge of Android UI components and to build functional user interfaces in Android projects. [K2]

CO2 : utilize interactive UI components to create dynamic and responsive Android applications. [K2]

CO3 : build and execute Android applications incorporating intents and databases. [K3]

CO4 : create detailed documentation outlining the steps and procedures for mobile application development. [K3]

CO5 : analyze and apply appropriate layouts, widgets, listeners, and components for efficient Android application development. [K3]

Develop Android applications for the following

1. Simple Counter.
2. Display your personal details using GUI Components.
3. Simple Calculator that uses radio buttons and text view.
4. Intent and Activity.
5. Dialog Boxes.
6. Splash Screen.
7. Layout Managers.
8. Different types of Menus.
9. Send messages from one mobile to another mobile.
10. Send E-mail.
11. Play Audio and Video.

12. Local File Storage.
13. Simple Animation.
14. Login Page using Sqlite.
15. Student Marksheet processing using Sqlite.

Course Code 24UDSC61P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	3	1	1	3	2	2	2	1	2
CO2	3	3	1	1	3	2	3	2	1	2
CO3	3	3	2	1	3	2	3	2	1	3
CO4	3	3	3	2	3	2	3	2	2	2
CO5	3	3	2	2	3	3	3	3	3	3

Strong (3) Medium (2) Low (1)

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**BIG DATA ANALYTICS**	Hours/Week: 5	
Elective Course DSEC – 3		Credits: 4	
Course Code **24UDSE61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : recall the fundamental characteristics and evolution of Big Data, and the components of a Hadoop environment. [K1]

CO2 : understand the fundamental concepts and characteristics of Big Data and explain the architecture of Hadoop ecosystem. [K2]

CO3 : describe the structure, data types, and architecture of MongoDB, Cassandra, Hive and Pig, and understand their use in big data processing. [K2]

CO4 : apply the components of the Hadoop ecosystem, such as the functioning of HDFS and data processing with MapReduce programming. [K3]

CO5 : develop queries and perform data manipulation using MongoDB, Cassandra, Hive and Pig for analyzing large-scale structured and semi-structured data. [K3]

UNIT I

Introduction to Big Data: Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – What is Big Data? – A Typical Data Warehouse Environment – A Typical Hadoop Environment. **The Big Data Technology Landscape:** Hadoop: Hadoop Distributions. **Introduction to Hadoop:** Why Hadoop? – Hadoop Overview – HDFS (Hadoop Distributed File System). (15 Hours)

UNIT II

Introduction to Hadoop: Interacting with Hadoop Ecosystem – Processing Data with Hadoop. **Introduction to MAPREDUCE Programming:** Introduction – Mapper – reducer – Combiner – Partitioner – Searching – Sorting – Compression. (14 Hours)

UNIT III

Introduction to Hive: What is Hive? – Hive Architecture – Hive Data Types – Hive File Format – Hive Query Language (HQL). **Introduction to Pig:** Data Types in Pig – Relational Operators – Eval Function – Complex Data Types. (15 Hours)

UNIT IV

Introduction to MongoDB: What is MongoDB? - Why is MongoDB? – Terms used in Mongo DB – Data Types in MongoDB – MongoDB Query Language: Insert Method – Save() Method – Adding a New Field to an Existing Document – Update Method – Removing an Existing Field from an Existing Document – Remove Method – Finding Document based on Search Criteria – Find Method – Dealing with NULL Values – Count, Limit, Sort, Skip – Arrays – Aggregate Function. (16 Hours)

UNIT V

Introduction to Cassandra: Apache Cassandra - An Introduction – Features of Cassandra – CQL Data types – CQLSH - Keyspaces – CRUD (Create, Read, Update and Delete) operations – Collections – Using a Counter – Time to Live (TTL) - Alter commands - Import and Export - Querying System Tables. (15 Hours)

SELF-STUDY: (Not included for Examination)

MongoDB Query Language: MapReduce Function – JavaScript Programming – Cursors in MongoDB – Indexes – Mongo Import – Mongo Export (Sections: 6.5.10 – 6.5.15)

TEXT BOOK

JSeema Acharya, Subhashini Chellappan. (2015). *Big Data and Analytics*, Wiley Publication.

UNIT	CHAPTER	SECTIONS
I	2	2.1 – 2.5, 2.10, 2.11
	4	4.2.5
	5	5.2, 5.7, 5.10
II	5	5.11,5.13
	8	8.1 – 8.8
III	9	9.1 – 9.5
	10	10.7, 10.11 – 10.13
IV	6	6.1 – 6.4, 6.5.1 – 6.5.9
V	7	7.1 – 7.12

REFERENCE BOOKS

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman. (2013). *Big Data for Dummies*, John Wiley & Sons, Inc.
2. Tom White. (2011). *Hadoop: The Definitive Guide*, O"Reilly Publications.
3. Kyle Banker. (2012). *Mongo DB in Action*, Manning Publications Company.
4. Russell Bradberry, Eric Blow. (2014). *Practical Cassandra A developers Approach*, Pearson Education.
5. Ramesh Sharda, Dursun Delen, Efraim Turban. (2018), *Business Intelligence*, Pearson Education Services Pvt Ltd.

WEB RESOURCES

1. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics
2. https://www.coursera.org/articles/big-data-analytics

Course Code 24UDSE61	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	2	2	1	3	2	2	1	-	-
CO2	3	2	2	1	3	2	2	1	-	-
CO3	3	2	2	1	3	2	3	1	-	-
CO4	3	3	3	2	3	3	3	2	1	-
CO5	3	3	3	2	3	3	3	2	1	1

Strong (3) Medium (2) Low (1)

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**NATURAL LANGUAGE PROCESSING**	Hours/Week: 5	
Elective Course DSEC – 3		Credits: 4	
Course Code **24UDSE62**		Internal 25	External 75

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1 : outline the fundamental concepts and techniques of natural language processing. [K1]

CO2 : summarize the approaches to syntax and semantics, information retrieval, NLG systems and lexical resources in NLP. [K2]

CO3 : infer the approaches to machine translation, discourse, generation, dialogue, word level and summarization. [K2]

CO4 : use NLP technologies to explore and gain a broad understanding of text data, language models, machine translation approaches and information retrieval systems.[K3]

CO5 : illustrate NLP methods to syntactic, semantic, word level analysis of a text document and use lexical resource to implement NLP systems. [K3]

UNIT I

Introduction: Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue – Applications – The role of machine learning – Probability Basics – Information theory – Collocations – N-gram Language Models – Estimating parameters and smoothing. (15 Hours)

UNIT II

Word level and Syntactic Analysis: Word Level Analysis: Regular Expressions – Finite – State Automata – Morphological Parsing – Spelling Error Detection and correction – Words and Word classes – Part-of Speech Tagging. **Syntactic Analysis:** Context-free Grammar – Constituency – Parsing – Probabilistic Parsing. (15 Hours)

UNIT III

Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation – Lexical Semantics – Ambiguity – Word Sense Disambiguation. **Discourse Processing:** Cohesion - Reference Resolution – Discourse Coherence and Structure**.**

(17 Hours)

UNIT IV

Natural Language Generation: Architecture of NLG Systems – Generation Tasks and Representations – Application of NLG. **Machine Translation:** Problems in Machine Translation. Characteristics of Indian Languages – Machine Translation Approaches – Translation involving Indian Languages. (14 Hours)

UNIT V

Information retrieval and lexical resources: Information Retrieval: Design features of Information Retrieval Systems – Classical, Non-classical, Alternative Models of Information Retrieval – Valuation Lexical Resources: World Net – Frame Net Stemmers – POS Tagger – Research Corpora SSAS. (14 Hours)

SELF-STUDY: (Not included for Examination)

Evaluating language models

TEXT BOOKS

1. Daniel Jurafsky, James H. Martin. (2015). *Speech & language processing*, Pearson publications.
2. James Allen. (1995). *Natural language understanding*, 2nd Edition, Pearson Education.

REFERENCE BOOKS

1. Pierre M. Nugues. (2006). *An Introduction to Language Processing with Perl and Prolog*, Springer-Verlag Berlin and Heidelberg GmbH.
2. Christopher D Manning, Heinrich Schütze. (1999). *Foundations of Statistical Natural Language Processing*, The MIT Press.
3. Tanveer Siddiqui, U. S. Tiwary. (2008). *Natural Language Processing and Information Retrieval*, Oxford University Press.

WEB RESOURCES

1. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics
2. https://www.coursera.org/articles/big-data-analytics

Course Code 24UDSE62	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	1	1	3	1	1	1	2	2	2	-
CO2	2	1	3	2	2	2	2	3	2	-
CO3	3	3	2	2	3	2	2	2	2	-
CO4	2	2	2	2	1	3	3	3	1	-
CO5	3	3	2	3	3	3	3	3	1	1

Strong (3) Medium (2) Low (1)

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**BIG DATA ANALYTICS PRACTICAL**	Hours/Week: 5	
Elective Course DSEC – 4 Practical - II		Credits: 3	
Course Code **24UDSE63P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : recall the basic CRUD operations, query operators, and projection techniques and use of aggregation operations for data processing and summarization in MongoDB. [K2]

CO2 : describe different data structures, functions and the implementation of data visualization techniques in R. [K2]

CO3 : apply MongoDB commands to perform Create, Read, Update, and Delete (CRUD) operations on collections and construct queries using projection and aggregation operations to retrieve and summarize specific data [K3]

CO4 : implement R programs using vectors, matrices, lists, and data frames for various data analysis tasks. [K3]

CO5 : create visualizations in R using bar plots, pie charts, box plots, scatter plots, and line graphs to represent data. [K3]

Write MongoDB programs for the following concepts:

1. Execute Where Clause, AND and OR operations.
2. Execute the Commands (Create, Insert, Update and Delete).
3. Develop query to select certain fields and ignore some fields of the documents from any collection.
4. Execute query selectors (comparison selectors, logical selectors, Geospatial selectors, Bitwise selectors)
5. Execute projection operators.
6. Execute Aggregation operations

Write R programs for the following concepts:

1. Data Structure (Vector, Matrix, List, Data frame)
2. Conditional and Iterative Statements
3. Mathematical functions
4. Statistical functions
5. Date functions
6. Bar Plot
7. Pie Chart
8. Box Plot
9. Scatter Plot
10. Line graph

Course Code 24UDSE63P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	3	2	2	2	2	2	3	2	1	-
CO2	3	2	1	2	1	2	1	2	-	-
CO3	3	2	2	2	3	2	3	2	1	-
CO4	3	2	2	1	2	2	1	3	-	-
CO5	3	3	2	3	3	3	2	2	2	1

Strong (3) Medium (2) Low (1)

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B.Sc. DATA SCIENCE
(2024 – 2025 onwards)

Semester VI	**NATURAL LANGUAGE PROCESSING PRACTICAL**	Hours/Week: 5	
Elective Course DSEC – 4 Practical - II		Credits: 3	
Course Code **24UDSE64P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : formulate input, procedure and algorithm for the specified problem. [K2]

CO2 : code and implement the algorithm. [K2]

CO3 : enter and execute the code with proper input. [K3]

CO4 : generate and record the output in required format. [K3]

CO5 : analyse the actual output with the expected output. [K3]

Write Python code for the following:

1. Write a Program to perform Lowercasing, Punctuation removal and Spelling correction.
2. Write a Program to perform Tokenization and Filtration.
3. Write a program for stop words, stemming and lemmatization of text.
4. Write a program to find all unigrams, bigrams and trigrams present in the given corpus.
5. Write a program to perform Regular Expression.
6. Write a program to perform Part of Speech (POS) Tagging.
7. Write a program to perform Name Entity Recognition.
8. Write a program to Perform Wordnet.
9. Write a program to Perform Word and Character n-grams.
10. Write a program to Perform Word Sense Disambiguation.
11. Write the python code to perform sentiment analysis using NLP.

12. Write the python code to develop Spam Filter using NLP.
13. Write the python code to detect Fake News using NLP/
14. Write a python program for CYK parsing (CockeYounger-Kasami Parsing) or Chart Parsing.

Course Code 24UDSE64P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	2	1	3	1	1	1	2	2	1	-
CO2	2	3	3	1	2	2	2	3	1	-
CO3	3	3	2	2	3	2	2	2	1	-
CO4	3	2	2	2	1	3	3	3	2	-
CO5	3	3	2	3	3	3	3	3	2	1

Strong (3) Medium (2) Low (1)

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Semester VI	**OPEN SOURCE SOFTWARE TECHNOLOGIES**	Hours/Week: 2	
SEC - 7		Credits: 2	
Course Code **24UDSS61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1 : define key concepts and functions of Linux, Unix and Apache Web Server. [K1]

CO2 : recall the syntax rules, commands and built-in functions in Perl, SQL and PHP. [K1]

CO3 : explain the functions and components of Linux and Unix systems, Apache server control mechanisms. [K2]

CO4 : describe the data types, operators, flow control structures and functions used in Perl, MYSQL and PHP. [K2]

CO5 : apply commands and scripts in Linux, Unix and Perl, configure and manage Apache web servers and develop dynamic web applications using PHP integrated with MySQL. [K3]

UNIT I

Linux – The Choice of a GNU Generation: Introduction: Linux Distributions, Linux Partition Sizes, Account, Security – Basic Unix: Shell, Owner, Groups, Permissions, Ownership, Processes, PATH and Environment, Commands, Basic Filesystem Essentials.

(6 Hours)

UNIT II

Apache Web Server: Introduction – Starting, Stopping, and Restarting Apache – Configuration – Securing Apache: Set User and Group, Remove Online Manuals, Considering Allowing Access to Local Documentation, .htaccess, Remove server-status and server-info. (6 Hours)

UNIT III

Perl: Introduction – Perl Documentation – Perl Syntax Rules: A First Perl program, Another Example, Declaring variables with use strict;, variables, Operators, Flow Control Constructs, Functions, File I/O, Additional Perl Constructs, Making Operating System Calls. (6 Hours)

UNIT IV

MySQL: Introduction – Tutorial: The SHOW DATABASES and CREATE DATABASE Commands, The USE Command, The CREATE TABLE and SHOW TABLE Command, The DESCRIBE Command, The INSERT Command, The SELECT Command, The UPDATE Command, The DELETE Command – Table Joins – Loading and Dumping a Database. (6 Hours)

UNIT V

PHP: Introduction – Embedding PHP into HTML – Language Syntax, Built-In PHP Functions – PHP and MYSQL. (6 Hours)

SELF-STUDY: (Not included for Examination)

Apache Web Server: Creating Web Site (Section: 3.5)

TEXT BOOK

James Lee, Brent Ware. (2003). *Open Source Web Development with LAMP using LINUX, Apache, MySQL, Perl and PHP*, Pearson Education Inc.

UNIT	CHAPTER	SECTIONS
I	2	2.1.1, 2.1.4 – 2.1.6, 2.2.1 – 2.2.6
II	3	3.1 – 3.3, 3.4.1 – 3.4.3, 3.4.5, 3.4.6
III	4	4.1, 4.2, 4.3.1 – 4.3.6, 4.3.8 – 4.3.11
IV	5	5.1, 5.2, 5.4, 5.5
V	12	12.1, 12.2, 12.5 – 12.7

REFERENCE BOOKS

1. Eric Rosebrock, Eric Filson. (2004). *Setting up LAMP: Getting Linux, Apache, MySQL and PHP and working together*, John Wiley and Sons.

2. Anthony Butcher. *Teach Yourself MySQL in 21 days*, 2nd Edition, Sams Publication.
3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska. *Apache Administrator's Handbook*, Sams Publication.
4. Tammy Fox. *RedHat Enterprise Linux 5 Administration Unleashed*, Sams Publication.
5. Naramore Eligabette, Gerner Jason. (2005). *Beginning PHP5, Apache, MySQL Web Development*, Wiley Publishing Inc.

WEB RESOURCES

1. Introduction to Open-Source and its benefits – GeeksforGeeks
2. https://www.bing.com/

Course Code 24UDSS61	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	2	1	1	1	1	1	2	1	-	-
CO2	2	2	2	2	1	2	2	2	1	-
CO3	2	1	1	1	1	2	2	1	1	-
CO4	2	2	2	2	2	2	3	2	2	1
CO5	2	2	2	3	2	2	3	2	2	1

Strong (3) Medium (2) Low (1)

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